Technology Design for Older Adults

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How can technology ENHANCE the lives of older adults... by enabling, augmenting, empowering, advancing, energizing, engaging, etc.?

- Develop strategies to match technology support with active engagement
- Balance between technology support, augmentation, replacement
- Develop technologies to challenge and enhance functional capabilities
- Focus on issues of motivation, self-efficacy, integration, engagement, safety, privacy, social connectedness
Human Factors and Aging Laboratory: Support Independent (Successful) Aging

• Allow individuals to function effectively and independently as they age.
• Maintain personal autonomy.
• Retain and enhance ability to function in later life.
  ❖ Contributors to healthy aging and are thus laudable goals but challenging to accomplish...
Theme of my remarks....

• Embrace the complexity of the problem of designing technology for older adults!
• Guided by World Health Organization’s International Classification of Functioning, Disability and Health (ICF)
  
  • Disability as a continuum
  
  • Activity and participation as equal goals
Response to challenges of aging

SOC Model of Aging

Selection
- Elective Selection – choosing goals
- Loss-based selection – pruning goals

Optimization
- Distribution of existing resources in support of maintaining performance

Compensation
- Using new resources (e.g., technology or outsourcing) to compensate for loss

Baltes & Baltes, 1990
CREATE Model of the Human/Technical System

Fisk, Rogers, Charness, Czaja, & Sharit (2009)
EXAMPLE OF DESIGNING ROBOTS FOR OLDER ADULTS
How do we design robots to support healthy aging?

• What do robots need to do?
  – Communicate with humans
  – Perform tasks for/with the person
  – Be trustworthy
  – Provide social support
  – Have an appearance people like

• Multi-faceted problem

• Solution success depends on:
  – understanding older adults’ capabilities, limitations, needs, preferences, attitudes
  – involving older adults in process of development and testing
What do people want their personal robots to look like?

It depends…

Prakash & Rogers (submitted)
Older Adults

Younger Adults

Robotic

Mixed

Human-like
1. Robotic

Chores: Cleaning your home

2. Mixed

Social Task: Chatting, playing game, or helping learn new skill

3. Human-like

Decision Making: Investing your money
Importance of Appearance

• What people want their robot to look like differs for:
  – Younger and older adults
  – Different types of tasks

• Have to consider the humans and the diversity of human needs and preferences
  – This understanding will facilitate the design of the most appropriate robots that will add to the functional capabilities of older adults
Framework for Human-Robot Interaction in Healthcare Contexts

**Human User**
- Age/education/sex
- Attitudes
- Cognitive
- Confidence
- Expectations
- Goals (comfort, speed)
- Motor
- Perceptual
- Personality/affect/emotion
- Preferences
- Robot experience
- Self-efficacy/locus of control

**Robot Characteristics**
- Adaptability
- Appearance
- Autonomy (programmed, independent)
- Consistency (predictability)
- Dexterity (manipulation)
- Error recovery
- Feedback/transparency
- Interaction method (voice, gesture, pointer)
- Learning method/state
- Maneuverability
- Personality/affect/emotion
- Reliability (accuracy)
- Responsiveness

**Task Constraints**
- Approach (front, side)
- Consequence of error
- Criticality
- Device/Supply features (thermometer, medication bottle, blood pressure)
- Dynamic process
- Interaction control demands (precision, method)
- Invasiveness
- Physical discomfort
- Proximity
- Speed/Accuracy requirements

**Context of Interaction**
- Care network
- Culture
- Living environment (private home vs. residential facility)
- Job demands
- Safety considerations
- Single/Multiple care provider(s)
- Single/Multiple care recipient(s)
- Social environment
- Stress level

**Successful Human-Robot Interaction**
Human User

- Age/education/sex
- Attitudes
- Cognitive
- Confidence
- Expectations
- Goals (comfort, speed)
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Conclusion

• Recognize the complexity of
  – Human-Technology Interaction
  – Human-Computer Interaction
  – Human-Automation Interaction
  – Human-Robot Interaction

• Challenging but solvable problems
  – Need to be guided by theory
    • Systematic and comprehensive approach
    • Develop generalizable solutions (not technology-specific)
Center for Research and Education on Aging and Technology Enhancement (www.create-center.org)

Technologies to Support Successful Aging with Disability (www.TechSAge.gatech.edu)

National Institute on Aging (National Institutes of Health) PO1 AG017211

National Institute on Disability and Rehabilitation Research (Department of Education) Grant H132E130037