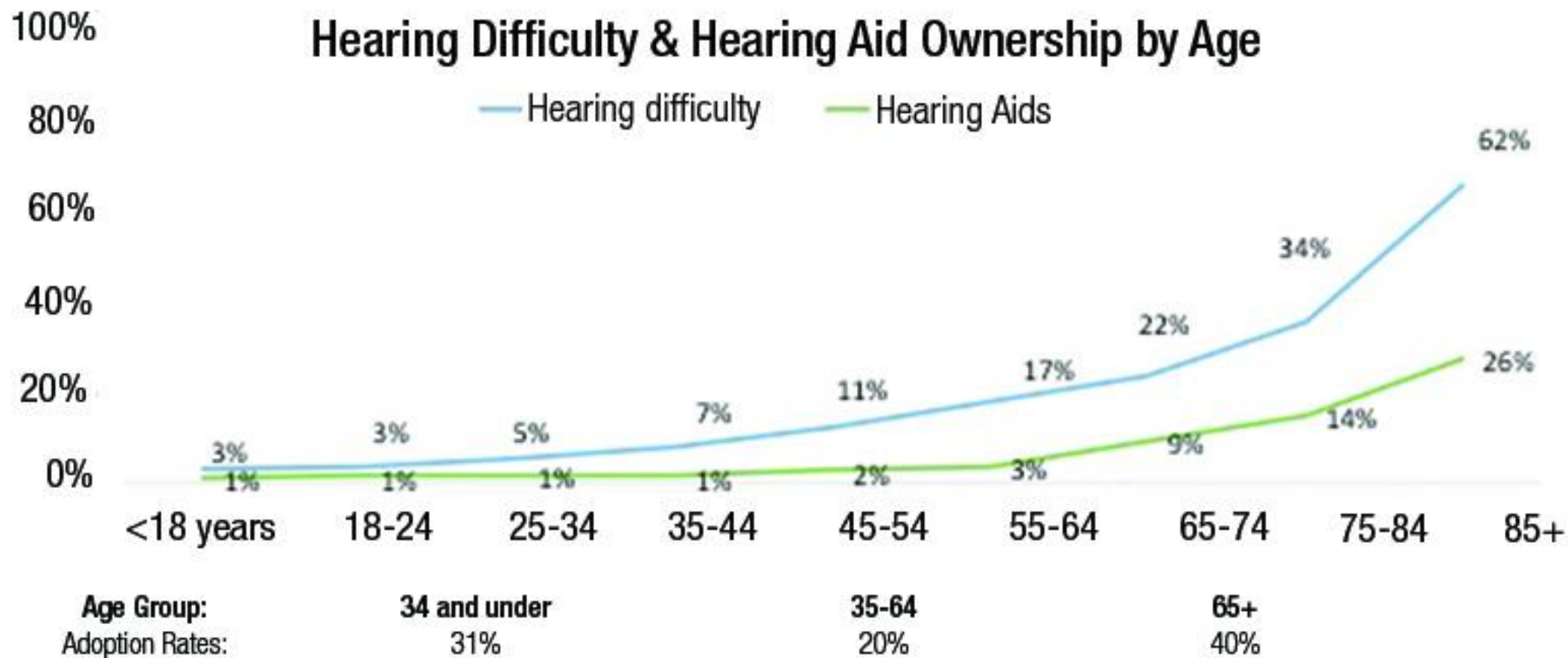




# THE ART AND SCIENCE OF AMPLIFICATION:

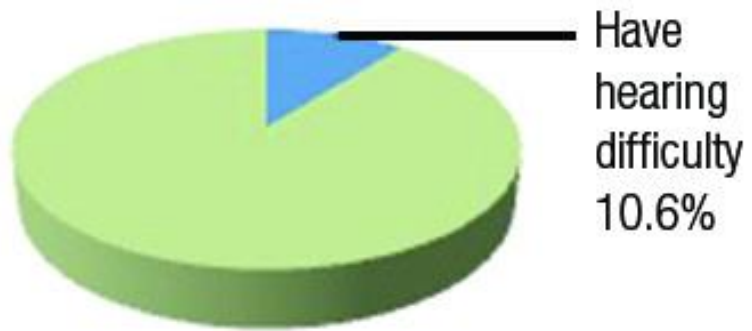
## *SUCCESSFUL LIVING WITH HEARING LOSS*

Patricia Gaffney, AuD  
Associate Professor  
Department of Audiology  
Nova Southeastern University

