

# HEARING SOLUTIONS SIG

- **Sun City Texas Computer Club**

**January 10, 2019**

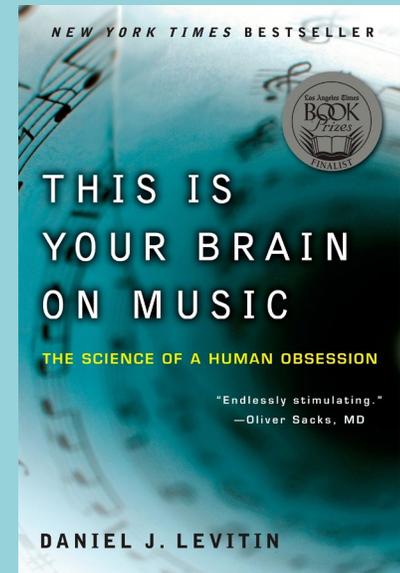


# Music Training for Better Hearing

Jill Davis, AuD  
Doctor of Audiology

# Music Training for Better Hearing

- Brain Changes and Aging
- Hearing loss and Cognitive Decline
- Brain Reorganization
- Hearing Aids
- Brain Training
- Music Training Research
- Kinds of Music Training
- Victory Music Program



# Brain Changes and Aging

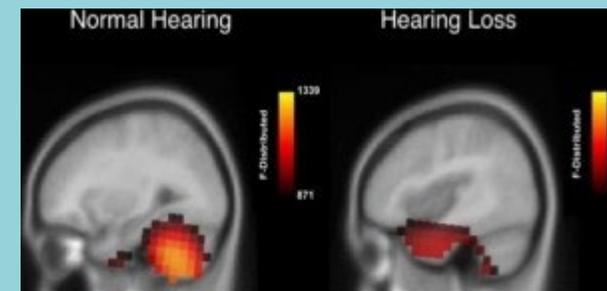
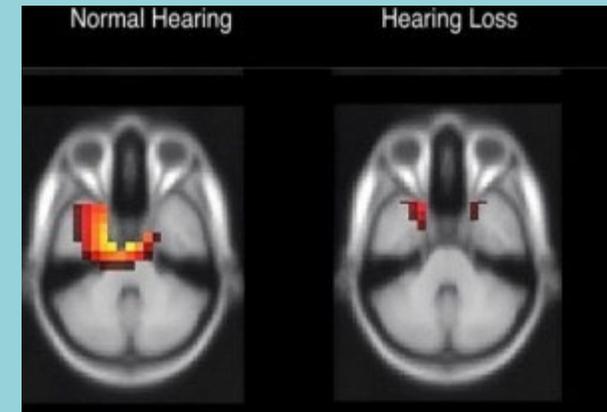
- Two major issues:
  - Cognitive decline
  - Understanding speech in background noise
- Aging causes reduction in speech processing, sensory, cognitive and motor systems
  - “I can hear but I can’t understand”
    - Even with hearing aids
- Aging causes delayed neural responses
  - but plasticity shows age-related declines are reversed with training

# Hearing Loss and Cognitive Decline

- Risk of all-cause dementia increased with hearing loss severity
- Compared to individuals with normal hearing; individuals with mild, moderate, and severe hearing loss had a 2,3, and 5 fold increase of incident all-cause dementia over 10 years
- HL effect on cognitive resources
  - Neuroimaging shows reduced cortical volumes in the auditory cortex and accelerated rates of lateral temporal lobe and whole brain atrophy
  - Reallocation of neural resources could deplete cognitive reserve available to other cognitive processes
- Dementia destroys areas of the brain responsible for episodic memory but procedural memory is left in tact
  - Episodic memory: the ability to encode and retrieve our daily personal experiences supported by circuitry of **medial temporal lobe**
    - **Auditory portion of brain: temporal lobe**

# Brain Reorganization

- Researchers exploring ways in which our brains respond to hearing loss found that the brain reorganizes, which may be the link between age-related hearing loss and dementia
  - As listening becomes more effortful, it leads to changes in the brain
  - As hearing loss increases, the brain has to work harder to listen
- “Cross-modal recruitment” of the hearing portion of the brain by the senses of vision and touch happens not only in deaf patients, but is also in adults with only a mild degree of hearing loss.
  - The hearing areas of the brain shrink in age-related hearing loss
  - Vision and touch take-over
  - Memory centers of the brain are compromised



# Hearing Aids and Speech in Noise

- Hearing aids can reverse negative changes (psychological and emotional) and may offset cognitive decline from untreated hearing loss
  - Wearing hearing aids show reversal in cross-modal recruitment
- Difficulty hearing in noise is the top complaint of older adults with or without hearing loss
  - Speech in noise is an important aspect of daily communication
  - Reduced ability to hear in noise leads to avoidance of social situations resulting in social isolation and decreased quality of life
- Hearing aids are increasingly remarkable in ability to suppress noise but is brain receiving proper stimulation to correct the aging auditory system?

