Separated from things and people

Making sense of the links between sensory loss and dementia

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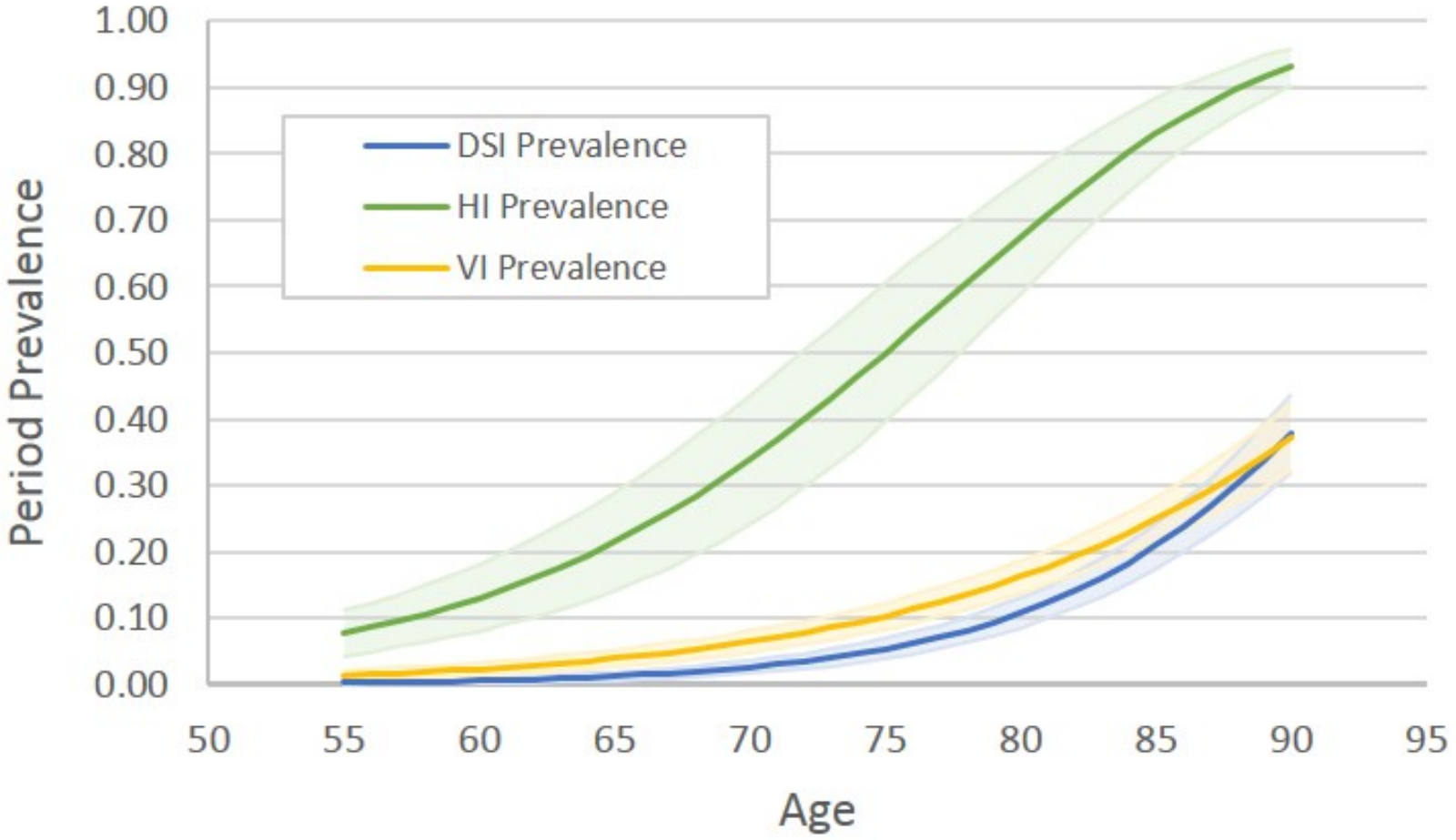
Things and people