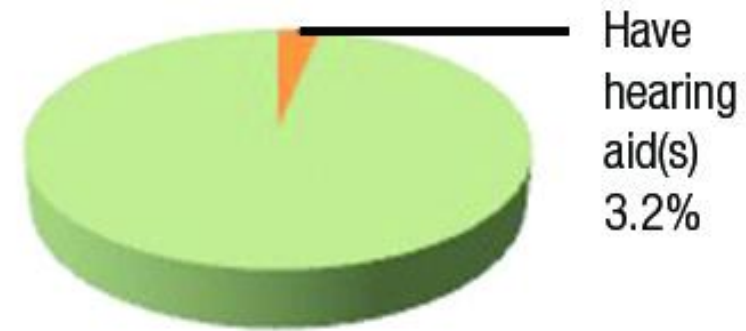


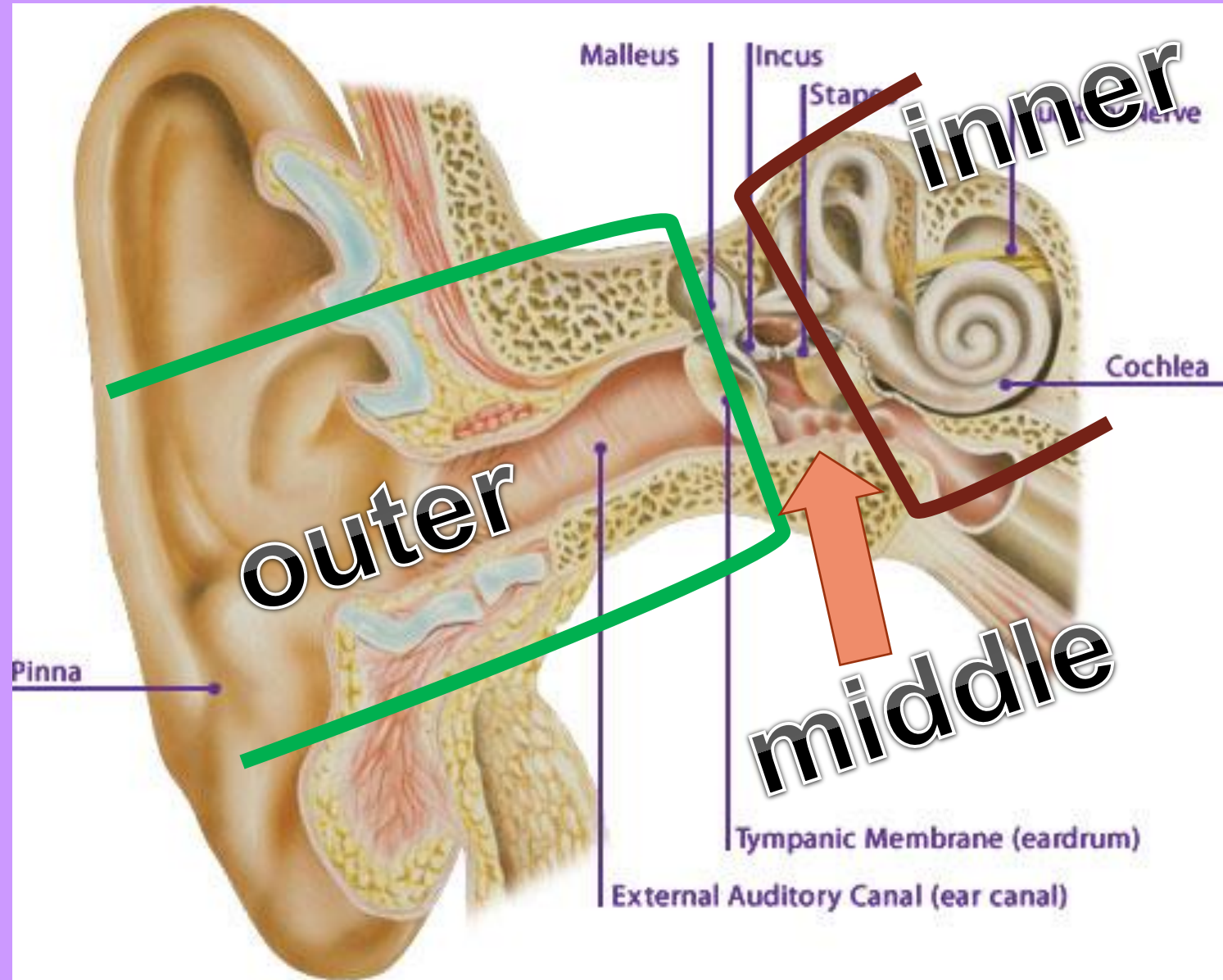
# HEARING AID USER RATES

**Hearing Difficulty Rate**

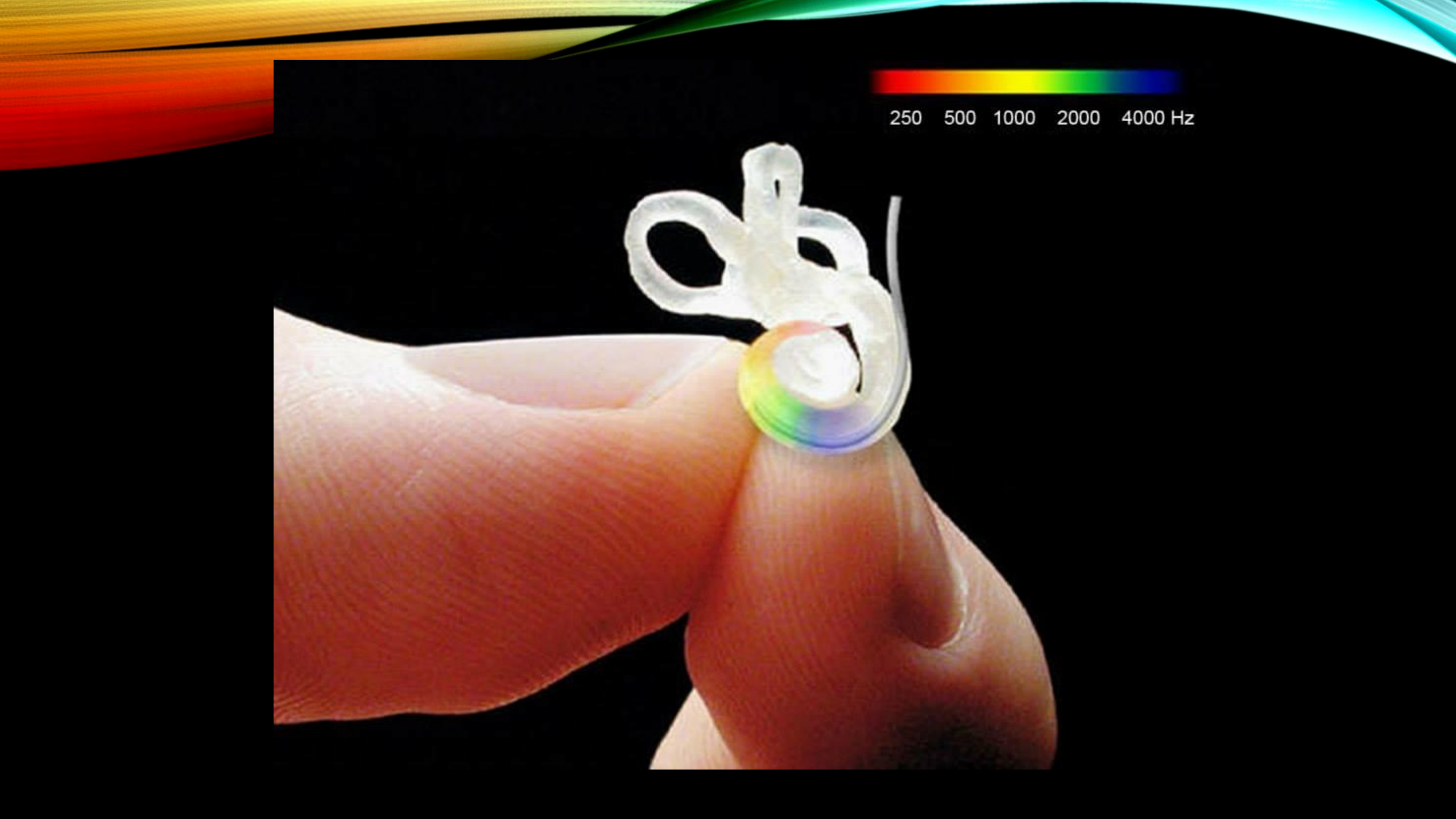


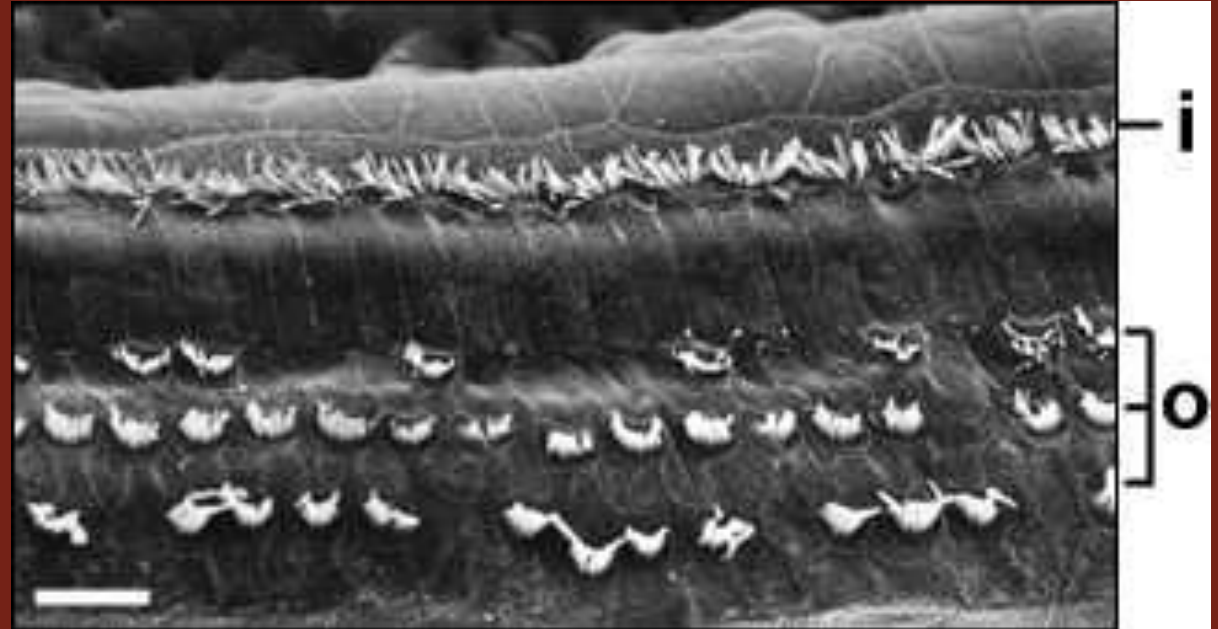
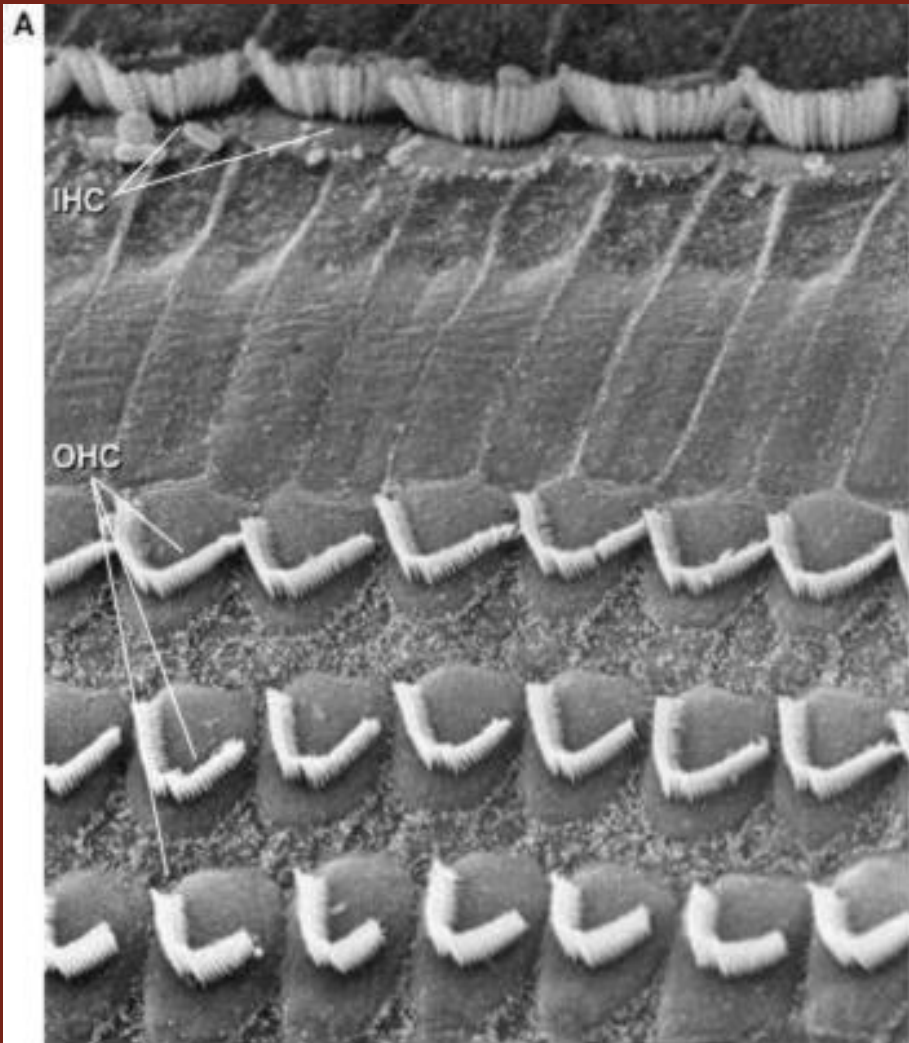
