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

Walter R. Boot

Florida State University

CREATE

Center for Research and Education on Aging and Technology Enhancement

NIH National Institute on Aging

ENHANCE

Enhancing Neurocognitive Health, Abilities, Networks, & Community Engagement

NIDILRR

National Institute on Disability, Independent Living, and Rehabilitation Research

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

CREATE

Center for Research and Education on Aging and Technology Enhancement

Empowering Aging Adults through Technology

Principle Investigators:

Sara J. Czaja, Walter R. Boot

Neil Charness, Wendy A. Rogers,

Joseph Sharit

NIH National Institute on Aging

Grant P01 AG073090

www.create-center.org

About the CREATE Center

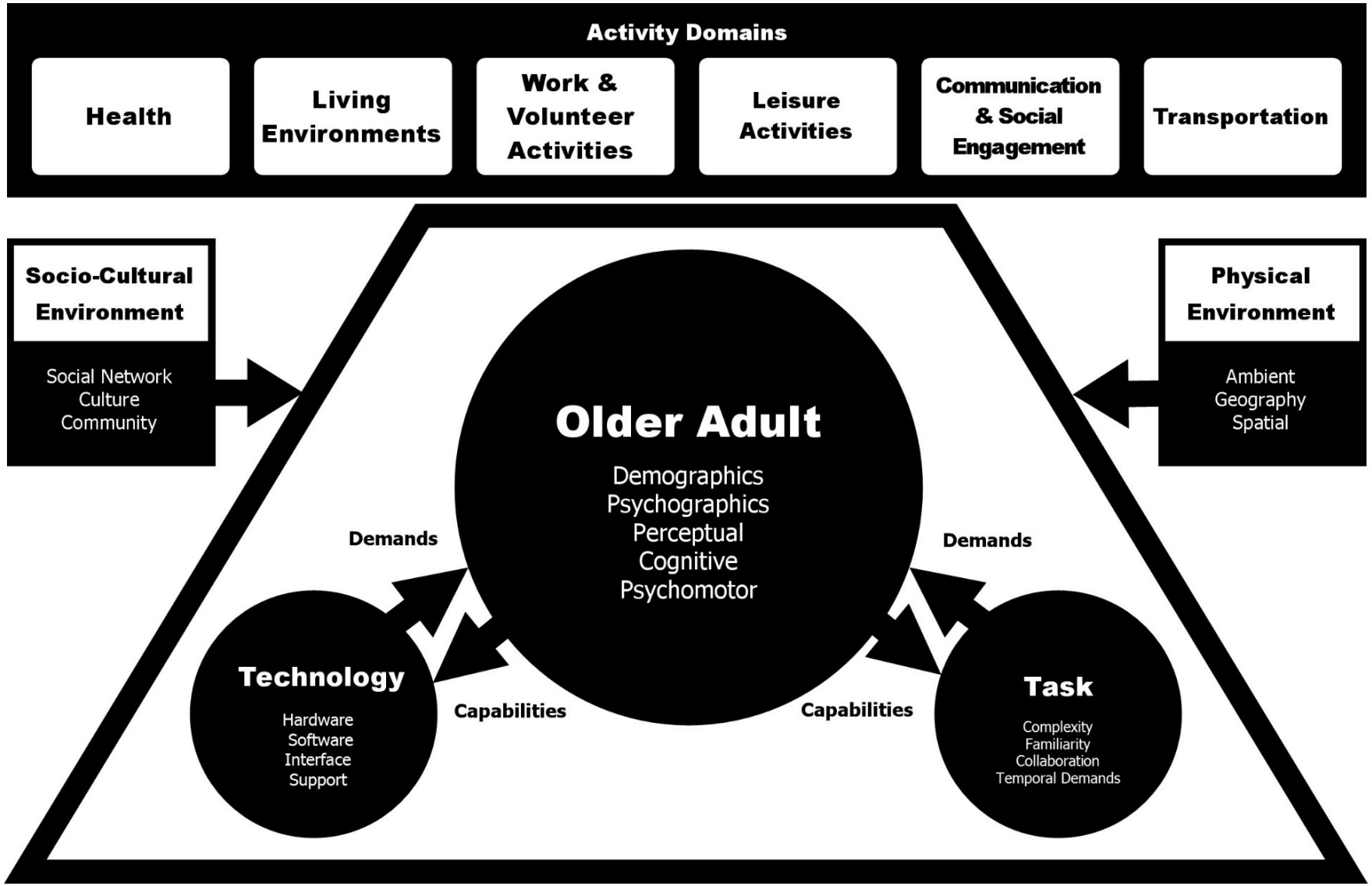
The Center for Research and Education on Aging and Technology Enhancement is **a multidisciplinary and collaborative center founded in 1999**.

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



ENHANCE

Center for Enhancing Neurocognitive Health, Abilities, Networks, & Community Engagement

Enhancing Neurocognitive Health, Abilities, Networks, and Community Engagement

Principle Investigators:

Co-Directors: Walter R. Boot, Sara J. Czaja

Neil Charness, Wendy A. Rogers

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).

www. enhance-rerc.org

About the ENHANCE Center

Primary ENHANCE objectives are to:

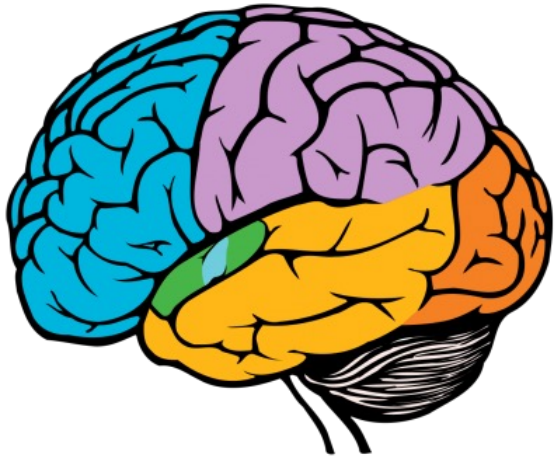
1) understand the challenges older adults with cognitive impairments (CIs) encounter with living activities, how these vary according to type of CI, and needed areas of and preferences for support;
2) identify, develop, and evaluate potential technology solutions;
3) advance new knowledge in the aging, cognitive disability, and technology space.

