

Detrimental Effects of Untreated Hearing Loss

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Sponsored by:



Background...

- * Owner of Adept Audiology, LLC
- * Au.D. from Central Michigan University
- * Conducted Research
 - * Audiologic Counseling and Aural Rehabilitation
- * Licensed by the State of Florida
- * Fellow of the American Academy of Audiology and American Speech-Language and Hearing Association
- * Board Member/Secretary of HLAA Sarasota/Manatee Chapter



Overview

- * Statistics on untreated hearing loss
- * Why is hearing loss often left untreated
- * Brain changes and hearing loss
- * Effects of untreated hearing loss
 - * Cognitive, physical and social
- * How to reduce the risk
 - * Solutions and outcomes



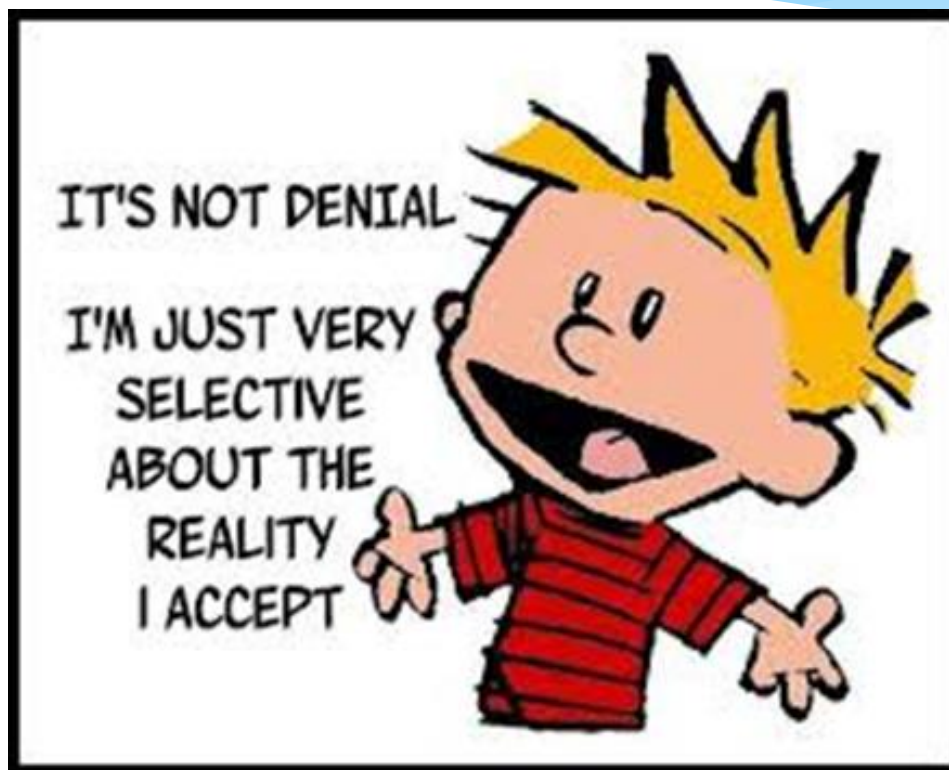
Who has Hearing Loss?

- * 50 million Americans have a hearing loss (Hearing Health Foundation, 2015)
- * From 2000 to 2015, the number of Americans with hearing loss has doubled (Hearing Health Foundation, 2015)
- * 1 in 5 adults has some degree of hearing loss (Hearing Health Foundation, 2015)
- * Approximately 1/3 of Americans between ages 65 and 74 --- nearly half of those over age 75 have hearing loss (NIDCD, 2010)
- * Hearing loss is the 2nd most prevalent chronic health condition globally (Hearing Health Foundation, 2015)

Who has Untreated Hearing Loss?

- * Only 20% of those individuals who might benefit from treatment actually seek help
 - * 40,000,000 untreated
- * Treatment often delayed until communication is severely affected
- * On average, hearing aid users wait **over 10 years** after their initial diagnosis to be fit with their first set of hearing aids

Why Wait to Treat HL



Why We Wait to Treat HL...

- * Denial!
 - * Unaware or unwilling to acknowledge loss
 - * “I hear what I want to hear” “Everyone needs to speak up and stop mumbling”
- * Stigma
 - * Makes you look old or is a sign of weakness
- * Vanity
 - * Afraid to wear big bulky device
- * Finances
 - * Costly devices – Medicare and most insurances do not cover

Why Should I Treat My HL?

- * Stay connected to the world around you!
 - * Improve relationships with friends and family
 - * Environmental sounds are crucial for safety and balance
 - * Better physical, social, and cognitive well being
 - * BETTER QUALITY OF LIFE!