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

~Helen Keller

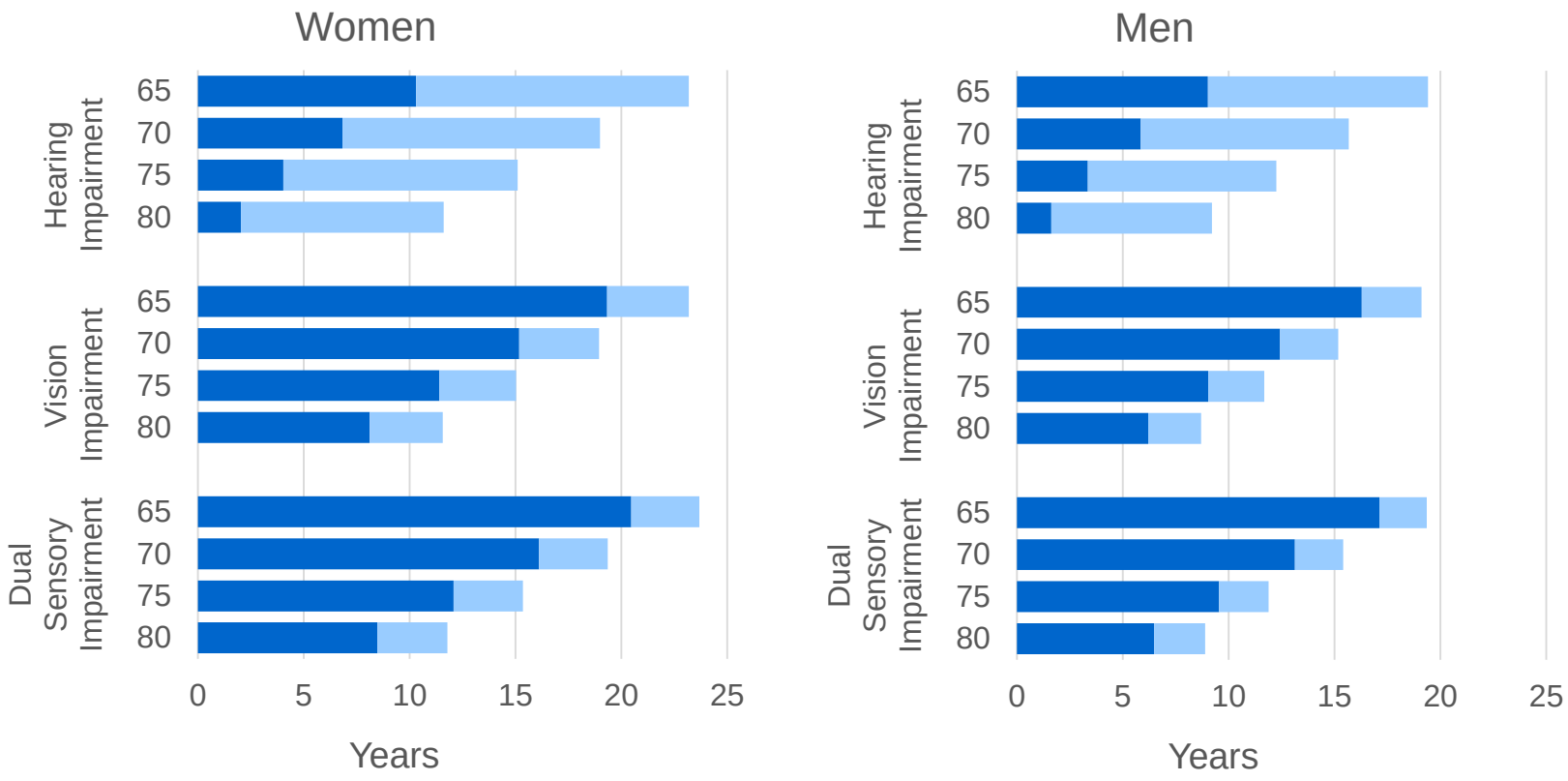
"I must live almost alone, like one who has been banished; I can mix with society only as much as true necessity demands. If I approach near to people a hot terror seizes upon me..."

