Therapy for Adults with Hearing Loss: Auditory and Cognitive

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Disclosure

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Agenda

- review research on link between hearing loss and cognitive decline/dementia
- aural rehabilitation
- cognitive therapy

Hearing Loss and Adults Statistics

- 48 million Americans with significant hearing loss (20% of US population-1 in 5)
- 38 million Americans have hearing loss in both ears (13% of US population)
- becomes more prevalent with age for American adults:
  - 18% between ages 45 and 54
  - 30% between ages 65 and 74
  - 47% ages 75 and older
Hearing Loss and Adults Statistics

- hearing loss is 3rd most prevalent health issue in older adults (after arthritis and heart disease)
- only 10 – 20% of people with hearing loss have ever used hearing aids
- 20 – 29% of patients who have used hearing aids at some point stop using them

Hearing Health Foundation.  
http://hearinghealthfoundation.org/statistics?gclid=CPmFsNbt7LsCFbIDOhEdhEA-w

Effects of Hearing Loss

- Studies have linked untreated hearing loss to:
  - stress
  - depression
  - avoidance or withdrawal from social situations
  - social isolation and loneliness
Effects of Hearing Loss

– And now:
Cognitive Decline and Dementia

Terminology

**Cognitive Decline**: normal part of aging; can involve problems with forgetfulness, decreased ability to maintain focus, decreased problem solving capacity

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**Mild Cognitive Impairment (MCI)**: intermediate stage between expected cognitive decline of normal aging and dementia; can involve problems with memory, language, thinking and judgment (greater than normal aging effects)

↓

**Dementia**: group of symptoms affecting memory, thinking and social abilities severely enough to interfere with daily functioning. Alzheimer's disease is most common cause.
Research

– Dr. Frank Lin, M.D., Ph.D
– Johns Hopkins University School of Medicine
www.linresearch.org

Hearing Loss and Incident Dementia

• 639 subjects, ages 36 – 90 (most between 60 – 80)
• followed for long-term
• none had cognitive impairment at beginning of study; some had hearing loss

– Participants in Baltimore Longitudinal Study of Aging
– 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. Arch Neurol. 2011;68(2):214-220.
Hearing Loss and Incident Dementia

- Findings at median follow-up 11.9 years; compared to those with normal hearing:
  - participants with hearing loss at the beginning of the study were significantly more likely to develop dementia by the end
  - individuals with mild, moderate, and severe hearing loss had twofold, threefold, and fivefold, respectively, the risk of developing dementia over time
  - the more hearing loss they had, the higher their likelihood of developing dementia

Hearing Loss and Cognitive Decline in Older Adults

- 1,984 older adults studied; 1,162 had hearing loss
- mean age was 77
- no prevalent cognitive impairment at beginning of study
- studied over 11 year period (part of Health ABC Study)

- Frank R. Lin, MD, PhD; Kristine Yaffe, MD; Jin Xia, MS; Qian-Li Xue, PhD; Tamara B. Harris, MD, MS; Elizabeth Purchase-Helzner, PhD; Suzanne Satterfield, MD, DrPH; Hilsa N. Ayonayon, PhD; Luigi Ferrucci, MD, PhD; Eleanor M. Simonsick, PhD; for the Health ABC Study Group

Findings:

- used two well-recognized tests of memory and thinking ability Modified Mini-Mental State (3MS): asked to memorize words, given commands or instructional tasks to follow, and asked basic questions as to the correct year, date and time
- Digit Symbol Substitution (DSS): asked to match specific numbers to symbols and timed on how long it takes to complete the task

- individuals with hearing loss had annual rates of decline in 3MS and DSS test scores 41% and 32% greater, respectively, than individuals with normal hearing
- individuals with hearing loss at baseline had a 24% increased risk for cognitive impairment than individuals with normal hearing
- rates of cognitive decline and risk for cognitive impairment were linearly associated with the severity of an individual’s baseline hearing loss (as already seen in previous study)
Research indicates that connection is associative, not causal. Specific mechanisms underlying this association not known but may be related to the effects of increasing cognitive load, hearing loss on cortical processing and social isolation. (Dr. Frank Lin)