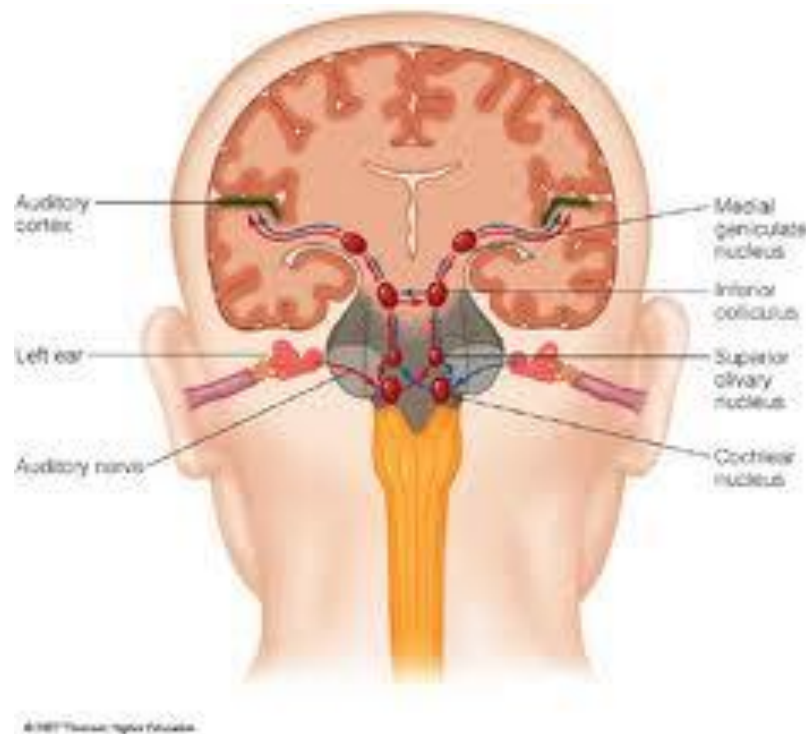
What happens if I Ignore My HL?

- * Research shows detrimental effects to overall well being
- * Greater risk to physical, cognitive, and social wellness



Cognitive Effects

- * We don't hear with our ear, we hear with our Brain!
- * Sound is transmitted from ear to brain
- * All sounds are processed at the level of the brain



Hearing Loss and the Brain

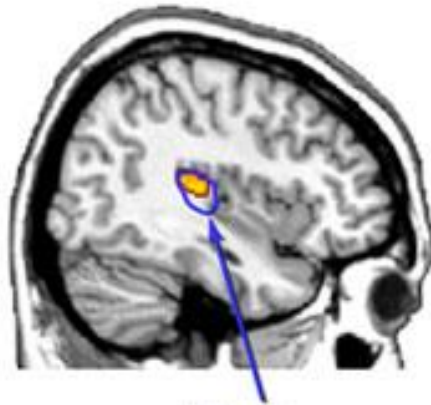
- * Hearing loss causes inadequate stimulation of specific areas in the brain
- * Lack of stimulation causes structures to atrophy
- * Ability to process and recognize speech and other sounds is compromised
 - * Speech can become garbled and muffled
 - * Brain cannot remember how to distinguish between certain speech sounds
 - * f/v – b/p—s/t (mixing of consonant sounds)



Brain Activity

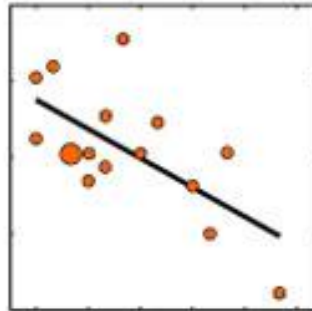
- * Perelman School of Medicine at the University of Pennsylvania, 2011
- * Analyzed brain activity when listening to complex sentences
- * People with hearing loss showed less brain activity on functional MRI scans
- * Poorer hearers also had less gray matter in the auditory cortex, suggesting that **areas of the brain related to auditory processing may show accelerated atrophy when hearing ability declines**

Brain activity related to sentence processing is reduced in listeners with poorer hearing

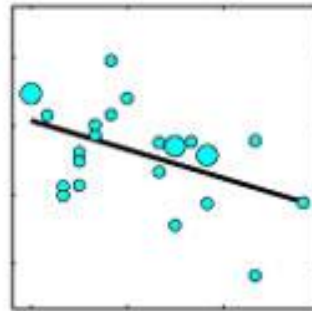


right primary auditory cortex

Auditory cortex language-related brain activity



Auditory cortex gray matter volume



better ← → worse
hearing ability

Better hearing = more brain activity and more auditory cortex gray matter

Worse hearing = significantly LESS brain activity and less auditory cortex gray matter.

