Older adults need more brain power to understand and remember what they hear

Kathy Pichora-Fuller
Professor, Dept of Psychology
Why are sensory factors important?

- Help people to live their lives optimally
- Improve quality of life
- Connect to others, environment, self
- “Communication” is key to participation

Help people **AGE WELL**
Words of an older woman who is hard of hearing...

“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.”

Coping with challenge:
Quit (Avoid) ~ risk of social isolation
Persist (Control) ~ maintain social interactions
Hearing

Mobility

Vision

Cognition

Converse

Cross a street

Remember to tell news

Ears - “Listening” - Life
FIGURE 1.6 Each person is the product of the interaction of biological, psychological, sociocultural, and life-cycle forces.
WHO ICF (2001)

http://www.who.int/classifications/icf/en/
Berlin Study of Aging – Importance of Sensory-Cognitive Links

Sensory Functioning and Intelligence in Old Age: A Strong Connection

Ulman Lindenberger and Paul B. Baltes

Emergence of a Powerful Connection Between Sensory and Cognitive Functions Across the Adult Life Span: A New Window to the Study of Cognitive Aging?

Paul B. Baltes and Ulman Lindenberger
Max Planck Institute for Human Development and Education

Everyday Activity Patterns and Sensory Functioning in Old Age

Michael Marsiske
Wayne State University

Petra Klumb and Margret M. Baltes
Free University Berlin
Sensory-Cognitive Connections

“The role of sensory functions (such as vision and hearing) as antecedents, correlates, and consequences of intellectual functioning has not been at the center of research on the aging of intelligence, some exceptions notwithstanding…. the impetus was more due to the serendipities arising from interdisciplinary collaborations…. the strong connection between the two domains of functioning may not only involve age-related changes in brain integrity, but also age-based changes in other bodily functions. Finally, we cannot exclude the possibility that age- or cohort-associated changes in experiential conditions, such as differences in life contexts and life events, also contribute to the connection.”

Baltes & Lindenberger, Psychology and Aging, 1997
Outline

Themes

- Inter-individual/group differences between listeners (age)
- Intra-individual/group differences between situations
- Speech-in-speech (auditory and cognitive challenges)

Aging and auditory-cognitive interactions

Experiments

- Beyond word recognition outcomes:
  1. Memory post word recognition (quiet)
  2. Speed (signal vs. semantic context)
- Effects of challenges on word recognition in speech-in-speech tests:
  1. Informational masking - build-up of stream segregation
  2. Spatial location certainty
  3. Multi-tasking – listening while walking
Aging and Speech Understanding in Noise
(CHABA, JASA, 1988)

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

- **Difficulty in challenging listening conditions**
  - Listener factors: age
  - Talker factors: fast speech, accent, unfamiliar
  - Environmental factors: masking noise

Auditory & Cognitive SITUATIONAL Challenges:
- Multiple talkers (voice cues, informational masking)
- Context & expectations (semantic, topic, situation)
- Task demands (complexity, multi-tasking)
Audiograms & 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 as a Signal: Temporal Cues

- Syllabic patterns (envelope)
  - prosody (speech rate, rhythm)
- Onsets/offsets or gaps/durations
  - phonemic contrasts (apple – al)
- Synchrony/periodicity cues
  - fundamental frequency & harmonic structure (voice pitch, quality)
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
Older “normal” vs HL

Older vs Younger Adults

Older “normal” hearing for age clinically normal audiograms up to 4 kHz (N = 48; average age ~ 70 years)
SSQ and Behavioural Hearing Tests: Not Significantly Correlated

<table>
<thead>
<tr>
<th>Activity</th>
<th>SSQ Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversing in adverse environment</td>
<td>1.7</td>
</tr>
<tr>
<td>Conversation in echoic environment</td>
<td>1.7</td>
</tr>
<tr>
<td>Talking with a person in continuous noise</td>
<td>1.6</td>
</tr>
<tr>
<td>Focusing, switching attention</td>
<td>1.6</td>
</tr>
<tr>
<td>Ignore interfering voice of different pitch</td>
<td>1.9</td>
</tr>
<tr>
<td>Following conversation switching in a group</td>
<td>1.6</td>
</tr>
<tr>
<td>Ignore interfering voice of same pitch</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Benefit from Voice and Spatial Differences on the LISN-S Test

(LISN-S: Cameron & Dillon, 2007; Besser, Festen, Goverts, Kramer & Pichora-Fuller, 2015, *Ear and Hearing*)
When Does Cognitive Aging Start?

