Hearing Accessibility and Assistive Technology Use by Older Adults: Application of Universal Design Principles to Hearing

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Presentation Outline

- Purpose of the Presentation
- Background Information
  - The Interprofessional Team
  - Existing Approaches to Support Accessibility and Usability
    - Barrier-Free Design Ideology
    - Universal Design Ideology
- An Occupational Perspective
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Purpose of the Presentation

- To describe an interdisciplinary approach to examine the applicability of Universal Design (UD) principles to hearing accessibility and usability
- To introduce participants to the UD principles
- To introduce participants to UD for Hearing (UDH) guidelines
- To discuss the implications of UDH for examining hearing accessibility and assistive technology use by older adults

The Interprofessional Team

The Interprofessional Research Team 2005 - Present

- Hearing Science and Audiology
  - Dr. Mary Beth Jennings, PhD
  - Dr. Margaret F. Cheesman, PhD
  - Mr. Michael Prangley, MClSc
  - Ms. Laya Poost-Foroosh Bataghva, MClSc, PhD (Candidate)
  - Ms. Pheba Ninan, BSc (Hons), MClSc (Student)
- Occupational Science, Occupational Therapy, Ergonomics and Human Factors
  - Dr. Lynn Shaw, PhD
  - Professor Lisa Klinger, MSc
  - Mr. Daniel Fok, MEng, PhD (Candidate)
  - Ms. Heather Hodgins, MSc
  - Ms. Ashley Kuchar, MSc

Existing Approaches to Support Accessibility and Usability

Barrier-Free Design Ideology

Barrier-Free Design Ideology

- **Barrier** = anything that prevents a person with a disability from fully participating in all aspects of society because of his/her disability, including physical, architectural, informational, communication, attitudinal, technological barriers, policies or practices (Accessibility for Ontarians with Disabilities Act, 2005)
- **Barrier-Free** = Means that a building and its facilities can be approached, entered and used by persons with physical and sensory disabilities (Ontario Building Code, 2006)

Barrier-Free Design Ideology

- Canadian Standards Association: Inclusive Design for an Aging Population (B659-08)
  - Aging presents diverse needs and complex challenges
    - "They may be as minor, for example, as sight or hearing impairments that can be overcome with reading glasses or a standard hearing aid. Or they can be more profound, such as blindness or deafness. Even minor limitations, when combined (as is often the case in late aging), can present a significant barrier to independence and a high quality of life." (p. 2)

Barrier-Free Design Ideology

- Individualized approach
- Current technological approaches to enable hearing focus on personal hearing devices
- Involves specialized design and/or adaptation
- This approach does not consistently or comprehensively consider the realm of occupations conducted in the daily life of an older adult

Existing Approaches to Support Accessibility and Usability

Universal Design Ideology

Universal Design Ideology

Mace, 1998

"… the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation of specialized design. Universal design seeks to create products and environments that are usable by the broadest spectrum of the population, regardless of age or physical differences."

Universal Design Principles

The Center for Universal Design, 1997

1. **Equitable use**
   - Design is marketable to people with diverse abilities
2. **Flexibility in use**
   - Design accommodates a wide range of individual preferences and abilities
3. **Simple and intuitive use**
   - Design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level

Universal Design Principles

The Center for Universal Design, 1997

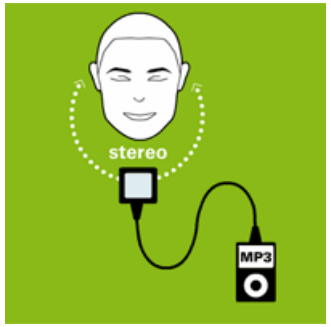
4. **Perceptible information**
   - Design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities
5. **Tolerance for error**
   - Design minimizes hazards and the adverse consequences of accidental or unintended actions
6. **Low physical effort**
   - Design can be used efficiently and comfortably and with a minimum of fatigue
7. **Size and space for approach and use**
   - Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility

Universal Design

- UD concepts and their application have largely remained restricted to physical and to visual domains
- Research in UD related to hearing
  - Electronic materials and distance education for persons who are hard of hearing or Deaf (e.g. Berent, 1996; Erath & Larkin, 2004; Obrenovic, Abascal & Starcevic, 2007)
  - Access within a model UD building for participants with vision, mobility and hearing impairments (Danford, 2003)

Universal Design

- **Product Design**



- http://www.phonak.com/consumer/products/accessories/icom_use.htm
- **http://www.phonak.com/phonak/com/b2c/en/products/accessories/communication/icom/overview.html**

Universal Design

- *Universal Design & Barrier Free Access: Guidelines for Persons with Hearing Loss*, Canadian Hard of Hearing Association's (2008)
  - Combines both approaches
  - Six theorized UD principles:
    - Good acoustics and noise control
    - Appropriate visual conditions
    - Built-in alerting systems
    - Augmented telecommunication systems
    - Provision of assistive communication technologies
    - Awareness of design elements
  - Do not provide a comprehensive approach to consider and evaluate environments from the perspective of what, how and with whom people conduct occupations that require hearing