~Ludwig van Beethoven



Kiely KM, et al. (2015) Estimating the years lived with and without age-related sensory impairment. **Journal of Gerontology Series A: Medical Sciences**, in press.

Sensory Impaired Life Expectancies



Kiely KM, et al. (2015) Estimating the years lived with and without age-related sensory impairment. **Journal of Gerontology Series A: Medical Sciences**, in press.

Burden of Disease in Older Adults (DALYs)

Figure 2.1
Contribution of chronic diseases to years lived with disability

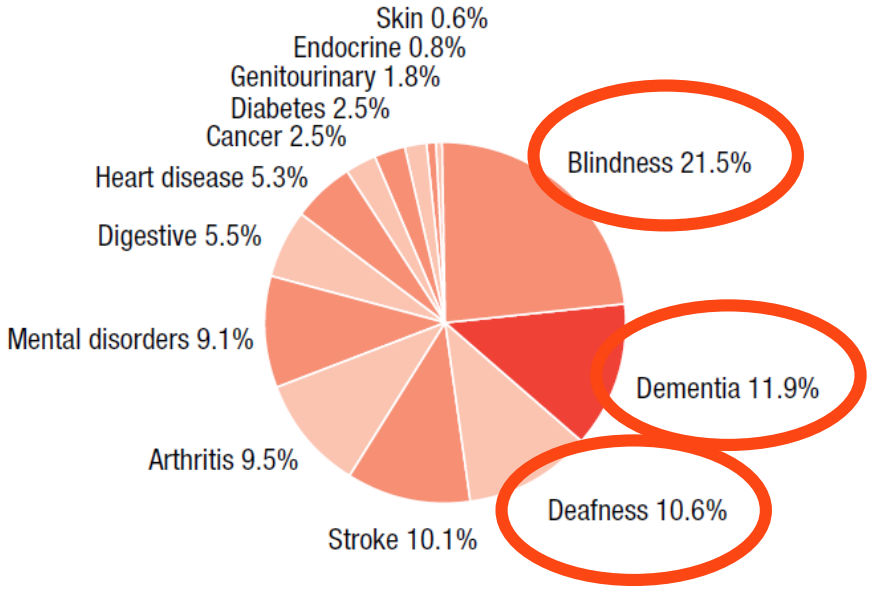
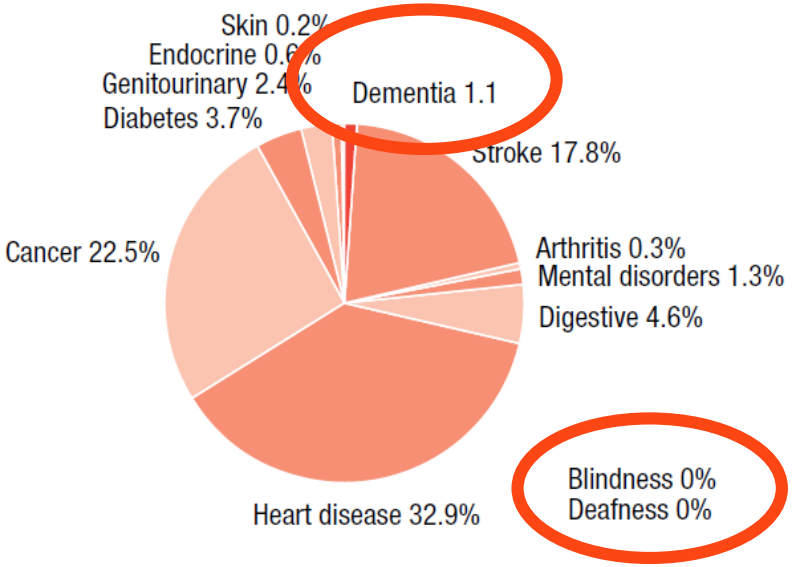
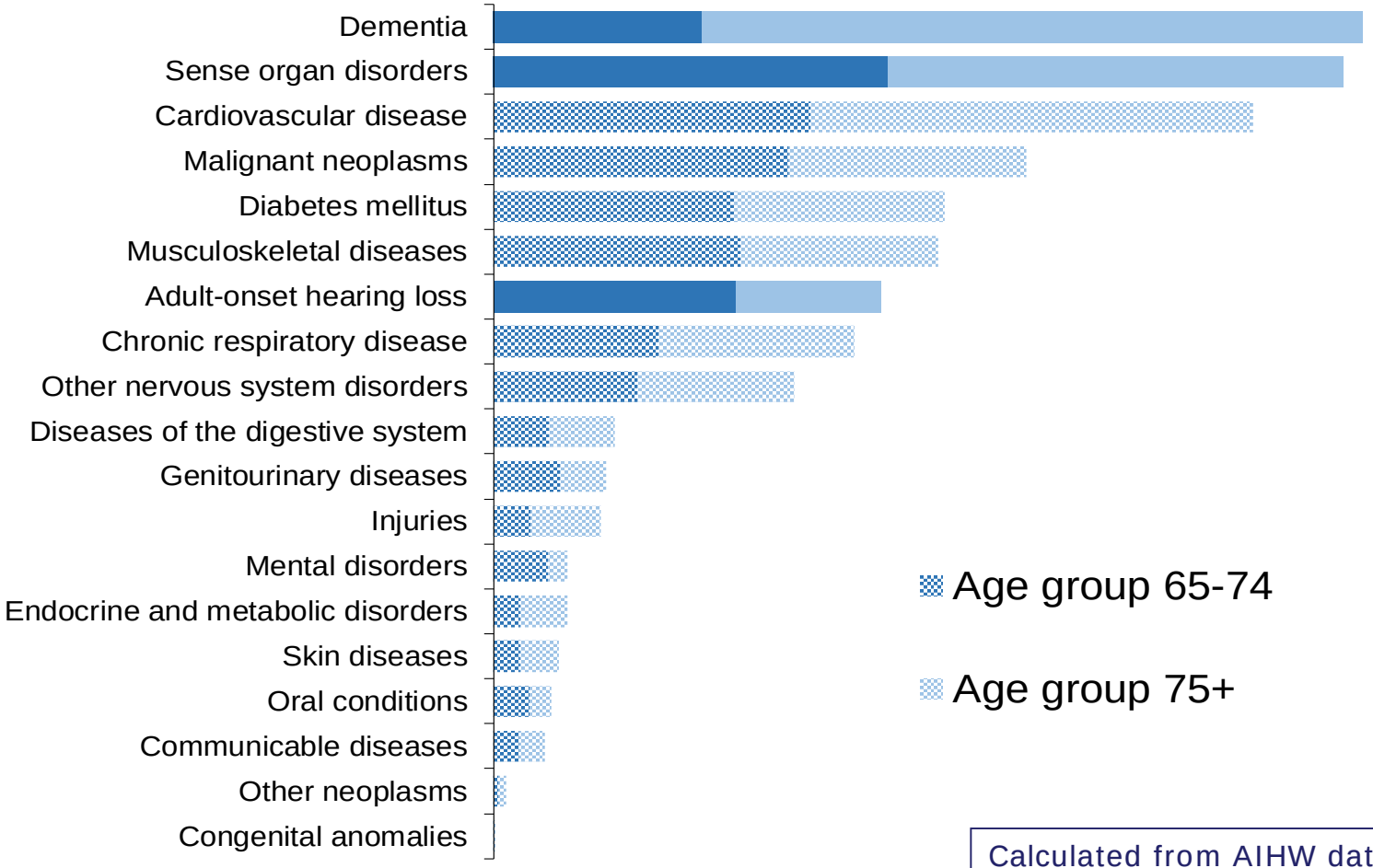


Figure 2.2
Contribution of chronic diseases to years of life lost



Alzheimer's Disease International (2009). ***World Alzheimer Report 2009***. London: ADI.