Salthouse (2004) *Current Directions in Psychological Science*
Cognitive Neuroscience of Aging

- Same performance achieved with different processing
- More widespread activation ~ brain reorganization
  - Young brain activity more lateralized
  - Old brain activity more distributed

- Deterioration or compensation?

- **HAROLD**: Hemispheric asymmetry reduction in older adults (Cabeza, 2002)
- **PASA**: Posterior-anterior shift in aging (Davis, Dennis, Daselaar, Fleck & Cabeza, 2008)
Cognitive Load and Compensation
(Grady, 2012, *Nature Reviews Neuroscience*, 13, 491-505)
Memory post Word Recognition
Coordinate Unfolding Signal Information and Stored Knowledge

Multiple modalities

External Inputs

Working Memory

Stored Knowledge

LTM: semantic/episodic
Associate: items/contexts

Task/goal driven

WORKING MEMORY:
System responsible for the PROCESSING and temporary STORAGE of information

- assumed to have a limited capacity that must be shared between processing and storage (Baddeley, 1976)
Bottom-Up & Top Down Processing

- Effortful listening
  - Bottom-up processing less efficient
  - Top-down processing more necessary

- Bottom-up (ear to brain)
  - Analysis of acoustic signal
    - Better signal (faster)
    - Poorer signal (slower)
    - @ amount & type of distortion

- Top-down (brain to ear)
  - Priming (pre-signal)
    - expectations facilitate recognition (faster)
  - Disambiguation (post-signal)
    - knowledge constrains alternatives (slower)
  - Repair (post-signal)
    - Fill in gaps or correct errors (slower)
Simulated Auditory Aging & Memory Span
(Pichora-Fuller, Schnieder & Daneman, JASA, 1995; Brown & Pichora-Fuller, Canadian Acoustics, 2000; Pichora-Fuller et al., Hearing Research, 2007)
Explained SNR variance from hearing loss and cognitive performance

Test condition

- Slow, Steady
- Fast, Fluctuating
Working Memory, Age, and Hearing Loss: Susceptibility to Hearing Aid Distortion

Kathryn H. Arehart, Pamela Souza, Rosalinda Baca, and James M. Kates

(Ear & Hearing 2013;34:251–260)

TABLE 1. Total distortion (as measured by HASQI) for the 10 stimulus conditions in quiet, including no processing and 9 frequency compression conditions.

<table>
<thead>
<tr>
<th>Condition Number</th>
<th>Frequency Cutoff (Hz)</th>
<th>Compression Ratio</th>
<th>HASQI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No process</td>
<td>No process</td>
<td>1.000</td>
</tr>
<tr>
<td>2</td>
<td>2000</td>
<td>1.5</td>
<td>0.833</td>
</tr>
<tr>
<td>3</td>
<td>1500</td>
<td>1.5</td>
<td>0.733</td>
</tr>
<tr>
<td>4</td>
<td>2000</td>
<td>2</td>
<td>0.723</td>
</tr>
<tr>
<td>5</td>
<td>2000</td>
<td>3</td>
<td>0.618</td>
</tr>
<tr>
<td>6</td>
<td>1500</td>
<td>2</td>
<td>0.578</td>
</tr>
<tr>
<td>7</td>
<td>1000</td>
<td>1.5</td>
<td>0.570</td>
</tr>
<tr>
<td>8</td>
<td>1500</td>
<td>3</td>
<td>0.462</td>
</tr>
<tr>
<td>9</td>
<td>1000</td>
<td>2</td>
<td>0.377</td>
</tr>
<tr>
<td>10</td>
<td>1000</td>
<td>3</td>
<td>0.253</td>
</tr>
</tbody>
</table>

HASQI, Hearing Aid Sound Quality Index.

