

# Imagine a World of Gerontechnology without Gerontechnologies:

## Design for Diversity is not Woke, It's a Wake-Up Call

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Technologies to Support Aging among People with Long-Term Disabilities

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# Gerontechnology vs. Gerontechnologies

| Feature  | Gerontechnology (Discipline)                              | Gerontechnologies (Applications)                                 |
|----------|---|--|
| Scope    | Broad field of study and design                           | Specific, individual tools                                       |
| Focus    | "What and why" (Theory & Design)                          | "How" (Implementation & Usage)                                   |
| Goal     | Creating a sustainable, supportive, inclusive environment | Enhancing independence and daily functioning                     |
| Examples | Research on "aging in place," ergonomic design theories   | Smart alarms, robotic companions, telecare systems, mHealth apps |

Courtesy of Google Gemini, March 12, 2026

# Gerontechnology: Field

- **Designing technology and environment** for independent living and social participation of older persons in good health, comfort, and safety ([gerontechnology.org/about/](https://gerontechnology.org/about/)).
- A transdisciplinary field **using technologies** (systems and equipment) to promote healthy aging and to solve problems related to chores, leisure, communication, and safety (Halicka, 2019).
- A transdisciplinary field **to conduct research and development of technological products and services**, based on the knowledge of aging processes, and to provide innovative tools to contribute to independent living environments, support healthcare and family caregivers, and increase social participation of older adults to promote health, comfort, and safety (Moreno, et al., 2024a).

# Gerontechnologies: Products

- Technologically-based products, services, and environments that **improve the functioning and quality of life of older adults** (van Bronswijk et al., 2009).
- Innovative tools to **contribute to independent living environments, support healthcare and family caregivers**, and increase social participation of older adults to promote health, comfort, and safety (Moreno, et al., 2024a).
- ...used to **prevent, delay, or compensate for physical, cognitive, and sensory decline** associated with aging (Colner, et al., 2020).

# What Products? – an Academic Perspective

- Products Useful for Successful Aging
  - **All technology** applied to the full human life span as far as it aims at **increasing quality of life in older age categories** (van Bronswijk, et al., 2009).
  - **Digital and non-digital applications to support aging in place**, including tools for medication administration (e.g., reminders and alarms), to environmental monitoring (e.g., air quality sensors and cameras), to fall detection systems, and health and activity monitoring (e.g., smartwatches) (Moreno, et al., 2024a).
  - COVID-19 accelerated the development and adoption of technological solutions to support remote care and communication (e.g., video calls) and home service delivery (e.g., meals and groceries) (Moreno, et al., 2024a).
- Academic, all-inclusive approach to types of technologies is evident in 2 systematic reviews...

# Systematic Review of GT Adoption (Huang and Oteng, 2023)

- Search criteria: **Gerontechnology AND**...adoption, caregivers OR social care, health, quality of life OR happiness.
- 13 of 25 articles defined a specific technology or category of technologies used by older adults, including both mainstream and specialized technologies.
  - Mobile phone technology/mhealth for healthcare (4)
  - Voice assistants/interfaces (2)
  - Social technologies for communication
  - Smart home technology
  - Wireless activity trackers
  - Gamified wearables
  - Mobile bathtubs (?)
  - Intelligent wireless sensor systems for detecting health issues
  - Fall detection devices

Mainstream Technologies



Gerontechnologies

# Systematic Review of Technology Use (Moreno, et al., 2024)

- 13 studies published between 2016 and 2021 on use of gerontechnologies for home support in dyads.
  - Search criteria: **Technology**, home support, older adults, family caregivers.
- 13 different technologies, but common applications
  - Videoconferencing/voice activation to increase communication/reduce social isolation
  - Medical devices to monitor health (e.g., blood pressure, temperature)
  - Wearable sensors to monitor health (e.g., ECG, activity tracking)
  - Environmental sensors to monitor ambient conditions
  - Environmental sensors to monitor falls, changes in behavior/activity patterns
  - Pill dispenser/medication reminder to increase and monitor adherence

Mainstream Technologies



Gerontechnologies

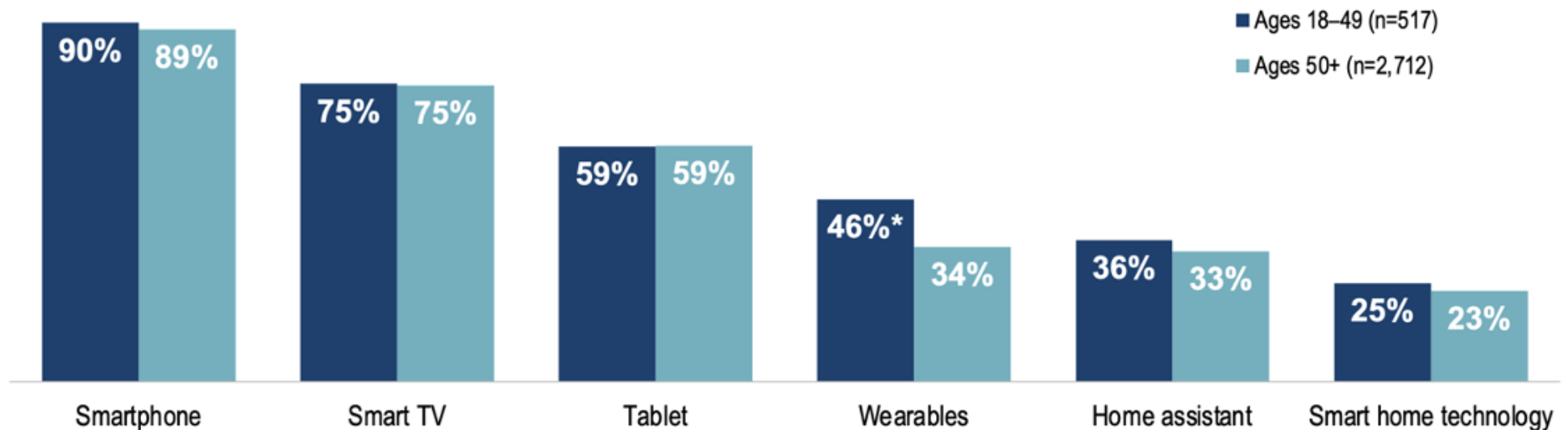
# Older Adults Adopt Mainstream Technologies

**Older adults ages 50-plus now own most devices at the same rate as those ages 18-49.**

In the past older adults adopt of technology devices may have lagged, but this year their ownership has reached parity with younger adults, with wearables being the exception.

