Aging and Hearing Loss: Why does it Matter?

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Perspective of an Older Adult who Lives with Hearing Loss

“When you are hard of hearing you struggle to hear; When you struggle to hear you get tired; When you get tired you get frustrated; When you get frustrated you get bored; When you get bored you quit.

-- I didn’t quit today.”

Avoid by withdrawal from social interaction!
Audiograms and Age (ISO 7029)

- HF audiometric threshold elevation
  - OHC (also noise-induced hearing loss)
  - Endocochlear potentials ~ stria vascularis
- Neural – loss of synchrony
  (Mills, Schmeidt, Schulte, & Dubno, 2006)
Speech Understanding in Noise
(CHABA, JASA, 1988)

- Little problem in ideal listening conditions
  - Quiet
  - One talker
  - Familiar person, topic, situation
  - Simple task, focused activity

- Difficulty in challenging listening conditions
  - Noise
  - Multiple talkers
  - Strangers, accents, new topic, novel situation
  - Complex task, many concurrent activities
  - Fast pace
  - Hearing aid
  - Health care encounters?

- Avoid by withdrawal from social interaction!
More than Pure-tone or Speech Thresholds
(Banh, Singh, Pichora-Fuller, JAAA, 2012)

Pure-tone Average (dB HL)

Words-in-Noise (WIN)
50% threshold (dB SNR)

Speech, Spatial and Qualities of Hearing Scale (Gatehouse & Noble, 2004)

- Conversing in adverse environment
- Focusing, switching attention (group conversation)
Speech Perception in Noise
(Pichora-Fuller, Schneider, Daneman, JASA, 1995)

- 8 lists: 50 sentences in babble
  - Half low-context
    
    John did not talk about the spoon.
  - Half high-context
    
    Stir your coffee with a spoon.

- Repeat last word of sentence
- Vary S:N (signal-to-noise ratio)
- (Sometimes also recall test)
- Old need 3 dB better S:N
- Context helps old 3 dB more
Effect of Simulated Auditory Aging
(Pichora-Fuller et al., Hearing Research, 2007)
Cognitive Aging
(Pichora-Fuller, IJA, 2008; Brown & Pichora-Fuller, Canadian Acoustics, 2000)

Gains:
Knowledge is preserved and context is helpful

Losses:
Processing declines
- Working memory
- Slowing
- Attention/Inhibition
MoCA Repeat & Recall
(Dupuis et al., under revision)

Good Hearing – Hearing Loss

NOT modality specific!
More Connections?

Cognition

Hearing (Vision)

Socio-Emotional
Early ARHL

Betula Model

Toronto Model

(Pichora-Fuller, Danielsson, & Dupuis, GSA, 2013)
Summary

- HL: diagnosed medically, experienced socially

- Ear-brain networks are plastic
  - Compensation (short term)
  - Deterioration (long term)
  - Social interactions are influenced by and may influence change
  - Everyday environments challenge communication accessibility

- Health implications
  - Promotion of healthy active aging
  - Prevention of adverse events
  - Self-management of various chronic health issues
  - Adherence and benefit from various interventions pivoting on communication in care or life contexts

- Solutions encompassing auditory, cognitive, social, environmental approaches
WHO International Classification of Functioning (ICF, 2001)

Health Condition (disorder or disease)

Body Function & Structure

Activity

Participation

Perception/Cognition

Environmental Factors

Personal Factors

Physiology

Supports and Barriers

Social Roles
Paradigm Shifts in Practice

- Impairment  Diagnosis
- Disability (Activity)  Rehabilitation
- Handicap (Participation)  Accessibility

- Biophysical to socio-environmental view of health
Age and Modality Issues

- **MoCA total score**
  - ~ PTA(W) .000
  - ~ age .051

- **Correlations** (p < .0005)
  - MoCA DR x Aud FR .378
  - MoCA DR x Vis FR .419
  - Aud FR x Vis FR .454

- **ANOVA for FR: Good vision only (N = 122)**
  - *Group (NH, HL): F(1,108) = 5.66, p = .019*
  - *Modality (A,V): F(1,108) = 10.66, p = .001*
  - *Group x Modality: F(1,108) = .53, p = .47*
Negative Views of Aging, Self-perceptions and Memory and Hearing Performance
(Chasteen, Pichora-Fuller, Dupuis, Singh, & Smith, in preparation)