Do Hearing Aids Prevent Cognitive Decline?

A Sonova brand

PHONAK life is on

Disclosure in accordance with CEU Requirements

PHONAK life is on

Paul Kreimer, M.A., CCC-A
Manager, Clinical Training, Phonak, US

- I have a financial relationship to disclose:
  - Employee of Phonak who receives a salary
- I have no nonfinancial relationship to disclose

Presented in Partnership wth

CONTINUED

Learning Outcomes

After this course, learners will be able to:

- describe the associations between cognitive decline and hearing loss.
- differentiate between different hypotheses about the origin of these associations.
- evaluate the current evidence related to this topic, cognitive decline and hearing loss.

Introduction

- Paul J Kreimer, M.A., CCC-A
  - Clinical Training Manager – Central Region
  - 11 years in a clinical setting
    - Hospital
    - ENT & Otology Practice
    - VA Hospital – Indianapolis
    - Private Practice
  - 11 years with Phonak as a Clinical Trainer and manager

PHONAK life is on

Connectivity?

OTC?

Streaming?

eSolutions?

Hearables?

Framing?

Healthy Aging?

What does Healthy Aging Look Like to You?

PHONAK life is on

Presented in Partnership wth

CONTINUED

Well hearing = Well-being

Agenda

PHONAK life is on

1. What we know about hearing loss and cognition
2. What we know about hearing aids and cognition
3. What opportunities do we have?

Presented in Partnership wth

CONTINUED

What we know about hearing loss and cognition

Cognitive abilities

- Attention
- Processing speed
- Short-term memory
- Working memory
- Long-term memory
- Executive functions
- Semantic and language knowledge

Dementia

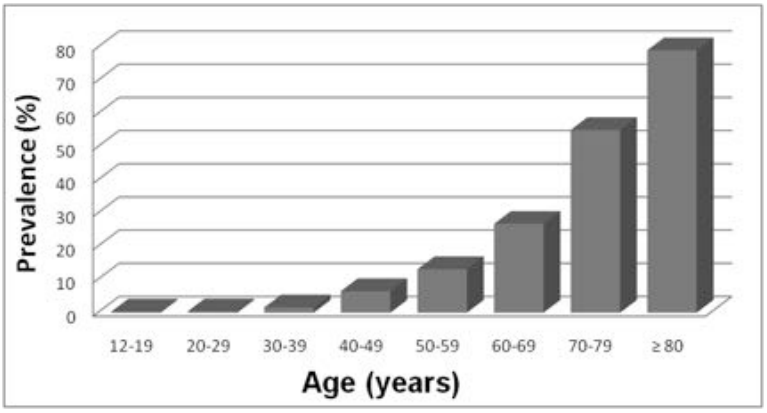
PHONAK life is on

- Deterioration in cognitive function beyond normal aging.
- It affects:
  - Memory
  - Thinking
  - Orientation
  - Comprehension
  - Calculation
  - Learning capacity
  - Language and judgement

