

Aging and Hearing Loss: Why does it Matter?

Kathy Pichora-Fuller

Professor, Psychology, University of Toronto

Adjunct Scientist, Toronto Rehabilitation Institute, University Health Network

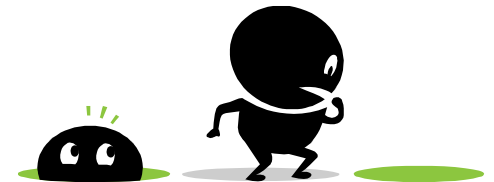
Adjunct Scientist, Rotman Research Institute, Baycrest Hospital, Toronto

Guest Professor, Linneaus Centre HEAD, Linköping University, Sweden

Perspective of an Older Adult who Lives with Hearing Loss

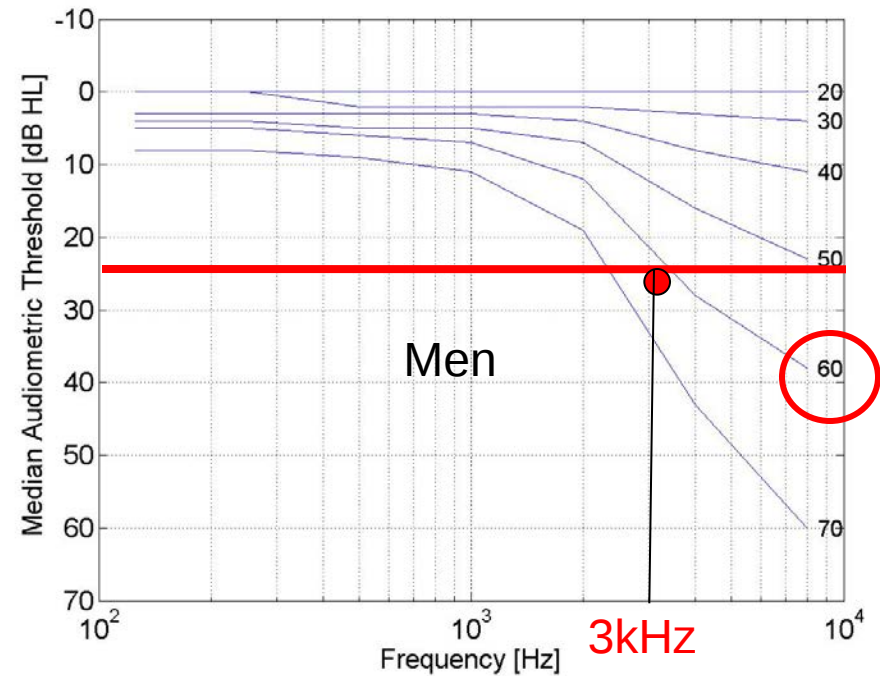
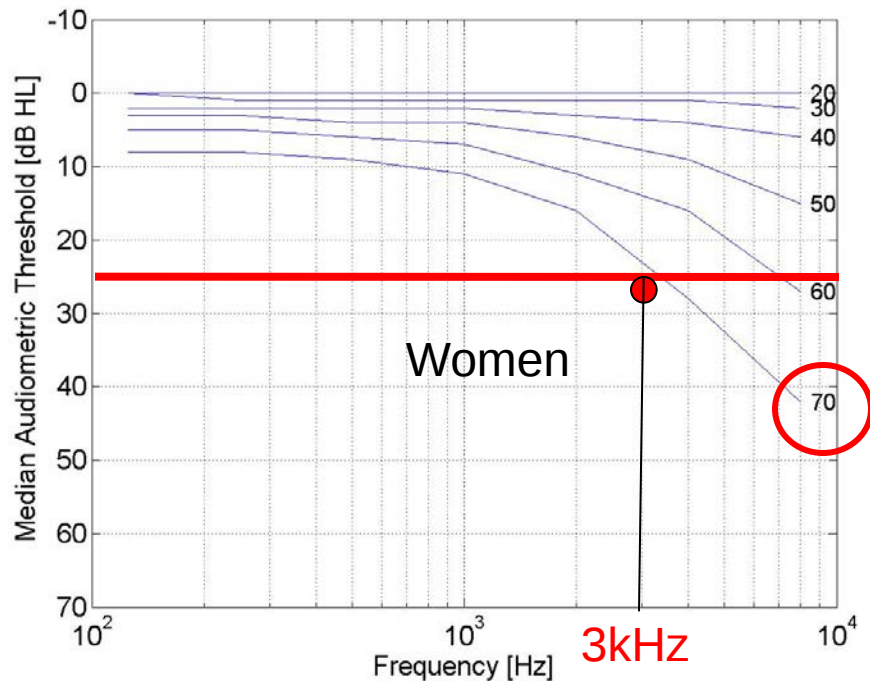
*“When you are hard of hearing you struggle to hear;
When you struggle to hear you get tired;
When you get tired you get frustrated;
When you get frustrated you get bored;
When you get bored you quit.*

-- 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)

**Heterogeneity
in ARHL**

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!