Disability Burden (YLD) in Australians 65+



Calculated from AIHW data (2003).

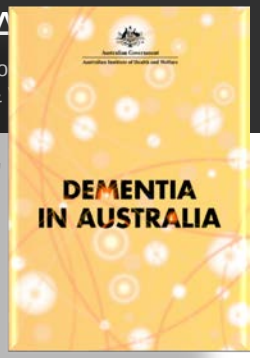
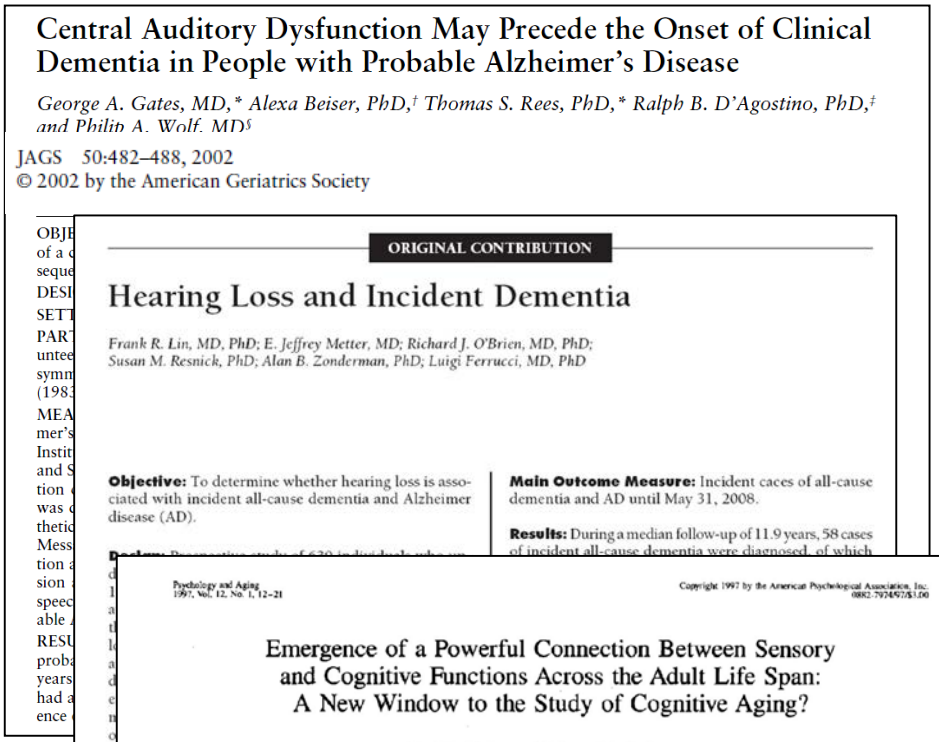


Table 3.15: Twenty most common co-existing long-term health conditions for people with dementia, 2009 (per cent)

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

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, MD§*

JAGS 50:482–488, 2002
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ORIGINAL CONTRIBUTION

Hearing Loss and Incident Dementia

Frank R. Lin, MD, PhD; E. Jeffrey Metter, MD; Richard J. O'Brien, MD, PhD; Susan M. Resnick, PhD; Alan B. Zonderman, PhD; Luigi Ferrucci, MD, PhD

Objective: To determine whether hearing loss is associated with incident all-cause dementia and Alzheimer disease (AD).

Main Outcome Measure: Incident caces of all-cause dementia and AD until May 31, 2008.