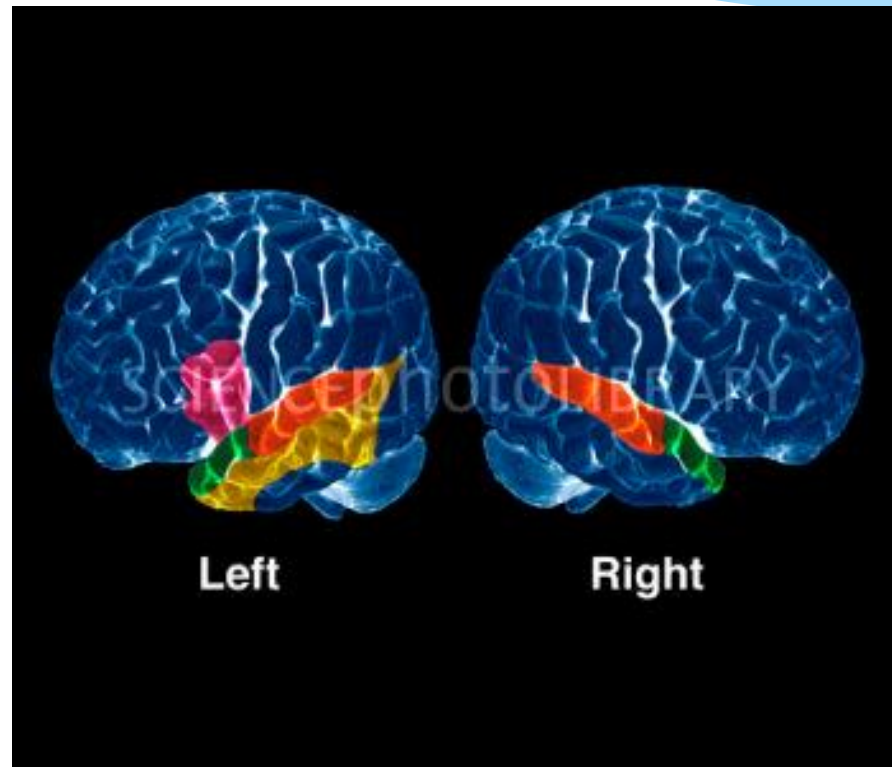
Loss Of Brain Tissue

- * Johns Hopkins – Dr. Lin
- * The Baltimore Longitudinal Study of Aging
 - * Started in 1958 by the National Institute on Aging
 - * Tracked various health factors in thousands of men and women
 - * 1994 – Started MRIs on 126 participants
 - * 75 had normal hearing, 51 had some degree of HL

Loss of Brain Tissue

- * Those with HL had accelerated rates of brain atrophy compared to those with normal hearing
- * Those with HL lost more than an **additional cubic centimeter of brain tissue each year** compared with those with normal hearing
- * Significantly more shrinkage in brain structures responsible for processing sound and speech

Brain Areas Related to Speech and Hearing



Why the Loss of Brain Tissue?

- * Regions of the brain are under stimulated
 - * Not as simple as affecting only one region
- * Areas that play roles in memory and sensory integration are also affected
 - * Mild cognitive impairment and Alzheimer's disease
- * "Our results suggest that hearing loss could be another 'hit' on the brain in many ways," Lin

Dementia



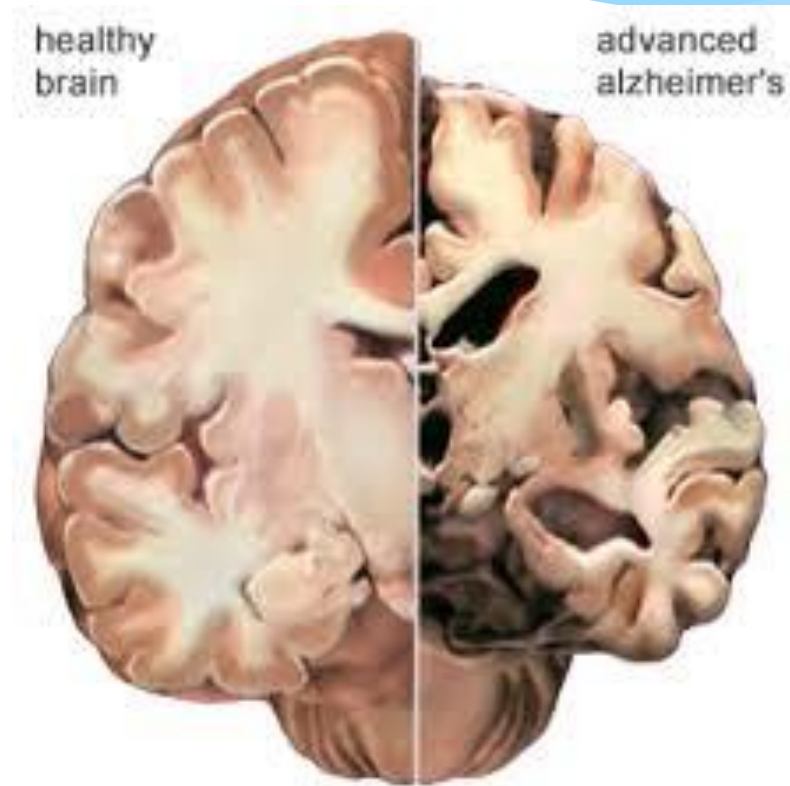
- * Johns Hopkins Medical Institutions, Dr. Lin and colleagues studied 639 individuals age 36 to 90 without dementia
 - * 125 had mild hearing loss (25 to 40 decibels)
 - * 53 had moderate hearing loss (41 to 70 decibels)
 - * 6 had severe hearing loss (more than 70 decibels)
- * During a median (midpoint) follow-up of 11.9 years, 58 individuals were diagnosed with dementia, including 37 who had Alzheimer's disease

Dementia



- * Risk of dementia was increased among those with mild hearing loss
- * Further increases in risk observed among those with moderate or severe hearing loss as compared with mild hearing loss
 - * For every 10 decibels of hearing loss, the extra risk increased by 20 percent
- * For participants age 60 and older, **36% of the risk of dementia was associated with hearing loss**

Dementia



Second Study Confirms Findings

- * 2nd Independent study by Dr. Lin
- * 1984 adults, started in 1997
- * People who suffer from hearing loss would typically experience a **loss of memory and thinking capabilities approximately 40% faster** than those who have no hearing problems

What is the Link?