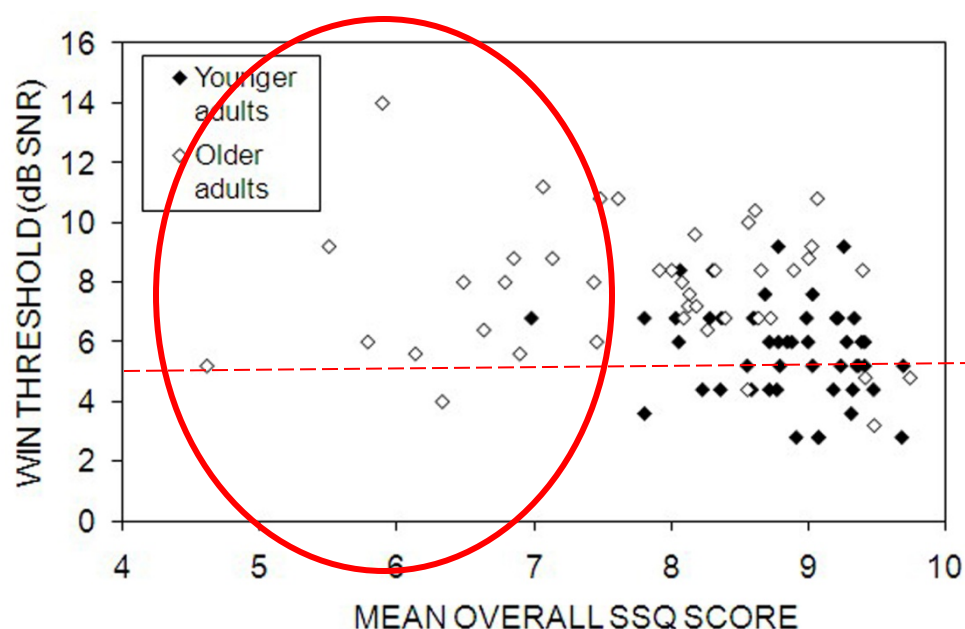
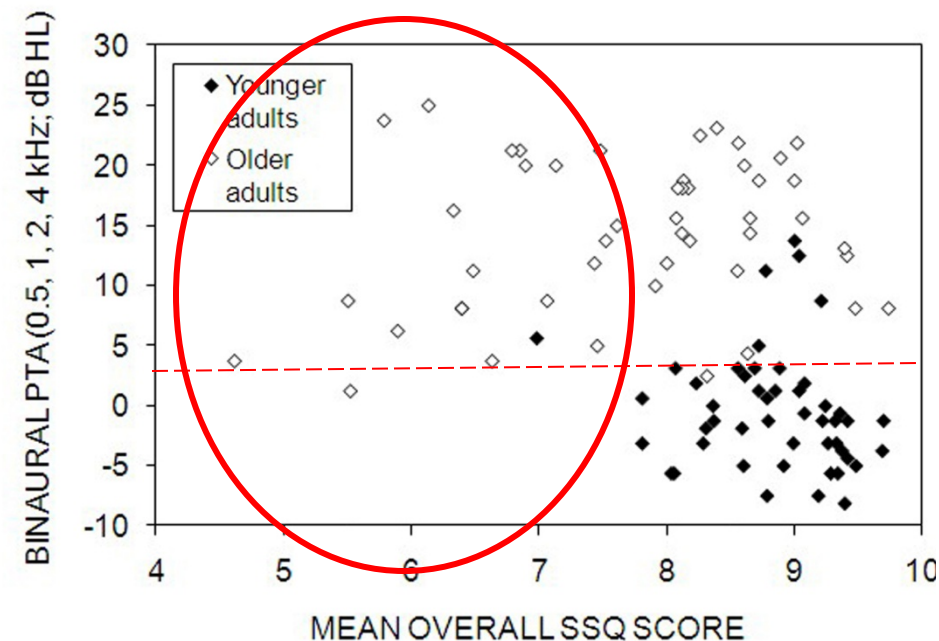


More than Pure-tone or Speech Thresholds

(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.