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

Psychology and Aging
1997, Vol. 12, No. 1, 12–21

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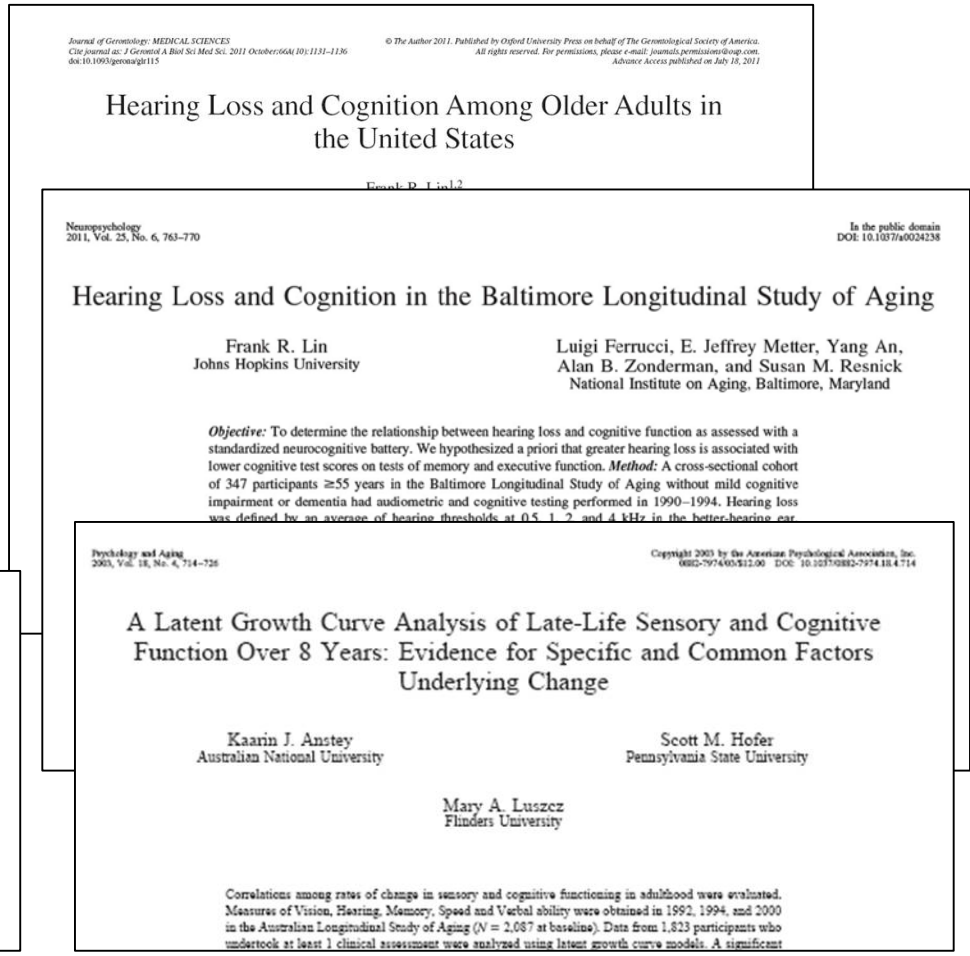
0882-7974/97/$3.00

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 25–103 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 connected to sensory functioning increased from 11% in adulthood (25–69 years) to 31% in old age (70–103 years). However, the link between fluid intellectual abilities and sensory functioning, albeit of different size, displayed a similarly high connection to age in both age groups. Several explanations are discussed, including a "common cause" 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 explana-



Journal of Gerontology: MEDICAL SCIENCES
Cite journal as: J Gerontol A Biol Sci Med Sci. 2011 October;66A(10):1131–1136
doi:10.1093/gerona/glr115

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Hearing Loss and Cognition Among Older Adults in the United States

Frank R. Lin[1,2]