**Percent of adults who own the following technology devices**

*By age range*



*Base: Total Respondents*

*QTech1/Q2. Which of the following items do you have/own? Q6. Do you currently own a smart TV?*

*\* Indicates a significant difference at a 95% confidence level*

# But not Specialized Technologies

- Study Findings

- Mainstream tech: improving overall health, performance, social connectedness preferred vs. specialized tech for specific conditions

(Huang and Oteng, 2023).

- Specialized tech: duplicated similar technology in the home, fear of being watched, stress from false alarms (Moreno, et al., 2024b).



- Take Home Messages

- Gerontechnologies (AgeTech, Eldertech), by the very label and purpose, are perceived as specialized.
- Adoption of mainstream technologies that support successful aging  $\neq$  adoption of specialized gerontechnologies.

# Gerontechnologies are Specialized

<https://esg.sustainability-directory.com/term/gerontechnology/#intermediate>



## Assistive Technologies

Compensate for age-related limitations to improve performance of daily tasks.

(SA: Colnar, 2020;  
<https://corealberta.ca>)



## Adaptive Technologies

Adapting the environment or task to better suit the capabilities of older adults



## Supportive Technologies

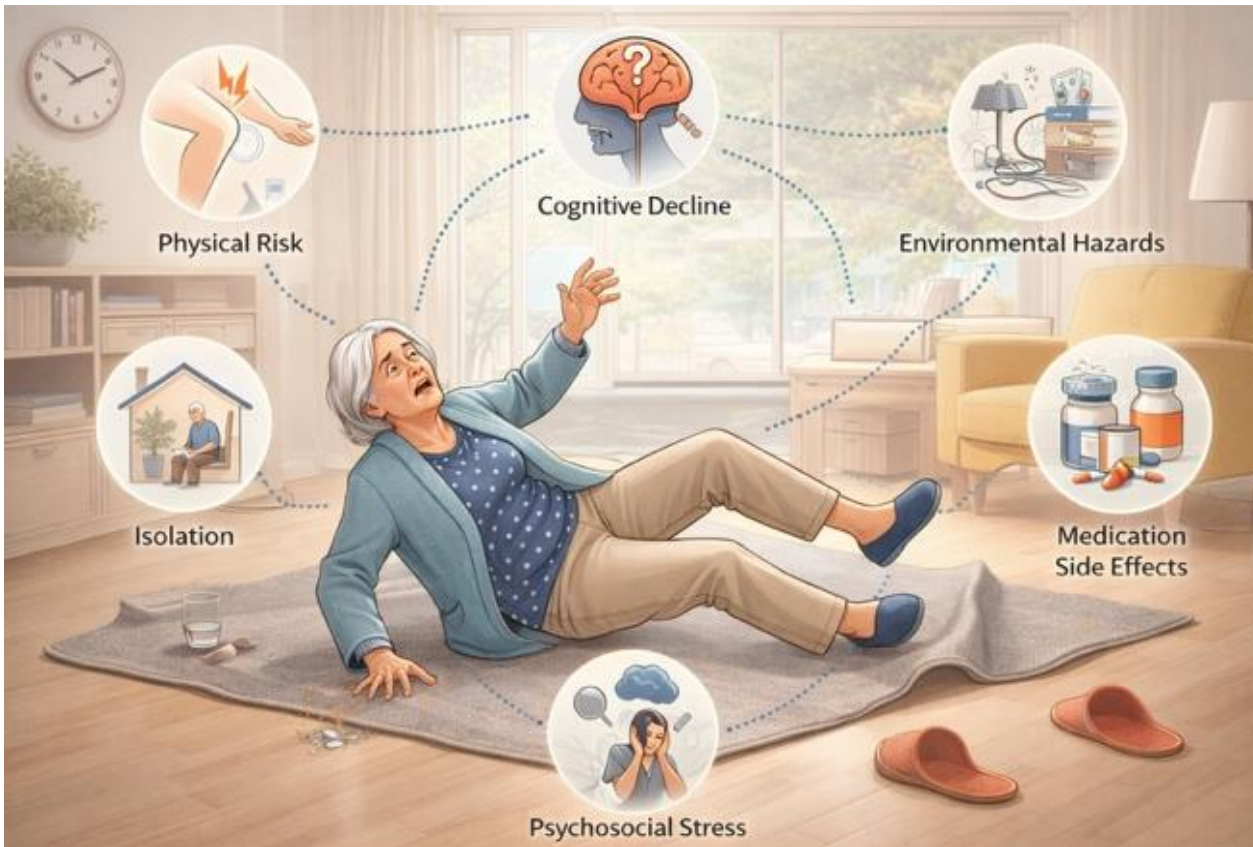
Enhance safety, adherence, and social connection through indirect support



## Rehabilitative Technologies

Restore function Aid in recovery and rehabilitation by restoring function

# Perceptions of Aging Impact Design



- Technology is shaped by language to describe aging (e.g., crisis, decline, tsunami) (Julie Brown, PhD, Assoc. Prof. Gerontology, Ohio University, LinkedIn post 3/9/2026).
- Drives negative stereotypical images of older people as frail, dependent, suffering from physical and cognitive decline (Colner, 2020, Gomez-Hernandez, 2024).

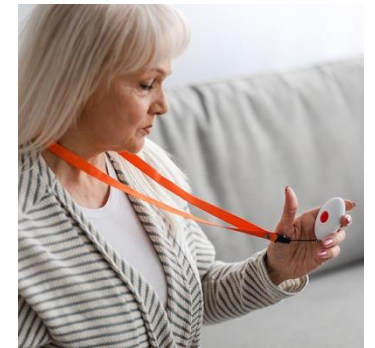
# Perception of Technology Impacts Adoption

- People resist technology built on assumptions of decline, but when it is based on independence and everyday life, technology becomes something people want to use.
- Leads to a mismatch between the design of GTs and the needs of older adults who neither match nor identify with this image (Giaccardia, et al., 2016).
- E.G. Neven, 2010.