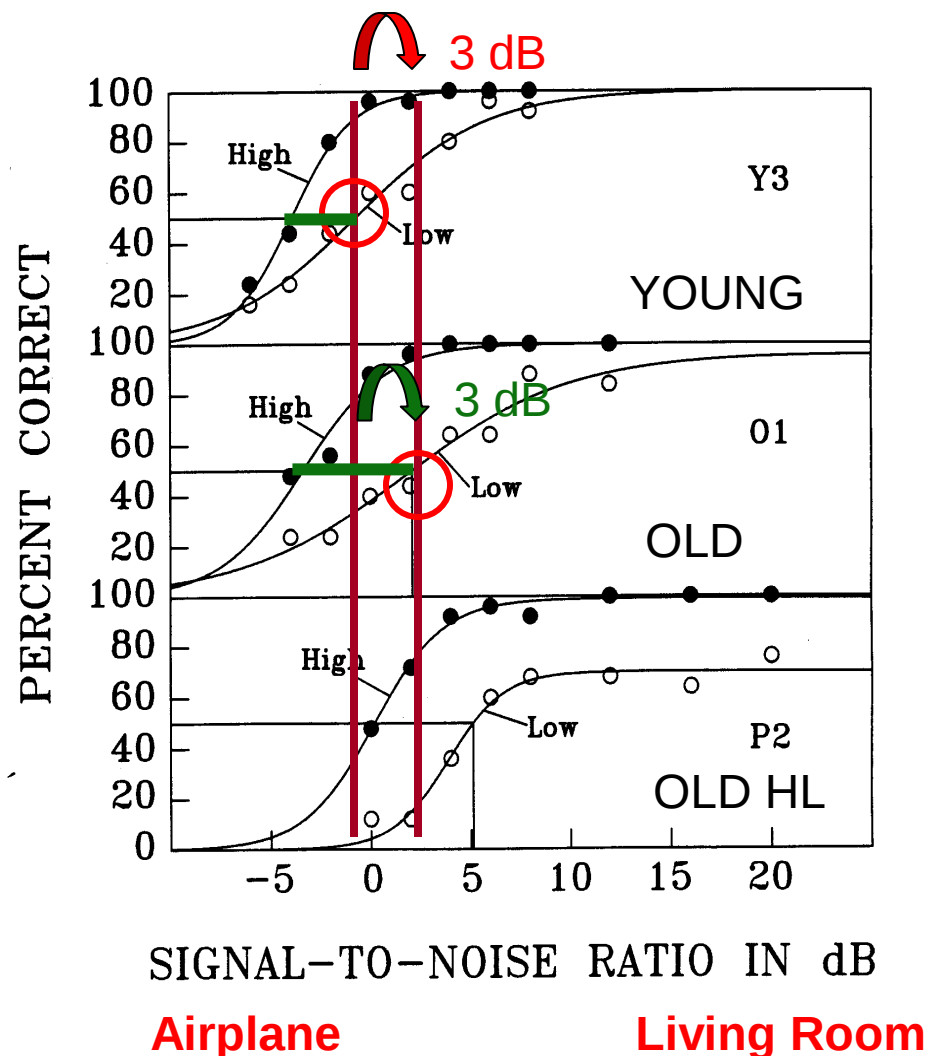
Repeat last word of sentence

Vary S:N (signal-to-noise ratio)

(Sometimes also recall test)