- * Uncertainty as to why HL increases risk of getting dementia
- * Theories:
 - * Cognitive overload--brain tires itself out because it has to overcompensate to hear things
 - * HL can cause social isolation, which could contribute to the decline of mental faculties

Cross Modal Neuroplasticity

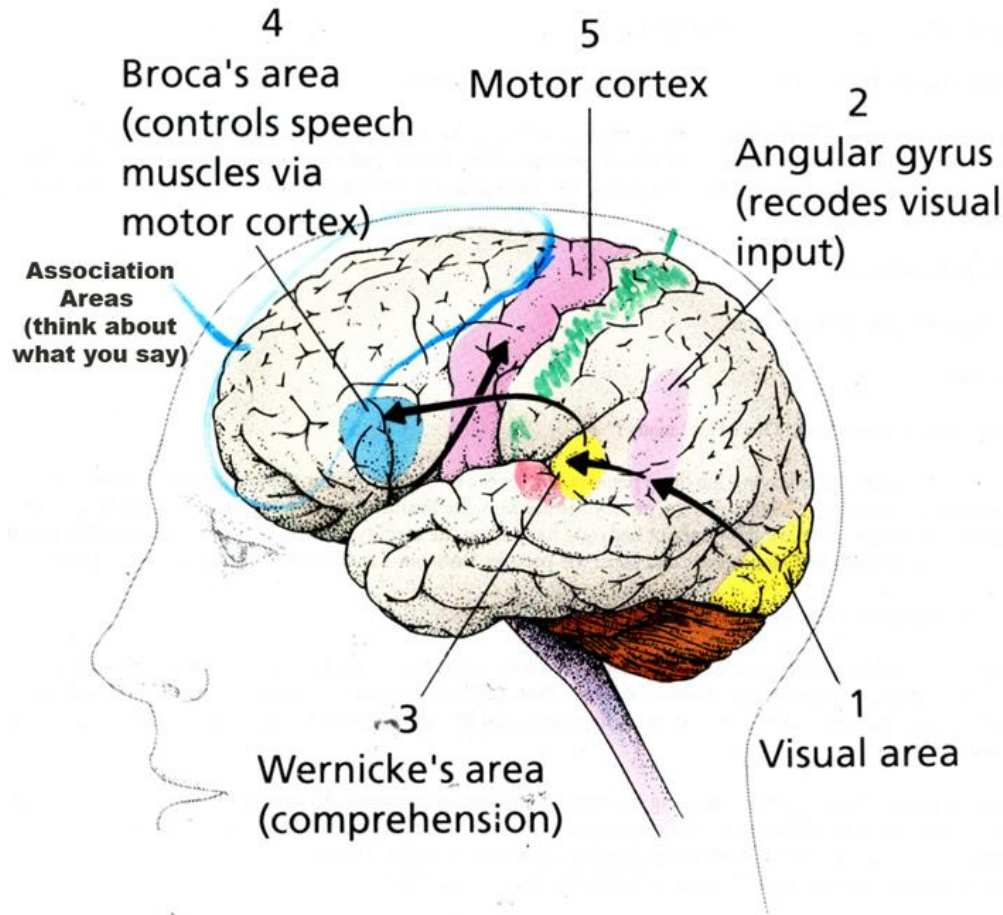
- * Dr. Anu Sharma, Univ. of Colorado, 2015
- * Lack of stimulation to auditory areas of the brain – results in compensatory cross-modal plasticity
 - * Stimulation of Visual and Temporal areas, instead of auditory areas
 - * Vision and Temporal areas are co-opting (recruiting and taking over) auditory areas
- * Cross-Modal Cortical Reorganization
 - * Brains way of compensating for lack of auditory stimulation
 - * Increases overall load on the brain

Transparency 17

Figure 2-18, page 46

Movement of information in the brain from the time a word is read until it is spoken

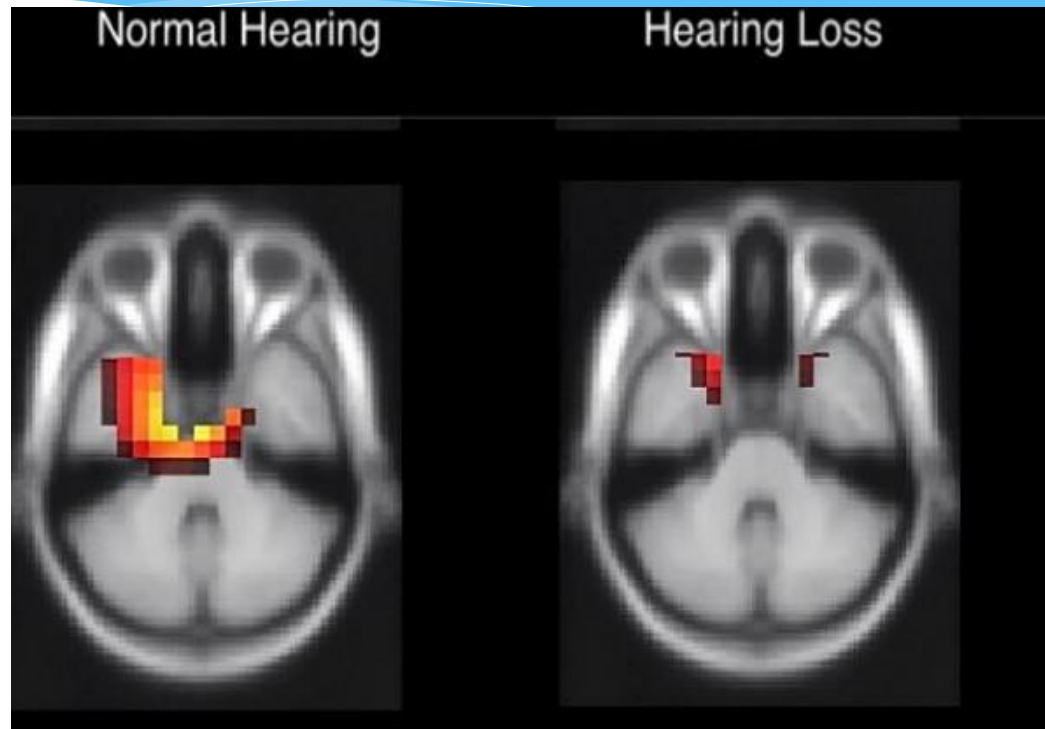
Myers: **Psychology**, Third Edition
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Recent Research