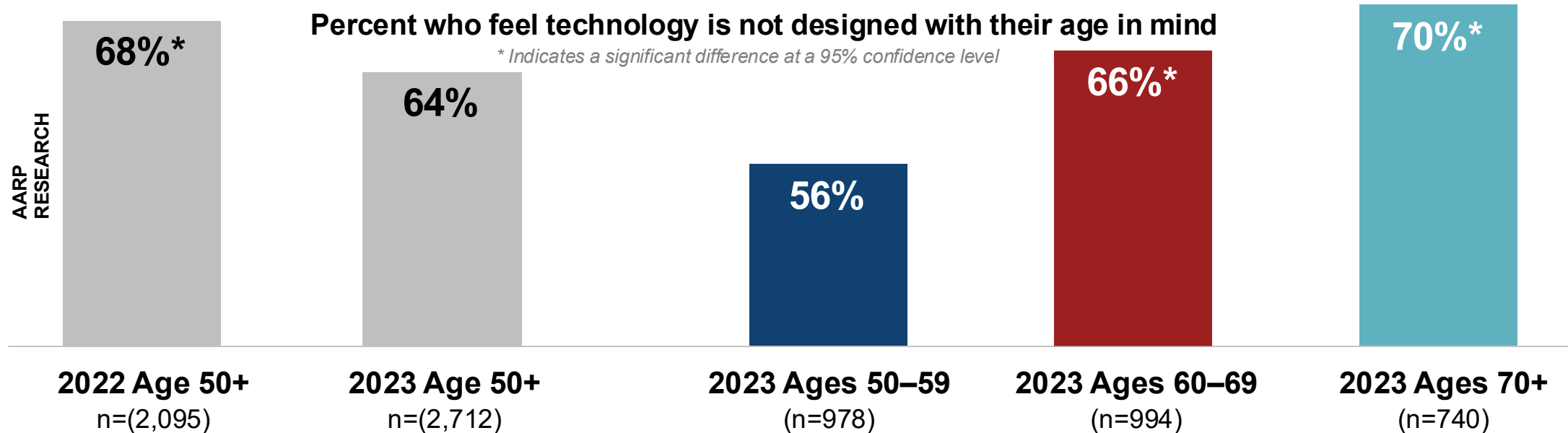


# Reasons for NonAdoption of Specialized GTs

1. **Geri-Centric:** It is perceived as only for older adults with health conditions, which causes stigma.
2. **Person-Centric:** It only supports the individual who needs it, potentially causing a barrier to others who occupy the same environment.
3. **Need-Specific:** It only works when it works, and when it doesn't it needs to be replaced with something else.
4. **Non-contextual:** Functional solutions are often not compatible with or integrated into the context of use, which is further stigmatizing.



# Mainstream Tech is not Designed for Older Adults



*“Older adults feel today’s technology is geared toward younger generations, is too complex, or needs more instruction or training” AARP 2024 Tech Trends and Adults 50+ (January 2024)*

- Perceived ease of use had a significant influence on acceptance of mainstream gerontechnologies, including devices for entertainment and communication, the internet, and microwave ovens (Huang and Oteng, 2023).
- Learning to use new technologies was difficult (Moreno, et al., 2024b).

# Transforming Mainstream Technologies for Older Adults in a ChatGPT Second



# Which AI Rings the Bell: ChatGPT vs Google Gemini



Courtesy of ChatGPT



Courtesy of Google Gemini

# A Toilet by any other Name, would...



Toto Neorest



Courtesy of ChatGPT



# Neorest for All vs. Neorest for Older Adults

| Feature Category            | Standard TOTO Neorest                        | GeroRest or Neorest "ComfortAge" (Older Adult Optimized)                       | Functional Impact                                 |
|-----------------------------|--|--|---|
| Seat Height                 | Standard comfort height (~15–16")            | Elevated comfort height (18–19"), slight forward tilt                          | Easier sit-to-stand transfer, reduced knee strain |
| Seat Illumination           | Bowl light only (cool white)                 | Warm amber illuminated seat ring + bowl glow                                   | Improved visual contrast, safer nighttime         |
| Floor Lighting              | Minimal or none                              | Soft base halo lighting activated at night                                     | Reduced nighttime fall risk                       |
| Support Arms                | Not integrated (requires external grab bars) | Built-in fold-down bilateral support arms                                      | Increased stability during transfers              |
| Control Interface           | Multi-button remote with small icons         | Simplified 3-button high contrast and tactile control, voice activation option | Reduced cognitive load                            |
| Motion Activation           | Auto lid open/close                          | Auto lid + lighting + gentle activation sequence                               | Reduced bending and balance shifts                |
| Wash Settings               | Multiple adjustable settings                 | Preset gentle mode optimized for aging skin                                    | Comfort + reduced tissue sensitivity              |
| Drying Function             | Standard timed dry                           | Extended adjustable dry cycle  | Less twisting/reaching                            |
| Health Monitoring           | Limited or none                              | Optional hydration + toileting pattern tracking                                | Early detection of UTIs or dehydration            |
| Aesthetic Direction         | Luxury modern minimal                        | Luxury modern with subtle stability cues                                       | Maintains dignity without medical look            |
| Primary Market Focus        | High-end residential luxury                  | Aging in place + universal design  | Expands accessibility market                      |
| Fall Prevention Integration | Indirect                                     | Directly integrated into lighting, height, support                             | Proactive safety enhancement                      |
| Caregiver Support           | Not emphasized                               | Emergency assist button + optional alerts                                      | Added layer of safety                             |

Courtesy of ChatGPT

# Useful and Usable Technology

- Must recognize needs, abilities, and preferences (Boot, 2022), complexity of their needs and wants; capabilities and limitations; attitudes and motivations (Rogers & Mitzner, 2016).
- Accommodate the dynamic nature of People, Environment, and P-E Fit
  - Not static data points – older adults move, improvise, and deviate from anticipated patterns (Gomez-Hernandez, 2024).
  - Not a homogenous group - there is a great variety in the everyday lives, abilities and needs are continually changing (Bouma, et al., 2009) as well as their interactions with their environment (Fozard, 2002).



# Call to Action (Rogers and Mitzner, 2016)

- To attain a future where technology meets the needs of older adults, we must act now;
- We must design the technology with involvement by today's older adults who represent the needs and capabilities of tomorrow's older adults;
- The technology must be integrated into people's lives at younger ages with adaptive functionality to support changing needs and preferences.
- To avoid the negative possible outcomes of future technologies that are neither useful nor usable, changes need to be made now.
- Designers need to understand the fundamentals of aging and consider age-related changes at the start of the design process.

# Inclusive Design to Inform Tech Development

- **Strategy:** Inclusive design enables older adults with a range of individual differences to actively participate in the design process, (Bouma, et al. 2009).
- **When:** Older adults should be included early on in the design process to ensure usefulness and usability (Rogers and Mitzner, 2016).
- **How:** Co-creation/co-design with users Can increase acceptability (Moreno, et al. 2024b).