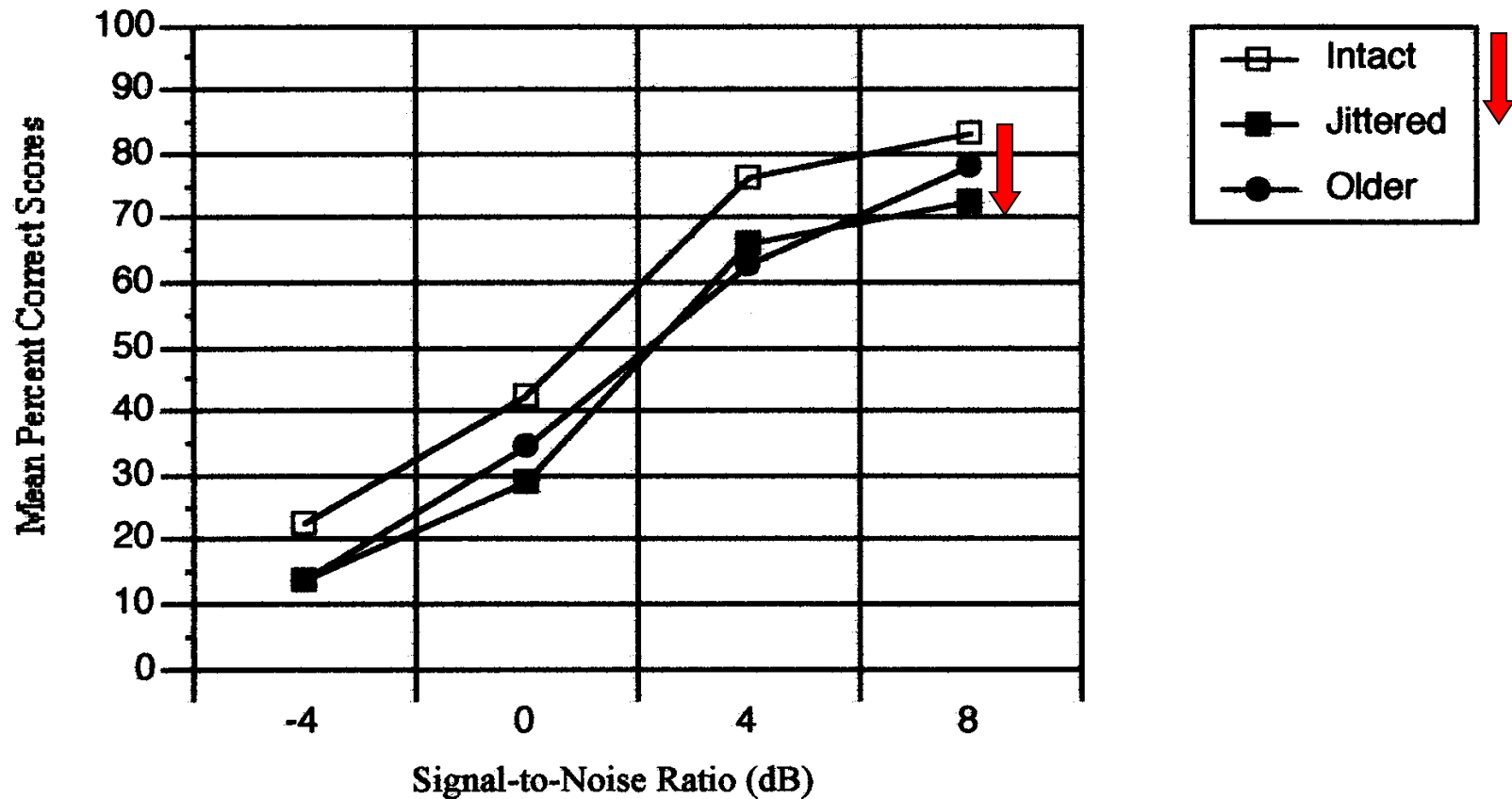
Old need 3 dB better S:N

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)

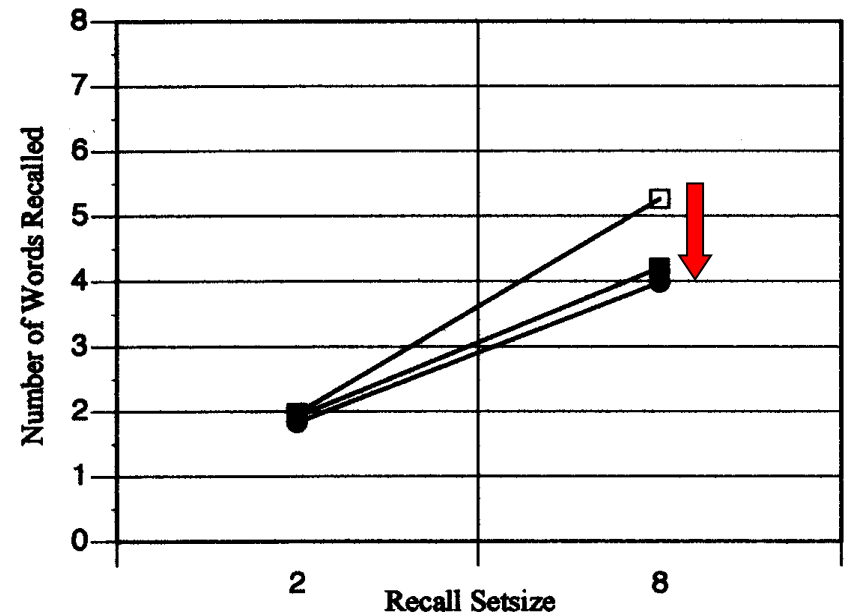
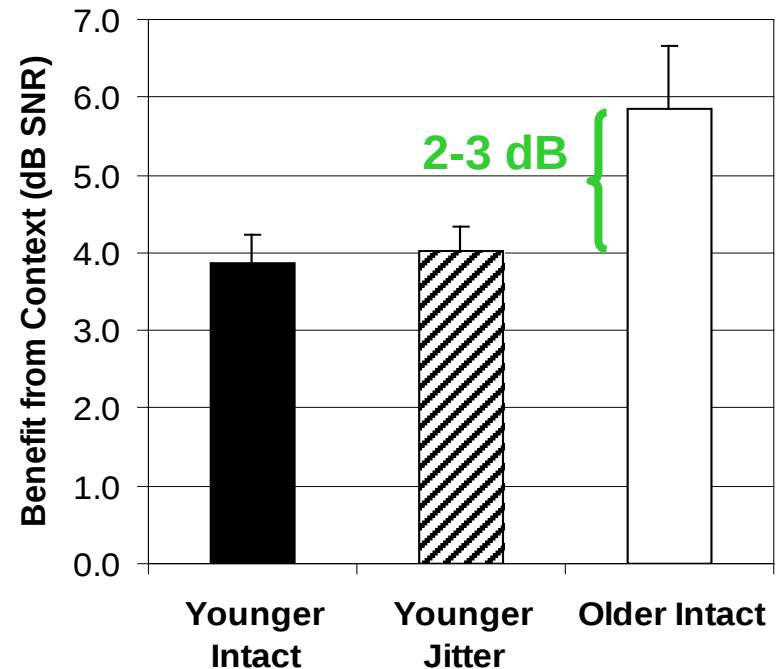
Gains:

Knowledge is preserved
and context is helpful

Losses:

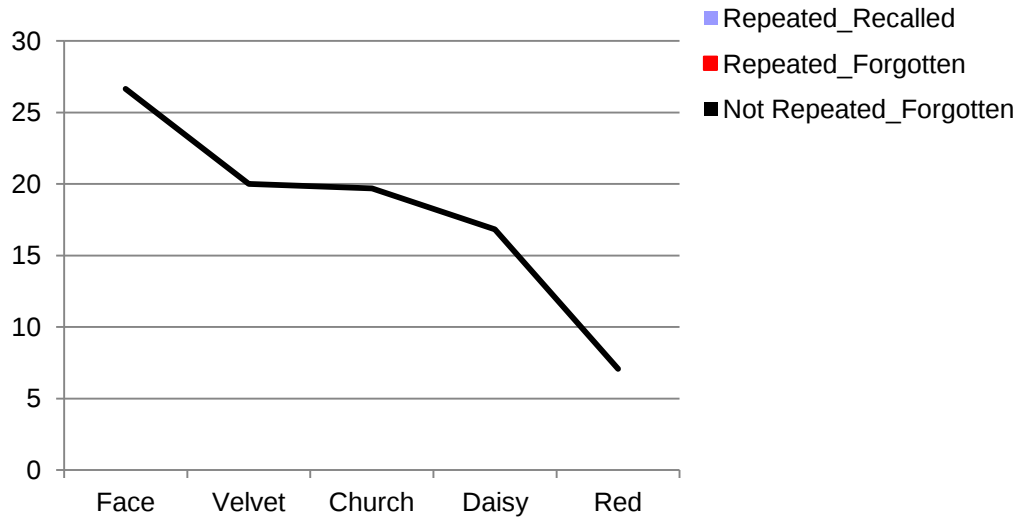
Processing declines

- Working memory
- Slowing
- Attention/Inhibition



MoCA Repeat & Recall

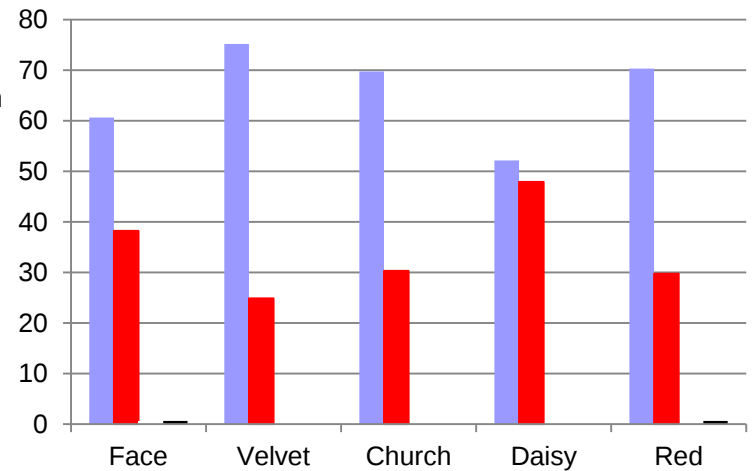
(Dupuis et al., under revision)



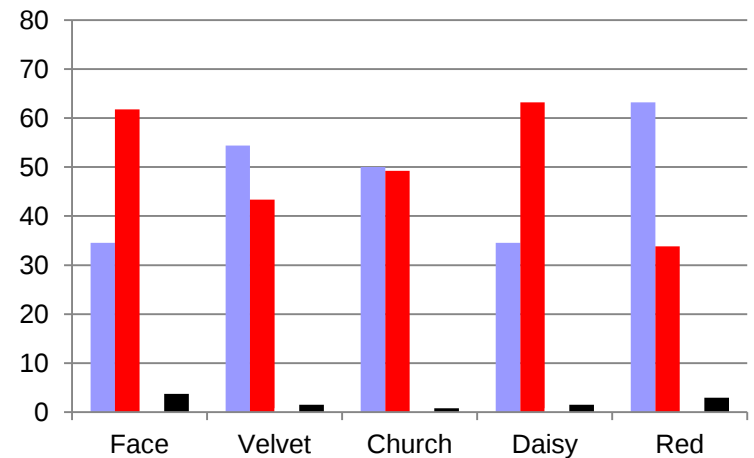
Good Hearing – Hearing Loss

NOT modality specific!