**Hearing Aid Rate**







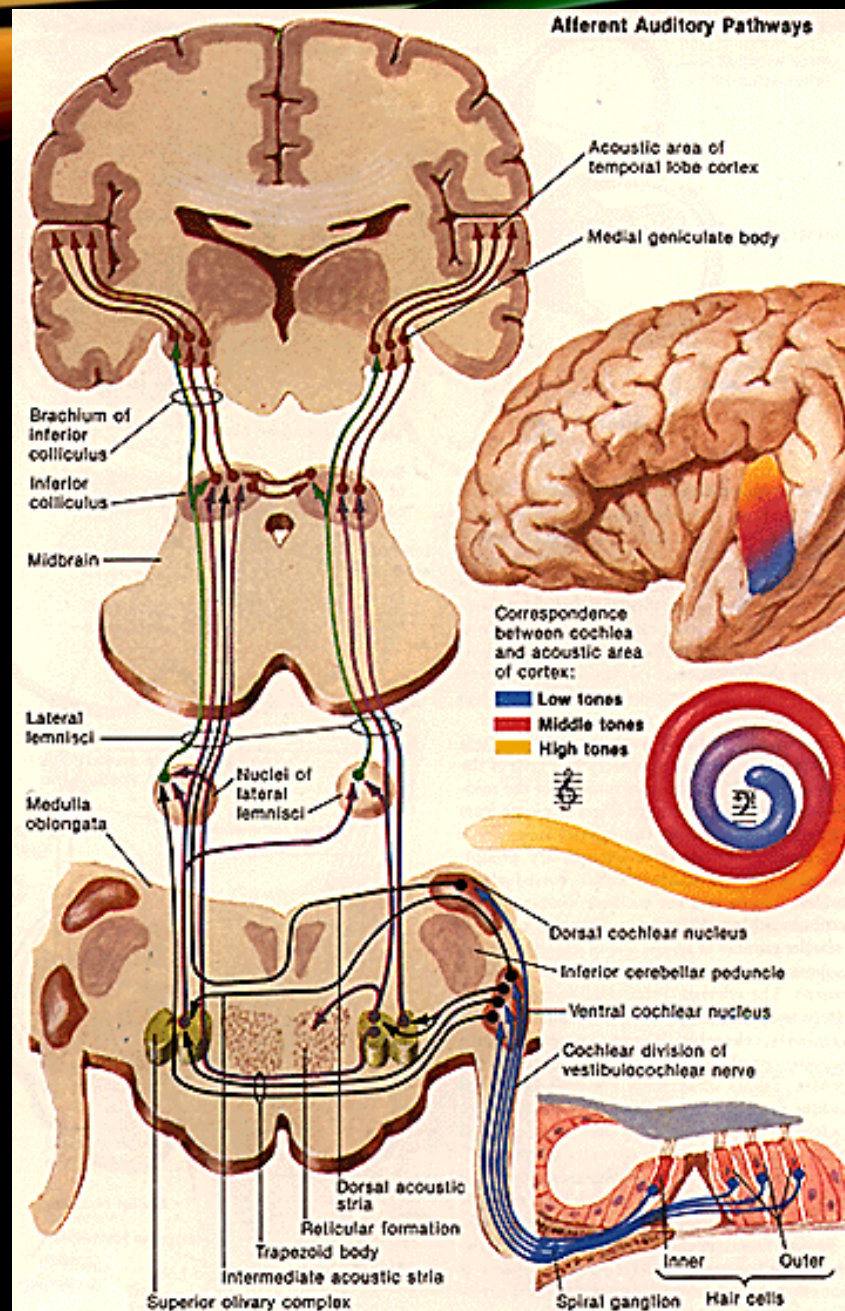




<http://scienceblogs.com/retrospectacle/upload/2006/06/hair%20cells.bmp>

<http://www.iurc.montp.inserm.fr/cric51/addition/english/pathology/amino/hcpath1.jpg>