- * Dr. Anu Sharma, 2015
- * Normal hearing group (n=75) and mild to mod HL group (n=51)
- * Evaluated responses to auditory stimuli and visual stimuli using EEG

Decreased Brain Activity

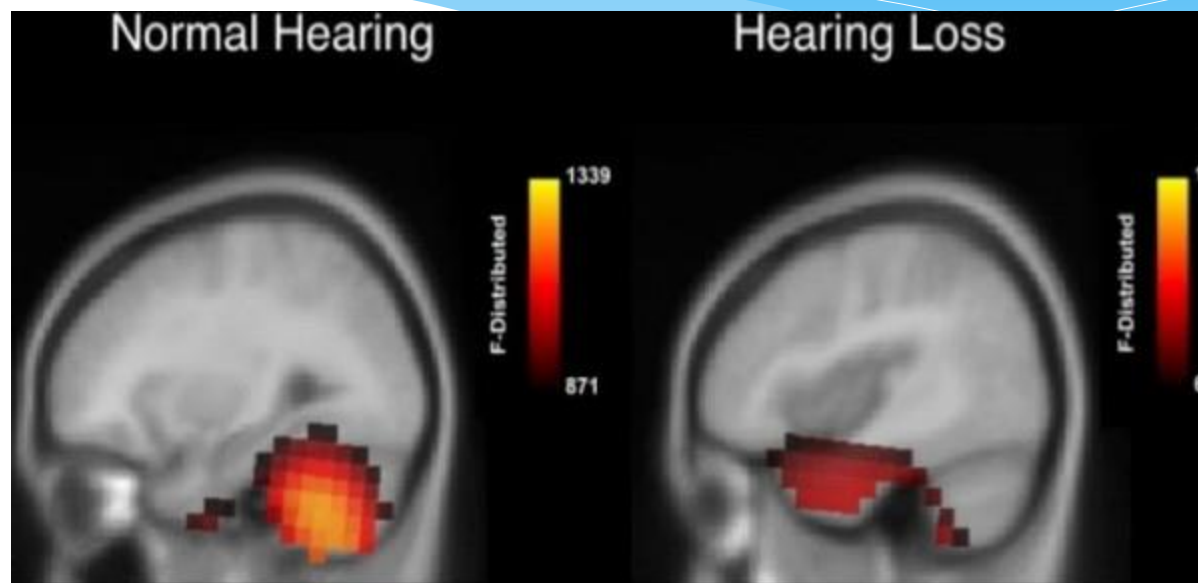


Adults with early-stage age-related hearing loss (right) show decreased activation of the hearing portion of the brain compared with normal hearing age-matched adults (left).

Auditory Stimuli Response

- * Very little activation of auditory cortex with mild to mod HL (as compared to normal hearing)
 - * Unexpected finding, most think changes do not occur until more severe HL
- * Frontal Cortex Activation also discovered
 - * Areas involved with memory execution and function
 - * Areas are used for higher-level decision-making are now activated in just hearing sounds

Visual Stimuli – Cortical Reorganization



Adults with mild age-related hearing loss (right) show brain reorganization in hearing portions of brain, which are recruited for processing visual patterns. This is not seen in age-matched adults with normal hearing (left).

Cortical Reorganization

- * EEG showed even those with mild HL, encroachment on auditory areas for visual and tactile stimulation
 - * As cross-modal (reorganization) increased, speech perception in noise decreased

Research Concluded

- * Reduced auditory stimulation leads to increased listening effort....
- * Causes over activation of visual cortex, due to compensatory neural plasticity
- * Visual areas take over auditory areas – brain reorganizes, which reduces ability to hear, especially in the presence of noise