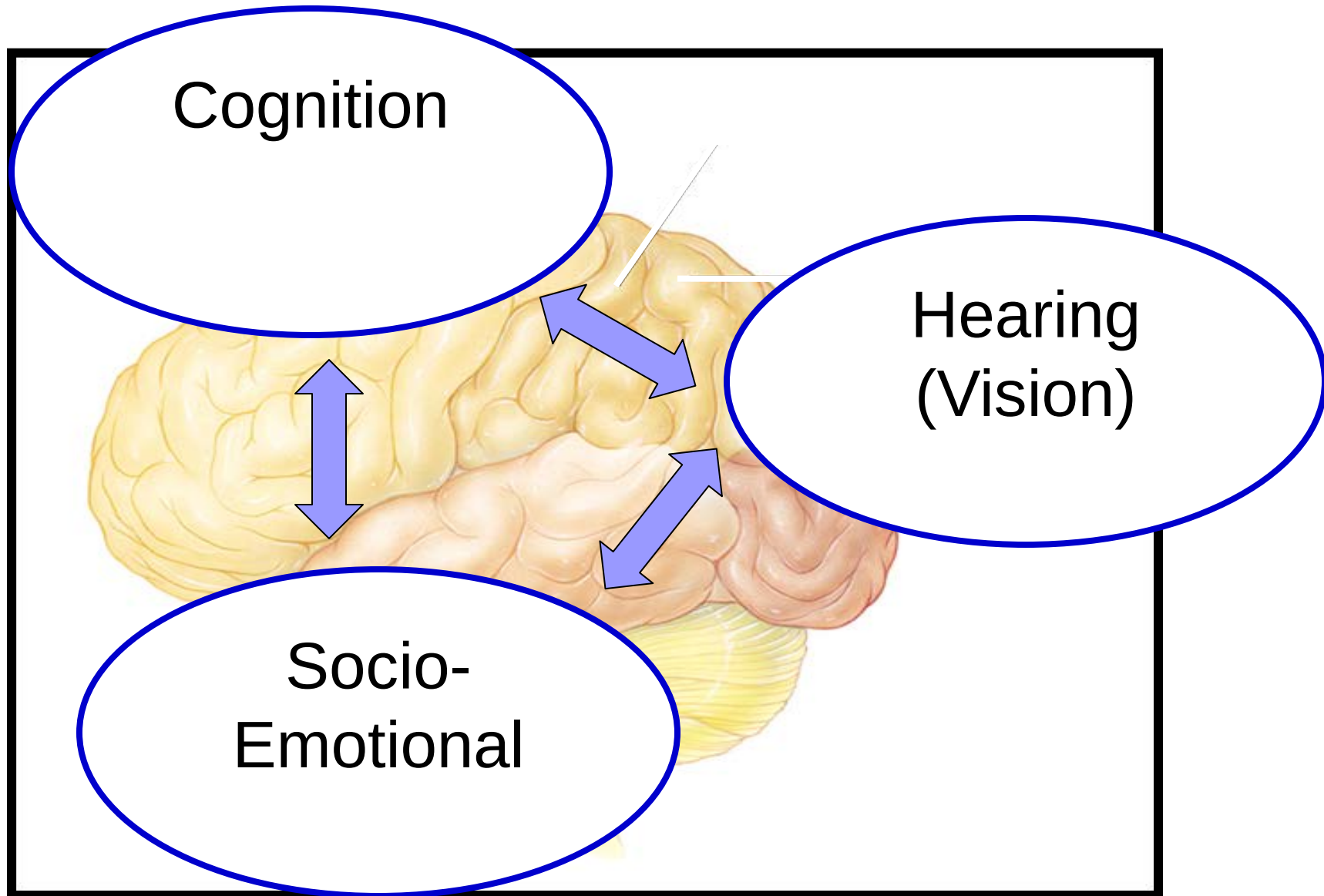
Good Hearing



Hearing Loss

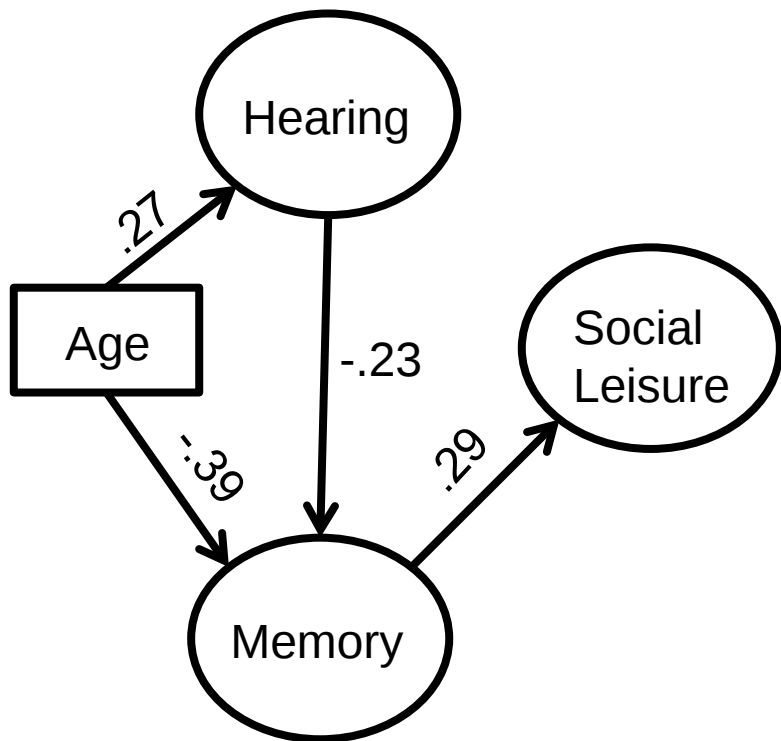


More Connections?

