# UNIVERSAL ACCESSIBILITY AND USABILITY FOR HEARING: CONSIDERATIONS FOR DESIGN

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## 1. INTRODUCTION

Hearing loss is the most prevalent and fastest growing sensory-related chronic disability in North America. Despite this trend, the accessibility and usability for hearing in community and public spaces is severely underemphasized in research and practice. Traditionally, designs for persons with disabilities in the built environment have focused on removing physical barriers through barrier-free design ideology. For the past decade, the universal design (UD) movement has played an instrumental role through informing building and product standards and policies. However, like its predecessor, UD concepts and their application have largely remained restricted to physical, and to a lesser extent, visual domains. Considerations for universal accessibility and usability for hearing in the built environment, by a person with or without a hearing loss, continues to be deficient. In this article, an interdisciplinary team of researchers draw attention to the need for a companion guideline to the original UD principles as it relates to hearing.

### 1.1 Universal Design

The term "universal design" was coined by the late Ron Mace whose work inspired architects and many other professionals to think beyond the boundaries of barrier-free design. According to Mace, Hardie and Place (1991), universal design means designing all products, buildings and exterior spaces to be usable by all people to the greatest extent possible without special adaptations. UD principles include: (1) equitable use; (2), flexibility in use; (3) simple and intuitive use; (4) perceptible information; (5) tolerance for error; (6) low physical effort; and (7) size and space for approach and use (The Center for Universal Design, 1997). Although all seven principles should be considered for designs, from the authors' perspective, four of these are particularly relevant for activities that involve hearing. First, principle (1) elaborates that designs should avoid segregating or stigmatizing any users. This is consistent with assistive technology literature which has shown that designs that segregate or stigmatize the user are likely to be abandoned. Although this may be less of a problem for contemporary hearing aids that have small and highly marketed mainstream form factors, other hearing technologies such as FM systems are sometimes left unused or are abandoned as they stigmatize along with requiring training and or a cumbersome set of steps to operate and use (Lederman & Hendricks, 2003; Myers, 2003). Principles (3)

and (6) also speak to this latter point. In many cases, these *end-of-pipe* solutions are implemented to compensate for a failure to consider factors such as building acoustics and other assistive listening systems during the initial design phase. Second, from principle (2), the idea of choice in the methods of use is an important notion for hearing accessibility and usability. Third, principle (4) draws attention to the idea of using different modes for redundant presentation of information. Good examples to demonstrate this principle are the various applications of captioning technology to present visual along with auditory information, on the television, during a presentation and most recently, on the telephone. Finally, under principle (5), the idea of discouraging unconscious action that require vigilance is also important and needs to be put in the context of the sensory task of hearing.

## 2. AN OCCUPATIONAL APPROACH

The development of this initial set of universal design for hearing (UDH) guidelines used an occupational approach focused on what people do, need to do, and want to do, in community and public environments where hearing activities take place. An occupational approach helps to understand how people *do* or participate in everyday life but also what constrains participation in occupations. As such, an occupational approach considers the complexity of interactions between person, environment, occupation (Law et al., 1996) and objects (Hocking, 1994). Hamilton (2004) also underscores that humans need to be occupied in a diversity of spaces, and that places shape what we do, or can do, over the course of a lifetime. In essence, participation in occupations is vital to health and quality of life (Wilcock, 1998). It follows that the lack of accessible and usable spaces can limit participation in daily, work and enjoyment occupations. Thus, occupational relationships and concepts can provide a backdrop for critically examining how environments support or hinder hearing accessibility and usability for persons who engage in community occupations (e.g. banking and grocery shopping) and use public spaces (e.g. train stations and airports).

This project enacted a participatory action method to bring together experts and consumers to critically analyze the literature, develop an evidence-based guideline for creating hearing accessible spaces in the community and validate it with consumers and stakeholders. To date, an interdisciplinary team of researchers from the fields of

human factors, audiology, hearing science, occupational therapy and occupational science drew upon their unique disciplinary knowledge as well as an occupational approach, to come up with an initial set of UDH guidelines that warrants further discussion, refinement and validation.

## 3. PRELIMINARY THEMES

Preliminary themes written in the form of initial UDH guidelines include:
(i) Design hearing environments that maximize the capabilities of a person to hear without a hearing device or with their current hearing device
(ii) Optimize object-person interactions for hearing
(iii) Consider designs that require low cognitive and physical effort
(iv) Allow for choice of interaction
(v) Design environments that support single-function or multi-functions, to allow for a range of planned or unplanned occupations that involve hearing

## 4. DISCUSSION

In this section, the authors will briefly discuss how the occupational approach was used, and will further emphasize it as a potential conceptual framework that may be adopted by related practicing professionals for the analysis of occupations that involve hearing. Based on the wording of (i) the authors emphasized the importance of considering environmental factors and their interactions with the person and objects. The interaction between the environment and the occupation(s) is more explicitly stated in (v). One of the key points in guideline (i) is that individuals should not be expected to obtain a new hearing device in order to participate and engage in occupations in a given environment. The design of the built environment should benefit most if not all individuals to hear better regardless of their hearing abilities. Examples of factors that should be considered include: reverberation, background noise and intelligibility.

In guideline (ii), the interaction between persons and objects are highlighted. Designers, engineers and architects need to be mindful of the positioning and maintenance of objects that generate unwanted noise like lights, fans and HVAC systems and that the impact of these for persons with hearing loss are far greater than can be predicted from persons with good hearing abilities. The relative distance between the person and the desired noise source (e.g. objects like loudspeakers) must also be considered.

The idea of choice was further developed from UD principles and examined through an occupational approach. All forms of interpersonal interaction needs to be considered as the preclusion of any particular method may affect individual experience and participation. Depending on the situation, a built environment may need to afford one-to-one, one-to-many and many-to-one hearing and

communication activities. Other related central notions include the choice of interaction across and in different contexts.

Finally, being able to hear in a built environment should not be a chore. A person should be able to walk into an environment and be able to hear the necessary information right away without having to expand considerable, or ideally any, cognitive or physical efforts, before, during or after the occupation involving hearing. The design of spaces for participation in community based occupations needs to become more seamless. The potential for integration of extant (e.g. inductive loop) and emerging technologies (e.g. Bluetooth, ultrawide band) in the appropriate context presents exciting, disciplinary, interdisciplinary and inter-professional possibilities and challenges to all stakeholders including, but not limited to, end-users, designers, engineers, architects, legislators and health professionals.

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