Hearing Loss, Aging, and Dementia

Lisa Taniguchi, Au.D., CCC-A
Assistant Professor and Clinic Coordinator
Department of Communication Sciences and Disorders, JABSOM
lisadt@hawaii.edu

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Learning Objectives

• Review how the ear processes sound and types of hearing losses
• Understand what happens to the hearing system with aging
• Identify the correlation between hearing loss and dementia
• Recognize how to communicate with someone who has hearing loss
Types of Hearing Loss

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<thead>
<tr>
<th>Types of Hearing Loss</th>
<th>Characteristics</th>
<th>Possible Causes</th>
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<tbody>
<tr>
<td>Conductive Hearing Loss</td>
<td>- Outer and/or middle ear problem blocking the sound waves - Usually can be treated medically</td>
<td>- Ear wax accumulation - Ear infection - Ear diseases - Injury</td>
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<tr>
<td>Sensorineural Hearing Loss</td>
<td>- Inner ear and/or auditory nerve damage - Hearing loss is usually permanent and often not medically repairable</td>
<td>- Aging - Noise damage - Ear disease - Toxic medication - Genetic</td>
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<tr>
<td>Mixed Hearing Loss</td>
<td>- Combination of conductive and sensorineural hearing loss in an ear</td>
<td>- Age + ear infection</td>
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Conductive Hearing Loss

v.s.

Conductive Hearing Loss
Sensorineural Hearing Loss

Sensorineural Hearing Loss

Intact cochlea  Damaged cochlea
Age-Related Sensorineural Hearing Loss Facts

• Age-related hearing loss (presbycusis) is one of the most prevalent chronic medical conditions among older adults.

• ~30% of Americans between ages 65 and 74, and nearly 50% of those age 75+ have hearing loss.

• Conditions that are more common in older people, such as high blood pressure or diabetes, can contribute to hearing loss.

  National Institute on Deafness and Other Communication Disorders (2018)

• By the year 2030, as many as 21 million Americans age 65+ will have hearing loss.

  (Garstecki and Erler, 1995)

• 1/3 of individuals age 65+ have disabling hearing loss in the world: 164.5 million

  (World Health Organization, 2012)
Can Hear: Lower-pitched sounds (voiced):
  - A, O, U, M, N, Z, V

Cannot Hear: Higher-pitched sounds (unvoiced):
  - TH, T, F, S, SH, CH, P, K

**Signs & Symptoms of Hearing Loss**

- Can hear speech, but cannot understand what is said
  - Sounds like people are mumbling
- Difficulty understanding in background noise
- Need louder volume for TV or telephone
Signs & Symptoms of Hearing Loss

• Others ask you to have your hearing checked
• Becoming more isolated due to avoiding social situations

**Individuals with presbycusis do not realize that they have hearing loss because of the slowly progressive nature of age-related processes**

Negative Impacts of Hearing Loss

• Hearing loss can have a significant impact on the quality of life, with the following possible consequences
  • Loss of independence
  • Depression
  • Anxiety
  • Social dissatisfaction
  • Cognitive decline

(Dalton et al., 2003; Gates and Mills, 2005; Heine and Browning, 2002)
Negative Impacts of Hearing Loss: Dementia

• Increased stress for family members/caregivers
• Correlation between degree of hearing loss and risk of developing dementia (Lin et al., 2011)
• Baseline hearing loss showed ↑ rate of cognitive decline 30-40%; 24% ↑ risk of incident cognitive impairment over 6 years vs normal hearing
  • Mild hearing loss = 2x likely to develop dementia
  • Moderate hearing loss = 3x likely to develop dementia
• Accelerated cognitive and brain volume decline were seen in older adults with hearing loss (Lin et al., 2013 & 2014)

Hearing Loss and Dementia

• Proposed Mechanisms
  • Cognitive Loading:
    • Compensatory recruitment in prefrontal and temporalparietal cortex taxing on working memory
  • Change in brain structure:
    • Older adults with hearing loss have less gray matter in the part of their brain that receives and processes sounds from the ears
  • Social Isolation
• Hearing loss associated with cognitive decline for Alzheimer's → central auditory processing dysfunction
  • Cannot be corrected with hearing aids
  • Potential mechanisms: Frontal lobe dysfunction (Lin et al., 2013)
Hearing Beyond the Ears...