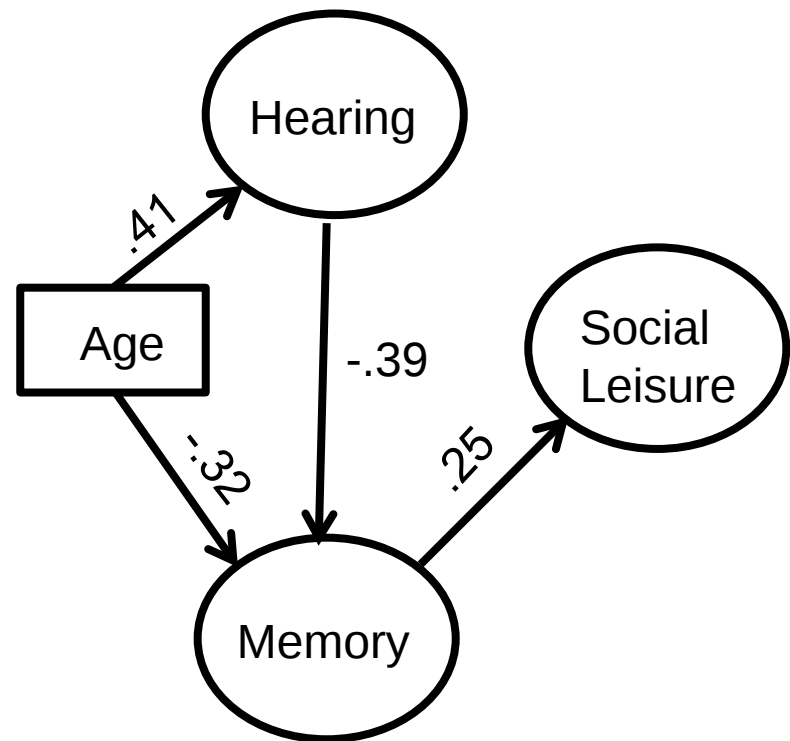


Early ARHL

Betula Model



Toronto Model



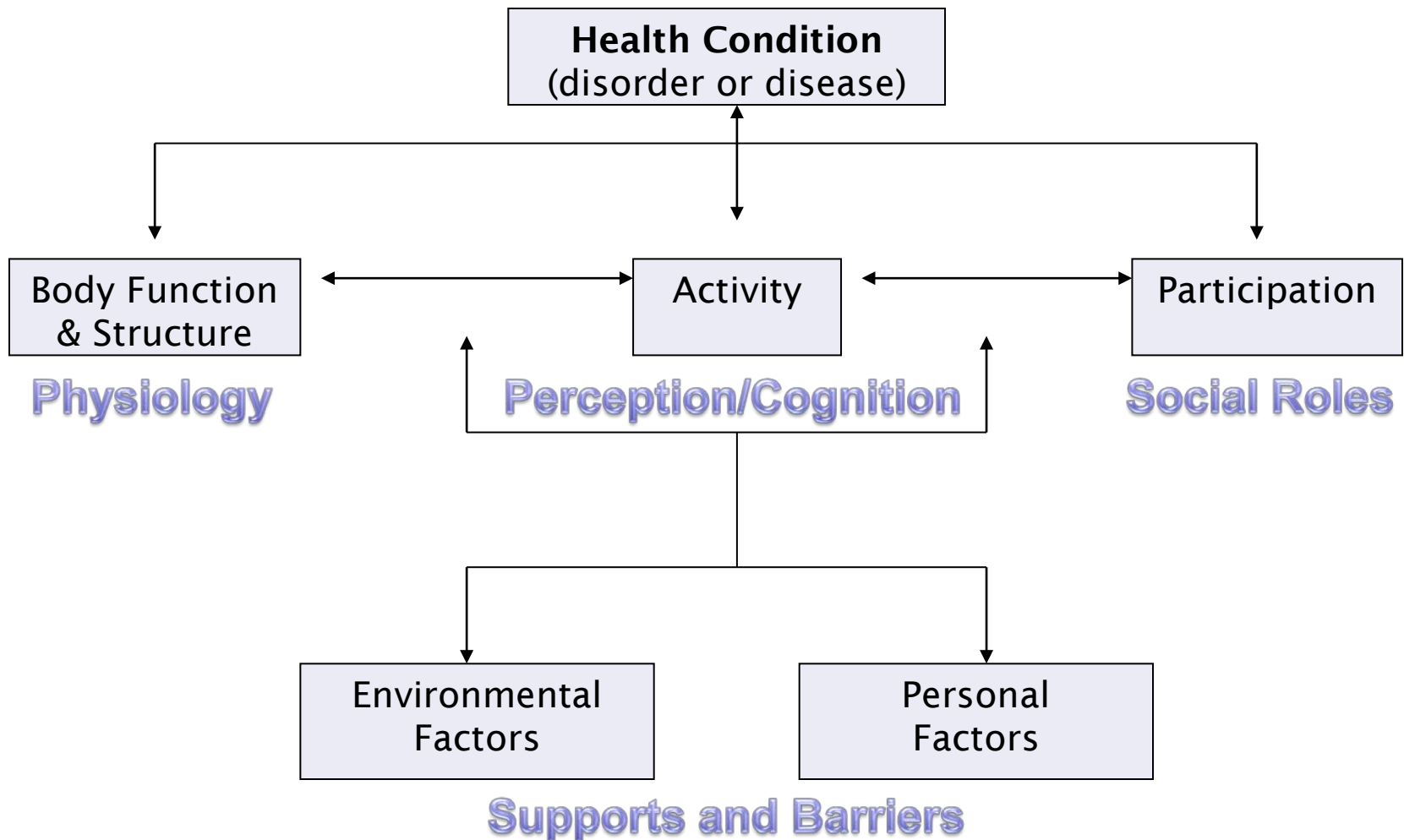


Summary

- 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)



Paradigm Shifts in Practice

- Impairment
 - Disability (Activity)
 - Handicap (Participation)