# AgeTech as Inclusive Design (A. Jung, post on Medium)

- Definition of technology for older adults is the same: “AgeTech refers to technologies, products, and services designed to support older adults...”
- Gerontechnology provides theoretical rigor, methodological frameworks, and evidence-based evaluation, AgeTech accelerates translation, adoption, and scaling in real-world contexts.
- **Older adults are viewed as active users and consumers**, emphasizing autonomy, prevention, and quality of life rather than decline or dependency.



**Older adults contribute their wants and needs throughout the design process**

# Question 1: Who is Included?

5 Specialized Controls to Replace 1 Mainstream Product



Easy Remote for Seniors, Alzheimer's Store



Remote for Older Adults



Remote for People with Low Vision



Remote for People who are Blind



Remote for People with Low Vision, Blind or Impaired Hand



Remote for People with Alzheimer's

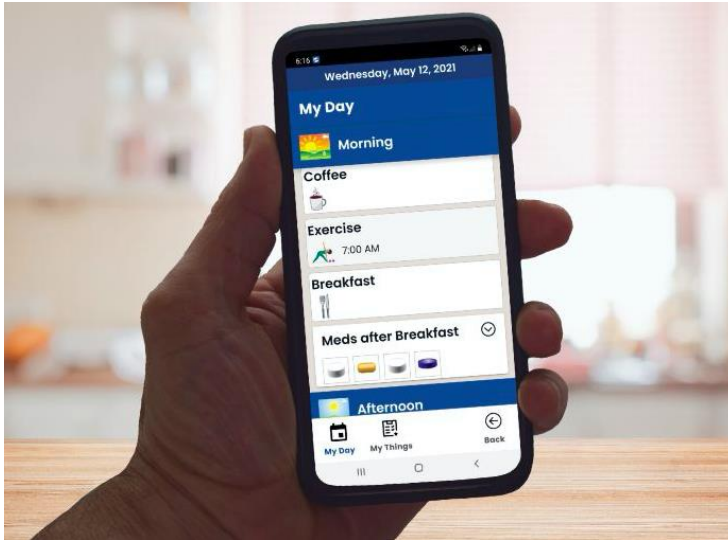
## Question 2:

# Is AgeTech Better than Mainstream Tech?

CR Accessibility and Aging



# Question 3: Is it AgeTech or Just Tech?



**MAXminder's** medication reminders include photo-realistic images of actual pills, showing their shapes and colours.

<https://agewell-nce.ca/impact-profile-paul-lea>

## AgeTech startups commercialize and launch valuable products with help from AGE-WELL

**DataDay** is a new app designed to support people with early dementia or mild cognitive impairment. Its name is a play on “day-to-day” because it structures and follows users’ daily routines.

<https://agewell-nce.ca/archives/7240>



# Designing for Diversity

- Inclusive design strategies are a step in the right direction
  - But older adults are not a homogenous population.
  - Products only represent contributions of those individuals who are engaged.
  - AgeTech products may still be specialized—just differently specialized.
  - Or, not specialized at all – i.e. Mainstream
- Design for diversity
  - Older adults preferred and are using mainstream technologies.
  - Design of mainstream products based on the needs of all individuals, regardless of age or ability = a more inclusive and effective design and marketing strategy.



Create an image that represents a technology that is designed for a diverse population. **Gemini:** This image illustrates the concept of **inclusive design**, where technology is built from the ground up to be accessible and useful to as many people as possible, regardless of background or ability.

# Universal Design is Design for Diversity

- Mace, 1991
  - The design of **everyday** [i.e., mainstream] products and spaces to be usable by all people to the greatest extent possible without the need for adaptation or specialized design.
- Overcomes the Limitations of Specialized Design
  - **Generalizable**: Useful to multiple individuals regardless of ability.
  - **Sustainable**: Useful across the lifespan of an individual and the environment.
  - **Usable**: Sets a baseline for usability that will reduce or eliminate need for specialized designs.
  - **Contextual**: Integrates physical and digital environments.