Fig 5. Final multilevel model graphs for different prototypical trajectories for intelligibility as a function of total distortion for listeners with the following characteristics: (1) High-RST, age 65 years, and a 4kHz threshold of 55 dB HL; (2) Low-RST, age 65 years, and a 4kHz threshold of 55 dB HL; (3) Low-RST, age 65 years, and a 4kHz threshold of 75 dB HL; and (4) Low-RST, age 80 years, and a 4kHz threshold of 75 dB HL. HASQI, Hearing Aid Sound Quality Index; RAU, rationalized arcsine units; RST, Reading Span Test.
Controlling Audibility (Humes, JASA 2002; JAAA 2007)

- Audibility is main factor for UNAIDED measures of speech (in noise)

- Aided (or amplified to 4 kHz): other factors account for over half of variance:
  - age,
  - central processing (SNR), and
  - cognitive factors (memory)

Cognition Important when Audibility Good
Loss of Neural Synchrony

- Aging results in more error in phase locking (poorer synchrony or “jitter”)
- Consider as if mild form of auditory “neuropathy”
Jittering a Tone or Speech

(Pichora-Fuller et al., 2007, Hearing Research)

Figure 1. Top panel. A 500 Hz pure tone. Bottom Panel. The same 500 Hz pure tone after random temporal jitter. The bandwidth of the temporal jitter used here was 100 Hz. The RMS amplitude of the temporal jitter was 0.5 ms.

Figure 2. Top panel. The time waveform for the word “spoon” from the SPIN sentence “Stir your coffee with a spoon.” Bottom panel. The temporally jittered version of the same word. The bandwidth of the temporal jitter was 500 Hz, and its RMS amplitude was 0.25 ms. Note that the temporal envelope of the utterance is unaffected by temporal jittering. Therefore prosody is preserved.
Spectrograms for Jittered and Intact Sentence in Babble
Cognitive Aging

- **Gains:**
  - Knowledge is preserved
  - Context is helpful

- **Losses:**
  - Processing
  - Working memory
  - Slowing
  - Attention/Inhibition
Context, Intelligibility & Brain Activation
(Obleser, Wise, Dresner & Scott, 2006)

High vs. low predictability at intermediate signal quality for younger adults listening to distorted (noise-vocoded) SPIN sentences

Activation to **HIGH-CONTEXT > LOW-CONTEXT** speech

Various areas activated including the **left dorsolateral prefrontal cortex** (working memory & semantic processing)
Inter- & Intra-individual Differences
Pichora-Fuller, Phonak, 2007

**INTER**: Individuals differ in WM capacities

Fred

Mary

**INTRA**: Allocation of capacity resources to processing vs storage varies with task demands

**Bottom-up processing**  **Top-down processing**

Fred in quiet

Fred in noise

Fred in more noise

WMS = 6

WMS = 4

WMS = 2
Word Auditory Recognition & Recall Measure (WARRM)  
(Smith, Pichora-Fuller, & Alexander, Ear and Hearing, 2016)

<table>
<thead>
<tr>
<th>Word</th>
<th>Recognition</th>
<th>Judgment</th>
<th>Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>RICE</td>
<td>✓</td>
<td>✓</td>
<td>Rice, ✓</td>
</tr>
<tr>
<td>FIST</td>
<td>X, Fish</td>
<td>✓</td>
<td>Fish, ✓</td>
</tr>
<tr>
<td>RISK</td>
<td>✓</td>
<td>✓</td>
<td>Risk, ✓</td>
</tr>
<tr>
<td>GRACE</td>
<td>✓</td>
<td>✓</td>
<td>Grace, ✓</td>
</tr>
<tr>
<td>BAR</td>
<td>X, Car</td>
<td>X</td>
<td>Card, X</td>
</tr>
<tr>
<td>SHOVE</td>
<td>✓</td>
<td>X</td>
<td>Shove, ✓</td>
</tr>
<tr>
<td>WHAT</td>
<td>✓</td>
<td>✓</td>
<td>What, ✓</td>
</tr>
<tr>
<td>MOON</td>
<td>✓</td>
<td>✓</td>
<td>Moon, ✓</td>
</tr>
<tr>
<td>CALF</td>
<td>✓</td>
<td>✓</td>
<td>Rice, ✓</td>
</tr>
<tr>
<td>THAT</td>
<td>✓</td>
<td>✓</td>
<td>That, ✓</td>
</tr>
</tbody>
</table>
WARRM Study - Participants