ENHANCE

ENHANCE

Cognitive Impairment Among Older Adults

18% of those 60 or older experience Mild Cognitive Impairment

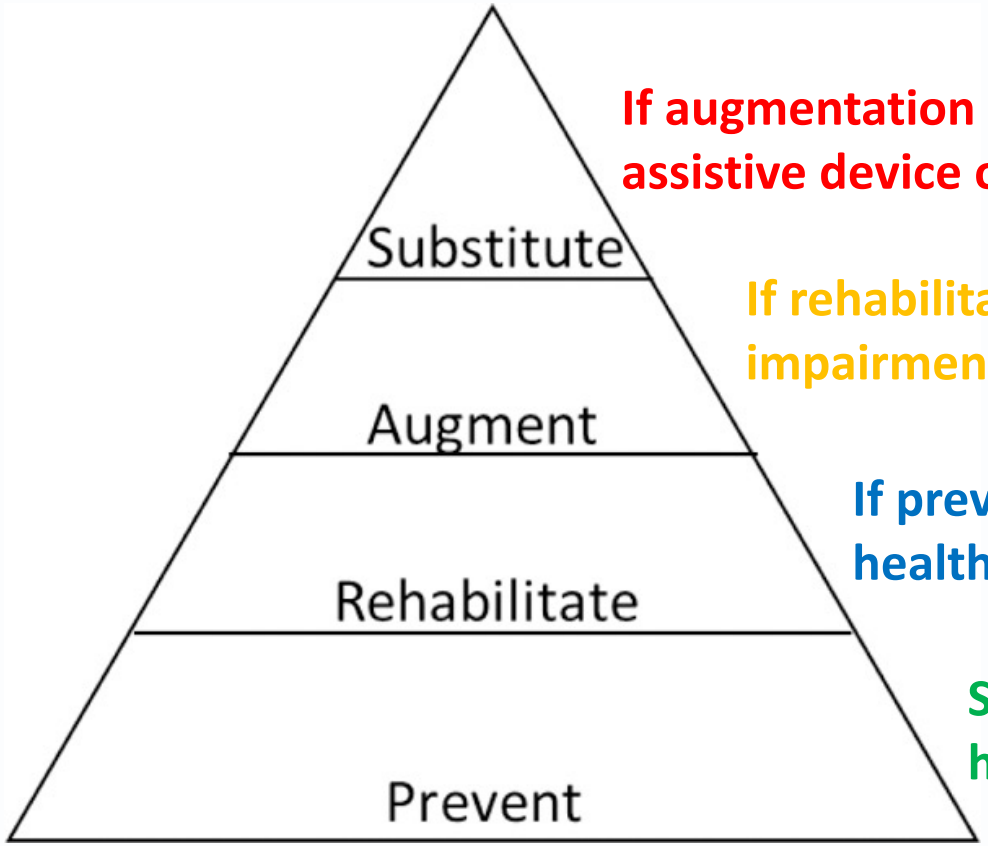


Traumatic brain injury highest among those 75+

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



Charness (2020)

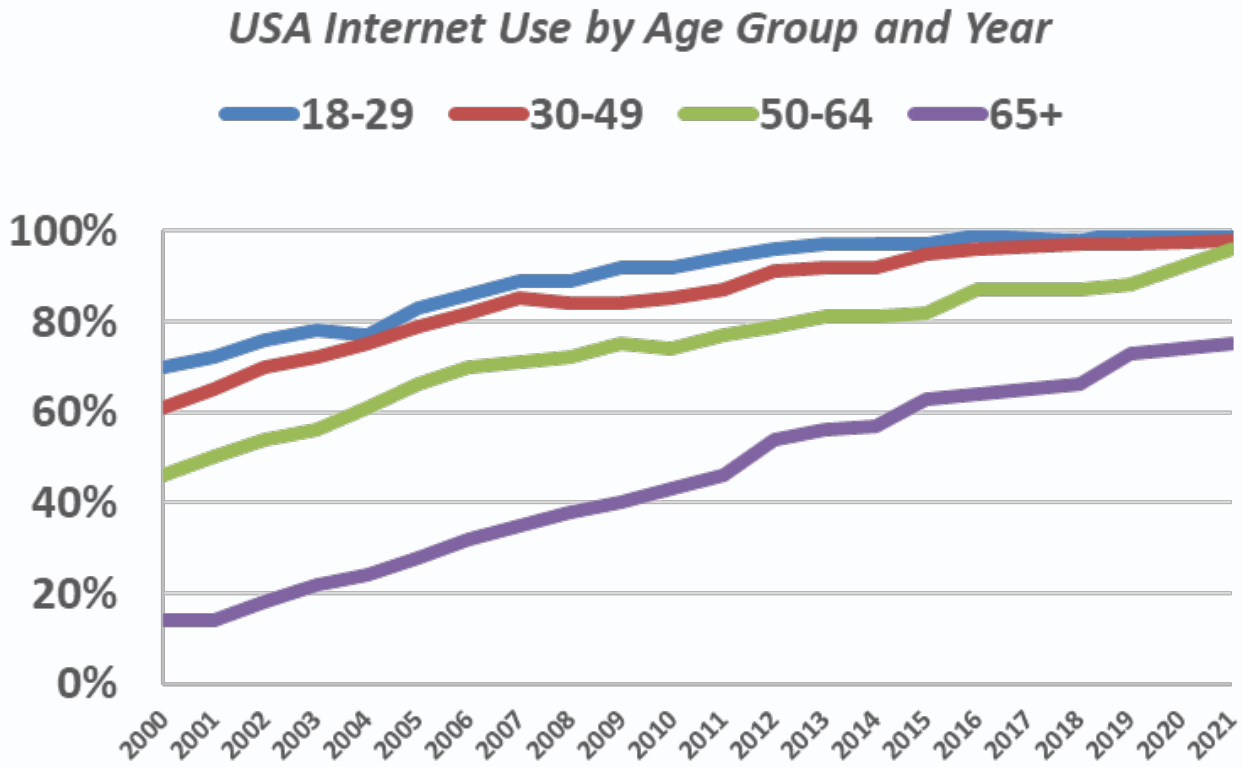
If augmentation fails, lost bodily or mental functions are replaced by some sort of assistive device or drastic change in one's interaction with the environment