# UD 101 Refresher: Principles of Universal Design

Inclusivity



1. Equitable Use

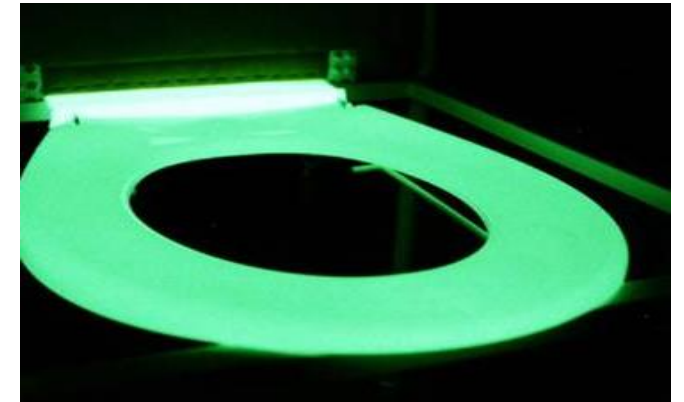
Usability



2. Flexibility in Use



3. Simple & Intuitive Use



4. Perceptible Information



5. Tolerance for Error



6. Low Physical Effort



7. Size and Space for Approach and Use

# Lets Take Aother Neorest “ComfortAge”

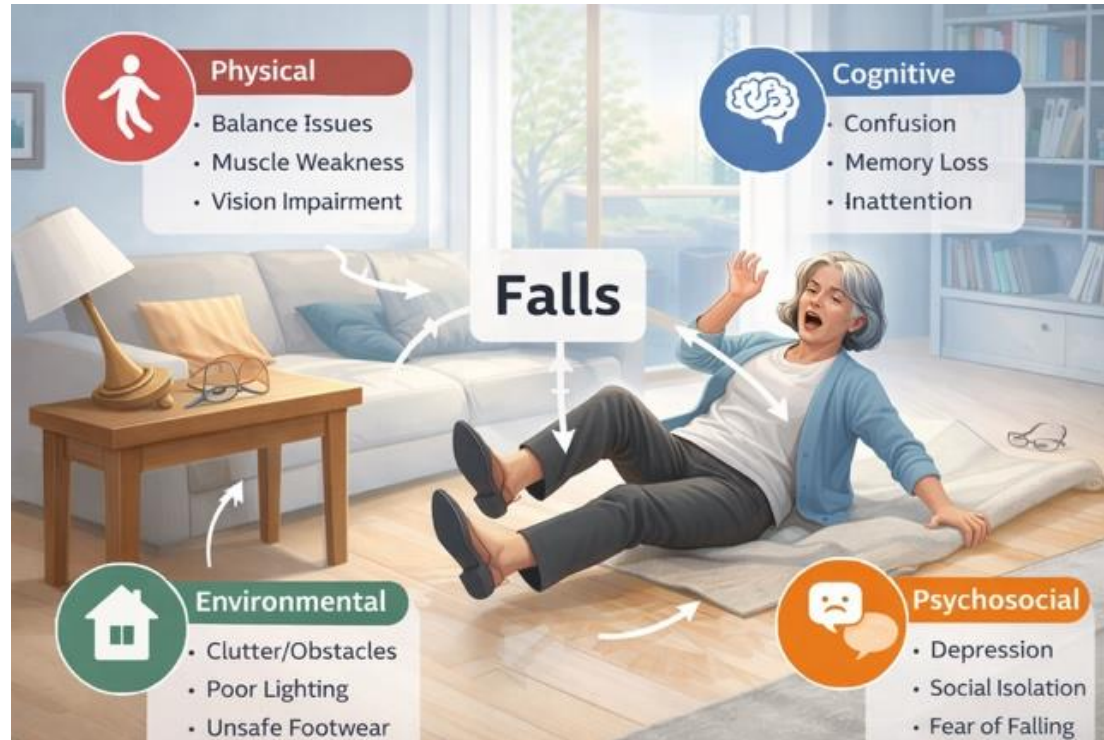
| Feature Category            | GeroRest/Neorest “ComfortAge”  | Functional Impact                                 | Universal Design Principle  |
|-----------------------------|--|---|---|
| Audio Guidance              | Voice prompts  | Reduced cognitive load                            | P3. Simple and Intuitive Use  |
| Seat Height                 | Elevated comfort height (18–19”)/slight forward tilt                           | Easier sit-to-stand transfer, reduced knee strain | P6. Low Physical Effort   |
| Seat Illumination           | Warm amber illuminated seat ring + bowl glow                                   | Improved visual contrast, safer nighttime         | P4. Perceptible Information   |
| Floor Lighting              | Soft base halo lighting activated at night                                     | Reduced nighttime fall risk                       | P5. Tolerance for Error   |
| Support Arms                | Built-in fold-down bilateral support arms                                      | Increased stability during transfers              | P2. Flexibility in Use<br>P5. Low Physical Effort<br>P6. Tolerance for Error<br>P7. Size & Space for Approach & Use |
| Control Interface           | Simplified 3-button high contrast and tactile control, voice activation option | Reduced cognitive load                            | P2. Flexibility in Use<br>P3. Simple and Intuitive Use<br>P4. Perceptible Information                               |
| Motion Activation           | Auto lid + lighting + gentle activation sequence                               | Reduced bending and balance shifts                | P6. Low Physical Effort   |
| Auto Flush Option           | Hands free flushing  | Reduced reaching and cognitive load               | P2. Flexibility in Use<br>P3. Simple and Intuitive Use<br>P5. Low Physical Effort                                   |
| Wash Settings               | Preset gentle mode optimized for aging skin                                    | Comfort + reduced tissue sensitivity              | P2. Flexibility in Use  |
| Drying Function             | Extended adjustable dry cycle  | Less twisting/reaching                            | P6. Low Physical Effort   |
| Health Monitoring           | Optional hydration + toileting pattern tracking                                | Early detection of UTIs or dehydration            | P2. Flexibility in Use  |
| Aesthetic Direction         | Luxury modern with subtle stability cues                                       | Maintains dignity without medical look            | P1. Equitable Use   |
| Fall Prevention Integration | Directly integrated into lighting, height, support                             | Proactive safety enhancement                      | P1. Equitable Use   |
| Caregiver Support           | Emergency assist button + optional alerts                                      | Added layer of safety                             | P5. Tolerance for Error   |

IT'S U.D.!

