Healthy Futures Summit

Age-Related Sensory & Cognitive Impairments: Identifying Opportunities for Prevention

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Disclosure: Phonak (Warrenville, IL) is contributing hearing aids for use in the ACHIEVE Study
Epidemiology of Age-Related Sensory Impairments

Sensory Impairments and Cognitive Function

Introduction to the ACHIEVE Study
Some Common Age-Related Sensory Impairments

- Reduced contrast sensitivity
- Cataract
- Hearing loss
- Macular degeneration
Major Community-Based Studies of Age-Related Sensory Impairments

**Beaver Dam Eye Study (BDES)**
- N=4926
- 1988-present
- Ron & Barbara Klein
- Vision, vascular disease

**Epidemiology of Hearing Loss Study (EHLS)**
- N=3753
- 1993-present
- Karen Cruickshanks
- Hearing, olfaction, cognitive function, vascular disease

**Beaver Dam Offspring Study (BOSS)**
- N=3296
- 2005-present
- Vision, hearing, olfaction, taste, cognitive function, vascular disease

Karen Cruickshanks
Prevalence of Hearing Impairment by Age: EHLS & BOSS

<table>
<thead>
<tr>
<th>Age Group, years</th>
<th>EHLS</th>
<th>BOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>45–49</td>
<td>99</td>
<td>15.2</td>
</tr>
<tr>
<td>50–54</td>
<td>615</td>
<td>17.1</td>
</tr>
<tr>
<td>55–59</td>
<td>532</td>
<td>25.6</td>
</tr>
<tr>
<td>60–64</td>
<td>513</td>
<td>37.8</td>
</tr>
<tr>
<td>65–69</td>
<td>543</td>
<td>49.4</td>
</tr>
<tr>
<td>70–74</td>
<td>510</td>
<td>60.4</td>
</tr>
</tbody>
</table>

Zhan W et al., Am J Epidemiol 2009; 171: 260-266
Prevalence of Macular Degeneration (%) by Age and Sex: BOSS

Klein R et al., Arch Ophthalmol 2010; 128: 750-758
Prevalence of Olfactory Impairment (%) by Age and Sex: EHLS

Murphy C et al., JAMA 2002; 288: 2307-2312
Incidence of Macular Degeneration by Age & Generation: BDES and BOSS

Cruickshanks KJ et al. JAMA Ophthalmol 2017; 135: 1417-1423

- Greatest Generation: b. 1901-24
- Silent Generation: b. 1925-45
- Baby Boom Generation: b. 1946-64
- Generation X: b. 1965-84

Baseline Age of Participants, y
5-y Incidence of AMD, %
20 25
10
5
0
20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Epidemiology of Age-Related Sensory Impairments: Key Findings of Beaver Dam Studies

- Incidence rates of age-related sensory impairments (hearing, vision, olfaction) have declined 20 to 30% per generation
- Rates of macular degeneration have declined 60% per generation

What can we take away from these findings?

  - Sensory impairments need not be considered an inevitable consequence of aging
  - These impairments have modifiable causes that (in aggregate) have become more favorable in more recent generations
  - There are considerable opportunities for prevention if we can identify and address these modifiable causes
# Age-Related Sensory Impairments and 10-Year Risk of Cognitive Impairment: EHLS

<table>
<thead>
<tr>
<th>Sensory Impairment</th>
<th>Age, Sex, Education Adjusted</th>
<th>Multivariable Adjusted&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing</td>
<td>1.96 (1.16–3.29)</td>
<td>1.90 (1.11–3.26)</td>
</tr>
<tr>
<td>Vision</td>
<td>1.85 (1.15–2.97)</td>
<td>2.05 (1.24–3.38)</td>
</tr>
<tr>
<td>Olfaction</td>
<td>4.02 (2.58–6.28)</td>
<td>3.92 (2.45–6.26)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Model adjusted for age, sex, education, smoking status, body mass index, exercise, alcohol consumption, hypertension, diabetes mellitus, number of high inflammatory markers, non-high-density lipoprotein cholesterol, mean intima-media thickness, frailty score, longest held job, cold or stuffy nose, nasal polyps, deviated septum, allergies, head injury, stroke or transient ischemic attack, and epilepsy.
Why are Age-Related Sensory Impairments and Cognitive Impairment Related? Some Possibilities...

Early neuronal dysfunction & degeneration → Sensory impairments

Sensory impairments → Cognitive impairment

General aging
Vascular disease
Other shared risk factors

Sensory impairments
Cognitive impairment
Does Age-Related Hearing Loss Increase Rates of Cognitive Decline?
Aging & Cognitive Health Evaluation in Elders (ACHIEVE) Study

2017-2022

Randomized, controlled trial designed to test two different treatments that may promote healthy aging and cognitive health in older adults

Funded by the National Institute on Aging (R01AG055426)

www.achievestudy.org
ACHIEVE Study Design

Pre-screening (telephone)

Screening visit

Baseline visit (randomization)

Hearing Loss Program

Successful Aging Education Program

Follow-up to assess 3-year changes (6 visits)

(N~490)

(N~490)

Cognitive function
Quality of life
Social/leisure activities
Daily functioning
Mobility
Brain structure (MRI)
ACHIEVE Locations and Eligibility Criteria

Participating Sites:
- George W. Comstock Center, Hagerstown, MD (field site)
- University of Mississippi Medical Center, Jackson, MS (field site)
- University of Minnesota, Minneapolis, MN (field site)
- Wake Forest University, Winston-Salem, NC (field site)
- University of North Carolina, Chapel Hill, NC (coordinating center)
- University of Pittsburgh, PA (successful aging education program)
- University of South Florida, Tampa, FL (hearing loss program)
- Mayo Clinic, Rochester, MN (MRI reading center)

Main Eligibility Criteria:
- Age 70-84 years
- Cognitively normal
- Mild to moderate hearing impairment
- Have not used a hearing aid in the last year
- Willingness to be randomized, adhere to the protocol, complete 12 visits
Acknowledgments

**BOSS:**
- Karen Cruickshanks, U of Wisconsin
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- Carla Schubert, U of Wisconsin
- Nathan Pankratz, U of Minnesota
- Mary Rachel Stimson, U of Minnesota

**ACHIEVE (Local Staff):**
- Lisa Miller, Coordinator
- Liz Anderson
- Kerry Witherell
- Luanne Welch
- Sarah Aguilar
- Soni Uccellini
- Kate Teece
- Matt Waggenspack
- Debbie Ng
- Sandy Potter
- Kristina Foyt
- Taia Strachan