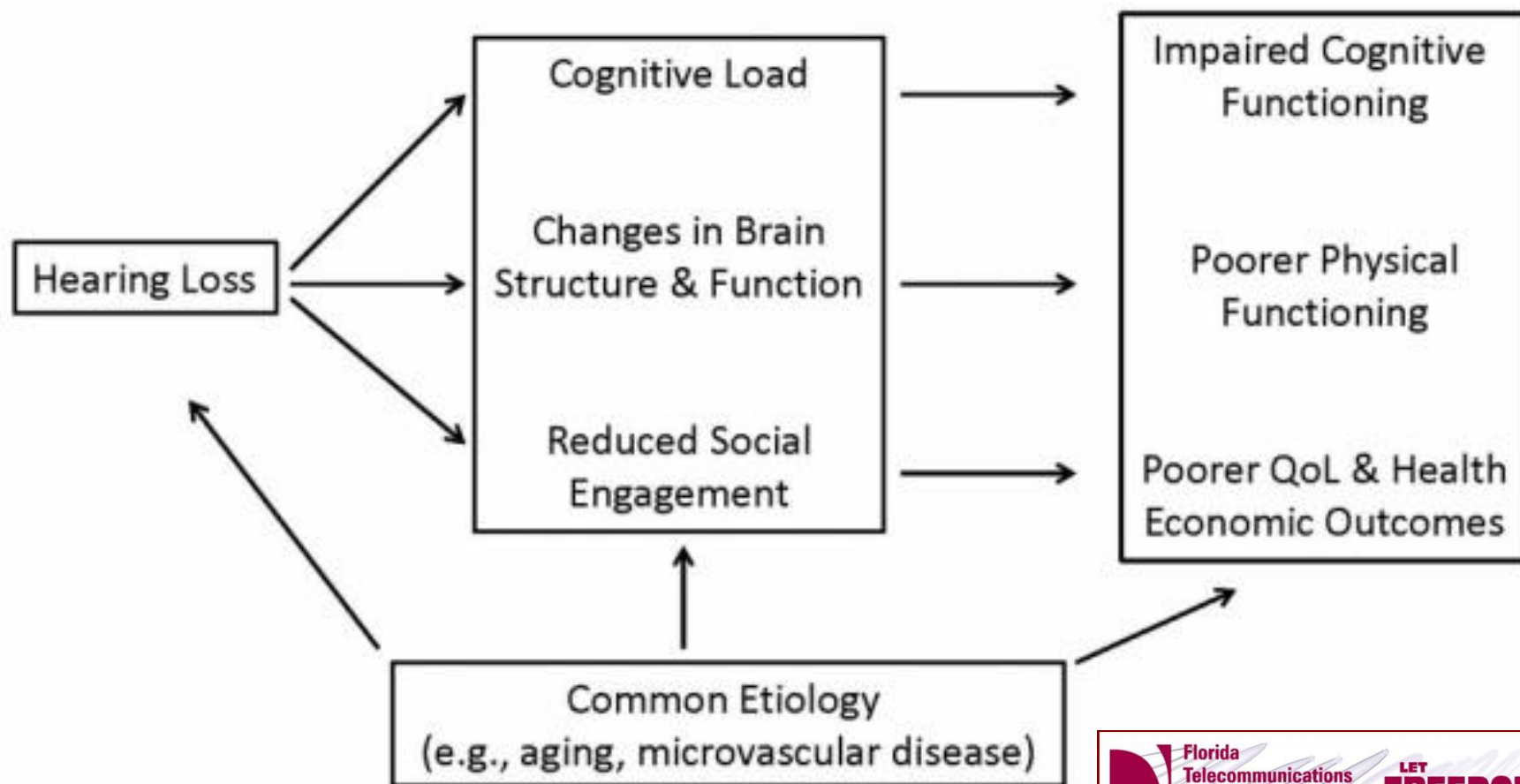
Can Early Intervention Help?

- * Reorganization was shown to occur as quickly as 3mos after onset of HL
 - * Visual areas taking over auditory regions in a pt with sudden SNHL
- * 30 days after HA fitting, brain re-organized
 - * No further frontal lobe stimulation (less cognitive overload!)
- * Long-term HA user
 - * Good discrimination abilities, brain reversed
 - * Poor discrimination abilities, no reversal
 - * Somatosensory and visual aud cortex areas still stimulated

Benefits of Early Intervention...

- * Findings suggest early intervention and proper hearing device fitting can help reverse neuroplasticity changes!
- * Those with untreated loss are more likely to experience Cross-Modal Cortical Reorganization, which leads to poorer hearing, especially in the presence of noise.

Dr. Frank Lin, MD, PhD



Additional Effects of Untreated HL

* **Physical Effects**

- * Fatigue
- * Balance and Falls
- * Hospitalizations
- * Stress

Social Effects

Sadness/Depression

Isolation

Paranoia

Relationship/Marriage

Fatigue

- * Vanderbilt study, (2015) - 149 participants
- * Those with untreated HL more likely to report lack of energy and increased fatigue
- * Fatigue strongly associated with negative psychosocial effects of HL
 - * HHI (Hearing Handicap Inventory)

Fatigue

- * Fatigue
 - * Brain is working overtime trying to put together the message
 - * Simple conversation relies on brain activity from many areas:
 - * Speech production, comprehension, hearing, and sight
- * A HOH person has to think, concentrate and work much harder



Balance and Falls

- * Johns Hopkins Study, Dr. Frank Lin, 2012
- * 2,017 people age 40 to 69, self reported falls last 12mo
- * People with a mild hearing loss are almost **three times more likely to have a history of falling than those with no hearing loss**
 - * Every additional 10 decibels of hearing loss means an increased 1.4-fold risk of falling
- * Adjustment for demographic and other health factors did not change results

Johns Hopkins Fall Study

- * Dr. Lin suggests....
- * Hearing loss decreases awareness of surrounding environment and increases cognitive load. In turn, this raises the potential for falls.
 - * The brain is overwhelmed with demands on its limited resources to maintain balance and gait, while straining to hear and process auditory input.

Hospitalization/Illness

- * Genther et al, 2013--analyzed data from more than 1,100 American men and women aged 70 and older with hearing loss
 - * Over a four-year period, **HOH individuals were 32% more likely to have been admitted to the hospital** than over 500 adults with normal hearing
- * 36% more likely to have prolonged stretches of illness or injury
- * HL was independently associated with hospitalization and poorer self-reported health over the past 12 months
- * Social isolation and cognitive decline and dementia due to HL may be playing a role

Stress

- * HOH report higher levels of stress (Healthy Hearing, 2015)
- * Stress can lead to:
 - * Increased muscle tension
 - * Headaches
 - * Increased blood pressure, hypertension
 - * Increased tinnitus (ringing/noise in the ears)
 - * Difficulty Sleeping



Summing up Physical Effects

- * Fatigue
- * Balance problems and more likely to fall
- * Increased risk for hospitalizations and illness
- * Increased stress, which can lead to a variety of other health problems

Social Effects



- * Study by The National Council on the Aging (NCOA), 1999
- * Survey of 2,300 hearing impaired adults age 50 and older
- * Those with untreated hearing loss were more likely to report **Depression, Anxiety, and Paranoia**
 - * Less likely to participate in organized social activities, compared to those who wear hearing aids
- * “This study debunks the myth that untreated hearing loss in older persons is a harmless condition.”