Gaps in Enabling Change

- Individualized approach to accommodate needs
- Hearing demands and requirements related to the daily lives of older adults have not been adequately investigated or addressed
  - How older adults with hearing loss communicate with others
  - How the environmental context impacts competent performance
- There is a need for a companion guideline to the original UD principles as it relates to hearing
- We propose a more comprehensive approach that integrates concepts and perspectives from occupational science to complement and build on current knowledge on accessibility and usability

An Occupational Perspective

An Occupational Approach

- Focused on:
  - What people do, need to do, and want to do in community and public environments
  - What constrains participation in occupations
- Considers the complexity of interactions between the person, environment, occupation and objects (Hocking, 1994; Law et al., 1996)
- Assessment of participation and performance must include an examination of the processes and contexts that support them

An Occupational Approach

Fok, Shaw, Jennings, & Cheesman, 2007

- An indepth understanding of the contexts and available resources for change is required
- Contexts that underscore productivity for persons with diverse abilities
  - Micro Level Contexts
    - Refers to the places and physical spaces where occupations occurs
  - Meso Level Contexts
    - Refers to the characteristics or nature of the occupation (i.e. culture and procedures)
  - Macro Level Contexts
    - Refers to the governance, policy, legislation, economics that support or undermine occupations

Using an Occupational Perspective to Promote Universal Design Concepts for Hearing

Universal Design for Hearing (UDH)

Universal Design for Hearing

- UDH Guidelines
  - Not meant to provide specific solutions
  - Allow a better appreciation of accessibility and usability concerns as they relate to occupations requiring hearing
  - May also be useful for health practitioners in highlighting desirable outcomes, and for others wishing to develop guidelines for creating better hearing environments using an occupational perspective
  - Highlight the potential of integrating an occupational perspective towards a more comprehensive approach to addressing the hearing needs of older adults

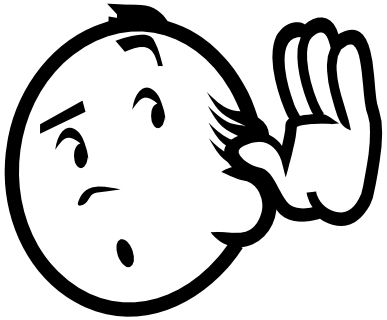
Universal Design for Hearing

- Design usability is affected by hearing even without a hearing loss, for example:
  - Determining where a siren is coming from while driving with the radio on
  - Giving directions to someone across a busy street
  - Following verbal instructions while listening to music through headphones
  - Using a cell phone, in a shopping mall, or airport amid background noise and distractions and/or when transmission quality is variable
- Design usability is affected by hearing for those with hearing loss who are not using hearing aids

Universal Design for Hearing

Fok, Shaw, Jennings, & Cheesman, 2007

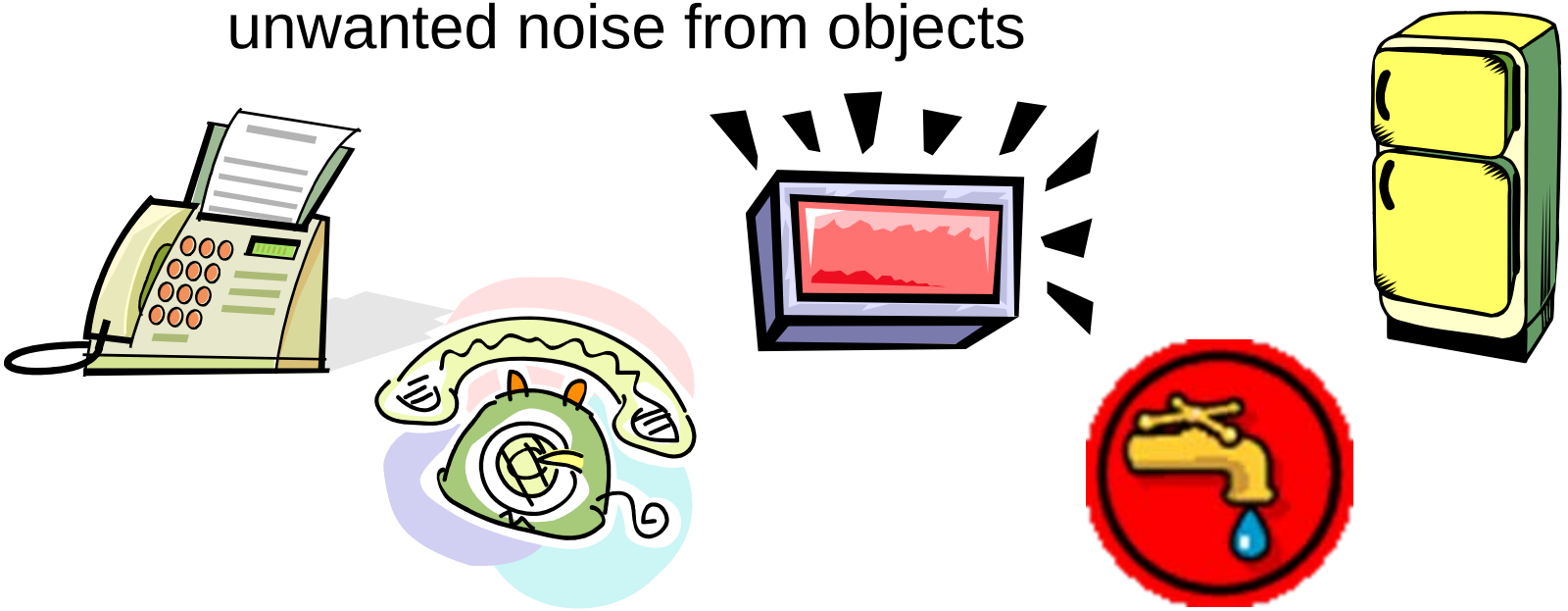
- **UDH I: Optimize Hearing Environment For All**
  - Consider hearing environments that maximize the capabilities of a person to hear with or without their current hearing assistive technologies