Presented in Partnership wth

CONTINUED

Hearing impairment by age group



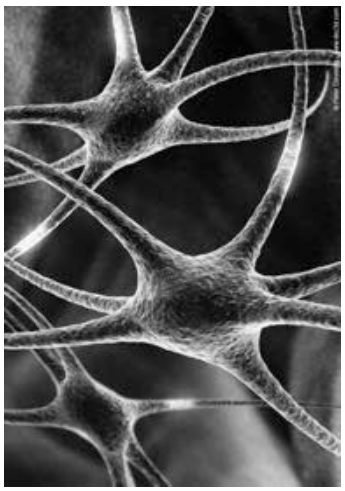
Lin et al., Arch Int Med. 2011

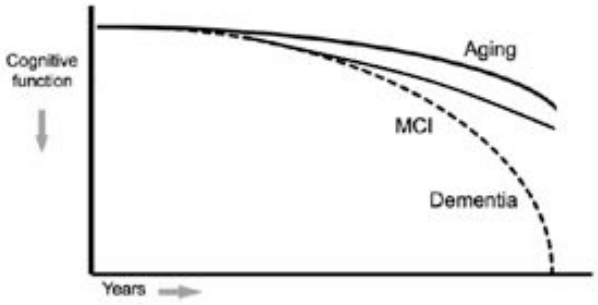
- 65% of HA users are 70 years or older

Presented in Partnership wth

CONTINUED

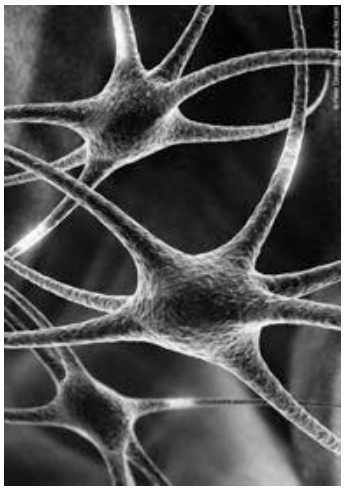
Brain aging – normal and abnormal

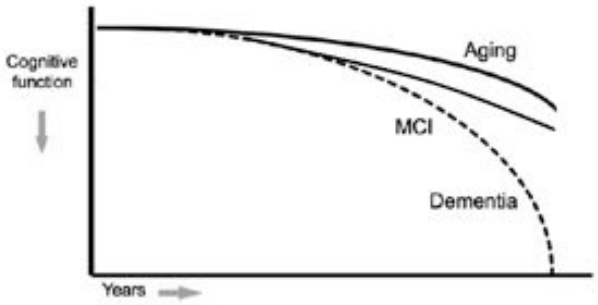




- Degeneration in brain physiology
- Reduction in cognition functioning

Brain aging – normal and abnormal





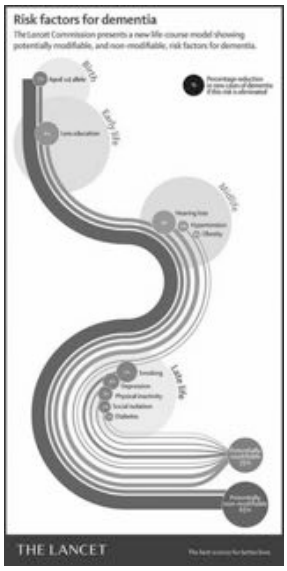
- *MCI is estimated to effect 22.6% of adults over 60*
- *The number of individuals with dementia is expected to double every 20 years, resulting in over 65 million individuals affected by 2030*