Sadness and Depression

- * Negative feelings about self -- associated with hearing loss
 - * Fear, anger, guilt, incompetence, self loathing, unworthiness (socialworktoday.com, 2010)
- * More of the seniors with untreated hearing loss reported feelings of sadness or depression that lasted two or more weeks during the past year (<http://www.audiology.org>)

Sadness and Depression

Depression	Uses Aids	Does not use aids
Mild	14%	23%
More Severe	22%	30%



Social Isolation

- * Hearing loss can create a psychological solitary confinement
- * Feeling inadequate, stupid, awkward, embarrassed, different, or abnormal
- * Leads to lack of desire to socialize
 - * Family relationships – spouse, children, grandchildren
 - * Friends
 - * Colleagues/work environments

Social Activity

Social Activity	Uses Aids	Does not use aids
Mild	47%	37%
More Severe	42%	32%

Paranoia

- * Individuals not treating their HL are more likely to experience paranoia
- * “Other people get angry at me for no reason” (classification in the study by NCOA)
- * Those with hearing loss often misinterpret and ask others to repeat

Paranoia

Paranoia	Uses Aids	Does not use aids
Mild	13%	24%
More Severe	14%	36%

Strain on Relationship/Marriage

- * Many studies illustrate strain on relationships and marriage
- * (Scarinici et al, 2012; Stark et al, 2004)
- * Effects of HL are similar for those with HL and spouses
 - * Concerns about isolation, emotional wellness, embarrassment (Scarinici et al, 2012)
- * Research study by HearingDirect.com -- Polled 1000 respondents with HL
 - * Hearing loss can lead to more arguments between couples, and cause a breakdown of marriages
 - * Lack of empathy
 - * Isolation from family, friends, and colleagues
- * 1/3 said their inability to hear properly caused major arguments within the family
- * 1/16 revealed that their partner had threatened to leave or divorce them unless they sought help



Decreased Earning Potential

- * Better Hearing Institute conducted a study on The Impact of Untreated HL on Household Income
 - * Directly affects income potential
 - * **HL negatively impacts household income on average up to \$12,000**
 - * Use of hearing devices mitigates the effects by 50%
- * Losses in compensation are due to:
 - * Underemployment
 - * Mistakes on the job
 - * Reduced quality of life which affects job performance



Summing up Social Effects

- * Sadness/Depression
 - * Social Isolation
 - * Paranoia – worrying about what others are thinking
 - * Strain on relationships and marriage
 - * Decreased earning potential
-
- * Studies show that use of hearing devices reduce these detrimental effects of HL!

What You Can Do to Avoid Risk!

- * Preserve Hearing!
 - * 90% of the time, HL is permanent
 - * Cannot restore hearing once it is gone
- * Protect Hearing
 - * Avoid loud sounds (noisy hobbies, loud music/concerts, gunfire, etc.)
 - * Wear hearing protection
 - * Firearms, noisy work environments/hobbies
 - * Keep music at safe levels
 - * Tinnitus or TTS is a sign of permanent damage

Be Proactive!



- * Annual hearing evaluations
 - * Baseline testing helps determine rate of decline
- * Be open with friends and family
 - * Majority of time, friends/family notice HL before patient

Seek Treatment!

- * Do not delay treatment
 - * Hearing devices stimulate the brain
 - * May preserve hearing
- * Reduce Risk of Brain Reorganization
 - * Leads to increased difficulty hearing, especially in noise
- * Hearing aids improve overall quality of life
 - * Based on many studies and user reports



Benefits of Treatment

(per NCOA study)

Improvement Area	Improvement by HA User (%)	Improvement by HA User's Family (%)
Relations at home	56	66
Feelings about self	50	60
Life overall	48	62
Relations with kids and grandkids	40	52
Mental Health	36	39
Self Confidence	39	46
Sense of safety	34	37
Social life	34	41
Relations at work	26	43
Sex life	8	N/A

Benefits of Using Hearing Devices?

- * More to come.....
- * At this point, not clear if treating hearing loss can delay declines in cognitive and physical functioning
- * ACHIEVE (Aging, Cognitive, and Hearing Evaluation in Elders) study is being planned
 - * Will evaluate if treating HL reduces the risk of cognitive decline and dementia in older adults

Auditory Training

- * Develop skills and strategies to help you listen and communicate
- * Retrain brain on speech comprehension
 - * Improvements up to 40%
- * Challenging Listening Environments
 - * Noisy Restaurants
 - * Rapid Speakers
 - * Competing Speakers
- * LACE and Ready My Quips