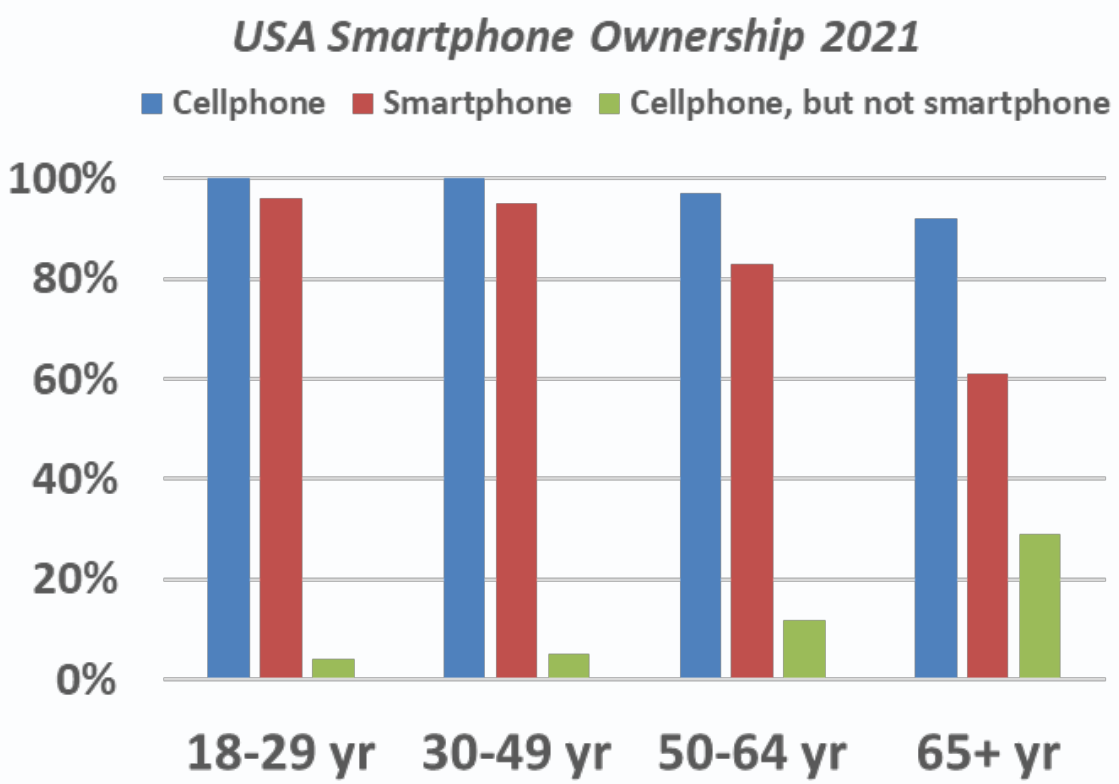
If rehabilitation fails, augmentation aims to compensate for a person's impairment in a way that allows them to use the faculties they still have