Hearing Loss:
Precursor & potential risk factor for cognitive decline

PHONAK life is on

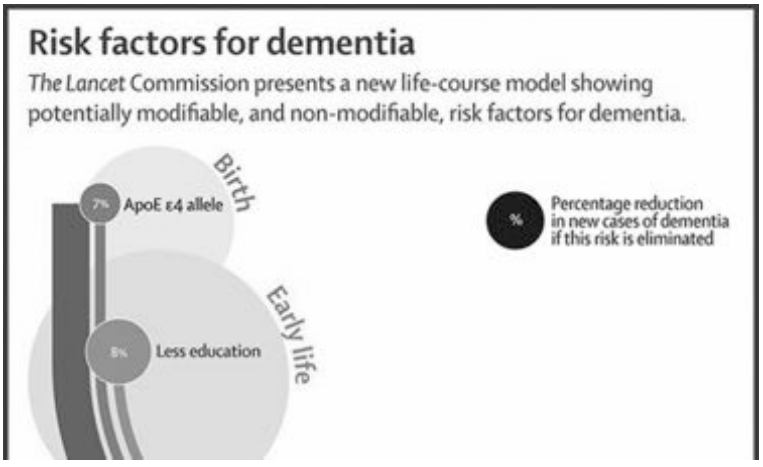

The Lancet Commissions

Dementia prevention, intervention, and care



Hearing Loss:
Precursor & potential risk factor for cognitive decline

PHONAK life is on

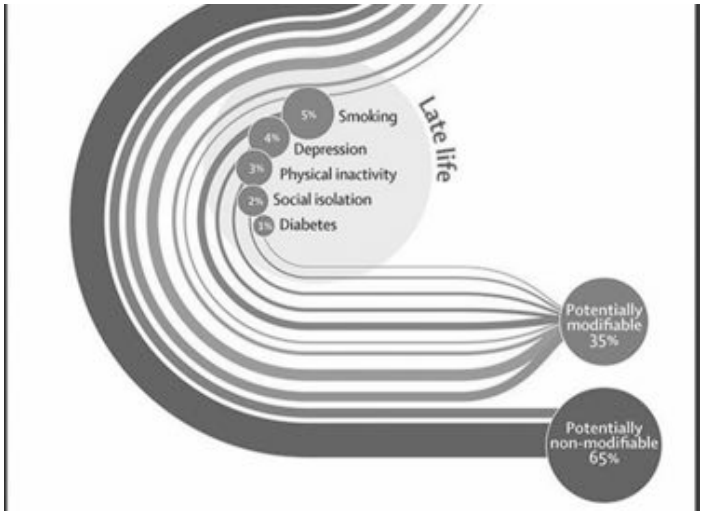


Presented in Partnership wth

CONTINUED

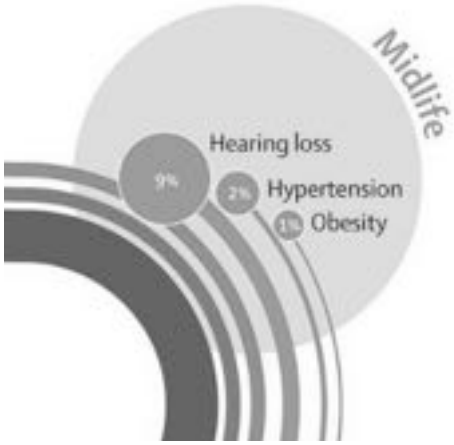
Hearing Loss:
Precursor & potential risk factor for cognitive decline

PHONAK life is on



Hearing Loss:
Precursor & potential risk factor for cognitive decline

PHONAK life is on



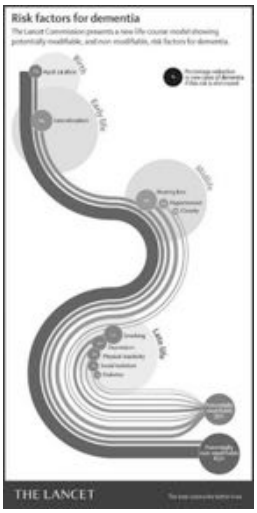
Hearing loss was identified as the largest modifiable risk factor for dementia

Presented in Partnership wth

CONTINUED

Hearing Loss:
Precursor & potential risk factor for cognitive decline

PHONAK life is on



- Weak but significant correlation
- Possible causal relation
- Potentially modifiable
- Hearing loss is most likely a pre-cursor

The Auditory System and Cognition

PHONAK life is on

Peripheral Hearing and Cognition

Peripheral hearing loss has been associated with:

- Poorer cognitive performance
- Accelerated cognitive decline [1,2]

Risk of cognitive decline increases linearly with hearing loss severity

Central Auditory Processing and Cognition

Studies suggest that CAP and cognition are related more strongly than are peripheral hearing and cognition. Additionally, CAP measures may be useful tools to help identify or assess cognitive impairment. [3,4]

1. Lin F R, Yaffe K, Xia J. et al. Hearing loss and cognitive decline in older adults. JAMA Intern Med. 2013;173(4):293–299. [PMCID: PMC3869227] [PubMed: 23337978]
2. Lin F R, Ferrucci L, Metter E J, An Y, Zonderman A B, Resnick S M. Hearing loss and cognition in the Baltimore Longitudinal Study of Aging. Neuropsychology. 2011;25(6):763–770. [PMCID: PMC3193888] [PubMed: 21728425]
3. 46. Brandino A Matthews C Valdés E G et al. Central and peripheral auditory processing in individuals with and without mild cognitive impairment Paper presented at: American Academy of Audiology Conference; March 27–29 2014; Orlando, FL
4. 47. Fluegel B A Matthews C Harrison Bush A L Lister J J Edwards J D Andel R Neurophysiological indicators of early-stage cognitive decline Paper presented at: American Academy of Audiology Conference; March 27–29 2014; Orlando, FL

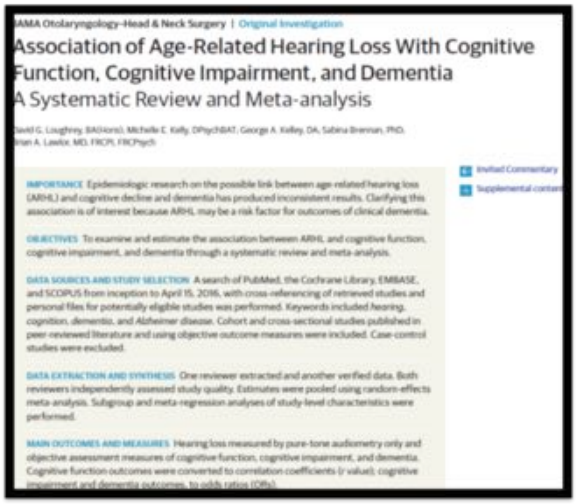
Presented in Partnership wth

CONTINUED

Correlation between hearing loss & various cognitive functions

PHONAK life is on

- A small but significant association was found for age related hearing loss (ARHL) within all domains of cognitive function
- ARHL precedes the onset of clinical dementia by 5 to 10 years making it a possible non-invasive biomarker



JAMA Otolaryngology–Head & Neck Surgery | Original Investigation

Association of Age-Related Hearing Loss With Cognitive Function, Cognitive Impairment, and Dementia
A Systematic Review and Meta-analysis

David G. Loughrey, BA(Hons), Michelle E. Kelly, DPsychBAT, George A. Kelley, DA, Sabina Brennan, PhD, Brian A. Lawlor, MD, FRCPI, FRCPsych

IMPORTANCE Epidemiologic research on the possible link between age-related hearing loss (ARHL) and cognitive decline and dementia has produced inconsistent results. Clarifying this association is of interest because ARHL may be a risk factor for outcomes of clinical dementia.

