Using Technology to Improve the Wellbeing, Quality of Life, & Social Connectivity of Older Adults

Walter R. Boot
Florida State University
Talk Outline

• Brief introduction to CREATE & ENHANCE Centers

• An overview of aging and technology issues

• A sampling of research
  – Technology to support social connectivity and cognitive engagement

Note: CREATE, ENHANCE logos identify which Center/Grant supported the research
The Center for Research and Education on Aging and Technology Enhancement

Principle Investigators:
Sara J. Czaja, Walter R. Boot
Neil Charness, Wendy A. Rogers,
Joseph Sharit
The Center for Research and Education on Aging and Technology Enhancement is a multidisciplinary and collaborative center founded in 1999.

It is dedicated to ensuring that the benefits of technology can be realized to support and enhance the independence, productivity, health, safety, social connectedness, and quality of life of older people.
CREATE Research Aims

• Conduct research aimed at developing, implementing, and evaluating **technology-based solutions** that:
  – support cognitive health and engagement among aging adults with and without cognitive impairments
  – enhance interpersonal support and social engagement among aging adults
  – enhance the ability of older adults to engage in health management activities
CREATE Conceptual Model

Activity Domains
- Health
- Living Environments
- Work & Volunteer Activities
- Leisure Activities
- Communication & Social Engagement
- Transportation

Socio-Cultural Environment
- Social Network
- Culture
- Community

Older Adult
- Demographics
- Psychographics
- Perceptual
- Cognitive
- Psychomotor

Technology
- Hardware
- Software
- Interface
- Support

Task
- Complexity
- Familiarity
- Collaboration
- Temporal Demands

Physical Environment
- Ambient
- Geography
- Spatial

Demands
- Capabilities

- Capabilities

- Capabilities
ENHANCE is a Rehabilitation Engineering Research Center (RERC) funded by the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR; grant number #90REGE0012-01-00).

Enhancing Neurocognitive Health, Abilities, Networks, and Community Engagement

Principle Investigators:
Co-Directors: Walter R. Boot, Sara J. Czaja
Neil Charness, Wendy A. Rogers
Primary ENHANCE objectives are to:

1) understand the challenges older adults with cognitive impairments (CI) encounter with living activities, how these vary according to type of CI, and needed areas of and preferences for support;

2) identify, develop, and evaluate potential technology solutions;

3) advance new knowledge in the aging, cognitive disability, and technology space.
Cognitive Impairment Among Older Adults

18% of those 60 or older experience Mild Cognitive Impairment

Traumatic brain injury highest among those 75+

795,000 strokes in U.S. per year, age a major risk factor
Prevention, Rehabilitation, Augmentation, and Substitution

The PRAS framework, described in Charness (2020), describes how technology can support older adults at different stages of decline, including cognitive decline.

If prevention fails, rehabilitation aims to restore normal, healthy functioning.

If rehabilitation fails, augmentation aims to compensate for a person’s impairment in a way that allows them to use the faculties they still have.

If augmentation fails, lost bodily or mental functions are replaced by some sort of assistive device or drastic change in one’s interaction with the environment.

Stay functional for as long as possible by maintaining good health, good cognition, etc.

Charness (2020)
A Persisting (but closing?) Divide

*USA Internet Use by Age Group and Year*

- 18-29
- 30-49
- 50-64
- 65+

*USA Smartphone Ownership 2021*

- Cellphone
- Smartphone
- Cellphone, but not smartphone

Source: Pew Research Center
Additional Barriers:
Technology Proficiency

Source: CREATE Center
Consequences of the Digital Divide

The New York Times

THE NEW OLD AGE

Older People Need Rides. Why Aren’t They Using Uber and Lyft?

Seniors need transportation alternatives more than ever, but many are intimidated by ride-hailing apps.
User-Centered Design Approach

• Early and continual involvement of users
• Interactive process
  – Needs Assessments
    • Focus groups
    • Surveys
    • Interviews
  – Pilot testing of initial prototype
  – Usability testing
  – Redesign
  – Re-review
  – Efficacy testing
Case Example: Design and Evaluation of the PRISM Computer System

Welcome to PRISM, Michael

Email
Internet
Classroom
Calendar
Photos
Games
Community

It is Wed, Nov 30, 2011, 09:34 AM

PICTURE OF THE DAY: IMG_0457.JPG

TODAY’S QUOTE:
"The fact is, that to do anything in the world worth doing, we must not stand back shivering and thinking of the cold and danger, but jump in and scramble through as"

MIA, FL WEATHER BY: Yahoo! News

CURRENT CONDITIONS: Party Cloudy.
68°F

TODAY’S FORECAST: Mostly Sunny.
High: 77 Low: 53

Forecast at Yahoo! Weather
(provided by The Weather Channel)
Specific Aims

• Obtain information on the usefulness and usability of the PRISM system among a diverse sample of older adults.

• Examine the impact of access to the PRISM system on:
  – Social isolation
  – Social support
  – Well-being
  – Cognition

• Examine the impact of access to the system on:
  – Computer attitudes
  – Computer self-efficacy
  – Technology adoption
PRISM
Multi-Site Randomized Control Trial