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

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

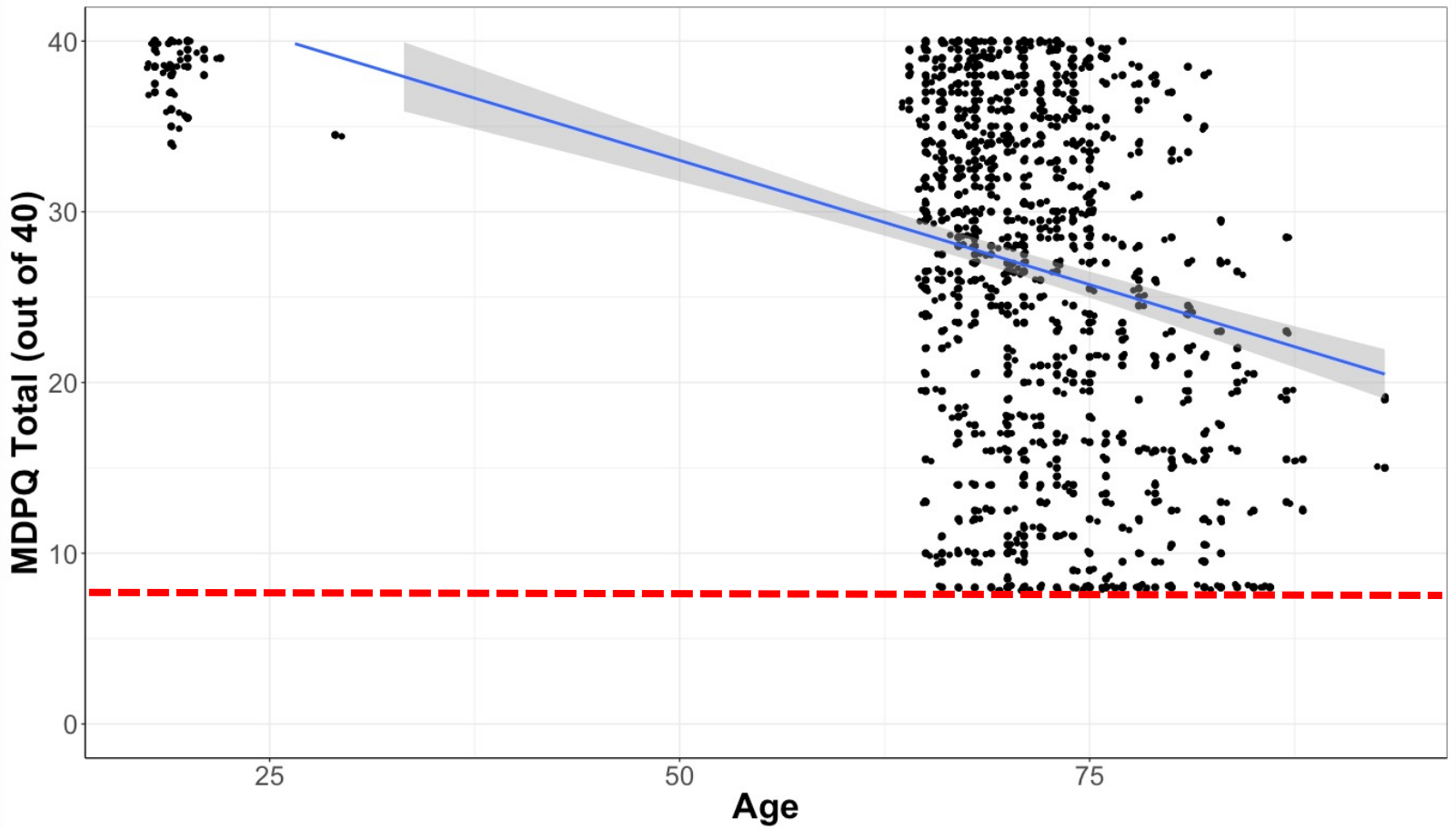
A Persisting (but closing?) Divide





Source: Pew Research Center

Additional Barriers: Technology Proficiency



Floor

Source: CREATE Center

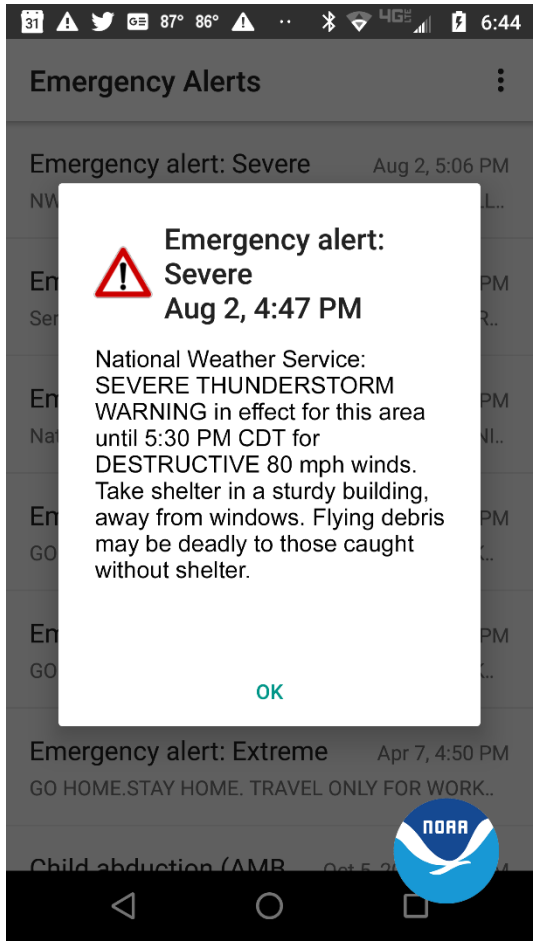
Consequences of the Digital Divide

The New York Times

THE NEW OLD AGE

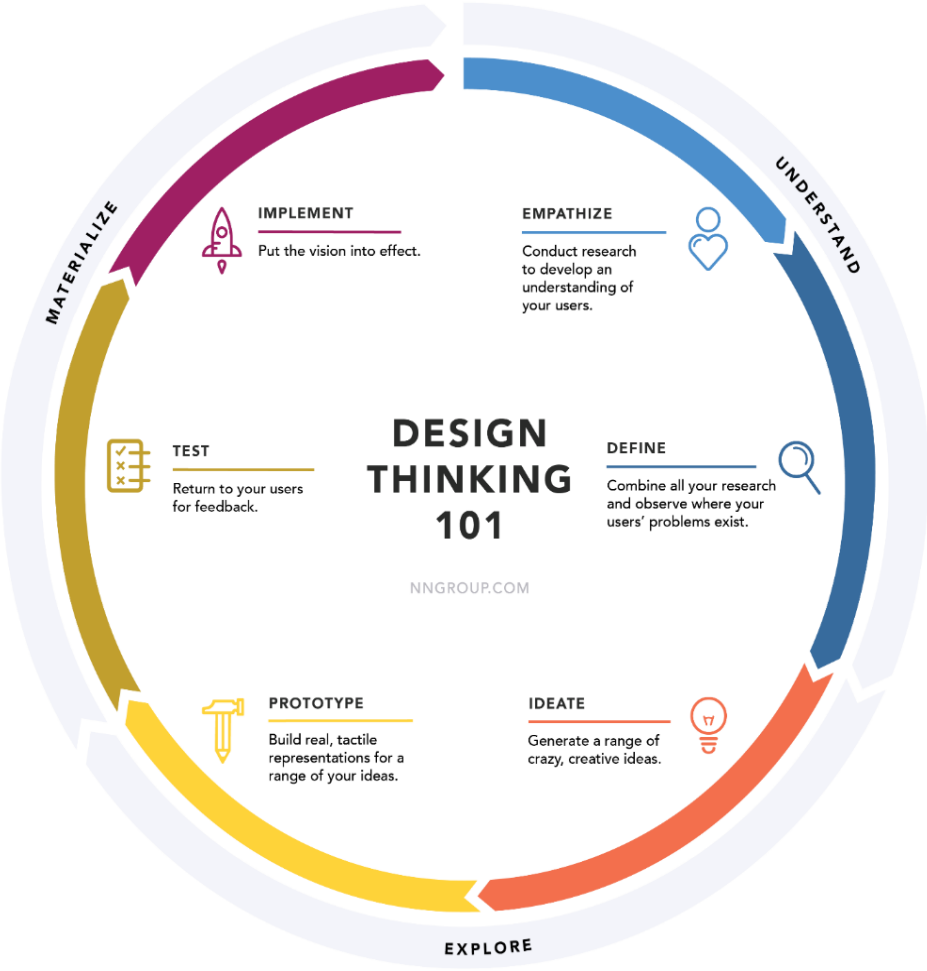
Older People Need Rides. Why Aren't They Using Uber and Lyft?