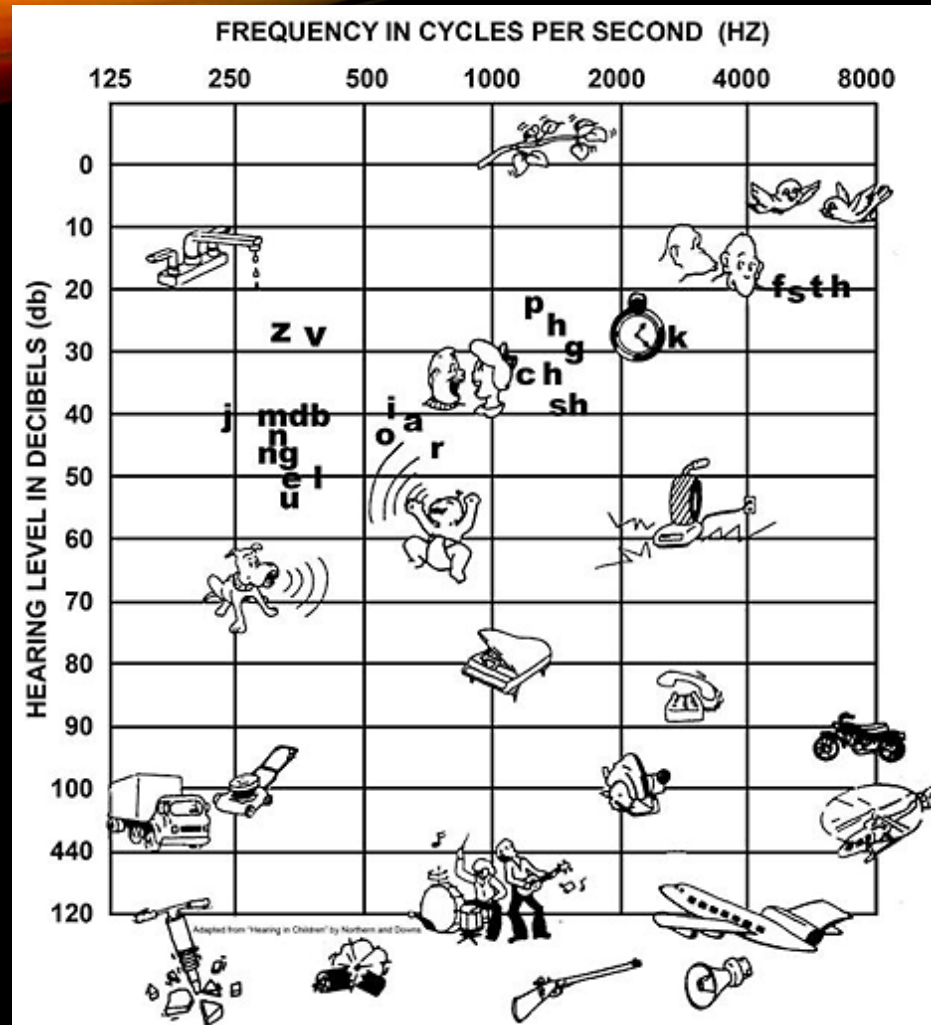


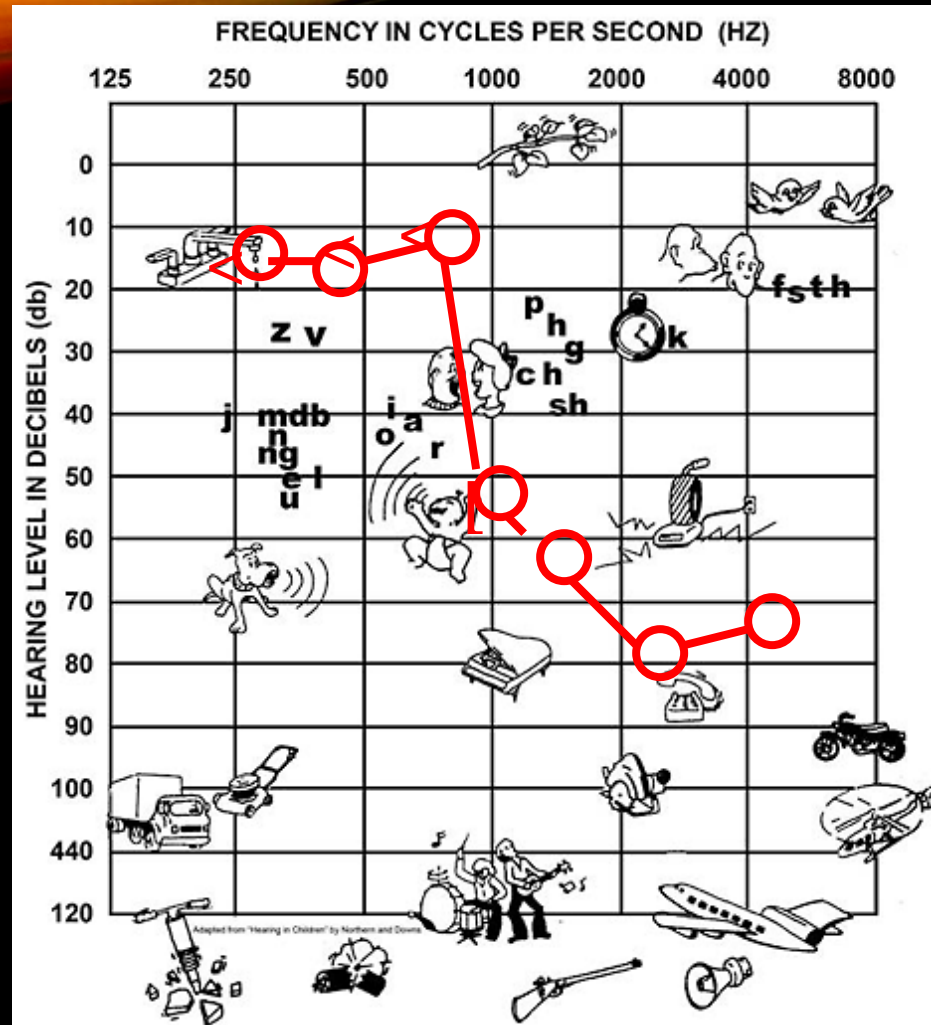


# PRESBYCUSIS

- Hearing loss (HL) related to the aging process
- Definition
  - Impaired auditory thresholds
    - High frequency range
  - Impaired frequency and temporal discrimination
  - Impaired sound discrimination
  - Impaired speech discrimination
  - Impaired auditory memory
- Caused by sensory and neural loss and metabolic changes
- Changes along the entire auditory pathway







# WAITING FOR HEARING INSTRUMENTS- THE AVERAGE IS 7 YEARS

## Cost

- Hearing instruments are expensive, which can be a barrier

## Need

- The need is not always clear or blame is shifted to other communication partners