Universal Design for Hearing

Fok, Shaw, Jennings, & Cheesman, 2007

- **UDH II: Optimize interactions between persons and objects to promote better hearing in an environment**
  - Maximize desirable sounds while minimizing unwanted noise from objects



Universal Design for Hearing

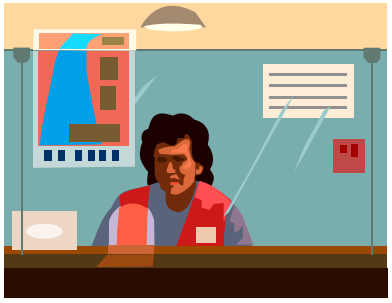
Fok, Shaw, Jennings, & Cheesman, 2007

- **UDH III: Consider the need of people to have multiple choices of interactions with one another**
    - Consider the many forms of interpersonal interactions within an environment, for e.g. including but not limited to one-to-one, one-to-many, many-to-one

Universal Design for Hearing

Fok, Shaw, Jennings, & Cheesman, 2007

- **UDH IV: Consider the need for different activities to be performed in and across environments**
  - Consider whether an environment is meant to support single-hearing activities or multiple hearing activities



Universal Design for Hearing

Fok, Shaw, Jennings, & Cheesman, 2007

- **UDH V: Enable use of the environment without extra steps for hearing access**
  - During preparatory, use and/or after use phases.
- **Enable safe, private and secure use of the environment**
  - While minimizing distraction/interference, or cognitive loading

Using an Occupational Perspective to Promote Universal Design Principles for Hearing (UDH)

Example

Universal Design for Hearing

- Consider the occupation of attending a play at a local theatre where an Infrared System is available.
- Identify the tasks required in order for the hearing aid user to participate in the theatre experience.
- What UDH principles have been violated?

Summary

- This presentation introduced participants to existing approaches to support accessibility and usability
  - Barrier-Free Design Ideology
  - Universal Design Ideology
- This presentation also introduced participants to an Occupational Perspective to promote Universal Design Concepts to hearing and introduced 5 UDH Guidelines
- This presentation showed how knowledge from occupational science can complement the hearing sciences, and the accessibility and usability literature to present a more comprehensive approach to support productive and safe occupations involving hearing

- Within a UDH approach:
  - Global consideration of hearing in the environment
  - Essential for the promotion of a hearing environment that is suitable for most people including older adults with hearing loss
- There is a need to:
  - Better understand the hearing abilities of adults as they age along with associated issues, such as awareness and disclosure
- This knowledge will assist in:
  - Identifying barriers and challenges for older adults in performing occupations involving hearing in a safe and productive manner

- With this knowledge:
  - There is a need to identify and be mindful of barriers and resistance to change that may impede successful designs for older adults, such as attitudes towards aging and hearing loss, and tolerance and acceptance of diversity
- These considerations can then assist us to carefully navigate towards identifying potential opportunities and resources to change the *micro* and *meso* contexts

- We believe there is a great potential for the enactment of more inclusive and more innovative public spaces
  - Opportunities to change accessibility and usability to meet the transitional needs of an older adult with hearing loss may also feed back to benefit others
- This work offers new insights into strategies to assist us in achieving compliance with disability and human rights guidelines and standards developed to protect the rights of older adults with hearing loss

Acknowledgements

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Questions …

Thank You

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