Local Solutions



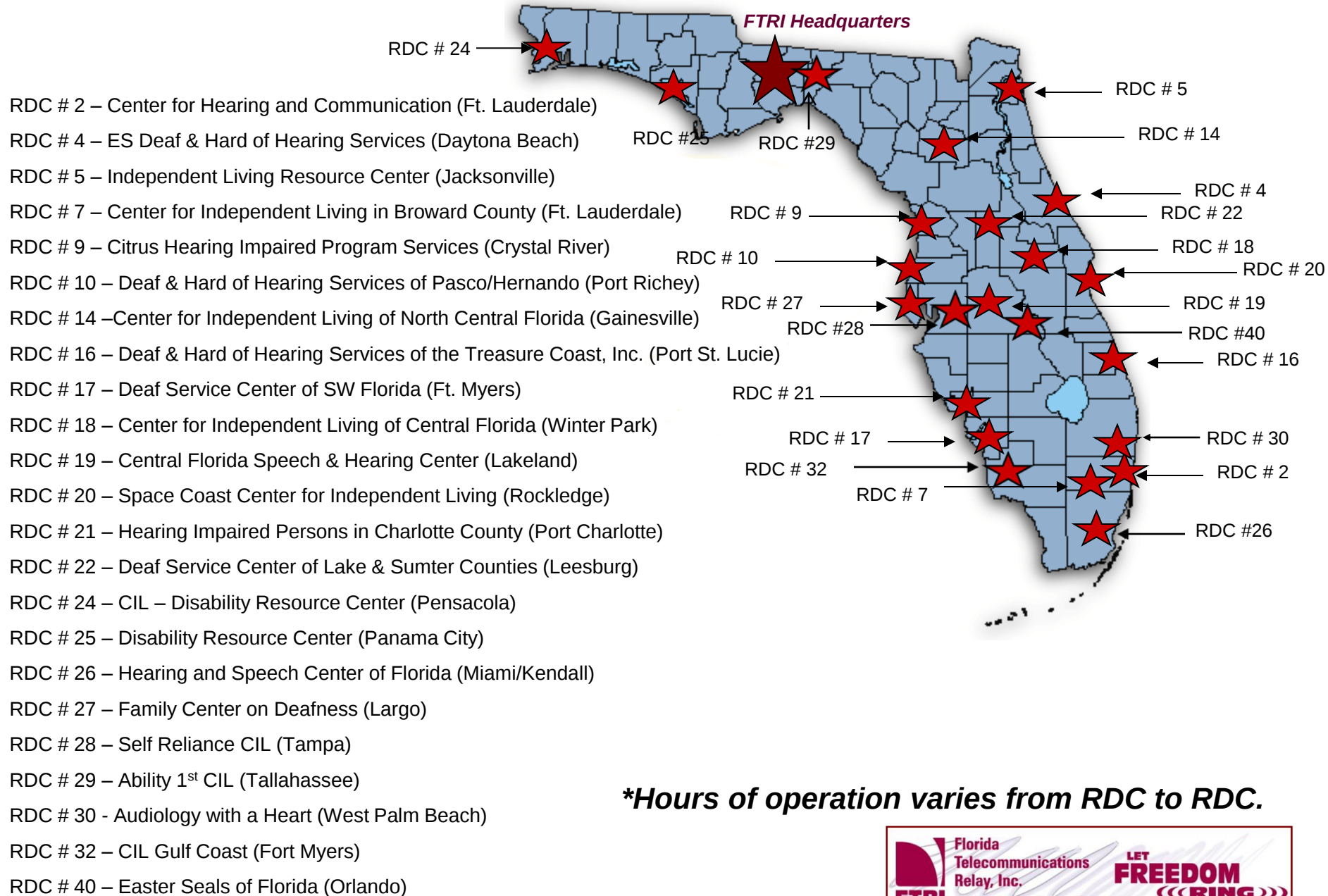
- * Local and national groups that can offer guidance and information about HL and the process
 - * HLAA – Local Chapters
 - * Advocacy, Education, and Support
- * FTRI – Florida Telecommunications Relay, Inc. (FTRI)
 - * Statewide non profit 501(c)3 organization
 - * Specialized Telecommunications Equipment Distribution Program for citizens of Florida who are Deaf, Hard of Hearing, Deaf/Blind and Speech Disabled.
 - * FTRI is also responsible for the education and promotion of the Florida Relay Service.

- * 1991 - The Florida Legislature passed the [Telecommunications Access System Act](#) (TASA F.S. 427)
 - * Provide basic telecommunications services for Hard of Hearing, Deaf, Deaf/Blind, and Speech Disabled individuals, in the most cost effective way possible.
 - * Funded by a monthly surcharge billed to all telephone customers (landlines) in the State of Florida.
 - * The specialized devices provided are loaned to all qualified permanent Florida residents for as long as they need it, at no charge.
 - * Most cost effective solution in FL

- * To Qualify for a new Phone:
- * Permanent Florida resident
- * At least 3 years old
- * Certified as having a hearing loss or speech impairment
- * Landline
- * Contact info:
- * <http://www.ftri.org/free>
- * Or call: 1-800-222-3448



FTRI Regional Distribution Centers



****Hours of operation varies from RDC to RDC.***

In Conclusion...

- * Untreated HL can negatively impact your physical, cognitive and social well being
- * In order to preserve brain function and improve overall quality of life, it is imperative that individuals seek treatment for their HL

Hearing Devices for Brain Preservation

- * Dr. Jonathan Peelle, PhD, Department of Neurology, University of Pennsylvania School of Medicine
- * "As hearing ability declines with age, interventions such as **hearing aids should be considered not only to improve hearing but to preserve the brain,**"
- * "Preserving your hearing doesn't only protect your ears, but also helps your brain perform at its best."

Thank You

Thank you all for attending this seminar!



Questions?