- Does this mean you WILL develop dementia if you have hearing loss?
  - NO
- But is your risk increased?
  - YES
- Can we do something about it?
  - POSSIBLY (more research is needed)
However…

Doi:10.1001/jamaoto.2015.129 Published online March 12, 2015

Study:
• prospective longitudinal study between 2006 and 2009
• 94 patients aged 65 to 85 years with profound, post-lingual hearing loss
• evaluated before and 6 and 12 months post-cochlear implantation
• cognitive function assessed using battery of 6 tests (attention, memory orientation, executive function, mental flexibility, fluency)
• quality of life and depression also assessed
Findings

CI led to improvements in:
• speech perception in quiet and in noise
• quality of life
• depression (76% of patients gave responses indicating no depression at 12 months post-CI compared to 59% before)

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<thead>
<tr>
<th>Prior to cochlear implant (91)</th>
<th>Post-cochlear implant (87)</th>
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<tbody>
<tr>
<td>Normal scores</td>
<td>25%</td>
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<tr>
<td>1 abnormal score</td>
<td>31%</td>
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<tr>
<td>2 abnormal scores</td>
<td>24%</td>
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<tr>
<td>3 abnormal scores</td>
<td>20%</td>
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Findings

• improved scores in all cognitive domains were observed as early as 6 months post-CI
• more than 80% of the patients who had the poorest cognitive scores before CI improved their cognitive function at 1 year
• findings suggest that CI may delay cognitive disorders BUT long-term evaluation is needed

Aural Rehabilitation Definition

• for adults includes assessment, sensory management, exploring and using assistive listening devices, intervention (auditory training), and counseling
• focus on intervention-aural rehabilitation (auditory training)
• data demonstrates that adults participating in a rehabilitation program have more rapid progress and improved listening outcomes
Auditory Training—Two Types

**Analytic**
- used to focus on missing sounds which are now accessible
- working on identification from closed set to open set activities
- consonant auditory discrimination

**Synthetic**
- more natural approach to learning how to distinguish spoken language
- uses content and language knowledge to predict and derive meaning

Auditory Training—Analytic

- **Vowel difference:** kite-cat-coat-cut-cute-kit-Kate
- **Consonant difference by manner of production:** shoe-boo-moo
- **Consonant difference by voicing:** pig-big, coat-goat
- **Consonant difference by place of production:** Kate-cape-cake, white-light-right, night-might
Auditory Training-Analytic

How many terms in office can a President of the US have?
I went grocery shopping and bought milk, eggs, and bread. What three things did I buy?
I went to the store and bought pepperoni, cheese, sauce, and olives. I went home and put all the ingredients on the crust and put it in the oven. What am I making?

Auditory Training-Analytic and Synthetic

- Hear at Home developed by Geoff Plant
  - developed as a home program for those without easy access to regular aural rehabilitation
  - designed for use with friends/family
  - exercises provide the talker with detailed instructions for presentation of the materials
  - CD format with receiver and talkers handbook as PDF
  - divided into 10 separate sessions
Auditory Training- Analytic

Examples:
• Words that contain /s/:
  – said saw same see small so
  – house miss place office perhaps
  – asked possible also recently himself question
• Words in sentences:
  said: I said hello.
  saw: We saw the old house.

Auditory Training-Synthetic

Examples:
• Numbers: identify from list, identify in sentence (i.e., what comes before #)
• Sentence Building: tracking from short to longer-build on same sentence (i.e., It’s cold – It’s a very cold day today)
• Topic Centered Sentences: track from familiar theme (i.e., time “What time is your appointment?”)
Practice

Months of the Year

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<thead>
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<th>January</th>
<th>July</th>
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<td>February</td>
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<td>March</td>
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<td>May</td>
<td>November</td>
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<td>June</td>
<td>December</td>
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Practice

The second of December
The sixteenth of April
The twenty-eighth of March
The fourteenth of August
The first of January
The thirteenth of September
The first of April
Practice

Dates in history


*When was the Library of Congress founded?*  The Library of Congress was founded on April 24, 1980.