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

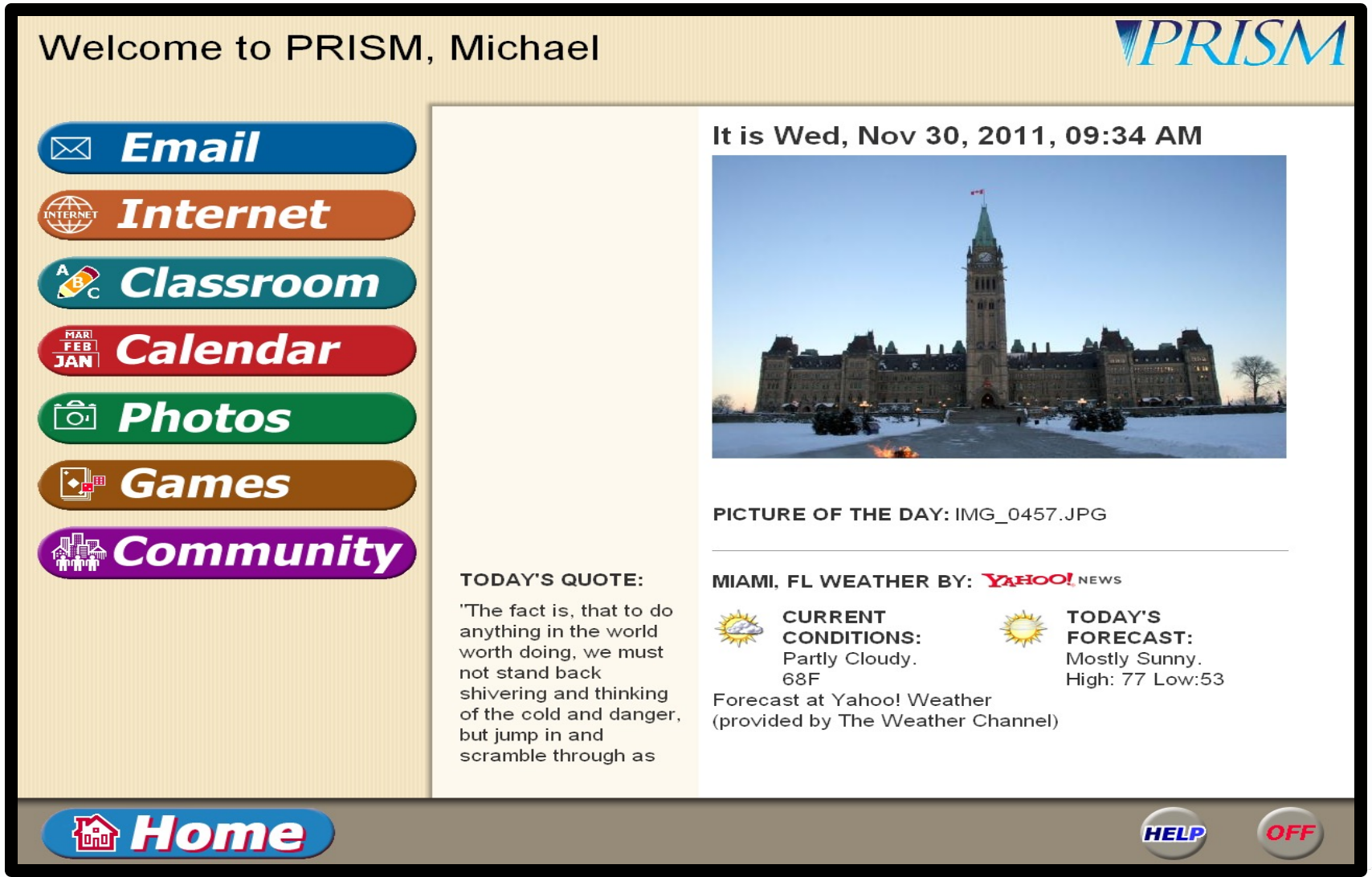


Case Example: Design and Evaluation of the PRISM Computer System

Software System designed for Older Adults

Personal
Reminder
Information
Social
Management
System

Target: Non-computer using older adults at risk for social isolation



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

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

Binder Control Condition

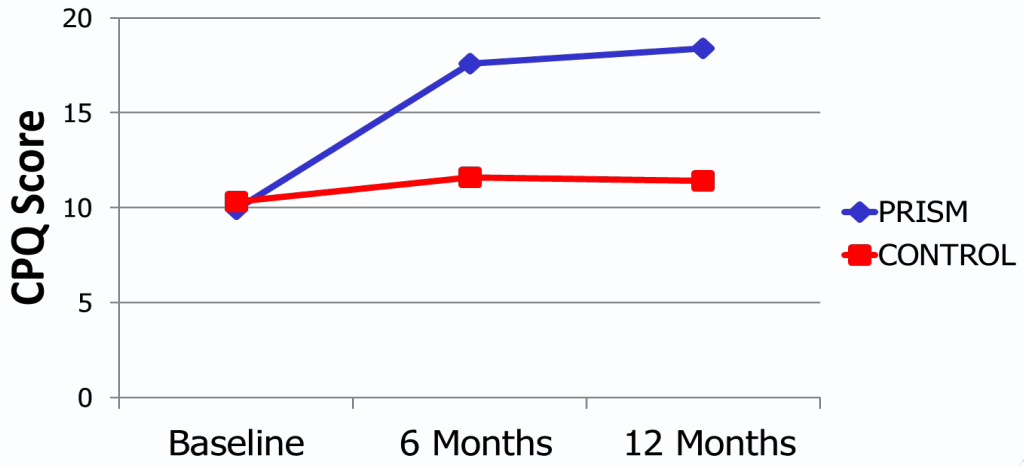
- Notebook
  - Resource guide
  - Information/tip sheets
  - Calendar/Organizer
  - Information about community groups
  - Games – e.g., crossword puzzles
- Same number of contacts as PRISM condition

PRISM Outcomes

- Able to successfully train all participants on PRISM.