## Benefit

- Cost: benefit ratio is unclear to many patients

## Aging

- Perception is hearing instruments are for “old” people



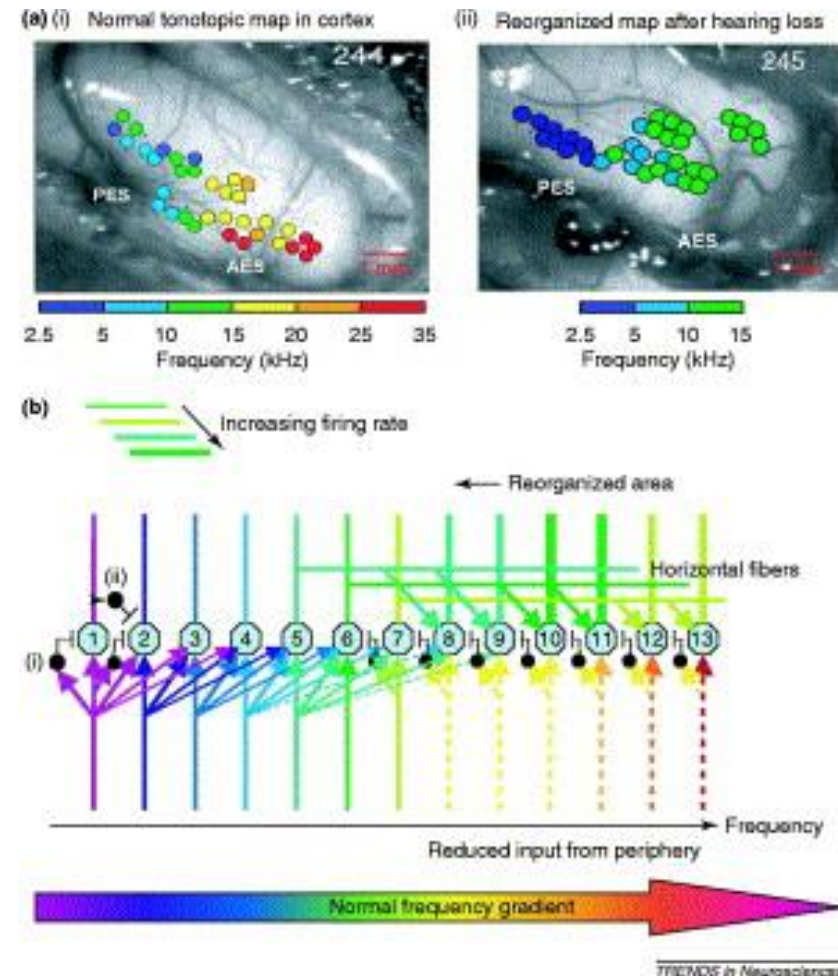
# WHY PATIENTS SHOULDN'T WAIT

## Auditory Deprivation

- Lack of input at the peripheral leads to decline of auditory nerve and cortical reorganization

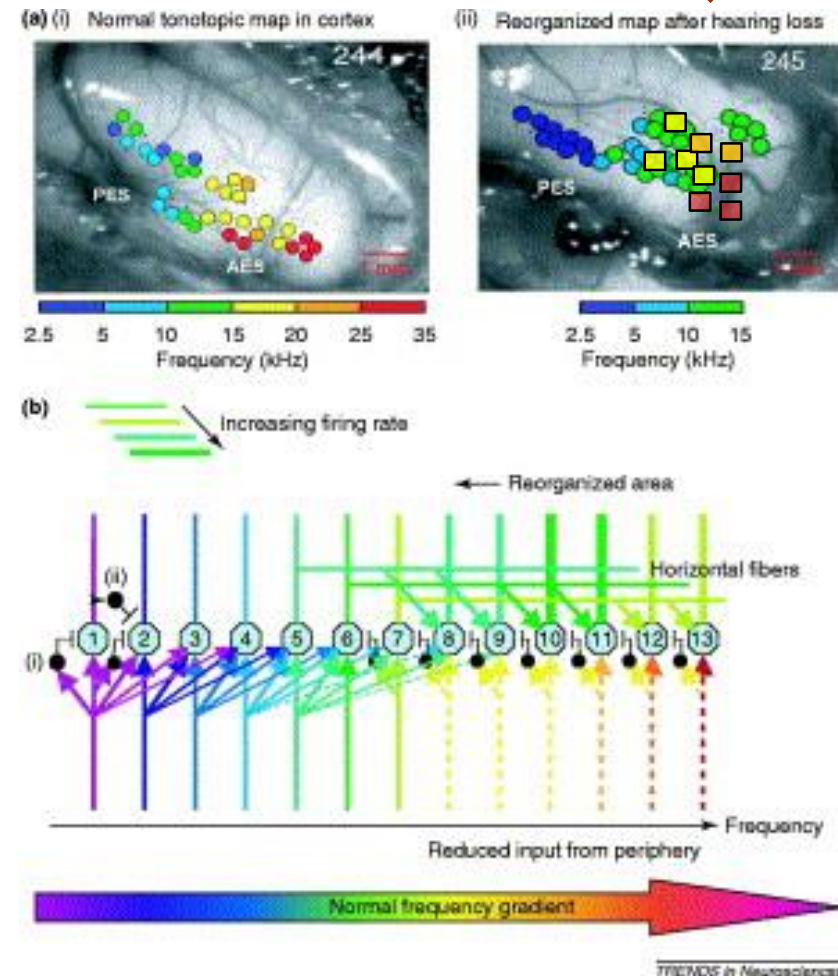
# CORTICAL REORGANIZATION

- With hearing loss there is reorganization
- Mid and low frequencies move to take over absent high frequencies
- Has a negative impact when high frequencies are re-amplified



# INTRODUCTION OF AMPLIFICATION

- Frequency resolution confusion
  - The longer the region is not amplified, longer to acclimatize





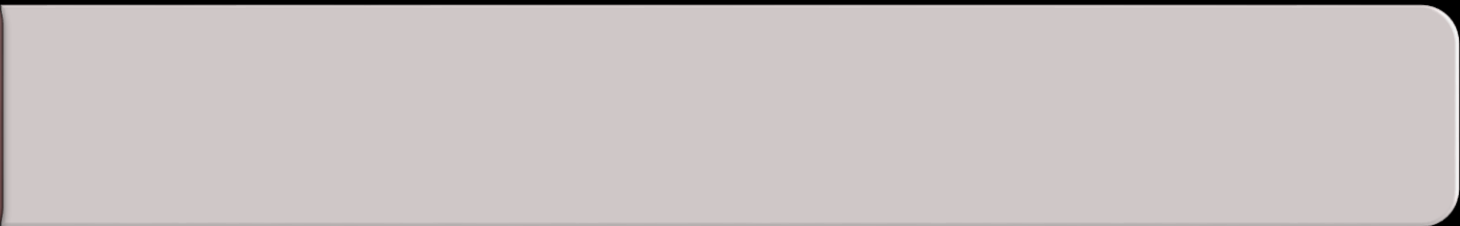
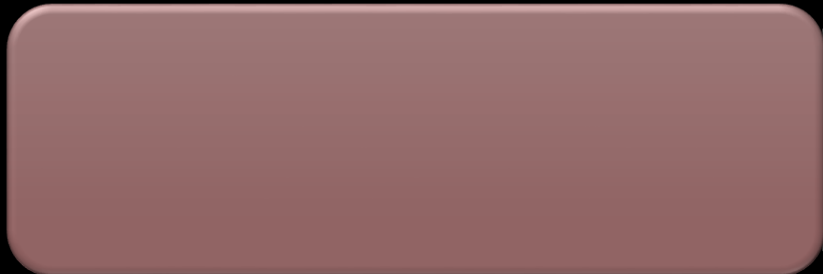
# WHY PATIENTS SHOULDN'T WAIT