*When did Alaska become a state?*  Alaska became a state on January 3, 1959.

*When did Elvis Presley make his first record?*  Elvis Presley made his first record on July 6, 1954.

Practice

Listening Up! CD 1, 2 & 3

- provides independent listening practice for young people and adult hearing implant recipients
- CD 1- Listening Training for Beginners
- CD 2- Listening Training for Advanced Listeners
- CD 3- Music Training for Beginners
Practice
Listening Up! CD 1, 2 & 3
• CD is approximately 30 minutes
• alternates female and male speakers
• contains 11 -12 different exercises
• 2 small booklets, one is the Exercises and the other is the Solutions.
• listen to the CD-follow along with the Exercises booklet-write your answers, check them with the Solutions booklet

Practice
Listening Up! CD 1, 2 & 3 Examples
• Write the series of words related to clothing that you hear. The Exercises booklet provides a list (you can review the list first or try without looking at the list). You will then hear 10 sentences (written out in the Exercises booklet), write the order in which they are presented.
• Write the order in which you hear random words. The Exercises booklet provides a list of the words. You will then hear 10 sentences containing the words (written out in the Exercises booklet), write the order in which they are presented.
Practice

Listening Up! CD 1, 2 & 3 Examples

• Listen to word pairs that differ by one vowel only, then write down the word that is said again. The Exercises booklet provides a list of the words.

• Listen to a text being read and follow along in the Exercises booklet. Fill in the missing words in the written text as you hear them.

Analytic Practice

#7

bed  pet
fall  hall
back  bag
tone  done
free  three
comb  cone
bowls  vowels
same  sane
beach  beat
tour  door
beam  bean
Listening Up!
CD 1 Listening Training for Beginners
Analytic Practice
#7

Practice

- Malaysia is a nation of diverse cultures and striking contrasts: modern cities, ever growing __________ and upwards; idyllic resorts; __________ cities; colonial hill stations and expanses of __________ which cover about 70% of the land area.
Practice

Malaysia is a nation of diverse cultures and striking contrasts: modern cities, ever growing outwards and upwards; idyllic resorts; historic cities; colonial hill stations and expanses of rainforest which cover about 70% of the land area.

Cognitive Decline

May impact:

- attention (decreased ability to maintain focus): fundamental skill required for new learning and successful cognition. Attention is generally divided into 5 types:
  
  **Focused Attention:** ability to respond discretely to specific visual, auditory, and tactile tasks.

  **Sustained Attention:** ability to maintain cognitive dedication to a specific, continuous, or repetitive task (requires vigilance and working memory).
Cognitive Decline

**Divided Attention:** ability to respond or attend to multiple stimuli at once-multitasking.

**Selective Attention:** ability to select and maintain cognitive focus in the presence of internal or external stimuli or distractions. It's the ability to tune-out those distractions.

**Alternating Attention:** involves the mental flexibility for moving between tasks with different cognitive requirements. Shifting attention.

Cognitive Decline

May impact:

- **thinking and judgment:** decreased problem solving capacity, difficulty quickly processing information (how fast you think), difficulty with organizing thoughts
- **memory:** remembering, learning and remembering new information
Cognitive Therapy

- Focus on:
  - attention/focus/concentration
  - speed of information processing skill building
  - problem solving
  - organization
  - memory

• some activities can include auditory training
• some activities will be purely cognitive therapy
• can start some activities as cognitive therapy (get visual cues) but as make progress can add in auditory only to make an aural rehabilitation activity also
Cognitive Therapy-Activities

- turn off other sounds and distractions when working on therapy tasks
- focused attention: listening for a certain sound (e.g., /s/) in a list of words (also aural rehabilitation)
- list of words: find/tell me all the words that start with __
- rapid naming
- generate items in a given category

