Separated from **things** and **people**

Making sense of the links between sensory loss and dementia

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"Blindness separates us from things but deafness separates us from people."

~Helen Keller

“I must live almost alone, like one who has been banished; I can mix with society only as much as true necessity demands. If I approach near to people a hot terror seizes upon me…”

~Ludwig van Beethoven
Sensory Impaired Life Expectancies

Burden of Disease in Older Adults (DALYs)

**Figure 2.1**
Contribution of chronic diseases to years lived with disability

- Skin: 0.6%
- Endocrine: 0.8%
- Genitourinary: 1.8%
- Diabetes: 2.5%
- Cancer: 2.5%
- Heart Disease: 5.3%
- Digestive: 5.5%
- Mental Disorders: 9.1%
- Arthritis: 9.5%
- Stroke: 10.1%
- Blindness: 21.5%
- Deafness: 10.6%
- Dementia: 11.9%

**Figure 2.2**
Contribution of chronic diseases to years of life lost

- Skin: 0.2%
- Endocrine: 0.6%
- Genitourinary: 2.4%
- Diabetes: 3.7%
- Stroke: 17.8%
- Dementia: 11.9%
- Cancer: 22.5%
- Arthritis: 0.3%
- Mental Disorders: 1.3%
- Digestive: 4.6%
- Heart Disease: 32.9%
- Blindness: 0%

Disability Burden (YLD) in Australians 65+

- Dementia
- Sense organ disorders
- Cardiovascular disease
- Malignant neoplasms
- Diabetes mellitus
- Musculoskeletal diseases
- Adult-onset hearing loss
- Chronic respiratory disease
- Other nervous system disorders
- Diseases of the digestive system
- Genitourinary diseases
- Injuries
- Mental disorders
- Endocrine and metabolic disorders
- Skin diseases
- Oral conditions
- Communicable diseases
- Other neoplasms
- Congenital anomalies

Age group 65-74
Age group 75+

Calculated from AIHW data (2003).
Table 3.15: Twenty most common co-existing long-term health conditions for people with dementia, 2009 (per cent)

<table>
<thead>
<tr>
<th>Long-term health condition (a)</th>
<th>Per cent (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritis and related disorders</td>
<td>39.6</td>
</tr>
<tr>
<td>Hypertension (high blood pressure)</td>
<td>37.1</td>
</tr>
<tr>
<td>Deafness/Hearing loss</td>
<td>36.8</td>
</tr>
<tr>
<td>Depression/mood affective disorders (excluding postnatal depression)</td>
<td>21.9</td>
</tr>
<tr>
<td>Stroke</td>
<td>20.9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>15.5</td>
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<td>•</td>
<td></td>
</tr>
<tr>
<td>Heart disease</td>
<td>7.9</td>
</tr>
<tr>
<td>Head injury/acquired brain damage</td>
<td>7.3</td>
</tr>
<tr>
<td>Asthma</td>
<td>6.4</td>
</tr>
<tr>
<td>Other diseases of the eye and adnexa</td>
<td>6.4</td>
</tr>
</tbody>
</table>

Australian Institute of Health and Welfare (2012). *Dementia in Australia*. Cat. no. AGE 70, Canberra; AIHW
Hearing loss predicts Dementia and Cog.

Central Auditory Dysfunction May Precede the Onset of Clinical Dementia in People with Probable Alzheimer’s Disease
George A. Gates, MD,* Alexa Beiser, PhD,* Thomas S. Rees, PhD,* Ralph B. D’Agostino, PhD,* and Philip A. Wolf†‡

JAGS 50:482-488, 2002
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Objective: To determine whether hearing loss is associated with incident all-cause dementia and Alzheimer disease (AD).

Main Outcome Measure: Incident cases of all-cause dementia and AD until May 31, 2006.

Results: During a median follow-up of 11.9 years, 58 cases of incident all-cause dementia were diagnosed, of which

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

Six hundred eighty-seven individuals ages 20-108 years were studied cross-sectionally to examine the relationship between measures of sensory functioning (visual and auditory acuity) and intelligence (14 cognitive tasks representing a 5-factor space of psychometric intelligence). As predicted, the average proportion of individual differences in intellectual functioning associated with sensory functioning increased from 1% in adulthood (25-49 years) to 30% in old age (70-90 years). However, the link between intellectual abilities and sensory functioning, absent of different rates, displayed a similarly high connection to age in both age groups. Several explanations are discussed, including a “sensory-capacity” hypothesis. In this vein, we argue that the increase in the age-associated link between sensory and intellectual functioning may reflect brain aging and that the search for explanations...
Sensory Loss and Dementia