Preceded by:
Survey Studies
Focus Group Studies
Cognitive Walkthrough & Heuristic Analyses
Usability Studies
Design and Redesign
## Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Control (N=150)</th>
<th>PRISM (N=150)</th>
<th>Overall (N=300)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>64 – 94</td>
<td>65 – 98</td>
<td>64 – 98</td>
</tr>
<tr>
<td></td>
<td>(75.24, 7.42)</td>
<td>(76.75, 7.10)</td>
<td>(76.00, 7.29)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>36 (25%)</td>
<td>30 (20%)</td>
<td>66 (23%)</td>
</tr>
<tr>
<td>Female</td>
<td>113 (75%)</td>
<td>121 (80%)</td>
<td>134 (77%)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school or less</td>
<td>53 (36%)</td>
<td>65 (44%)</td>
<td>118 (40%)</td>
</tr>
<tr>
<td>Some college/Vocational</td>
<td>61 (41%)</td>
<td>51 (34%)</td>
<td>112 (38%)</td>
</tr>
<tr>
<td>College graduate</td>
<td>23 (15%)</td>
<td>15 (10%)</td>
<td>38 (13%)</td>
</tr>
<tr>
<td>Post college graduate</td>
<td>11 (8%)</td>
<td>17 (12%)</td>
<td>28 (9%)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>15 (10%)</td>
<td>12 (8%)</td>
<td>27 (9%)</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>79 (53%)</td>
<td>79 (53%)</td>
<td>158 (53%)</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>48 (33%)</td>
<td>51 (34%)</td>
<td>99 (33%)</td>
</tr>
<tr>
<td>Non-Hispanic Other</td>
<td>6(4%)</td>
<td>7 (5%)</td>
<td>13 (4%)</td>
</tr>
<tr>
<td><strong>Health</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor/Fair</td>
<td>41 (28%)</td>
<td>39(26%)</td>
<td>80 (27%)</td>
</tr>
<tr>
<td>Good</td>
<td>68 (45%)</td>
<td>74 (50%)</td>
<td>142 (48%)</td>
</tr>
<tr>
<td>Very good/Excellent</td>
<td>40 (27%)</td>
<td>36 (24%)</td>
<td>76 (25%)</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (&lt; $30K)</td>
<td>118 (89%)</td>
<td>116 (85%)</td>
<td>234 (87%)</td>
</tr>
<tr>
<td>Medium ($30K - $59,999)</td>
<td>13 (10%)</td>
<td>18 (13%)</td>
<td>31 (11%)</td>
</tr>
<tr>
<td>High ( ≥ $60K)</td>
<td>1 (1%)</td>
<td>3 (2%)</td>
<td>4 (2%)</td>
</tr>
</tbody>
</table>
Binder Control Condition

• Notebook
  – Resource guide
  – Information/tip sheets
  – Calendar/Organizer
  – Information about community groups
  – Games – e.g., crossword puzzles

• Same number of contacts as PRISM condition
PRISM Outcomes

• Able to successfully train all participants on PRISM.

• Changes in Outcomes in the Expected Direction:
  – Increase in Social Support ($p < .01$)
  – Decrease in Loneliness ($p < .05$)
  – Increase in Well-being ($p < .05$)
  – Increase in Comfort with Computers ($p < .001$)
  – Increase in Computer Efficacy ($p < .001$)
  – Increase in Computer Proficiency ($p < .001$)

• Continued use of PRISM throughout the 12 months (~ 4 days/wk.)
  – Email
  – Internet
  – Games

I feel very, very fortunately for being part of the PRISM program...I’m lonely and alone and I appreciate the computer so much. It has brought me a lot of the email, a lot of information from the internet.

To pass time, I play the games. And I thank everybody involved with the PRISM program for this opportunity...I love the email, I can’t get out, so I love the email. And when I want some information, I go on Google or Yahoo.

And when I am able to sit longer, I like to play the games so keep my mind going...I think it's very helpful to me...when I was without it for few days, I really, really miss it. really did.
Emerging Technologies to Support Social and Cognitive Engagement

The pace of technology advancement is rapid
  – New potential to support older adults
  – But also, potentially new barriers

We are moving quickly to understand the potential of virtual and augmented reality to support older adults with and without cognitive impairment

These are preliminary investigations to prepare for larger clinical trials
ENHANCE Pilot Study

Aim: Explore the benefits of nature-based VR experience with older adults with and without cognitive impairment

50 participants
- Average age = 68 years
- 24 with probable MCI
  - MoCA < 26
- 10 with self-reported physical disability

(a) A tutorial helped participants to learn the VR controls. (b) The video module allowed participants to view short, 360-degree footage of local natural areas.
Social VR Experiment

$N = 36$ (18 dyads)

Preliminary Results

- Participants found the virtual experience to be engaging ($M=4.18$ out of $5$, $SD=0.91$).

- There was also a significant positive change in the calm–nervous dimension of mood after the shared virtual experiences ($t=2.53$, $p=0.022$).

- They also reported a relatively low workload ($M=2.86$ out of $7$, $SD=1.17$); measured via modified NASA TLX.

- Interest in reconnecting with their virtual partner ($M=3.69$ out of $5$, $SD=0.79$).
Upcoming CREATE Cross-site Pilot Trial

The sample will be stratified by sex within intervention versus control group and include **216 males and females** (72 at WCM; 72 at FSU; and 72 at UIUC) adults aged 65+

VR Program vs. Tablet Control

Summary of Findings

• Technology has massive potential to support the health, wellbeing, quality of life, and social connectivity of older adults

• However, this potential will not be reached unless a careful, user-centered, iterative approach is taken to the design of technology solutions
  – Needs assessments
  – Heuristic analyses
  – Usability testing
  – Redesign (and redesign again)
  – Efficacy trials
• CREATE and ENHANCE are committed to this approach and are developing novel technology solutions to benefit older adults with and without cognitive impairments.

• Emerging technologies are promising solutions to help support successful aging through social and cognitive support.
Tips for Learning New Technologies

• Don’t buy into ageist stereotypes!

• Take advantage of community resources

• Allow time for new learning
  – Don’t try to learn it all at once
  – Space learning sessions out over time

• Recognize the source of frustration if it occurs
  – It may not be you; it may be bad design!
Thank You and Questions

Sara J. Czaja
Walter Boot
Neil Charness
Wendy A. Rogers
Joseph Sharit