Successful Aging: Linking Hearing and Memory to Social, Psychological and Health Factors
Kathy Pichora-Fuller, PhD
Department of Psychology

Based on:

Outline
1. Health and aging across the lifespan
2. Auditory-cognitive-social links
3. AR to promote healthy aging

World Health Organization (WHO) Definition of Health (1948)
- Health is a complete state of well-being:
  - Physical well being
  - Mental well being
  - Social well being
- Health is NOT merely the absence of disease or infirmity.
- State of optimum health is called “wellness”
Issues in Adult Development and Aging

![Diagram](Image)

**WHO ICF (2001)**

http://www.who.int/classifications/icf/en/

**A Model of Disability in Later Life**

- **Disability:**
  - Effects of chronic conditions on people's ability to engage in activities that are necessary, expected, and personally desired in their society.

- **ENABLEMENT**
Hearing loss is a risk factor for having automobile accidents in a large cohort of male workers in Quebec.

<table>
<thead>
<tr>
<th>Hearing status</th>
<th># who had at least 1 accident</th>
<th>Prevalence ratio (age-adjusted)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>7473</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Just noticeable HL</td>
<td>1986</td>
<td>1.06</td>
<td>1.01, 1.11</td>
</tr>
<tr>
<td>MSLH</td>
<td>777</td>
<td>1.13</td>
<td>1.05, 1.21</td>
</tr>
<tr>
<td>Moderate HL</td>
<td>559</td>
<td>1.18</td>
<td>1.08, 1.27</td>
</tr>
<tr>
<td>Severe HL</td>
<td>622</td>
<td>1.31</td>
<td>1.20, 1.42</td>
</tr>
<tr>
<td>Total</td>
<td>11397</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Attributable risk of traffic accident to HL = 5.6%

Clear dose-response

The impact of hearing loss on the driving performance of 107 seniors with normal visual acuity and cognitive function tested on a closed road circuit.

Source: Hickson et al, JAGS 2010
Hearing loss → Reduced perception of hazard noise

Ears - "Listening" - Life

When Does Cognitive Aging Start?

Salthouse (2004) Current Directions in Psychological Science
Estimates of age-specific prevalences of Alzheimer’s disease (AD), Mild Cognitive Impairment (MCI), and Non-Affected (NAs), aged 60–85, assuming 1.0% rate for conversion from NA to MCI at age 60. (Adapted with permission from Yesavage JA, O’Hara R, Kramer H, et al. Modeling the prevalence and incidence of Alzheimer’s disease and mild cognitive impairment. J Psychiatr Res 2002;36:281-286.)

* Note: very similar results for the digit-symbol substitution test

94
92
90
88
86
84
82
80

Modified mini-mental state score*

Study year

Hearing loss and cognitive decline

Health ABC cohort (Lin et al., JAMA Intern. Med. 2013)

Hearing loss and Incident Dementia

Baltimore Longitudinal Study of Aging cohort (Lin et al., Arch Neurol, 2011)
Interactive Effects of Physical Activity and Diet

High exercise + great diet
No exercise + poor diet

Mild Cognitive Impairment
(e.g., Troyer & Murphy, 2007)
- Active lifestyle ~ risk of future dementia
  - Cognitive engagement
    - Tasks involving problem-solving, decision-making, learning, remembering new information
  - Social interaction
    - Rich social stimulation and active social network
    - Participating in group activities and interactions
  - Physical activity
    - Some activities are done in groups, with music
- Enriched environments
- Group interventions
- Communication-related disorders???

Cognitive Hypotheses & Training
- Cognitive Compensation Hypothesis
  (Li, Krampe, & Bondar, 2005; Li & Lindenberger, 2002)
  - declining sensory (and motor) functions are compensated by higher-level cognitive and attentional processes
- CRUNCH - Compensation-Related Utilization of Neural Circuits Hypothesis
  (Reuter-Lorenz & Cappell, 2008)
  - additional brain regions are recruited by older adults when capacity limits are reached in a given task or combined tasks.
- STAC - Scaffolding Theory of Aging and Cognition
  (Park & Reuter-Lorenz, 2009)
  - there is the potential to enhance such compensation by training.
Cognitive Benefits of Better Hearing

- Slower cognitive decline in Alzheimer’s cases with better hearing (Peters, Potter, & Scholer, 1988; Wahl & Heyl, 2003)
- Reduced rate of decline in scores on a cognitive screening test over a six-month period following intervention with hearing aids (Allen et al., 2003)
- Hearing aid use reduced problem behaviours judged by caregivers of adults with dementia (Palmer et al., 1998)
- Older adults using hearing aids have better emotional and social well-being and greater longevity (Appelhans et al., 1996; Cacciatoro et al., 1999; Naramura et al., 1999; Seniors Research Group, 1999)
Outline

1. Health and aging across the lifespan
2. Auditory-cognitive-social links
3. AR to promote healthy aging

---

Total articles cited in PubMed: March 3, 2014

---

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!
Health is…

“…the capacity of people to adapt to, respond to, or control life’s challenges and changes.”

