Technology in Support of Healthy Aging
Innovations in the Design of Electronic Cognitive Prostheses

rmb@kmdi.utoronto.ca | University of Toronto
Department of Computer Science and Knowledge Media Design Institute
Baycrest, Columbia University, Progevity Neuroscience Inc., Sunnybrook Health Sciences Centre, University of Windsor, Toronto Rehabilitation Institute

Research Framework and Design Space

What cognitive process?
- Reminding, reminiscing, recognizing, finding, communicating, ...

For whom?
- Individuals with Alzheimer’s Disease (AD), or Mild Cognitive Impairment (MCI)
- “Normally aging” senior citizens

Who is actually the “user”?
- Person with cognitive impairment
- Caregiver
- Family member

What design approach is to be used?
- User-centered design (UCD), design for users
- Participatory design (PD), design with users
- Patient-centered design, design for individual

What technology to employ?
- Desktop or laptop computers
- Mobile phones
- Streaming media
- Ubiquitous computing devices

Goals for Technology?

Diagnostic
- Detecting cognitive decline

Prosthetic
- Compensating for loss

Rehabilitative
- Improving cognition

Preventative
- Delaying cognitive decline

Multimedia Biographies

Challenge: Facilitate reminiscing and social interactions for individuals with AD or MCI
Technology: DVD-based multimedia biographies
Participants: 6 AD and 6 MCI patients + family members and caregivers
Outcomes: Engagement, reminiscing, enjoyment, family interaction, legacy for family, understanding/empathy by third party caregivers
INSIGHT: “Cognitive prosthetics” also profoundly psychosocial interventions — identity, personhood, communication, social stimulation

Sponsor: Alzheimer’s Association and Intel Corporation

Lifelogging and Digital Storytelling

Challenge: Recall recent experiences
Technology: For a series of special outings, compare & contrast the use of SenseCam (passive capture camera from Microsoft Research) image streams to authored SenseCam narratives produced by caregivers
Participants: 12 patients with AD or MCI + caregivers
Conjectured Outcomes: Improved re-experiencing of personal events, family interactions

Sponsor: Microsoft Research

Mobile Phone Software for Name Recall

Challenge: Recalling names
Technology: Mobile phones with location-sensing inference engine – elicit social network, use tags to compute a list of people most likely to be encountered by the user
Participants: “Normally aging seniors” and MCI patients
Conjectured Outcomes: Improved ability to recall names, more confidence in one’s abilities in social situations

Sponsor: Bell University Labs

Cognitive Gaming Website

Challenge: Improving cognitive performance
Technology: Website for cognitive and social stimulation via individual, competitive, and collaborative gaming. Also a tool for cognitive research studies
Participants: “Normally aging seniors”
Conjectured Outcomes: Increased cognitive reserve, decreased rate of mental aging, stimulation of online social interactions

Sponsor: NSERC