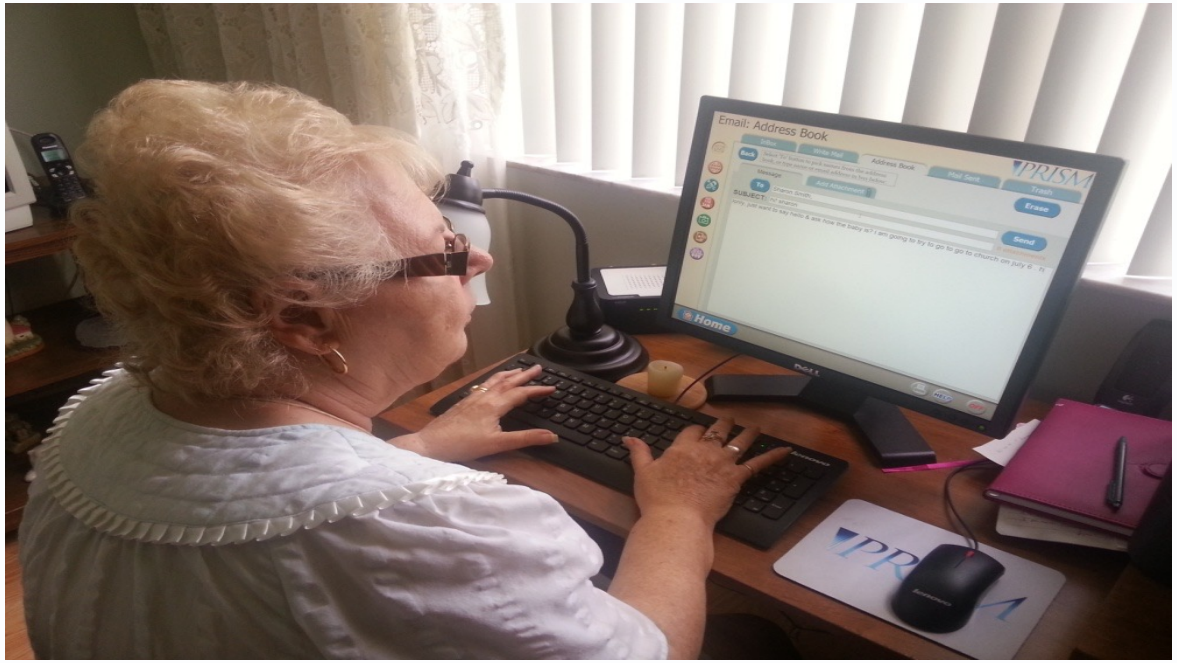
- Changes in Outcomes in the Expected Direction:
  - Increase in Social Support (p <.01)
  - Decrease in Loneliness (p < .05)
  - Increase in Well-being (p < .05)

  - 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

Czaja, S. J., Boot, W. R., Charness, N., Rogers, W. A., & Sharit, J. (2018). Improving social support for older adults through technology: Findings from the PRISM randomized controlled trial. *The Gerontologist*, *58*(3), 467-477



Church Newsletter

St. Benedict's Episcopal Church
A Part of the Anglican Community

People Are Important

Congratulations to [redacted] who completed the Senior program run by the University of Miami. She had to take a 3hr oral test every month and a 5 hr written test on the computer for a year to complete the course. She completed the course on June 11th and is now eligible to keep the computer and printer that was given to her to do the course.

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

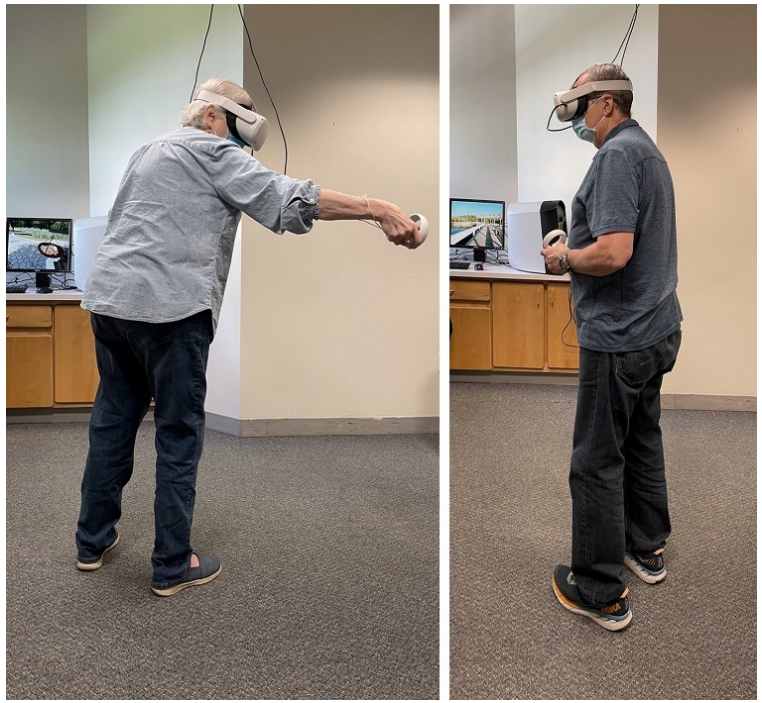
These are **preliminary investigations** to prepare for larger clinical trials