OBJECTIVES To examine and estimate the association between ARHL and cognitive function, cognitive impairment, and dementia through a systematic review and meta-analysis.

DATA SOURCES AND STUDY SELECTION A search of PubMed, the Cochrane Library, EMBASE, and SCOPUS from inception to April 15, 2016, with cross-referencing of retrieved studies and personal files for potentially eligible studies was performed. Keywords included hearing, cognition, dementia, and Alzheimer disease. Cohort and cross-sectional studies published in peer-reviewed literature and using objective outcome measures were included. Case-control studies were excluded.

DATA EXTRACTION AND SYNTHESIS One reviewer extracted and another verified data. Both reviewers independently assessed study quality. Estimates were pooled using random-effects meta-analysis. Subgroup and meta-regression analyses of study-level characteristics were performed.

MAIN OUTCOMES AND MEASURES Hearing loss measured by pure-tone audiometry only and objective assessment measures of cognitive function, cognitive impairment, and dementia. Cognitive function outcomes were converted to correlation coefficients (r value); cognitive impairment and dementia outcomes, to odds ratios (ORs).

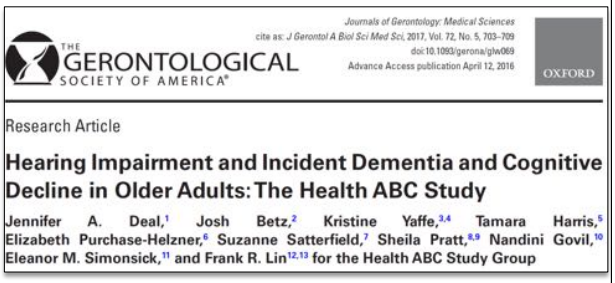
Loughrey, D. G., Kelly, M. E., Kelley, G. A., Brennan, S., & Lawlor, B. A. (2018). Association of Age-Related Hearing Loss With Cognitive Function, Cognitive Impairment, and Dementia: A Systematic Review and Meta-analysis. *JAMA otolaryngology-- head & neck surgery*, *144*(2), 115–126. doi:10.1001/jamaoto.2017.2513

Hearing Loss is Correlated with Incident Dementia

PHONAK life is on

Health, Aging and Body Composition (Health ABC) study (2017):

- N = 1889
- age: 70 – 79 years
- no dementia at baseline
- adjusted for demographic and cardiac factors
- Normal/mild/moderate-severe HL



THE GERONTOLOGICAL SOCIETY OF AMERICA

Journals of Gerontology: Medical Sciences
cite as: J Gerontol A Biol Sci Med Sci, 2017, Vol. 72, No. 5, 703–709
doi:10.1093/gerona/glw069
Advance Access publication April 12, 2016

OXFORD

Research Article

Hearing Impairment and Incident Dementia and Cognitive Decline in Older Adults: The Health ABC Study

Jennifer A. Deal,[1] Josh Betz,[2] Kristine Yaffe,[3,4] Tamara Harris,[5] Elizabeth Purchase-Helzner,[6] Suzanne Satterfield,[7] Sheila Pratt,[8,9] Nandini Govil,[10] Eleanor M. Simonsick,[11] and Frank R. Lin[12,13] for the Health ABC Study Group

Conclusion:

- HI is associated with increased risk of developing dementia in older adults
- Randomized trials are needed to determine possible dementia onset postponement through treatment of HL