- Peripheral hearing:
  - Outer, middle and inner ear

- Central hearing:
  - Primary auditory pathway:
    - CN VIII → Brainstem = duration, intensity and frequency
    - Midbrain = localization of sound
    - Thalamus/subcortical = prepare motor response
    - Auditory cortex = recognition
  - Cortical/higher level
    - Parietal/frontal lobes = final processing, modulated by multiple neurotransmitters

The Lancet Commissions

- “one of three cases of dementia could be prevented” if people managed just nine lifestyle factors
  - Increasing childhood education
  - Hypertension
  - Obesity
  - Hearing loss
  - Smoking
  - Depression
  - Physical inactivity
  - Social isolation
  - Diabetes

- Managing these nine modifiable risk factors at various stages of life could “contribute to prevention or delay of dementia”

- Experimental evidence on whether hearing aid use might alleviate some of these negative effects is not available.

(Livingston, G., et al., 2017)
Future Direction

• Lin, F., 5 year study NIH, Treating hearing loss to see if it can delay onset of cognitive decline and dementia
• Treatment for adults would certainly help offset social isolation and depression.

Hearing-Related Facts

• The damaged inner ear/nerve creates distortion, so words may sometimes be unclear even with hearing aids

➢ Amplification alone may not be enough…
Enhancing Communication in Adults with Dementia and Age-Related Hearing Loss

- Hearing aids may not be enough
- Hearing aids may be too taxing for a person with dementia to wear
  - Refusing to wear,
  - Losing/misplacing hearing aids,
  - Unable to care for the devices, etc...

- Caregivers, professionals
- Think beyond the hearing aids
  - Simple amplifiers
  - Education
  - Communication Strategies

(Mamo, S.K., Oh, E., and Lin, F., 2017)

Communication Strategies

1. Address the person with hearing loss
   - Get the person's **attention** before starting to communicate. Their brain must be alerted to be ready to focus and listen

2. Do not obstruct the mouth
   - Hands, gum, food, etc.

3. Have face-to-face communication
   - The more important high-pitched sounds of speech are very directional (only propagate well in the direction the speaker is facing). Additionally, the production of the high-pitched sounds are visible on the mouth

4. Speaker should start with the topic
   - It is easier for the listener to fill in missed information if they know the context.
Communication Strategies Cont...

5. Speaker needs to use a slower rate
   • It gives more time for the listener’s brain to process missed or incorrect information.

6. Use appropriate distance
   • The more important high-pitched sounds are very weak and are not able to travel far from the speaker
   • 3 to 6 feet

7. Use facial expressions and gestures

8. Control noise (unwanted sounds)
   • Noise will always affect communication negatively by interfering with the weak but important high-pitched speech sounds.

Communication Strategies Cont...

9. Rephrase instead of repeat
   • “DO YOU WANT A DRINK?” → “WOULD YOU LIKE SOME WATER?”

10. Do not shout
    • Shouting actually distorts the sound signal

11. Type of write key words or important information down
    • Names, phone numbers, appointments, etc.

12. Experiment a little. Use humor and smiles. Ask how you can help or what might work better. Be patient, positive and relaxed.
Final Remarks

- It is important for older adults with dementia have regular hearing checks
- Varying degrees of hearing loss will change hearing loss management/recommendations
- Think beyond hearing aids
  - Additional support
  - Assistive devices

References

- Marrone, N., Durkin, M.R., & Harris, F.P. (2012). Hearing each other is a two-way street. ASHA Leader, Vol. 17, 5-7
Thank you!!

• Contact Information:
  • lisadt@hawaii.edu
• UH Speech and Hearing Clinic
  • Phone: (808) 692-1580
  • Website: http://csd.jabsom.hawaii.edu/uhshc/
  • Email: uhshc@ucera.org
• 677 Ala Moana Blvd., Suite 625

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