# Misconceptions: Gerontization of Universal Design

Query: Create a universal design bathroom

Courtesy of ChatGPT



AI perception of users who need UD

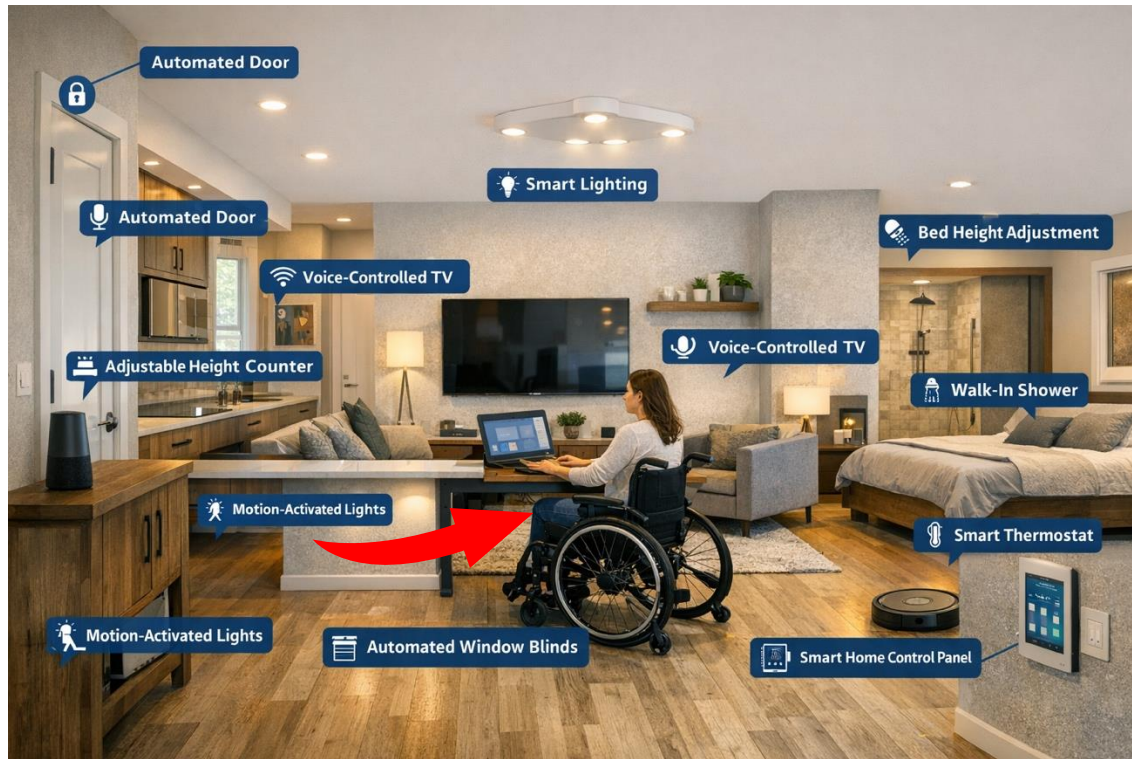


Accessible bathroom with universal design

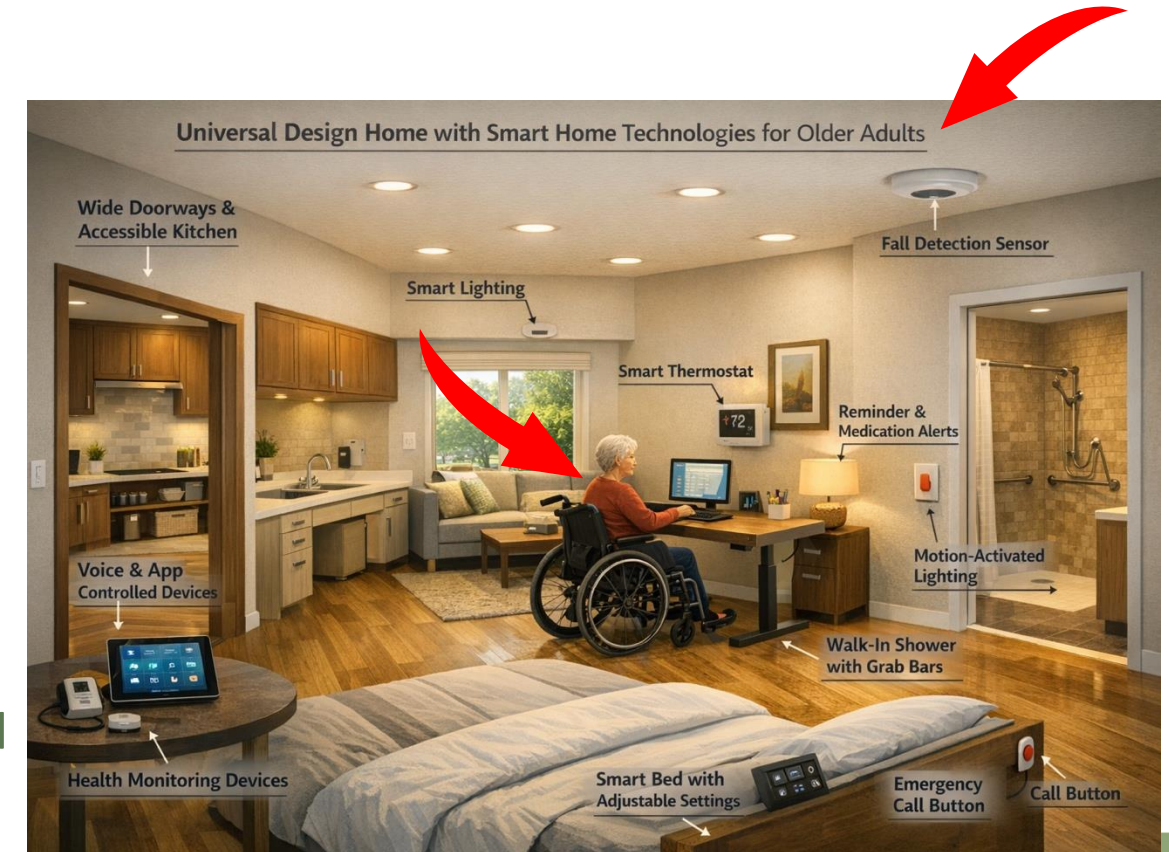


Accessible & inclusive bathroom design

# ChatGPT Universal Design Smart Home

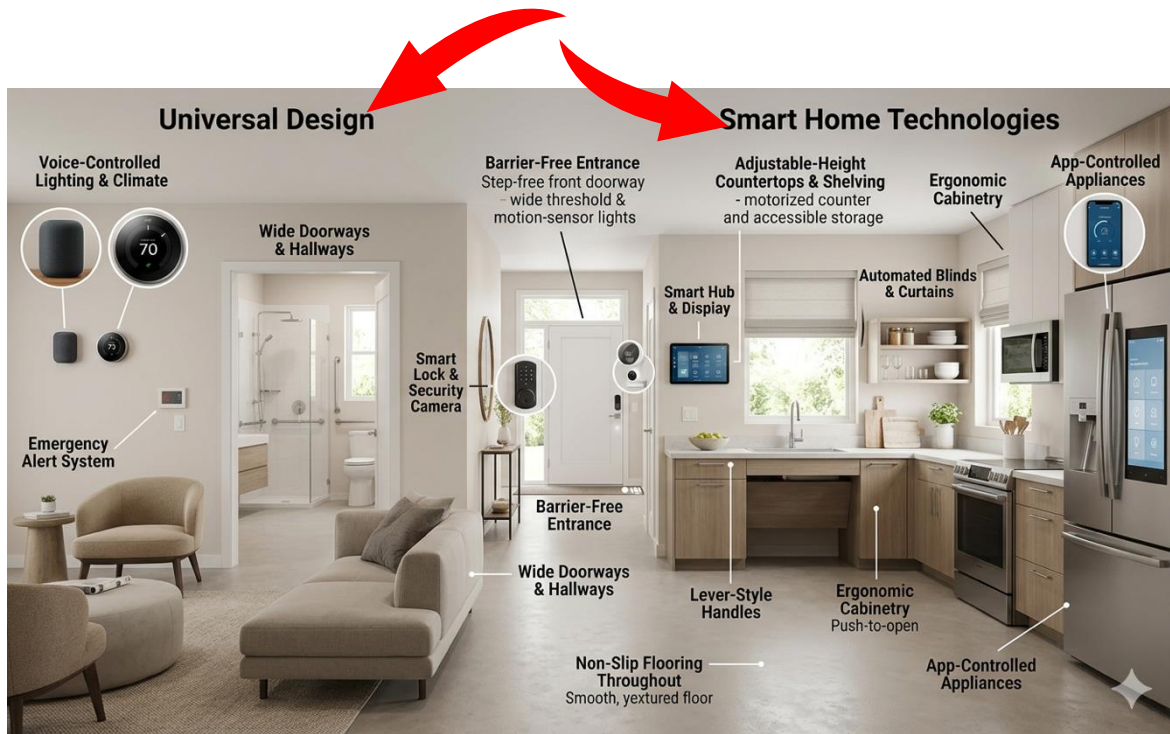


Query: Create an image of the interior of a universal design home with smart home technologies



+ older adults

# Gemini Universal Design Smart Home



Query: Create an image of the interior of a universal design home with smart home technologies



+ older adults

# Slow Uptake of Universal Design

## Design Tensions



### Universal

Design for all ability levels, without the need for adaptation.