(Frankish et al., 1997)

---

Social Costs associated with Impaired Hearing

By Paul M. Tooley, M.D., F.R.C.P.

Lecturer in Physiology, University College, London

“Hearing aids are surgical appliances, but they generally have not yet been accorded a footing equal to that of trusses, artificial limbs, or spectacles. The deaf have gathered for themselves misleading, exaggerated information from newspaper advertisements, and the choice of instrument has been unusually haphazard.” (Page 244-245)

Describes that hearing aids can help to prevent hearing impaired individuals from social isolation.
Sensory-Cognitive-Social Trio

1. Quality of auditory input affects memory (e.g., Rabbit, 1968; 1990; Pichora-Fuller et al., 1995; Wingfield, 1996)

2. Hearing loss reduces communication functioning, increasing risk for social isolation (e.g., Appollonio et al., 1996; Bess et al., 1989; Crews & Campbell, 2004; Fuller et al., 1999; Legget et al., 1996; Linden et al., 1999; Mowbray et al., 1990; Rudberg et al., 1993; Reuben et al., 1999; Sindhusake et al., 2001; Weigel & Stoneley 1997)

3. Engagement in leisure activities is related to cognition and health (e.g., Bassuk et al, 1999; Fabrigoule et al, 1995; Fratiglioni et al., 2000; Hultsch et al., 1993; Mousavi-Nasab, 2012; Strawbridge et al., 1998; Wang et al. 2002)


Hypotheses (Danielsson, Dupuis, Pichora-Fuller, in prep)

1. Social withdrawal mediates the association between hearing loss and cognitive decline
2. Cognitive functioning mediates the association between hearing loss and social withdrawal
3. Social withdrawal can be caused by hearing loss and/or cognitive decline (all effects of aging)

Participants

<table>
<thead>
<tr>
<th></th>
<th>Betula, Sweden</th>
<th>Stigma, Toronto</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>297</td>
<td>273</td>
</tr>
<tr>
<td>Age (years)</td>
<td>M = 67 (35-90)</td>
<td>M = 71 (56-96)</td>
</tr>
<tr>
<td>Education</td>
<td>M = 14 YoE (36% &gt; secondary)</td>
<td>M = 16 YoE (81% &gt; secondary)</td>
</tr>
<tr>
<td>Employed</td>
<td>62%</td>
<td>76%</td>
</tr>
<tr>
<td>Female</td>
<td>45%</td>
<td>64%</td>
</tr>
<tr>
<td>Married</td>
<td>73%</td>
<td>54%</td>
</tr>
<tr>
<td>Good General Health</td>
<td>84%</td>
<td>82%</td>
</tr>
</tbody>
</table>
Hearing Variables Used in Models

• Pure-tone thresholds (worse ear; 3, 4, 6, 8 kHz)

Leisure Activities

<table>
<thead>
<tr>
<th>Betula, Sweden</th>
<th>Stigma, Toronto</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;How many times have you done ____ in the last 3 months?* (16)</td>
<td>In the past year did you ____?* (16)</td>
</tr>
<tr>
<td>Mean for 4 activities = 8.17 +/- 2.2</td>
<td>Mean for 4 activities = 2.93 +/- 1.16</td>
</tr>
<tr>
<td>travel</td>
<td>leisure activities</td>
</tr>
<tr>
<td>go to a restaurant</td>
<td>go to a concert/theatre</td>
</tr>
<tr>
<td>visit family/friends</td>
<td>play a musical instrument</td>
</tr>
<tr>
<td>go to the movies, concert, theatre</td>
<td>play a musical instrument… sing/choir</td>
</tr>
<tr>
<td></td>
<td>read a newspaper… magazine… book</td>
</tr>
<tr>
<td></td>
<td>handicrafts… hunting… hobbies</td>
</tr>
<tr>
<td></td>
<td>write poetry/prose… photography… art</td>
</tr>
<tr>
<td></td>
<td>use library services</td>
</tr>
<tr>
<td>watch TV/brides to radio</td>
<td>attend committee meetings</td>
</tr>
<tr>
<td></td>
<td>visit family/friends</td>
</tr>
<tr>
<td></td>
<td>attend religious service</td>
</tr>
</tbody>
</table>