ENHANCE Pilot Study

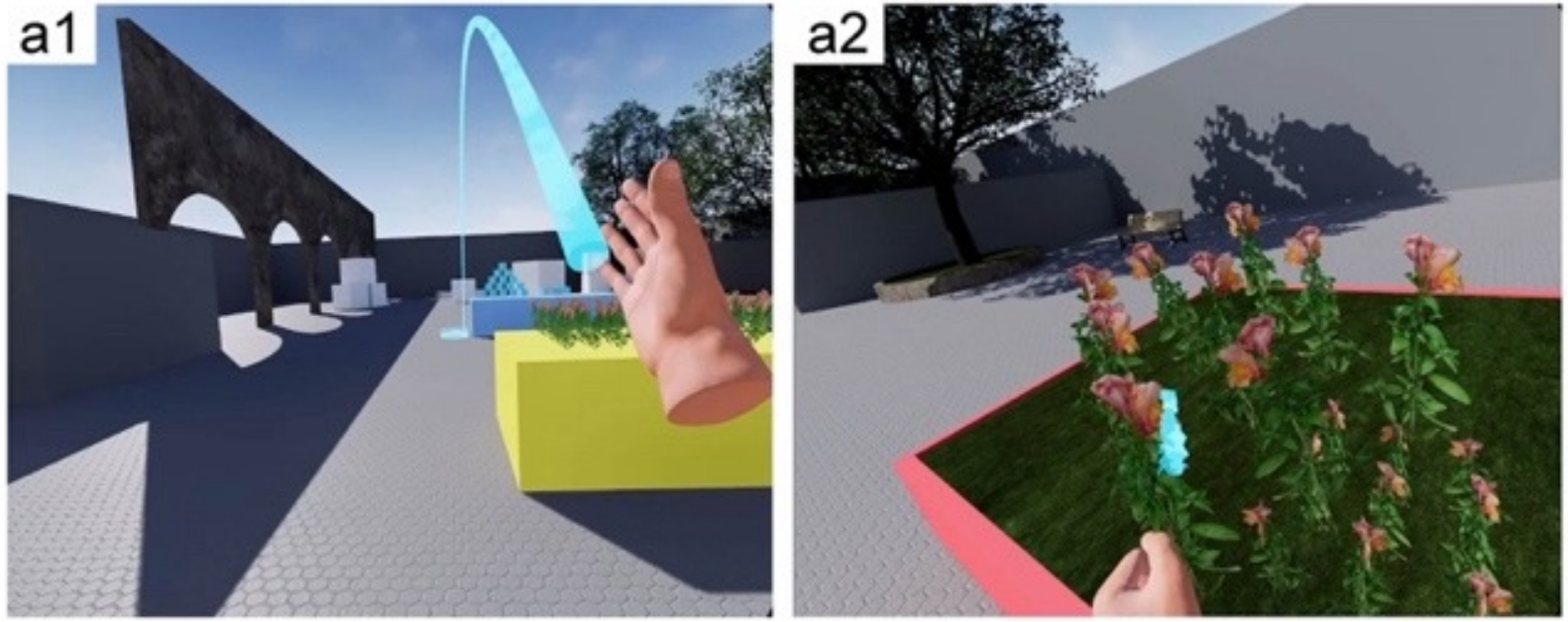
Aim: Explore the benefits of nature-based VR experience with older adults **with and without cognitive impairment**

50 participants

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

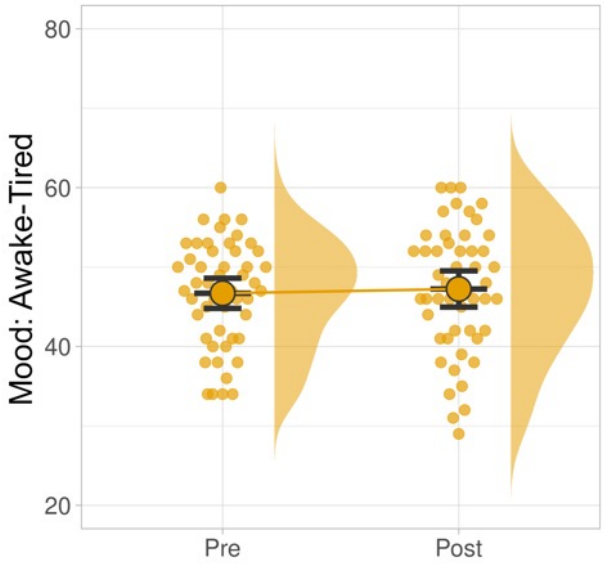


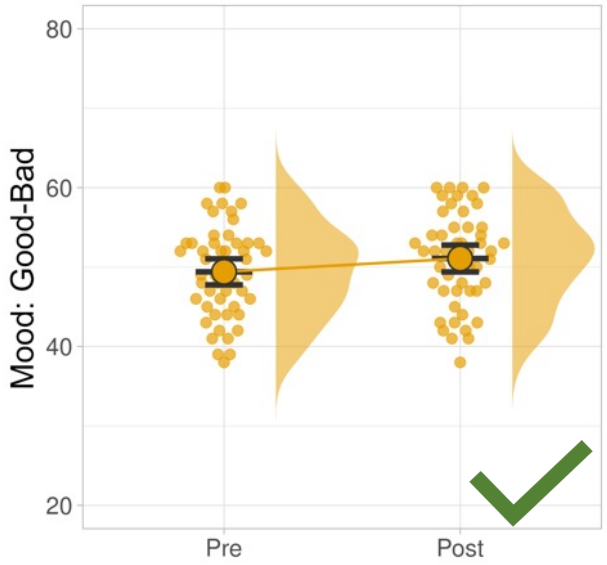
Kalantari, S., Xu, T. B., Mostafavi, A., Lee, A., Barankevich, R., Boot, W., & Czaja, S. (2022). Using a Nature-based Virtual Reality Environment for Improving Mood States and Cognitive Engagement in Older Adults: A Mixed-method Feasibility Study. Innovations in Aging.