 - Biophysical to socio-environmental view of health
- | |
|----------------|
| Diagnosis |
| Rehabilitation |
| Accessibility |

Age and Modality Issues

■ MoCA total score

□ ~ PTA(W) .000

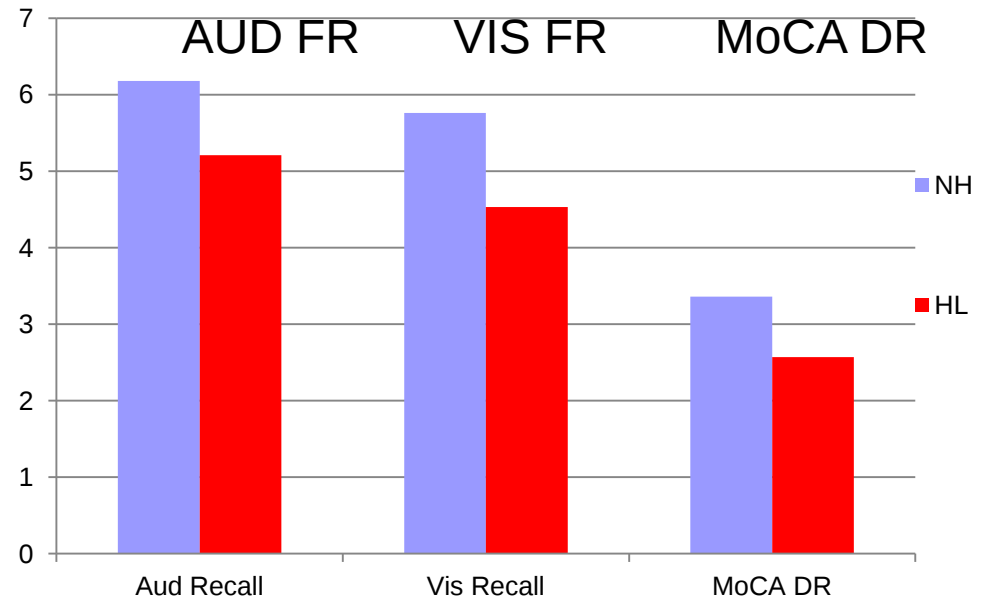
□ ~ age .051

■ 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)