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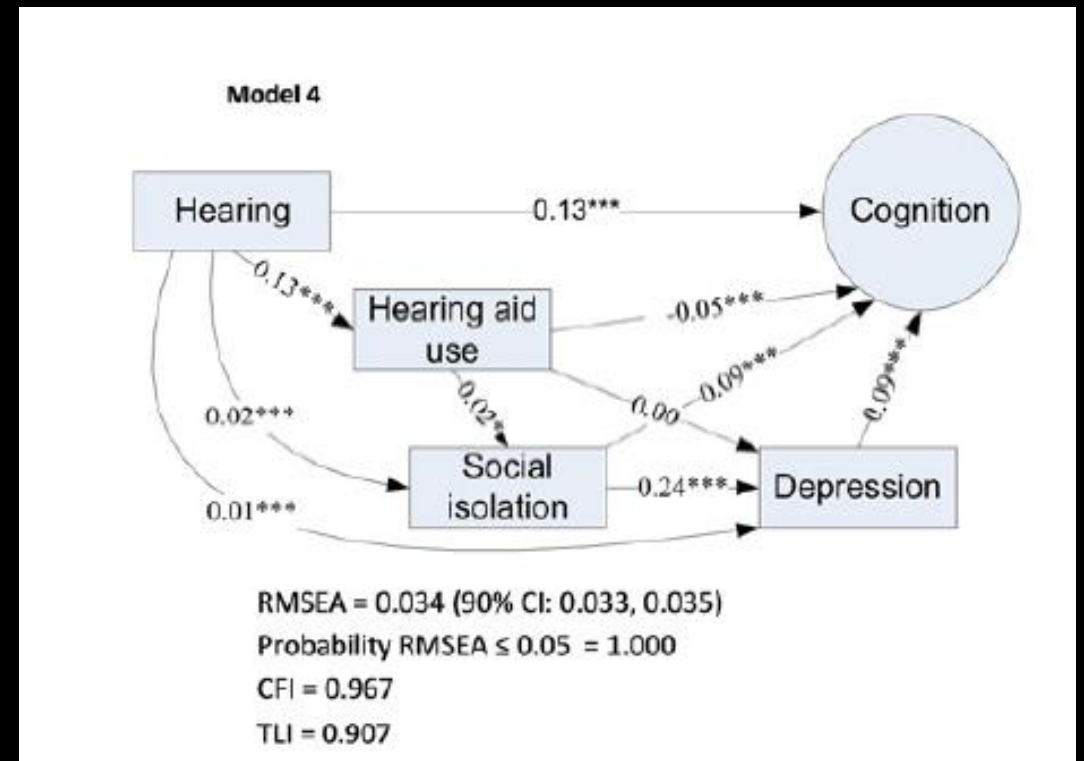
## Social Isolation

- Withdraw from social activities due to difficulties with communication



# SOCIAL ISOLATION

- Reduce communication can lead to communication breakdown
- Continued communication difficulties can lead to social withdraw
  - Depression



Dawes, et al (2015)

# WHY PATIENTS SHOULDN'T WAIT

## Auditory Deprivation

- Lack of input at the peripheral leads to decline of auditory nerve and cortical reorganization

## Social Isolation

- Withdraw from social activities due to difficulties with communication

## Cognitive changes

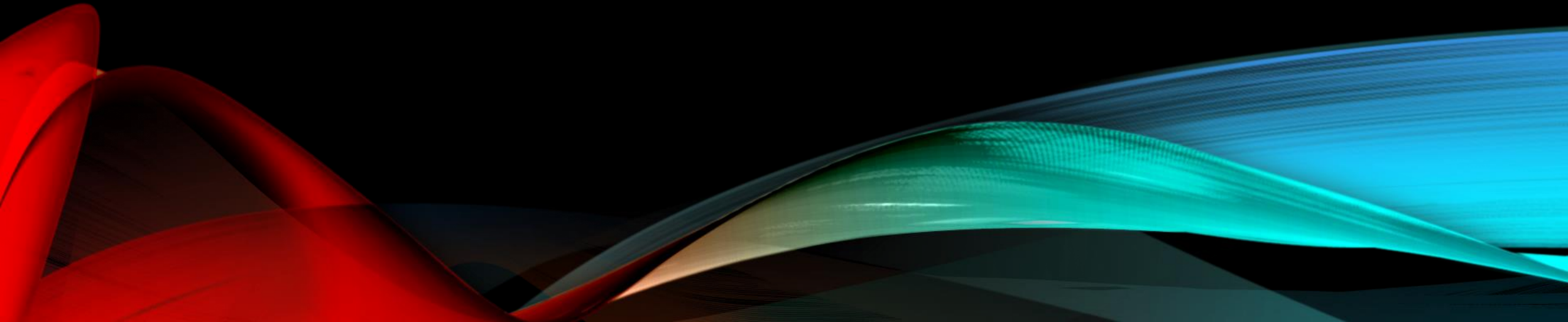
- Research suggesting cognitive decline related to hearing loss



# COGNITIVE FUNCTION AND HEARING LOSS

- Influx of new research on cognitive function and hearing loss
- Bush, Lister, Lin, Betz, & Edwards (2015)
  - Significant effect between hearing loss and:
    - Digit Symbol Substitution (processing speed)
    - Digit Symbol Copy (processing speed)
    - Letter Comparison (processing speed)
    - Pattern Comparison (processing speed)
    - Useful Field of View (processing speed)
    - Trail Making Test part B (executive function, inhibition, set-shifting)
    - Stroop Color Word Test (executive function, inhibition)
    - Digit Span (verbal memory)
    - Pattern Span (spatial memory)
    - Hopkins Verbal Learning Test (memory)
    - Mini Mental State Exam (global screening)

