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IMPACT OF AGING & COGNITION ON HEARING ASSISTIVE TECHNOLOGY USE

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DISCLOSURES

The views expressed here are that of the Authors and do not represent the US Government or the Department of Veterans Affairs

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LEARNING OBJECTIVES

Describe the impact of aging on the interaction between the peripheral auditory system and the central auditory system.

Describe the impact of cognitive ability on HAT recommendations

Describe the impact of cognitive ability on HAT use
AUDITORY SYSTEM

BIOLOGIC AGING

Theories of Aging (many): Examples:
- Wear-and-tear
- Cellular
- Autoimmune
- Genetic mutation

Progressive changes to: telomere length, accumulated damage to DNA, degradation of mitochondrial function

Telomere – at end of DNA, shortens after every division (50 max)

Damage to DNA – oxidative & radiation

Degraded mitochondrial function – oxidation and free radicals
PRESBYCUSIS

Discrim: 80%

Sensory

Discrim: 92%

Strial/Metabolic

Discrim: 88%

Mechanical/Cochlear Conductive

Discrim: 36%

Neural

COMPONENTS AFFECTING ABILITY TO PERCEIVE THE AUDITORY SIGNAL

Audibility
- Not intense to cause adequate movement of the auditory structures necessary

Cochlear Pathology
- Reduced frequency discrimination
- Temporal coding errors

Auditory Processing
- Inability to perceive, decode, and understand the signal
AGING AND HEARING ABILITY

Reduced Frequency Resolution

Difficulty listening and understanding, especially in different environments

Reduced Intensity Resolution

Reduced Temporal Resolution

Encoding

Understanding

Cognitive Processing

Effort

Ages at which cognitive skills peak

<table>
<thead>
<tr>
<th>Age</th>
<th>Cognitive Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>late teens</td>
<td>Cognitive processing speed</td>
</tr>
<tr>
<td>early 20s</td>
<td>Learning and remembering names</td>
</tr>
<tr>
<td>25-35</td>
<td>Short-term memory</td>
</tr>
<tr>
<td>early 30s</td>
<td>Face recognition memory</td>
</tr>
<tr>
<td>45-55</td>
<td>Social understanding</td>
</tr>
<tr>
<td>65+</td>
<td>Verbal knowledge</td>
</tr>
</tbody>
</table>

Source: Laura Germine

Continued
AGING AND HEARING ABILITY

Understanding

Encoding

Effort

Cognitive Processing

AGING AND HEARING ABILITY

Continued
HEARING IMPAIRMENT AND COGNITIVE EFFORT

Hearing loss $\rightarrow$ increased auditory attention $\rightarrow$ increased cognitive load to perceive the auditory stimuli = the cognitive system is working harder

HEARING ASSISTIVE TECHNOLOGY (HATs)

Devices and/or strategies designed to lessen the impact of the specific challenges associated with hearing impairment, and in turn improve quality of life for the user.
COGNITION AND TECHNOLOGY SELECTION

• Cognitive ability
• Family/significant other/friend support
• History of stroke
• Expectations
HAT FITTING

• Audiologist should ensure that the HAT is fit and functioning appropriately for each patient through:
  • Verification measurements
    • Acoustic: REAR/REIG
    • Electrical: eSRT
  • Validation measurements
    • Questionnaires, booth testing, etc.

• Device use
  • Device Insertion/Removal
  • Battery Use
  • Safety

BENEFITS OF HATS FOR THOSE WITH COGNITIVE IMPAIRMENT

Consistent use = reduce patient reported combativeness and reduce patient anxiety

Early identification and treatment
  • Early = experience better outcomes if they appropriately use HATs earlier in the aging process

Use of HATs can also decrease caregiver stress due to better communication between caregiver and patient

Use of remote technology??
HAT SELECTION: THE AUDIOLOGIST’S ROLE

• Appropriate selection of HAT should be determined through:
  • Physical and cognitive limitations
  • Case history
  • Comprehensive evaluation of audiometric abilities, including speech in noise testing
  • Determination of patient needs, abilities, and desires
  • Within each type of HAT, what features would be appropriate for the patient?

• ANY of the discussed HATs could be appropriate for a person with severe NCI – it depends on each patient’s needs/support

HATS AND MEMORY

• From popular media:
  • HATs are devices that will
    ▫ Improve memory
      ▪ Really?
    ▫ Enable continued active social life
      ▪ Direct link?
    ▫ Prevent mental slowing
      ▪ Proven?
    ▫ Make it possible to continue living an independent, active, mentally-healthy life
      ▪ Hmmm…
  • Wearing HAT is a “Brain training” exercise that has immediate positive impact
HAT COUNSELING FOR PERSONS WITH COGNITIVE DECLINE

- Patients with cognitive decline may have greater difficulty remembering step-by-step directions
- Introduce the device, then show them features over time
- Battery use and insertion/removal of the device should be taught at the first appointment— they are most critical to device success!

FINAL POINTS

Cognition and selection
Cognition and use
Cognition and outcomes
   Performance
   Benefit
   Satisfaction