Umeå Social

Toronto Social
Early vs Later Presbycusis

- Associations between hearing loss and cognition and social interaction would likely be stronger for those with greater impairment
- Nevertheless, even in early presbycusis, associations are already apparent

Hearing Screening & Health


Is hearing loss associated with poorer health in older adults who might benefit from hearing screening? Ear and Hearing.

- The 60-69 year olds with unacknowledged or unaddressed hearing loss had significantly increased risk of prevalent social isolation and lower cognitive scores.
■ Effort and fatigue
■ Stress and anxiety
■ Social life restrictions
■ Impact on intimate communication

Bi-directional Effects?

■ hearing problems may exacerbate communication problems accelerating cognitive and psychosocial declines in older adults

■ age-related social factors may exacerbate poor perceptual and cognitive performance
Social Support

Definition: The perception and actuality that one is cared for, has assistance available from other people, and that one is part of a supportive social network.

Typically categorized into 4 kinds of acts:
- **Emotional** support (empathy, love, trust)
- **Instrumental** support (tangible aid, money, service)
- **Informational** support (advice, suggestions, information)
- **Appraisal** support (constructive feedback, affirmation)
Review of Social Support in Audiology

Frankel & Turner (1983):
- 420 HOH listeners completed measures of communication handicap and psychological distress (depression, anxiety, paranoia)
- Perceived social support strongly correlates of adjustment to the psychological distress wrt HL

Brooks, 1987: SOs with negative attitudes towards hearing aids can act to delay help-seeking

Lemmes & Stephens (1994):
- SOs can assist clinicians understand communication difficulties of HOH

Duijvestijn et al. (2003): Help seeking more likely when SO exerts social pressure

Gummins et al. (2000):
- Social support can potentially be provided by the internet
- Participation in an on-line self-help group was predicted by a lack of real-world social support and was positively correlated with subjective benefit

Preminger (2003):
- Compared perceived hearing handicap for persons with hearing loss when attending aural rehabilitation classes either with or without significant others
- Attendance with a SO leads to reductions in hearing handicap than if the classes were attended alone

Lockey et al. (2010):
- HI listeners report SOs can act as a source of motivation when using hearing aids.
- SOs report that they often:
  - Encourage partners to pursue and adhere to treatment
  - Facilitate conversation (reiterate comments, indicate the topic, etc)

Social Support and Hearing Aid Satisfaction


Research questions:
1. Is there a significant correlation b/t social support and hearing aid satisfaction?
2. How does social support compare with other known correlates of hearing aid satisfaction?

Methods: Distributed questionnaires to users of hearing instruments
- Study 1: 173 adults (mean age = 68.9 years, SD = 13.4)
- Study 2: 169 adults (mean age = 32.0 years, SD = 13.1)

Questionnaires/Measures
- Satisfaction with Amplification in Daily Life (SADL)
- Hearing aid benefit (APHAB)
- Hearing Handicap Inventory for Adults (HHIA)
- Health Related Quality of Life (HRQoL)
- Experience with hearing aids
- Daily hearing aid usage
- Personality: the Big 5 Inventory
- Perceived Social Support (FSSQ)
Perceived social support is the strongest correlate of hearing aid satisfaction in both studies!

Summary: Social Support in Audiology
Significant others can potentially:
- Encourage help seeking
- Advocate for (or against) the adoption of hearing aids
- Assist with the care and operation of hearing aids
- Boost/reinforce motivation during rehab
- Facilitate communication
- Increase treatment adherence
- Reduce hearing handicap by participating in AR classes
- Decrease hearing-related psychological distress
- Foster hearing aid satisfaction
Outline

1. Health and aging across the lifespan
2. Auditory-cognitive-social links
3. AR to promote healthy aging

Aging and Social Factors

- Person-environment fit
- Stress
- Ageism and stereotype threat
- Self-efficacy
- SOC

**Competence and Environmental Press**

- **Competence** is the theoretical upper limit of a person’s capacity to function
  - biological health
  - sensory-perceptual functioning
  - motor skills
  - cognitive skills
  - personality

- **Environments** can be classified on the basis of the varying demands they place on the person, a notion called "environmental press"
  - physical, social