Presented in Partnership wth

CONTINUED

Summary

PHONAK life is on

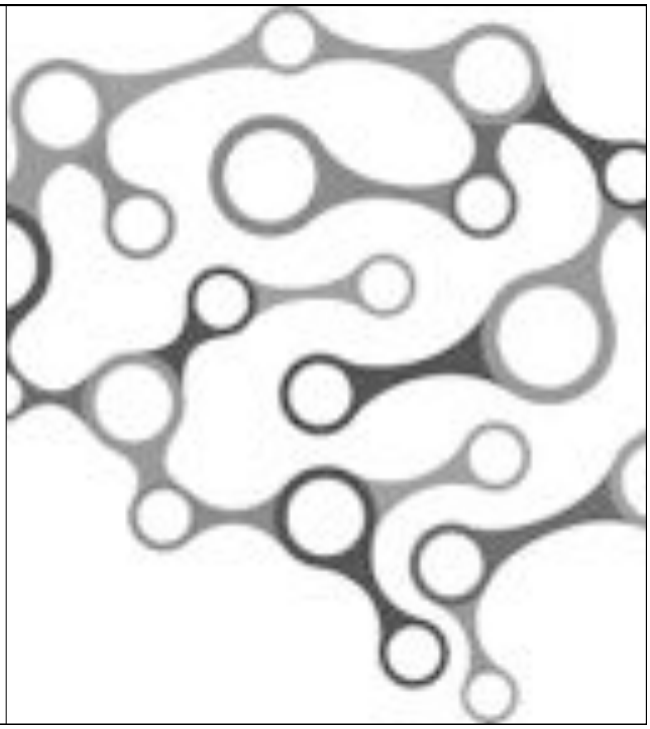
- Hearing loss and cognitive decline are associated with each other.
- This holds for specific cognitive functions and dementia

- People with HL also have accelerated cognitive decline compared to NH (Amieva et al., 2015)
- HL is linked to accelerated brain atrophy (Gurgel et al., 2014; Lin et al., 2011,2013, 2014)

Note:

- Study samples are usually large and effects are small
- Not all studies observe an association

What we know about the underlying mechanisms



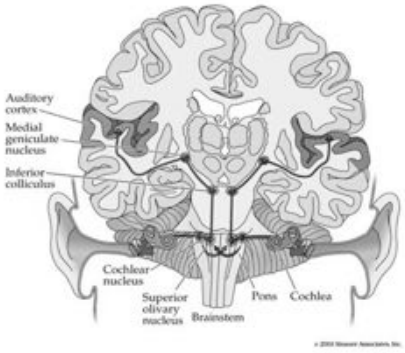
Presented in Partnership wth

CONTINUED

Auditory Event-Related Potentials and Cognition

PHONAK life is on

- Older adults with sloping HL and MCI have longer latencies and lower amplitude P1-N1-P1 complex, compared to without MCI [1,2,3]
- Hemispheric activation pattern more diffuse with MCI
- "Results suggest auditory signal traveling in the superiorly in the system appears to be degraded in individuals with MCI compared to those without" Fulton, Seminars in Hearing, 2015
- ERPs may be a useful indicator of emergent MCI or AD

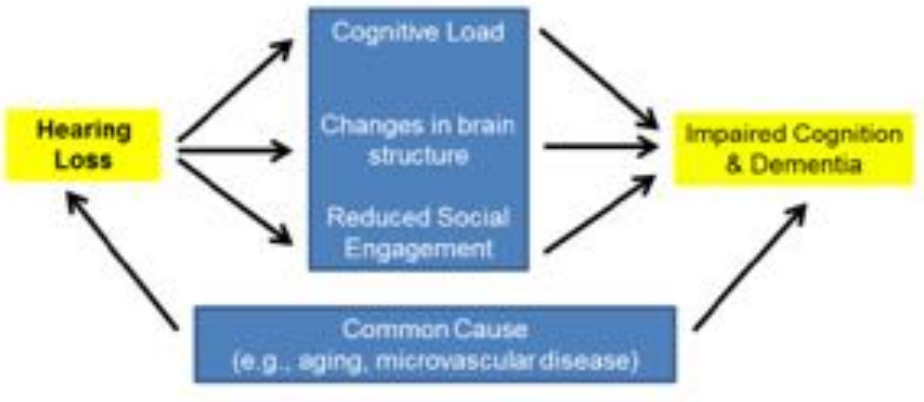


1. Fluegel B A Matthews C Harrison Bush A L Lister J J Edwards J D Andel R Neurophysiological indicators of early-stage cognitive decline Paper presented at: American Academy of Audiology Conference; March 27–29 2014; Orlando, FL
2. Golob E J, Irimajiri R, Starr A. Auditory cortical activity in amnestic mild cognitive impairment: relationship to subtype and conversion to dementia. Brain. 2007;130(Pt 3):740–752. [PubMed: 17293359]
3. Golob E J, Johnson J K, Starr A. Auditory event-related potentials during target detection are abnormal in mild cognitive impairment. Clin Neurophysiol. 2002;113(1):151–161. [PubMed: 11801437]

Potential Mechanisms behind the Association

PHONAK life is on

Common Cause vs Cascade Effect



(Lin et al., AAIC 2016)