Cognitive Therapy-Activities

- solve math story problems
- calculate money amounts in ascending or descending order (e.g., 5 nickels + 2 dimes; 4 quarters + 4 dimes + 2 nickels)
- sorting tasks (flip over cards one by one and with each flip say color, then next flip say number, then next flip say shape, continue in order)
- alternate patterns: use months, numbers, days of week, letters, and alternate with a different category (e.g.,: food and then alphabet in order)
Cognitive Therapy-Activities

- use a map to determine how to get from one city to another
- provide navigational directions to another person
- follow map directions
Cognitive Therapy-Examples

- **Auditory Recall**
  - recall of sentences (speech tracking—also used in aural rehabilitation)

  If difficult, have sentence written out with a few words blank—as listen to sentence, fill in blank, rehearse then try again
  (e.g., Dinner is at my house at _____ on _____)

- **Auditory Recall**
  - recall of stories (increase in length and complexity)
    - client’s history, current events (read), made up stories, history, informative (enjoyable topic)

  multiple choice questions (recognition versus recall)
  “wh” and open-ended questions
  recall and retell story
Cognitive Therapy-Examples

Auditory Recall
Bob is married to Kim and they have two children, both boys. Bob is a firefighter and Kim is a teacher. They live by a lake and like to go fishing.
Multiple choice: What does Bob do for a living?
- a.) police officer
- b.) firefighter
- c.) bus driver
- d.) accountant
Open-ended: Who is a firefighter?
Recall and retell

Cognitive Therapy-Examples

- Processing, comprehension, recall and sustained and divided attention (in a group setting)
  - Ask 3 questions, each on a different topic, client answers questions and has to recall other group member’s answers
  - What is your favorite food?
  - Who was your first best friend?
  - What has been your greatest challenge with your hearing loss?
### Cognitive Therapy-apps

- Museum search
- Doodle Find
- Imazing
- Differences
- Find the Hidden Objects
- Brain baseline app
- Memory Matches
- Art Puzzles HD
- Find Photo Differences
- I Spy Book
- Where’s Waldo
- Little Things

### Cognitive Therapy-apps

- More Grillin’: sequencing and procedural memory
- Chain of Thought: word association game
- 4 Pics 1 Word: word association, retrieval, naming, reasoning
- Dumb Facts: reasoning, recall, discussion
- Deja Vu: addresses memory and helps with attention
- Idioms: hundreds of idioms in addition to a multiple choice quiz system
Cognitive Therapy-games

- Unscramble words
- Word searches
- Wheel of Fortune
- Jeopardy
- Sudoku
- Differences in pictures
- Scrabble

Cognitive Therapy-Aural Rehab

- Memory: deck of cards or written rhyming words (choice of 2 or 4); first do as visual then auditory only
- Uno cards-visual then auditory
- Math problems: visual first-Mike has 9 cans of soda, Josh gave him 5 and Emily gave him 3. Sam came along and took 4 of them. How many cans does Mike have now? Then give as auditory only.
Cognitive Therapy-Aural Rehab

• Answering questions about information presented: provide visual of answers

Tony Bennett first signed with Columbia Records in 1950.

In which year did he sign?

a.) 1940  b.) 1960  c.) 1950  d.) 1955

Then ask a question and provide no visuals; if need then give choices.

• Crossword puzzles-visual clues then only as auditory clues
• Crossword puzzles - visual clues then only as auditory clues

Across
4. Fats Domino fruity song '____ Hill'.
5. The Isley Brothers' loud song.

Down
1. Johnny Cash's straightforward song - I Walk the ____.
2. Jerry Lee Lewis had a hot song 'Great Balls of ____'.
3. Buddy Holly's song about 'Peggy ____'.
4. Carl Perkins had colorful shoes.
5. Elvis Presley's canine song '____ Dog'.

Conclusion
• for rehabilitation (aural and cognitive), the goal is to stimulate listening skills, thinking, increase attention, improve memory, increase processing skills, and improve problem solving and organization
• improved cognitive and communication outcomes can lead to improved quality of life
• as with children, enhancing skills should be accomplished in a fun and relevant way
Thank you

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For more information on resources, contact the MED-EL Consumer Outreach Manager in your area.