# HEARING INSTRUMENTS



# WHAT THEY WON'T DO







GOAL OF HEARING INSTRUMENTS

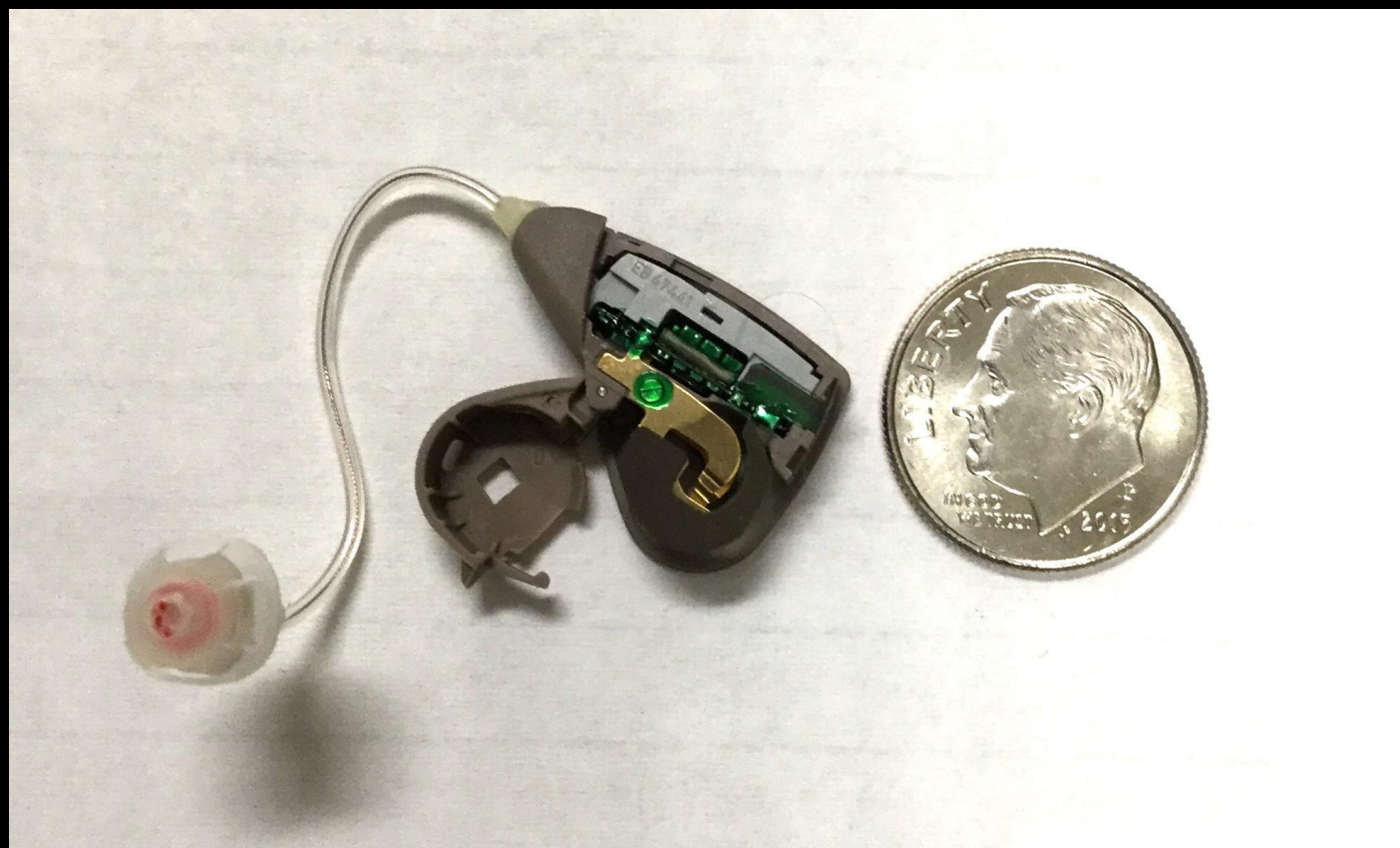
**Audibility**



Cosmetics



Features



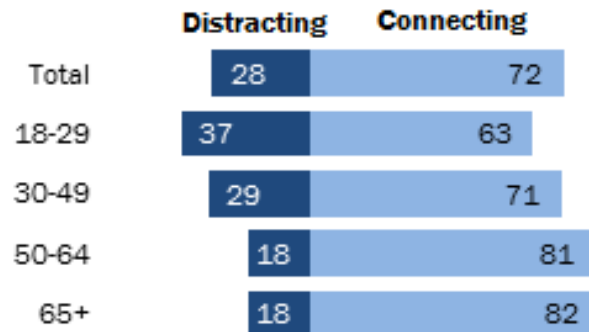
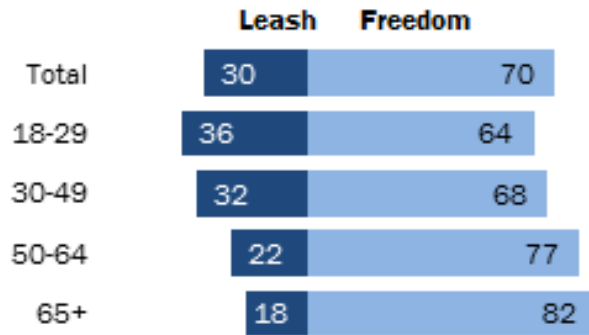






## Older Adults Most Likely Age Group to Describe Their Smartphone as 'Freeing,' 'Connecting'

*% of U.S. smartphone owners who say that the following items from each pair describe how they feel about their phone*



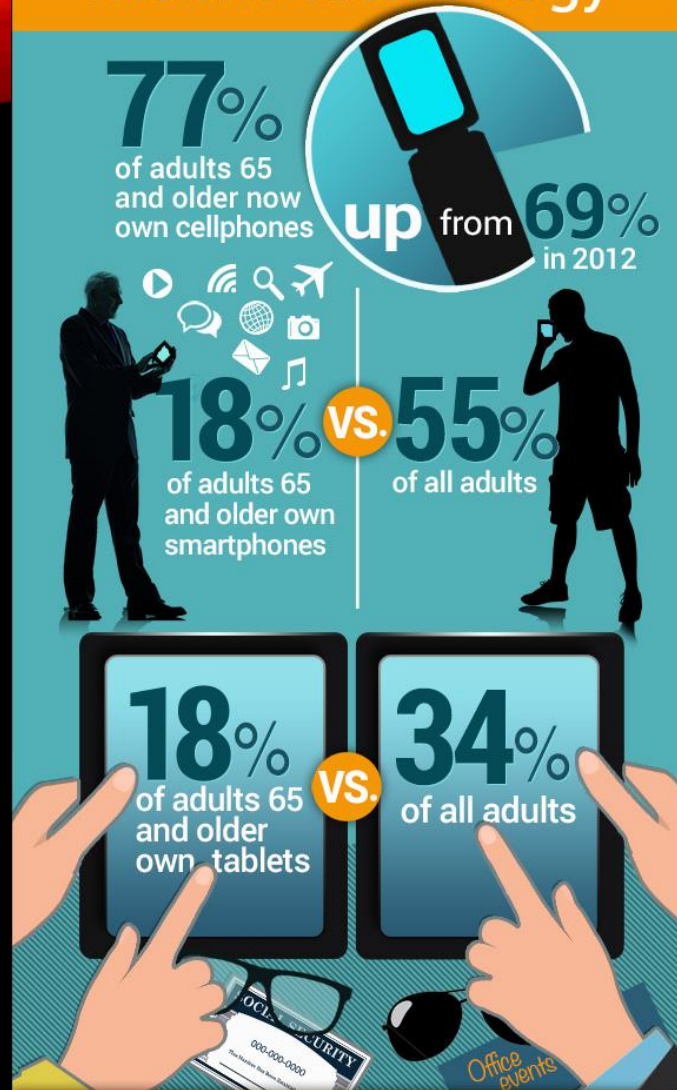
Pew Research Center American Trends Panel survey. Oct. 3-27, 2014.

PEW RESEARCH CENTER

# NEW TECHNOLOGY

<http://www.pewresearch.org/fact-tank/2015/04/29/seniors-smartphones/>

# Seniors slow to adopt mobile technology



Source: Pew Research Center

Bankrate

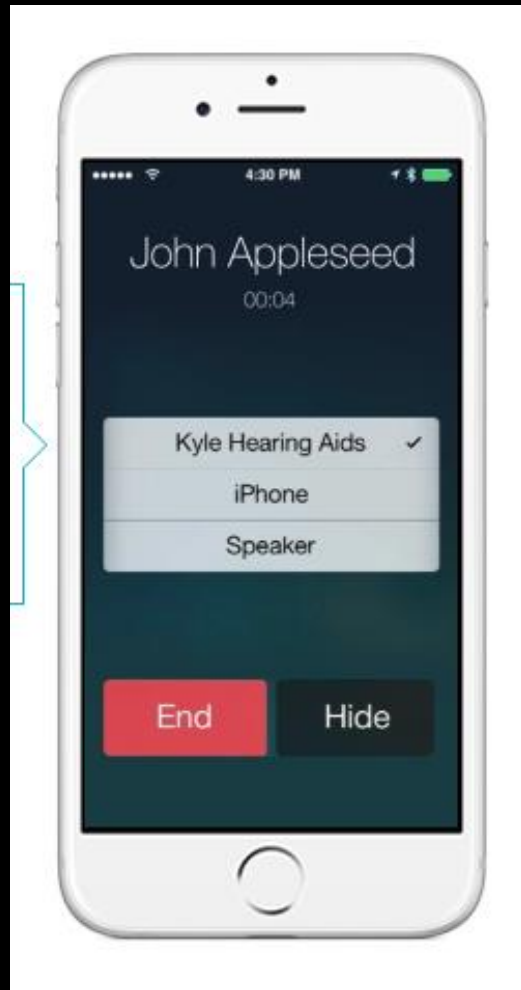
## 2. Does the user need any additional accommodations?

**Hearing:** Hearing-impaired seniors may want to add on captioning or relay services, which are free as guaranteed by the Federal Communications Commission's Universal Services Program. With these services, the user can see a transcript of the conversation as it's happening. While the services themselves are free, the data needed to run them is not, so users who will rely on them may need a more robust data plan, especially if opting for a video relay service, says Matt Gerst, director of external and state affairs for CTIA, a wireless communications trade group.