Presented in Partnership wth

CONTINUED

What we know about hearing aids and cognition

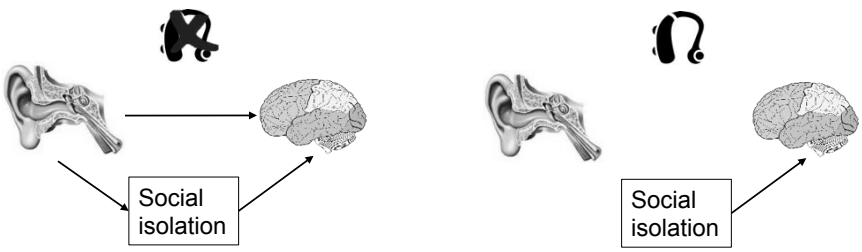
Untreated Hearing Loss Drives the Association

PHONAK life is on

"*Cognitive decline associated with ARHL is probably preventable by early rehabilitation and increased opportunistic screening for the elderly*"

Ray et al. *JAMA Otolaryngol Head Neck Surg*. 2018;144(10):876-882.

- English longitudinal study of aging
- Sample: N = 7385; 50+ years; no dementia, Alzheimer, Parkinsons, ear infections, CI
- Cross-sectional analyses



Presented in Partnership wth

CONTINUED

Does hearing aid use alter cognitive trajectories?

PHONAK life is on

Rate of cognitive decline faster than controls

Rate of cognitive decline similar to controls

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

- Amieva et al 2015: Over 25-yr follow-up, observational study,

Does hearing aid use alter cognitive trajectories?

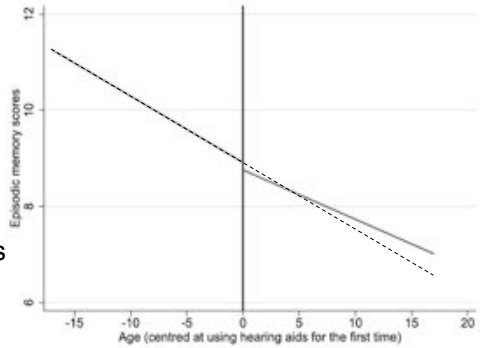
PHONAK life is on

"Providing hearing aids or other rehabilitative services for hearing impairment much earlier in the course of hearing impairment may stem the worldwide rise of dementia"

- Health and Retirement Study (HRS)
  - Repeated cognition measurements every 2nd year 1996 – 2014
- Sample: N = 2040; 50+ years
  - Started using hearing aids during evaluation period
- Longitudinal analyses

- Better memory scores in HA users
- Slower decline in memory scores after than before using HAs

(Maharani et al. 2018. JAGS.)

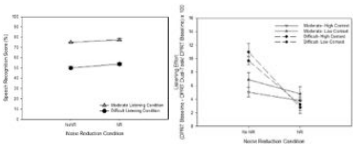


Presented in Partnership wth

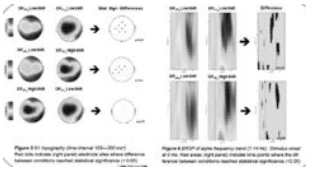
CONTINUED

Hearing Aids and Listening Effort

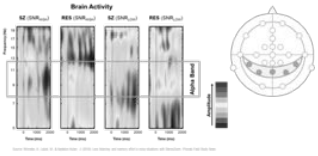
PHONAK life is on



- Noise reduction reduces cognitive load.
- Listeners have free capacity to do other things in parallel with listening.



- DuoPhone reduces cognitive load as if listening at a 3 dB higher SNR



- Stereozoom increases performance and reduces subjective and objective listening effort, noise annoyance, and memory effort in adverse listening conditions

Lower risk with use of hearing instruments!

PHONAK life is on

Journal of the American Geriatrics Society

AGS Geriatrics Healthcare Professionals

Clinical Investigation

Can Hearing Aids Delay Time to Diagnosis of Dementia, Depression, or Falls in Older Adults?

Elham Mahmoudi PhD, Tanima Basu MS, Kenneth Langa MD, PhD, Michael M. McKee MD, MPH, Philip Zazove MD, Neil Alexander MD, Neil Kamdar MA

First published: 04 September 2019 | https://doi.org/10.1111/jgs.16109

Listen Up: Hearing Aids May Do More Than Just Treat Hearing Loss

Kristen Gerencher Contributor

Healthcare

Age-related hearing loss is rarely dramatic, happening slowly over time, robbing older people of snippets of conversation and leaving them unable to filter out background noise as well as they once could. Early signs can include routinely cranking up the TV volume and having trouble with phone dialogue. Left untreated, hearing loss can lead to social isolation and mental and physical decline.