N = 48 per group
Word Repetition vs Recall

- **Repetition (recognition)**
  - No effect of setsize or task

- **Recall (serial position)**
  - Effect of setsize x group
  - Effect of setsize x task
Effects of Modality and Linguistic Level on Recall across Age
(Pereira, Pattison, Pichora-Fuller & Smith, AAS, 2018)

Younger

Older
Speed (RT) as an Outcome
Speed and Ease of Processing

As adults age:

- Auditory temporal processing declines
- Cognitive information processing slows
- Auditory and cognitive aging can combine to make listening sluggish
- Easier listening is reflected in faster listening
- Reaction time or online measures could reveal differences in speed/ease when accuracy measures are near ceiling and insensitive
Lexical decision reaction time in younger & older: The effects of semantic context and the type and amount of acoustical distortion

- Preceding context distorted or intact
  - Congruent: Stir your coffee with a spoon.
  - Neutral: Its name is feast.
  - Incongruent: Stir your coffee with a risk.

- Distortions: filtering, time-compression, babble

- Measure RT when lexical decision correct
- Facilitation (RT neutral context – RT congruent context)

Facilitation by Congruent Context is Greater for Older than Younger Adults is Reduced by Signal Distortion
Speed (and Ease) of Listening

- Signal quality affects listening:
  - Faster if signal is intact
  - Slower if signal is distorted or degraded or noisy
  - *Could be influenced by signal processing (devices)*

- Context affects listening:
  - Faster if context is semantically congruent
  - Slower if context is semantically incongruent
  - *Could be influenced by AR training*
Informational Masking and Build-up of Stream Segregation
Speech-on-speech Listening
Ezzatian, Li, Pichora-Fuller & Schneider, 2015, *Ear and Hearing*
(adapted from Freyman et al., 1999 “A rose could paint a fish.”)

- 16-band vocoded
- 3-band vocoded
- intact two-talker speech masker
Spatial Location Certainty and Allocating Spatial Attention
Spatial Attention and Location Certainty

• Task: Identify **colour** and **number** with target callsign
• **Callsigns** = Charlie, Hopper, Baron, etc.
• **Probability** of target at the centre location (1.0, 0.8, 0.6, 0.33)

Adapted from Kidd et al., 2005; CRM sentences from Bolia et al., 2000
Task Complexity Hurts Older Adults if Target at Unlikely Location

Singh, Pichora-Fuller, Schneider, JASA 2008; Ear & Hearing 2013

Simple vs Complex instruction
Multi-tasking: Listening while Walking
Challenging Environment Assessment Lab (CEAL) at the Toronto Rehabilitation Institute

Listening Task
**Certain** vs. **Uncertain**
(100% or 60% probability target front)

“Ready Hopper, go to white 2 now”

“Ready Charlie, go to green 3 now”

“Ready Tiger, go to blue 8 now”

**Dual Walking Task**

Street crossing on self-paced treadmill
Location Certainty and Walking
Nieborowska, Lau, Campos, Pichora-Fuller, Novak & Li (under review)
Lau, Pichora-Fuller, Li, Singh & Campos, JAAA, July 2016

Dual-Task Cost (% Correct)

Condition

DUAL-certain
DUAL-uncertain

Older Adults
Hearing loss

Increased perceptual effort drains cognitive resources available for other purposes

Driving?