Gerst says that all wireless handsets are given a rating for their compatibility with hearing aids. You can find a device's hearing aid compatibility rating through either the FCC or on a service provider's website.

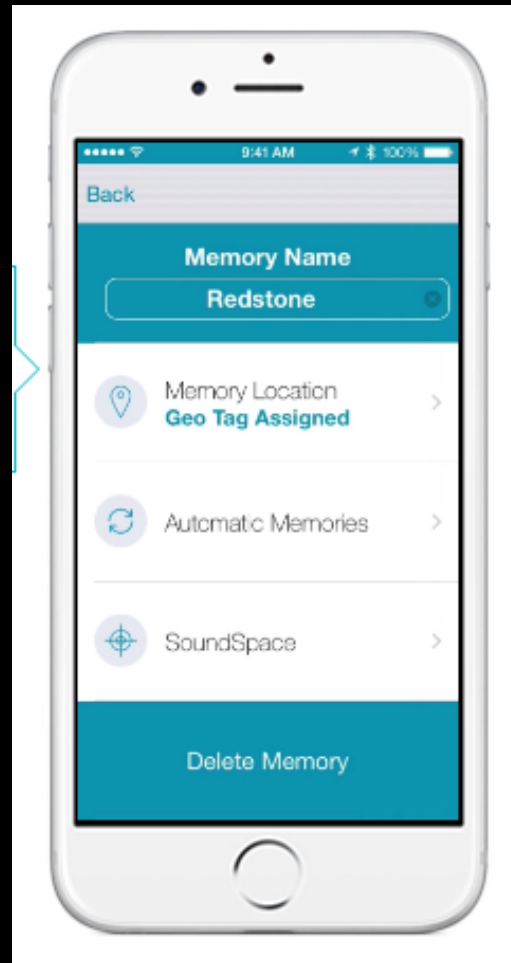
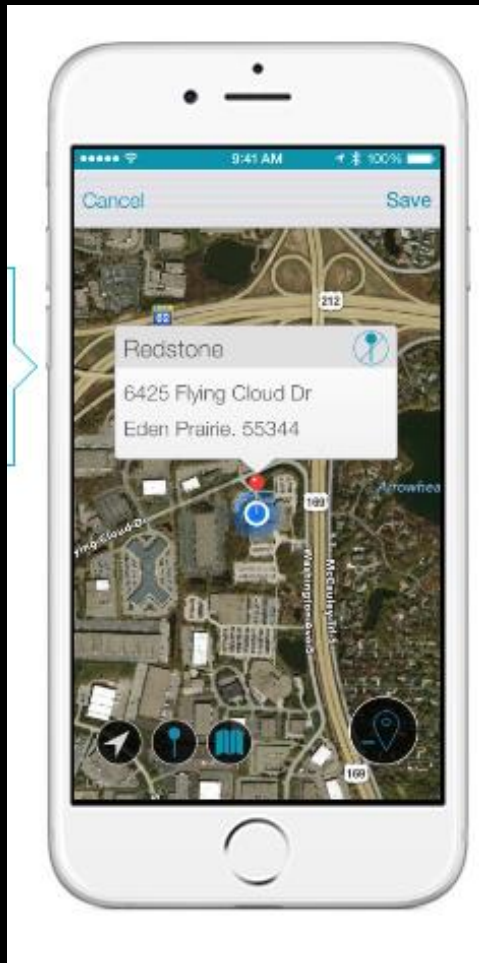
<http://www.bankrate.com/finance/smart-spending/what-seniors-should-look-for-in-phone.aspx>

# CALLS



- Stream:
  - Calls
  - Skype
  - FaceTime

# GEOTAGGING



Geotag settings to  
specific locations



# AUDIO STREAMING:



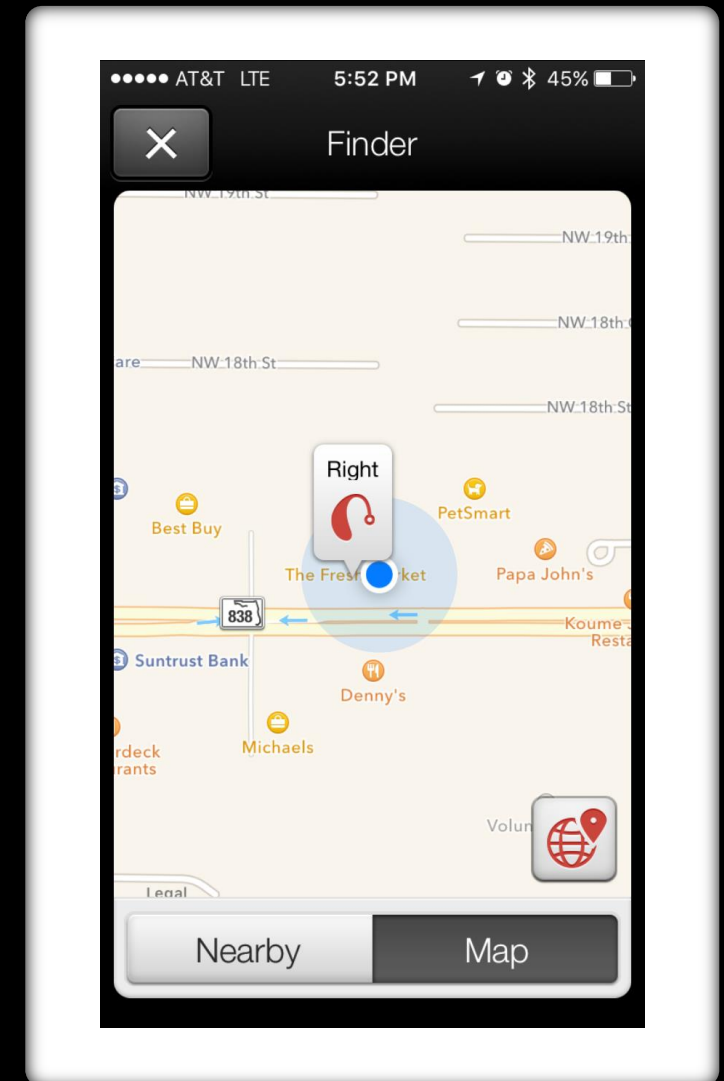
# REMOTE MICROPHONES

- Listening to that one person in noisy environments:
  - Restaurants
  - Café
  - In the car
  - In the home



# LOCATING A LOST HEARING INSTRUMENT

- If a hearing aid is lost- use GPS to find it
  - Out of the house – map
  - Close by- hot/cold



# PURPOSE

The overall  
purpose of  
these features:

- Provide audibility for the hearing loss
  - Reduce auditory deprivation
- Customize the acoustical environment
- Allow patients to socialize with family/friends
  - Reduce social isolation



# REFERENCES

- Abrams HB, Kihm J. (2015). An Introduction to MarkeTrak IX: A New Baseline for the Hearing Aid Market. Hearing Review, 22(6):16.  
<http://www.hearingreview.com/2015/05/introduction-marketrak-ix-new-baseline-hearing-aid-market/#sthash.OLK3FnBf.dpu>
- Bush, Lister, Lin, Betz, & Edwards (2015). Peripheral Hearing and Cognition: Evidence From the Staying Keen in Later Life (SKILL) Study. Ear and Hearing, 36(4), 395-407.
- Dawes, P, Emsley, R, Cruickshanks, KJ, Moore, DR, Fortnum, H, Edmondson-Jones, M, et al. (2015). Hearing Loss and Cognition: The Role of Hearing Aids, Social Isolation, and Depression. PLoS One, 10(3),
- Eggermont, JJ & Roberts, LE (2004). Neuroscience of Tinnitus. Trends in Neuroscience, 27(11), pg 676-82.