- Diagnosed with dementia – 18% lower
- Diagnosed with depression – 11% lower
- Treated for fall-related injuries – 13% lower

Presented in Partnership wth

CONTINUED

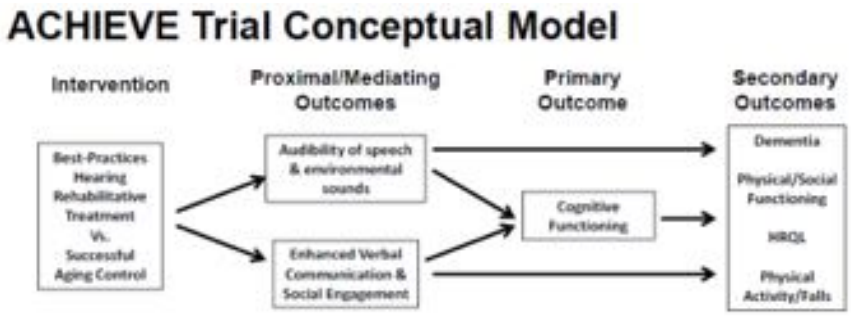
PHONAK life is on

So can we conclude that hearing aids prevent cognitive decline?

Longitudinal randomly controlled trials (RCTs) are needed

Cognitive decline - Achieve Study

PHONAK life is on



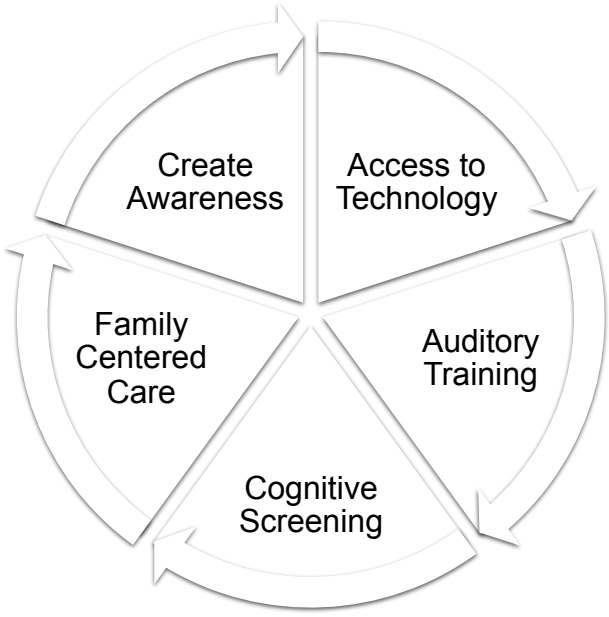
- ACHIEVE Study (started early 2018)
  - Multicenter RCT investigating whether hearing loss treatment could reduce cognitive decline; duration 5 years
  - N = 850; age 70–84 years; cognitively normal with hearing loss
    - Arm1 hearing intervention: hearing needs assessment, fitting of HAs, education/counseling
    - Arm2 successful aging intervention: individual sessions with a health educator on healthy aging

Evidence suggests that...

PHONAK life is on

- Hearing loss and cognitive decline are associated
  - This holds for specific cognitive functions and dementia
- Untreated hearing loss drives the association
  - Better cognition with HA use
  - Slower cognitive decline with HA use
  - Reduced listening effort with HA use
- Hearing loss is a **modifiable** risk factor. Early intervention is strongly recommended
- **Results from longitudinal RCTs needed to confirm the causal pathway!**

What opportunities do we have to become patient advocates?



Create Awareness

Optimized Amplification Leads to Reduced Listening Effort

Access to Technology

Exceptional sound quality

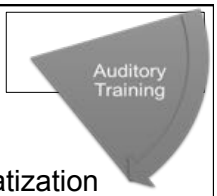
RogerDirect™

Reduced listening effort in noise

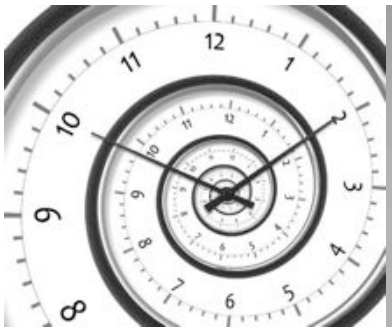
Presented in Partnership wth

CONTINUED

Why is auditory training needed?

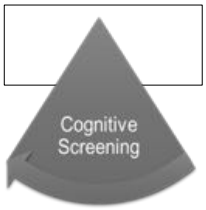


Delayed Treatment ⇨ Under-stimulation ⇨ Longer Acclimatization



- Auditory training can help speed up this process

It Can Start with YOU!