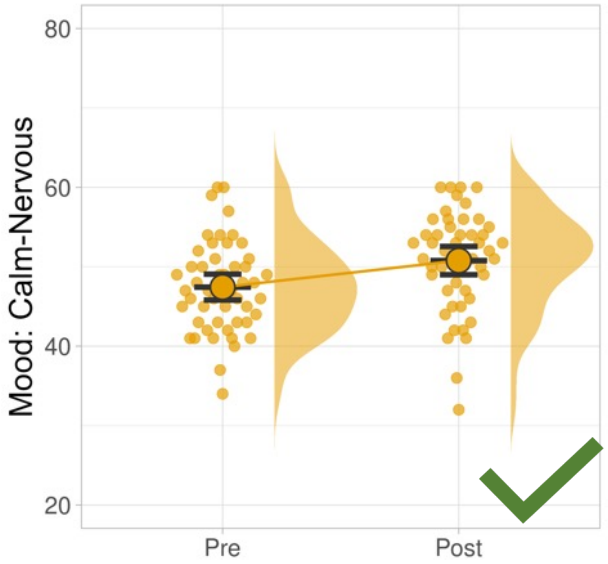


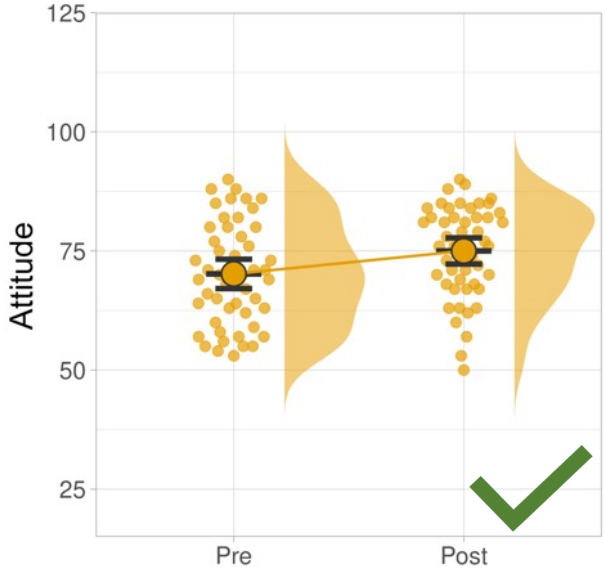
(a) A tutorial helped participants to learn the VR controls. (b) The video module allowed participants to view short, 360-degree footage of local natural areas.

ENHANCE


Mood: Awake-Tired
80
60
40
20
Pre
Post

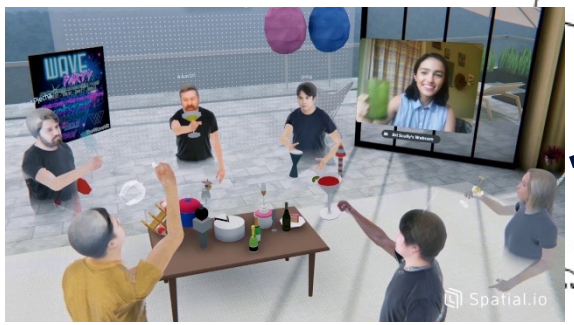

Mood: Good-Bad
80
60
40
20
Pre
Post

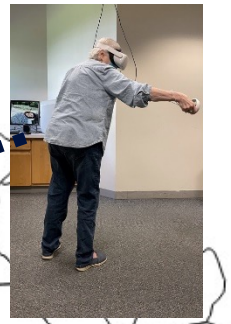

Mood: Calm-Nervous
80
60
40
20
Pre
Post


Attitude
125
100
75
50
25
Pre
Post

Social VR Experiment

N = 36 (18 dyads)





Weill Cornell Medicine

Kalantari, S., Xu, T. B., Mostafavi, A., Dilanchian, A., Kim, B., Boot, W., & Czaja, S. (2022). Using Immersive Virtual Reality to Enhance Social Interaction among Older Adults: A Multi-site Study. *arXiv preprint arXiv:2210.04954*.

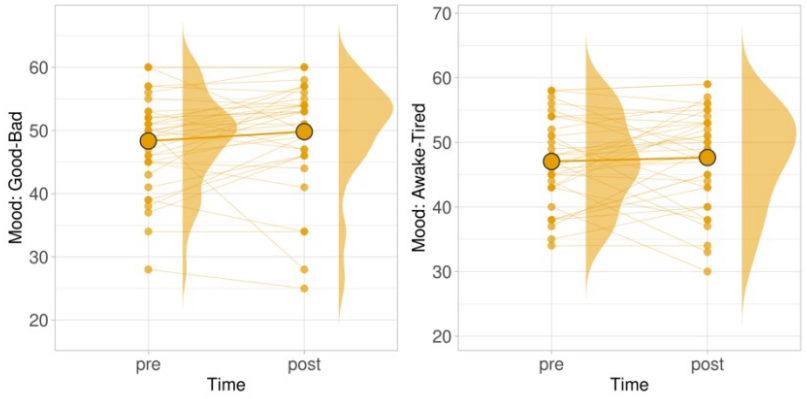
User 1

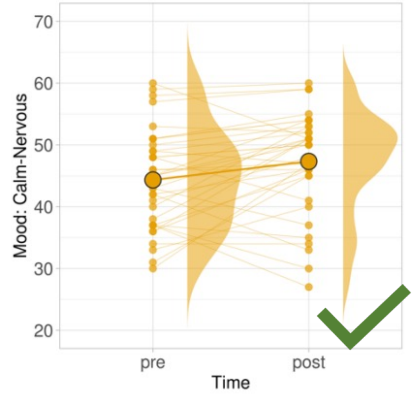
User 2

ENHANCE

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

Home-based intervention: Feasibility? Acceptability? Initial Efficacy?

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

Summary of Findings

- 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

National Institute on Aging

NIDILRR
National Institute on Disability, Independent Living, and Rehabilitation Research

CREATE

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

ENHANCE

- Sara J. Czaja
- Walter Boot
- Neil Charness
- Wendy A. Rogers