Reduced perception of hazard noise

Falls?
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 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>1966</td>
<td>1.06</td>
<td>1.01, 1.11</td>
</tr>
<tr>
<td>Mild HL</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%

N=46030 male workers

**Clear dose-response**

Conclusions

- Word recognition achieved in various ways
  - Depends on person, environment, task factors

- When word recognition is highly accurate
  - Memory (signal- and task-related demands)
  - Speed (RT and build-up of stream segregation)

- Word recognition in speech-in-speech listening is susceptible to cognitive demands
  - Spatial certainty
  - Multi-tasking

- Older use signal less but knowledge more
- Older may exceed cognitive capacity sooner
COGNITIVE LOSS
Hearing loss increases many health risks

- Health states associated with hearing loss in cross sectional or longitudinal observational studies:
  - Mortality
  - Dementia
  - Cognitive decline
  - Depression
  - Falls
  - Injuries
  - Frailty
  - Social isolation

All cause mortality ~ Sensory impairment

Kaplan Meier plots for all-cause mortality rates by type of sensory impairment adjusted for relevant confounders

Males

Females

N=4926 Icelandic individuals aged 67+

Years past sensory examination

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.

Hearing Loss Prevalence & Dementia


- **Audiogram**
  - Gold, Lightfoot & Hnath-Chisolm (1996)
    - 27 of 30 (90%) patients with Alzheimer’s had hearing impairment (pure-tone screen & HHIE)
  - Uhlmann et al. (1989)
    - Case-control study with 100 pairs
      - Prevalence higher in those with Alzheimer’s-type dementia
      - Hearing loss significantly correlated with MMSE

- **Central Auditory (DDT)**
  - Idrizbegovic et al. (2011)
    - Performance on DDT worse for those with MCI and worse still for those with DAT

- **DSI and cognitive decline**
  - Dual sensory loss associated with greatest odds for cognitive decline and for functional decline on five everyday activities over a period of four years (Lin, MY et al., 2004)
“Central Auditory” (Speech in Noise) Problems May *PRECEDE* Dementia

- **Longitudinal epidemiological studies**
  - Gates et al. (1996)
    - N >700, speech in competing speech test (SSI-ICM) in those without stroke, dementia, or HL (PTA 40 dB HL)
    - MMSE administered 2, 4, 6 years later
    - Those with low scores on SSI-ICM were 6-12 times more likely to develop clinical dementia
  - Gates et al. (2002, 2008)
    - Similar results for longer follow-up period (3-12 years)
Pure-tone HL Related to Incident Dementia


Hearing loss and cognitive decline
Health ABC cohort, 2013

Modified mini-mental state score*

Study year

Normal hearing group

Hearing loss group

p=.004 for difference in change over time

* Note: very similar results for the digit-symbol substitution test
Hearing loss and Incident Dementia
Baltimore Longitudinal Study of Aging cohort, 2011

<table>
<thead>
<tr>
<th>HL severity</th>
<th>HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mild</td>
<td>1.89 (1.00-3.58)</td>
</tr>
<tr>
<td>moderate</td>
<td>3.00 (1.43-6.00)</td>
</tr>
<tr>
<td>severe or more</td>
<td>4.94 (1.09-22.4)</td>
</tr>
</tbody>
</table>

Cox proportional hazards model adjusted for age, sex, race, education, diabetes, smoking and HTN. Hazard ratios relative to normal hearing.

Source: Lin et al, Arch Neurol 2011
The Lancet Commissions
July 20, 2017

Dementia prevention, intervention, and care
Gill Livingston, Andrew Sommerlad, Vasiliki Orgeta, Sergi G Costafreda, Jonathan Huntley, David Ames, Clive Ballard, Sube Banerjee, Alistair Burns, Jiska Cohen-Mansfield, Claudia Cooper, Nick Fox, Laura N Gitlin, Robert Howard, Helen C Kales, Eric B Larson, Karen Ritchie, Kenneth Rockwood, Elizabeth L Sampson, Quincy Samus, Lon S Schneider, Geir Selbek, Linda Teri, Naheeda Mukadam

Risk factors for dementia: A life course model
Numbers indicate population attributable fractions

Mid-life risk factors
- Hearing loss 9%
- Hypertension 9%
- Obesity 2%

Late-life risk factors
- Potentially modifiable 35%
- Potentially non-modifiable 65%