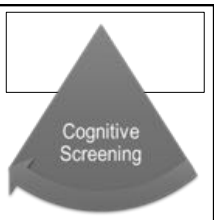


- Hearing Care Professionals are in an ideal position to observe the longitudinal cognitive trajectory of the older adult and recognize pathological cognitive function in the preclinical phase
  - Nature of the service delivery model
  - Counseling segment

Presented in Partnership wth

CONTINUED

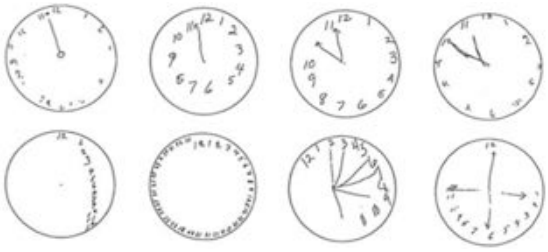
Test Yourself!

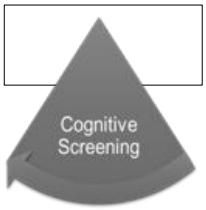


Rules:
(1 minute)

"Draw a clock. Put in all the numbers and set the time to 10 after 11".

How did you do?

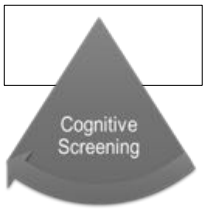




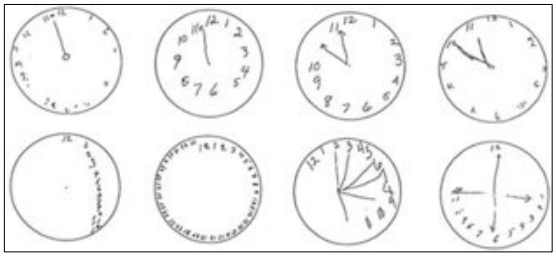
Three criteria:

1. *Contour (1 pt.):* the clock face must be a circle with only minor distortion acceptable (e.g., slight imperfection on closing the circle);
2. *Numbers (1 pt.):* all clock numbers must be present with no additional numbers; numbers must be in the correct order and placed in the approximate quadrants on the clock face; Roman numerals are acceptable; numbers can be placed outside the circle contour;
3. *Hands (1 pt.):* there must be two hands jointly indicating the correct time; the hour hand must be clearly shorter than the minute hand; hands must be centred within the clock face with their junction close to the clock centre.

It Can Start with YOU!



- Consider the nature of your hearing care service delivery model
- Counseling segment



- AAA and ASHA have both included cognitive screening in the defined scope of practice for audiologists for over a decade

Integration Tips and Resources

PHONAK
life is on

- Understand your scope of practice
- Be sensitive to the "sensitive"
- Be prepared to explain why

Baseline Measurement → 12 month re-evaluation

Suggested language for referral:

"Our clinic has been utilizing the MoCA to screen patients for possible cognitive impairment. _____ recently scored ___ out of 30 on his/her exam which indicates a need for referral. Please evaluate at your discretion."

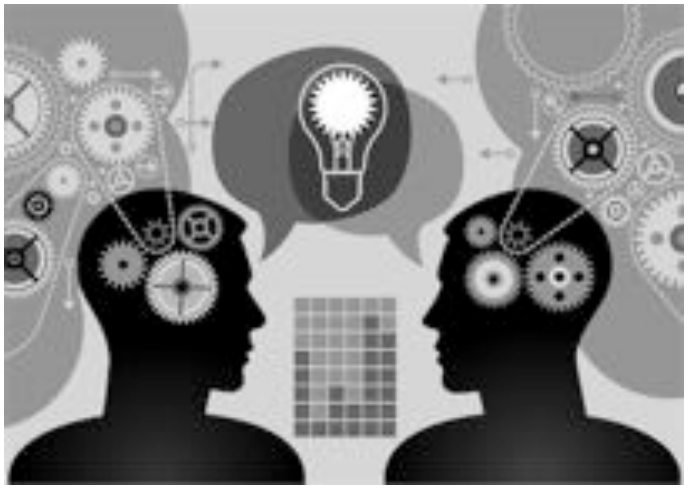
Presented in Partnership wth

CONTINUED

Family Centered Care

Shared **understanding**, **empathy**, and **responsibility** for managing hearing difficulties for the patient and the family

Family Centered Care



*FCC will help develop a **shared understanding** and **shared responsibilities** for treating the communications difficulties both parties have.*

Presented in Partnership wth

Summary

PHONAK life is on

- Hearing loss and cognitive decline are associated
- Untreated hearing loss drives the association
- Further research needed
- HCPs are uniquely positioned to help with early detection
- Advocate for your patients' cognitive health and overall well-being
- Family unit involvement is integral to your patients' socio-emotional health

Together, we change lives

Presented in Partnership wth

CONTINUED