**Biological explanations**
Place your bets…
a vascular mechanism?

**Cognitive Load**
Increased demands placed on cognitive processing of low fidelity sensory inputs (e.g. Kahneman et al, cognitive resource capacity)

**Social mechanism**
Long term antecedent of cognitive decline
**Loneliness**: gateway to behavioural, psychological, and physiological pathways
e.g. reduced cognitive and social engagement
Impacts of hearing loss

Cascade of ‘knock-on’ effects:

• Poorly recognised, under treated
• Communication Difficulties (Gates et al 2005, Lancet)
• Social withdrawal (Weinstein 2000, Geriatric Audiology)
• Reduced engagement (Kiely et al 2013, Frontiers)
• Loneliness and social isolation
• Lower cognitive and brain reserve
• Depressive symptoms (Kiely et al 2013, Frontiers)
• Lower quality of Life (Gopinath et al 2009, JAGS)
• Increased falls risk (Viljanen et al 2009, JOG A)
• Cognitive Impairment and Dementia (Lin et al 2011, Archives of Neurology)
• Mortality (Anstey et al 2001, Psychology and Ageing)
Is Cognitive Function in Adults with Hearing Impairment Improved by the Use of Hearing Aids?

A Young Choi, MD ·  Hyan Joon Shim, MD · Sung Heo Lee, MS · Sang Won Yoon, MD · Eun-Jeong Joo, MD

Departments of Otorhinolaryngology and Neurosurgery, Eulji University School of Medicine, Seoul, Korea

Objectives. In the present study, we investigated whether speech-related cognitive function and speech recognition ability under background noise in adults with hearing impairment are improved with the use of hearing aids.

Methods. Participants were recruited from the ENT Department of Eulji Hospital from September 2008 to July 2009. The 30-50 years age group, total 57
total VVLT months after hearing improved from control group. For it, no statistically significant differences in age, sex, and hearing level between the control group and the hearing aids group were noted. The results revealed that those with high working-memory capacity were better than those with low capacity in identifying and reporting the specific processing effects of the aid. This may have implications for how reported results should be interpreted in a research context, how a person’s rehabilitative needs are formulated, and how hearing aid controls should be supervised. In conclusion, careful attention should be paid to the cognitive status of listeners, as it can have a significant influence on their ability to utilize their hearing aids.

"This study overturns decades-old beliefs that most of the brain is hard-wired before a critical period that ends when one is a young adult," said MPT.

Cognitive function in relation to hearing aid use

Abstract. Two experiments were conducted to investigate possible relationships between cognitive functions and hearing aid use. In Experiment 1, 72 first-time hearing aid users were tested for speech recognition in noise (Hegedusian sentence test) with and without hearing aids. Cognitive function was assessed by tests of working memory (stair test) and visual information-processing speed. The results indicate that, after controlling for age and hearing loss, significant correlations exist between the measures of cognitive performance and speech recognition in noise, both with and without hearing aids. High cognitive performance was associated with high performance in the speech recognition task. In Experiment 2, 17 first-time hearing aid users with either high or low working-memory capacity tested on an experimental hearing aid which processed the sound differently depending on whether or not speech was detected. The results revealed that those with high working-memory capacity were better than those with low capacity in identifying and reporting the specific processing effects of the aid. This may have implications for how reported results should be interpreted in a research context, how a person’s rehabilitative needs are formulated, and how hearing aid controls should be supervised. In conclusion, careful attention should be paid to the cognitive status of listeners, as it can have a significant influence on their ability to utilize their hearing aids.
Summary

Sensory Loss:

- Antecedent of cognitive decline (and MCI and dementia)
- Broad ranging impacts that are also risks for cog. decline
  - Social and cognitive engagement
  - Mental health
  - Social isolation
  - Hearing is important
- Hearing aids – what direction?
  - Haven't quite connected the dots
- Risk marker or risk factor? (or both?)
- Links to neuropsychiatric symptoms of dementia
  - But only for those with limited cognitive resources
Future research I

• Sensory loss and cognitive decline
  – Does social engagement mediate hearing related cognitive decline?
  – Does treating/managing sensory loss alleviate burden
  – Mismatch between measured and subjective hearing loss
  – Factors facilitate uptake and adherence to hearing rehabilitation e.g. Hickson *Int J Audiol* 2014; *53*(Special issue)
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http://aagconference.asn.au/

PATHWAYS TO AGEING WELL
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