Neuropsychology
2011, Vol. 25, No. 6, 763–770

In the public domain
DOI: 10.1037/a0024238

Hearing Loss and Cognition in the Baltimore Longitudinal Study of Aging

Frank R. Lin
Johns Hopkins University

Luigi Ferrucci, E. Jeffrey Metter, Yang An, Alan B. Zonderman, and Susan M. Resnick
National Institute on Aging, Baltimore, Maryland

Objective: To determine the relationship between hearing loss and cognitive function as assessed with a standardized neurocognitive battery. We hypothesized a priori that greater hearing loss is associated with lower cognitive test scores on tests of memory and executive function. ***Method:*** A cross-sectional cohort of 347 participants ≥55 years in the Baltimore Longitudinal Study of Aging without mild cognitive impairment or dementia had audiometric and cognitive testing performed in 1990–1994. Hearing loss was defined by an average of hearing thresholds at 0.5, 1, 2, and 4 kHz in the better-hearing ear.

Psychology and Aging
2003, Vol. 18, No. 4, 714–726

Copyright 2003 by the American Psychological Association, Inc.
0882-7974/03/$12.00 DOI: 10.1037/0882-7974.18.4.714

A Latent Growth Curve Analysis of Late-Life Sensory and Cognitive Function Over 8 Years: Evidence for Specific and Common Factors Underlying Change

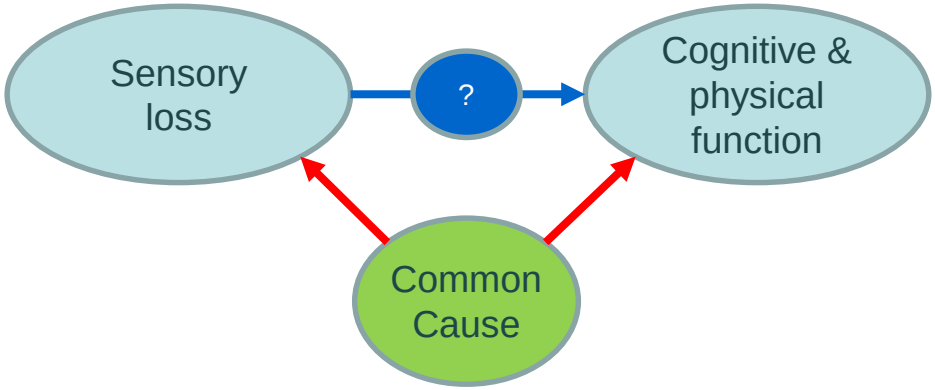
Kaarin J. Anstey
Australian National University

Scott M. Hofer
Pennsylvania State University

Mary A. Luszcz
Flinders University

Correlations among rates of change in sensory and cognitive functioning in adulthood were evaluated. Measures of Vision, Hearing, Memory, Speed and Verbal ability were obtained in 1992, 1994, and 2000 in the Australian Longitudinal Study of Aging (N = 2,087 at baseline). Data from 1,823 participants who undertook at least 1 clinical assessment were analyzed using latent growth curve models. A significant

Sensory Loss and Dementia



CC **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*)

https://twitter.com/jerology

CEO Clinical and Experimental Otorhinolaryngology Vol. 4, No. 2: 72-76, June 2011 DOI 10.3342/ceo.2011.4.2.72

Original Article

Is Cognitive Function in Adults with Hearing Impairment Improved by the Use of Hearing Aids?