# Hearing Aids and Brain Training

- Hearing aids alone are not enough
  - Separating speech from noise is not an ear task, but a brain task
- Need to train brain on sounds that are coming from hearing aids
- Auditory brain training provides training in processing speech and auditory working memory, which is crucial for hearing in noise.

# Auditory Brain Training

- Hearing and listening are not the same thing
  - Hearing allows you to receive sound
  - Listening requires your brain to attend and interpret speech
- Hearing aids reduce listening problems, but alone cannot develop listening and mental skills that are necessary to comprehend conversations
- Auditory Training accelerates the brain's rebuilding process. It is like physical therapy for the brain
- Auditory Brain Training improves:
  - Working memory
    - Increased cognitive tests of short term memory and speed of processing
  - Speech in noise
    - Better performance on Quick SIN test
- Training partially reversed affects of aging on neural timing, improving central auditory processing. Programs include:
  - cLEAR
  - Lace

Sounds great, stop there....right?

# Why Music Training?

- There is emerging evidence to suggest that music may help to delay the onset of dementia and improve brain function and information recall

# Why Music Training?

- Hearing Loss causes

- Depression
- Memory loss
- Speech in noise processing

- Music helps

- Depression
- Memory loss
- Speech in noise processing

- Music is wholistic and stimulates every part of the brain
- Relatively inexpensive
- Easy to begin at any age

# Music and the Brain

- Brain regions involved (from functional brain imaging):
  - Movement
  - Attention
  - Planning
  - Memory
  - Language
  - Emotion
  - Vision
- Benefits to music:
  - Reduced stress and anxiety
  - Increased mental alertness
  - Releases endorphins that make us
    - smarter
    - healthier
    - happier
    - more creative

# Music Training

- Simply Piano App
  - Free from app store or google play
  - [www.joytunes.com/simply-piano](http://www.joytunes.com/simply-piano)



# Music Training Research

- John Hopkins: Musicians display strengthened brain networks for selective auditory attention that non-musicians do not
- Baycrest Health Sciences Study: Playing piano improved the attention, memory and problem-solving abilities
  - Learning to play sound on a musical instrument alters the brain waves in a way that improves a person's listening and hearing skills over a short time frame
  - Learning the fine movement needed to reproduce a sound on an instrument changes the brain's perception of sound in a way that is not seen when listening to music
- Univ. of Toronto: Musicians showed less brain activity when completing difficult listening tasks
  - Require less effort to perform the same task, which protects them against cognitive decline and delay the onset of dementia

# Music Training Research Continued

- Northwestern Auditory Neuroscience Lab: Engagement in music activities improve memory, attention, spatio-temporal skills, language, social skills, and mathematical ability
- Hearing Review 2015: Neuroimaging studies found significantly increased grey matter volume in musicians compared to non-musicians
  - Musical training can be used to enhance auditory discrimination skills and may be applied to rehabilitation concepts for people with hearing aids, cochlear implants, auditory processing disorders, learning disabilities, and dementia
- Maquire University, Sydney: People involved in musical activities preserve speech listening skills better than others
  - Combining auditory rehabilitation, cognitive training, and music therapy can help a person with hearing loss hear conversations in loud, busy places

# Conclusion

- Hearing loss and aging create changes in the brain that lead to cognitive decline, memory loss, and difficulty hearing speech in background noise
- Hearing aids can amplify sound but cannot correct for the changes in brain due to aging
- Auditory Brain Training supplements hearing aids in order to improve hearing in background noise and working memory
- Musicians perform better in background noise and have better brain function on Brain Training exercises
- Music training results in better speech understanding in background noise and improved working memory
- Everyone can benefit from music training



VICTORY  
HEARING & BALANCE

3811 Bee Cave Road Suite 101  
Westlake Hills, TX 78746  
512-443-3500  
[jdavis@vhearing.com](mailto:jdavis@vhearing.com)