One size does not fit all — accessibility also means creating inclusive destinations for unique needs + situations.

### Targeted

Design for a group of individuals with very specific needs.



Principles are rules that are interpreted as "one size fits all" - not allowing personalization.

<https://createspaces.com/blog/inclusive-spaces-for-all/>

# Design for all users can be design for each user

- Usable by all to the greatest extent possible, does not mean perfection
- Dosing of UD principles rather than as applying each one as an absolute
  - Produces different designs
  - Accommodates individual differences
  - Does not result in one-size-fits-all



# A Tale of 2 Ballots: Case Study in UD for Voting

## Dosing of the UD Principles

- P1. Same Dell XPS 18" tablet hardware
- P2. Multi-modal voice, touch, gesture inputs provide choice
- P3. Simple, consistent, intuitive and familiar operations
- P4. Multi-modal outputs - audio, large text, high contrast
- P5. Confirmation of choices
- P6. Natural hand positions
- P7. Large buttons

EZ Ballot

**President and Vice-President (Vote for 1 pair)**

Joseph Barchi and Joseph Hallaren / Blue  
 Adam Cramer and Greg Vuocolo / Yellow  
 Daniel Court and Amy Blumhardt / Purple  
 Alvin Boone and James Lian / Orange  
 Austin Hildebrand-MacDougall and James Garritty / Pink  
 Martin Patterson and Clay Lariviere / Gold

**Do you want to vote for President and Vice-President?**

*Press Yes to vote in this contest.  
 Press No to skip this contest.*

## Quick Ballot

Contest 1 of 3  
**President and Vice-President**  
 Vote for 1 pair.

Joseph Barchi and Joseph Hallaren / Blue

Adam Cramer and Greg Vuocolo / Yellow

Daniel Court and Amy Blumhardt / Purple

Alvin Boone and James Lian / Orange

Austin Hildebrand and James Garritty / Pink

Martin Patterson and Clay Lariviere / Gold

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# Comparison of Voting Performance

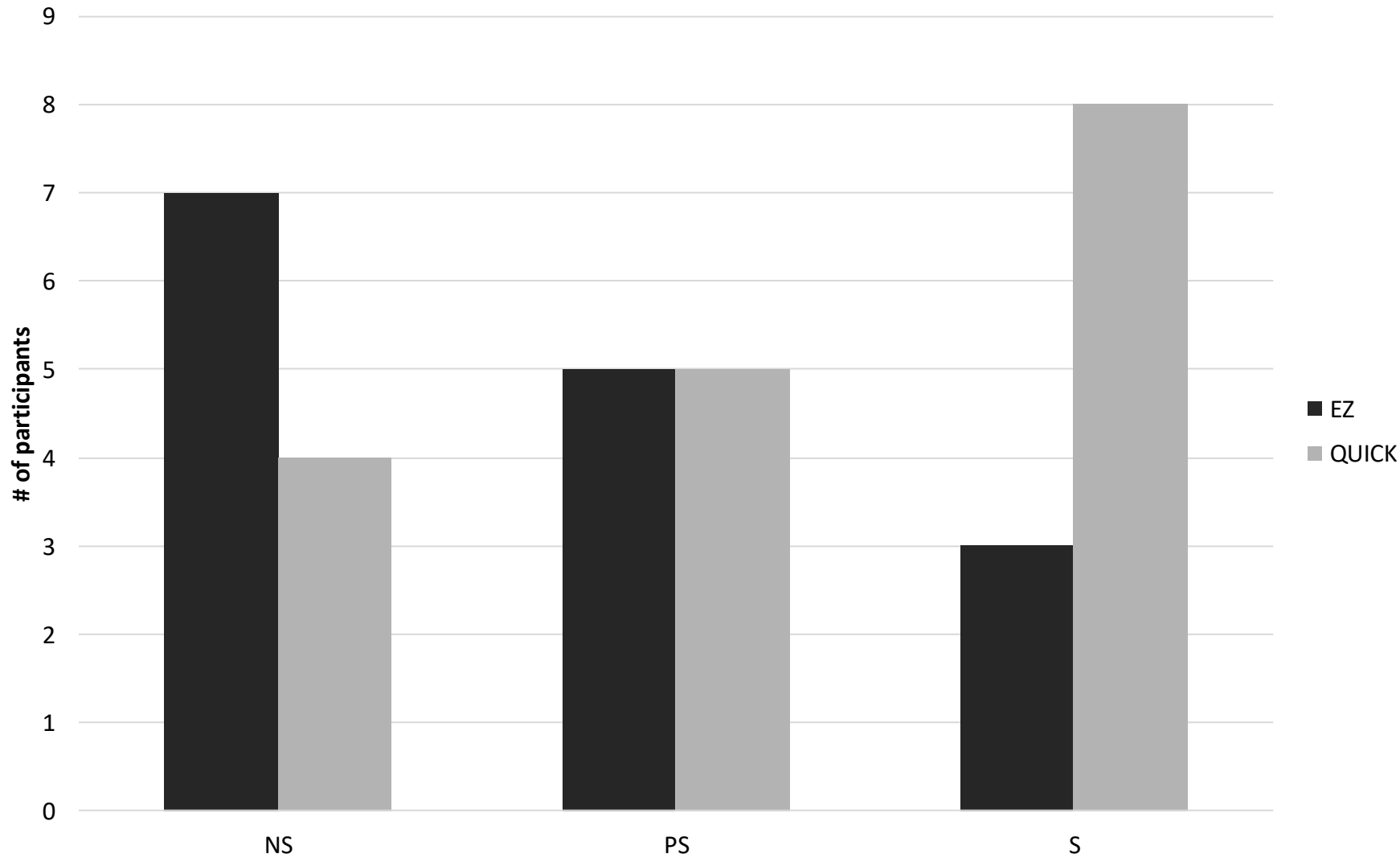
- **Participants:** 32 voters (30-67 years old) with and without vision loss  
NS (n=11) , PS (n=10), S (n=11)
- **Tasks:** voting on 3 trials with each ballot design in a controlled lab
- **Measures:** voting performance, user feedback, changes in performance