Hearing loss 9%
Social isolation 2%
Assessment Issue

- Should audiologists test cognition?
- Should others (e.g., neuropsychologists) test hearing?
- How could information be shared across professions?
Hearing Loss Can Impair Performance on Any Task Using Auditory Stimuli

- Weinstein & Amsel (1986)
  - N=30 institutionalized elders with senile dementia
  - 10 of 30 reclassified to less severe category of dementia when retested with amplification
  - (83% had hearing loss > 25 dB HL, significantly higher than comparison sample w/o dementia)
MoCA: Montreal Cognitive Assessment

www.mocatest.org

Visuo-spatial/executive
Naming
Memory
Attention
Language
Abstraction
Repetition
Orientation
MoCA Repeat & Recall (Dupuis et al., 2015)

Good Hearing – Hearing Loss

No difference on final word, but the HL group remembers fewer of the earlier words in the list, even if they correctly repeated the words twice on the learning trials.
Effect of Background Noise on MoCA Scores
(Dupuis, Marchuk, & Pichora-Fuller, CJA, in press)

Speech 50 dBHL
Babble 30 dBHL
Babble 62 dBHL

20 per group
Hearing loss and dementia often affect similar populations; specifically, both conditions occur more frequently in individuals over the age of 65. Since the majority of routine tests used to diagnose dementia are presented verbally, a significant hearing loss might impact the test results. The results of this investigation reveal that hearing status is not routinely considered during the diagnosis of dementia in a large medical center clinic.

**FIGURE 1.** Patients with confirmed hearing loss.
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???
- **SYSTEMATIC REVIEW** (Lehert et al. 2015)
  - Self-initiated activity
Baltimore Experience Corp
Michelle Carlson, Johns Hopkins

http://www.carlsonlab.org/#!Baltimore%20Experience%20Corps/zoom/mainPage/i3240h
Cold War tension in the land of my grandmother

The Crimea, demographically, is a sort of Western Cape of the Ukraine, writes Tony Leon

Hearing loss with age may come with serious long-term consequences for a healthy brain

BY MARIKA SBOROS, 04 FEBRUARY 2013, 10:50

Could Hearing Aids Delay Dementia?

Published February 15, 2011 / Reshare.

Hearing loss may push decline in memory, thinking

Older Americans who have hearing loss have an accelerated decline in thinking and memory abilities, compared to those with normal hearing, according to a study published in JAMA Archives of Internal Medicine.

Those with hearing loss experience a 30% to 49% greater decline in thinking abilities compared to their counterparts without hearing loss, according to the findings published Monday.
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** (Appolonio et al., 1996; Cacciatore et al., 1999; Naramura et al., 1999; Seniors Research Group, 1999)
“Across 148 studies (308,849 participants), the random effects weighted average effect size was OR = 1.50 (95% CI 1.42 to 1.59), indicating a 50% increased likelihood of survival for participants with stronger social relationships.”
Positive Age Beliefs Protects against Dementia

Positive age beliefs protect against dementia even among elders with high-risk gene

Becca R. Levy, Martin D. Slade, Robert H. Pietrzak, Luigi Ferrucci

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Abstract

One of the strongest risk factors for dementia is the ε4 variant of the APOE gene. Yet, many who carry it never develop dementia. The current study examined for the first time whether positive age beliefs that are acquired from the culture may reduce the risk of developing dementia among older individuals, including those who are APOE ε4 carriers. The cohort consisted of 4,765 Health and Retirement Study participants who were aged 60 or older and dementia-free at baseline. As predicted, in the total sample those with positive age beliefs at baseline were significantly less likely to develop dementia, after adjusting for relevant covariates. Among those with APOE ε4, those with positive age beliefs were 49.8% less likely to develop dementia than those with negative age beliefs. The results of this study suggest that positive age beliefs, which are modifiable and have been found to reduce stress, can act as a protective factor, even for older individuals at high risk of dementia.
Good Hearing Health Could Contribute to Healthy Aging

PRESERVE communication and social interaction
• slow cognitive decline
• reduce risk for adverse events
• improve benefit from health care
• increase longevity?
Age-friendly, Dementia-friendly… Sensory-friendly….