- **Competence x environmental press ~ (mal)adaptive behavior and affect**

- **Adaptation level: balance competence & press**

---

**Do Older Adults Have Social Lifestyles That Place Fewer Demands on Hearing?**

*Yeong Wua*  
*Hu, A. S.  
Bak, A.  
Bak*

![Graph](image)

"The data are consistent with the hypothesis that older adults have less active social lifestyles that place fewer demands on hearing"

"Social lifestyle, rather than age, is likely a better predictor of listening demand"

---

**Coping with STRESS**

- People respond differently to stress
  - imbalance in person-environment fit

- The impact of any potentially stress event is greatly influenced by how a person appraises it (Lazarus & Folkman, 1984)
  - Primary Appraisal: Is the event harmful, threatening, or challenging?
  - Secondary Appraisal: What are my coping resources? Are they adequate?
  - Reappraisal – changes in the situation may change the appraisal

- Coping is the process of trying to manage demands that are appraised as taxing or exceeding one’s resources

- As vulnerability (lack of coping) increases, it takes less stress to trigger illness
**Life Cycle Model of Stress**

**Figure 2** The life cycle model of stress. How the effects of chronic or repeated exposure to stress (or a single exposure to severe stress) in different stages in life depend on the brain regions that are developing or declining at the time of the exposure. Stress in the prenatal period affects the development of many of the brain regions that are involved in regulating the hypothalamus-pituitary-adrenal (HPA) axis — that is, the hippocampus, the frontal cortex and the amygdala (programming effects). …In adulthood and during aging the brain regions that undergo the most rapid decline as a result of aging (red bars) are highly vulnerable to the effects of stress hormones. Stress during these periods can lead to the manifestation of incubated effects of early adversity or to maintenance of chronic effects of stress (maintenance effects). PTSD, post-traumatic stress disorder.

---

**Stereotype Threat**

- Risk of confirming a negative stereotype of a group with which one identifies
  - Self or other stereotype
  - Reduced walking speed
  - Working memory
  - Hearing thresholds

---

**Negative Views of Aging, Self-perceptions and Memory and Hearing Performance**
Chasteen, Pichora-Fuller, Dupuis, Singh, & Smith, Psychology & Aging, 2015
Attitudes, Stereotypes, and Ageism
- Attitudes in general population are more negative re: older than younger adults
- Negative stereotypes are destructive for longevity and self-perception

BUT
- Elderly, 50+ years, with positive self-perception live 7.5 years longer
- Positive attitudes correlated with less frailty
- Self-efficacy facilitates coping

Self-Efficacy Theory
- Self-Efficacy
  - Belief individuals have in their abilities to accomplish skills to achieve a certain behavior, including health behaviors (Bandura, 1989, 1997)
- Patients with high self-efficacy beliefs for skills needed to manage a health condition:
  - Increased compliance with treatment/management recommendations
  - Improved subjective and objective outcomes
  - Higher health-related quality of life
  - Persevere in face of difficulty
  - Put forth greater effort in managing condition

Self-efficacy in ARHL
How to optimize the overall sense of competence

- **Selection**
  - Select subset of options to focus resources on

- **Optimization**
  - Find best way to achieve goal (e.g., improve by practice)

- **Compensation**
  - Use alternative route to find solution

- The SOC model
  - [http://www.marqret-baltes-stiftung.de/PBB-Website/SOC.html](http://www.marqret-baltes-stiftung.de/PBB-Website/SOC.html)

### Health Promotion

- "... is the process of enabling people to increase control over & to improve their health.”
  - (WHO, 1986 – Canadian Charter on Health Promotion)

- "... is any combination of educational, organizational, economic & environmental supports for actions conducive to health.”
  - (Green & Kreuter, 1991)

- ... programs enhance the “FIT” between people & their surroundings (Sokols, 1996)

### Overview of Self Management Approach

**Self Management**

A person’s active participation in achieving their own best health and wellness through gaining confidence, knowledge, and skills to manage physical, social and emotional aspects of life

**Self Management Support**

The range of organizational, community and provider strategies to support the active participation of individuals in achieving their best health and wellness
Good Hearing Health Could Contribute to Healthy Aging

STAY ACTIVE

PRESERVE
communication and social interaction
• slow cognitive decline
• reduce risk for adverse events
• improve benefit from health care

Vancouver, British Columbia
World Congress of Audiology
September 18-22, 2016
http://www.wca2016.ca/