Dell XPS 18 Portable Touch Tablet

# Ballot Preference

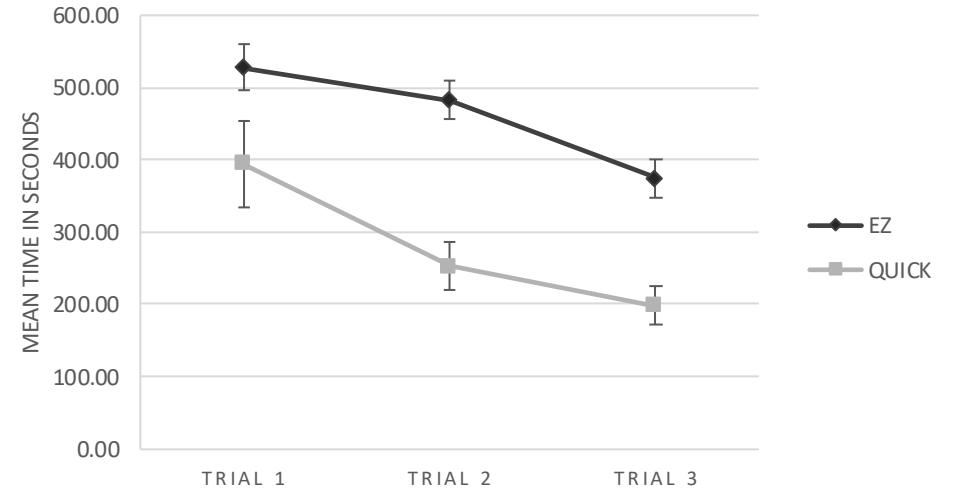
Preferences of Ballot Design



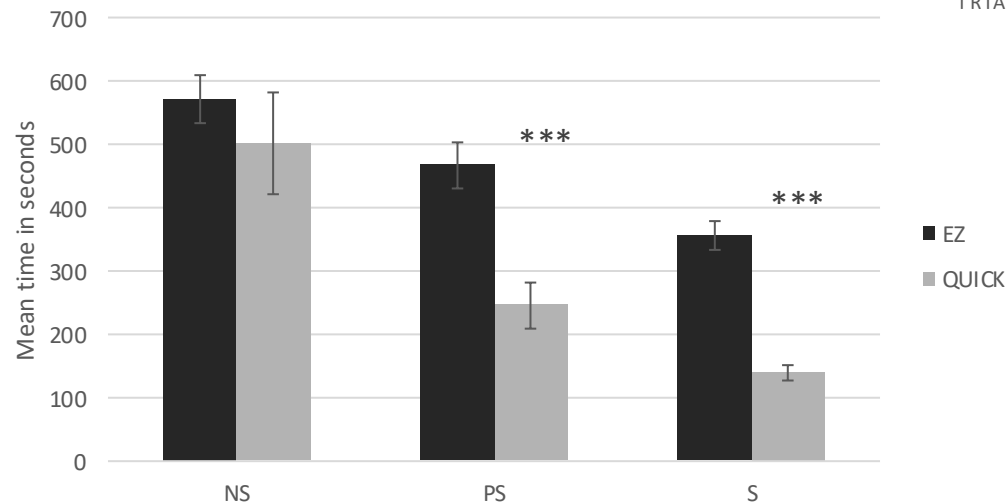
# Voting Performance

- Errors (at least 1)
  - 16 % (EZ), 17% (QUICK)
  - No significant differences
- Time
  - Quick took significantly less time to complete the ballot

BALLOT COMPLETION TIME



Ballot Completion Time

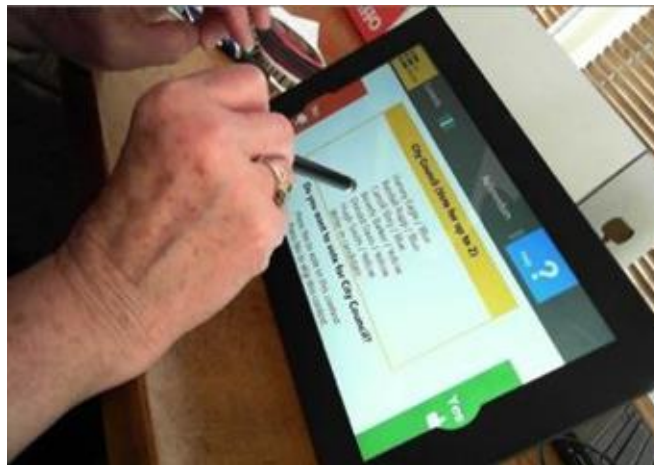


# User Feedback: Likes

| EZ Ballot  | QUICK Ballot   |
|--|--|
| <ul style="list-style-type: none"><li>• Accessible</li><li>• Step-by-step navigation</li><li>• Easier to view/ center focus</li><li>• Better communication style</li><li>• Confirmation messages</li><li>• Landscape orientation</li></ul> | <ul style="list-style-type: none"><li>• Accessible</li><li>• Quicker navigation</li><li>• Familiar</li><li>• Fewer steps</li><li>• More freedom</li><li>• Vertical orientation</li></ul> |

# Design for All can be Design for One

- Integration of physical and digital worlds enable the same or identical physical object to have many user interfaces.
- Hardware ensures inclusivity by providing everyone with access to the same technologies that are appealing for all.
- Software and 3D printing enable personalization and usability of device interfaces and functions, enabling adaptation to a variety of needs and abilities.



# So, Imagine a World

- Where...
  - As Jung posited, Gerontechnology is the brains to ensure that the needs and wants of older adults are represented in the design of all technologies, and
  - Universal design, rather than specialized Gerontechnologies, is the brawn to bring those needs and wants to fruition.
- Then...
  - Technology will be understood to be useful and usable, and, more likely to be adopted by a diverse population, including older adults.



*The field of Gerontechnology is future of universal design  
and  
Universal design is the future of “technology” that is  
useful and usable for diverse populations*

Thank You  
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[www.TechSAgeRERC.org](http://www.TechSAgeRERC.org)



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