A Young Choi, MD · Hyun Joon Shim, MD · Sung Hee Lee, MS · Sang Won Yoon, MD · Eun-Jeong Joo, MD[1]

Departments of Otorhinolaryngology and [1]Neuropsychiatry, 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 ... who were fitted ... 3.1±11.8 years) ... ean visual verbal ... roup and initially ... erences in the re- ... roup, total VVLT ... onths after hear- ... y improved from ... ontrol group. For ... st, no statistically ... the control group

Scandinavian Journal of Psychology, 2009, 50, 371–384 DOI: 10.1111/j.1467-9450.2009.00753.x

Background and Basic Processes

The emergence of Cognitive Hearing Science

STIG ARLINGER,[1,2] THOMAS LUNNER,[1,2,3,4] BJÖRN LYXELL[1,3] and M. KATHLEEN PICHORA-FULLER[1,3,5,6]

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[2]Department of Clinical and Experimental Medicine, Linköping University, Sweden
[3]Department of Behavioural Sciences and Learning, Linköping University, Sweden
[4]Oticon A/S, Research Centre Eriksholm, Snekk...
[5]Department of Psychology, University of Toron...
[6]Toronto Rehabilitation Institute, Toronto, Cana...

Arlinger, S., Lunner, T., Lyxell, B. & Pichora-Ful... 50, 371–384.

Cognitive Hearing Science or Auditory Cogni... hearing and cognition. It follows a trend over the... Science, then Cognitive Neuroscience, and ther... understand complex human behaviors, to develo... impairments that undermine typical behaviors. A... tics, Philosophy, Anthropology, and Sociology b... working on the design of technologies, and with... emergence of Cognitive Hearing Science include... nities to use complex digital signal-processing t... social imperatives to help people whose commun... three general topics: (1) language processing in ... ity to boost performance; (3) changes in perfor... translation of research into practice are suggested...

Key words: Hearing, cognition, hearing loss, wo...

M.K. Pichora-Fuller, Department of Psycholo...
E-mail: k.pichora.fuller@utoronto.ca

International Journal of Audiology 2003; 42:S49–S58

Cognitive function in relation to hearing aid use

Abstract

Two experiments were conducted to investigate possible relationships between cognitive function and hearing aid use. In Experiment 1, 72 first-time hearing aid users were tested for speech recognition in noise (Hagerman sentence test) with and without hearing aids. Cognitive function was assessed by tests of working memory (reading span test) and verbal 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 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 at 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 rehabilitation 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.

NEUROSCIENCES

Persistent sensory experience is good for the ageing brain

Rewiring in the brain is life-long

May 24, 2012

Despite a long-held scientific belief that much of the wiring of the brain is fixed by the time of adolescence, a new study shows that changes in sensory experience can cause massive rewiring of the brain, even as one ages. In addition, the study found that this rewiring involves fibres that supply the primary input to the cerebral cortex, the part of the brain that is responsible for sensory perception, motor control and cognition. These findings promise to open new avenues of research on brain remodelling and ageing.

"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 MPFI

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ORIGINAL PUBLICATION

...arcel Oberlaender, Alejandro Ramirez, ...andy M. Bruno
...nsory Experience Restructures ...alamocortical Axons during Adulthood
...Neuron, Volume 74, Issue 4 (24 May ...012), Pages 648–655,DOI ...0.1016/j.neuron.2012.03.022

COVER STORY

Exploring the maze of the cognition-audition connection

By Douglas L. Beck, AuD

Beck: Brent, let's start with your thoughts and observations on cognition and audition. What do we know?

Edwards: Our research has primarily addressed the effect of hearing aid technology on "cognitive load." We've been examining how much of an individual's cognitive resources are being used to accomplish listening in

...ames Jerger, ...miss the fore... ...tive process... ...motivation.[1]

JOURNAL OF THE AMERICAN GERIATRICS SOCIETY

Brief Reports

Self-Reported Hearing Loss, Hearing Aids, and Cognitive Decline in Elderly Adults: A 25-Year Study

Hélène Amieva PhD*, Camille Ouvrard MSc, Caroline Giulioli MSc, Céline Meillon MSc, Laetitia Rullier PhD and Jean-François Dartigues MD, PhD

Article first published online: 20 OCT 2015
DOI: 10.1111/jgs.13649

Issue

Journal of the American Geriatrics Society
Volume 63, Issue 10, pages 2099–2104, October 2015

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 - Social isolation
  - Mental health - 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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