Hearing Loss & Hearing Assistance Technologies

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Communication Science and Disorders

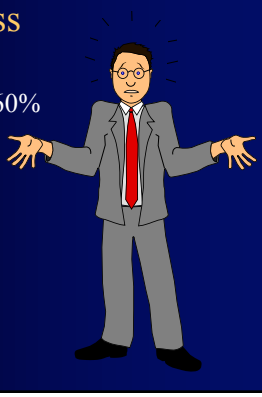
https://www.youtube.com/watch?v=j8E2QcKMV3o

Learning Objectives

- Describe basic components of the auditory system
- Describe functional communication disabilities associated with hearing loss
- Identify technologies available to maximize communicative function for hard of hearing individuals
- Employ appropriate communication strategies with hard of hearing clients

How Many People Have Hearing Loss

- 10% of the population
- Over age 65: 30 - 60%
- Age 45-64: 14%
- Age 18-44: 3%
- Under 18 years 2%

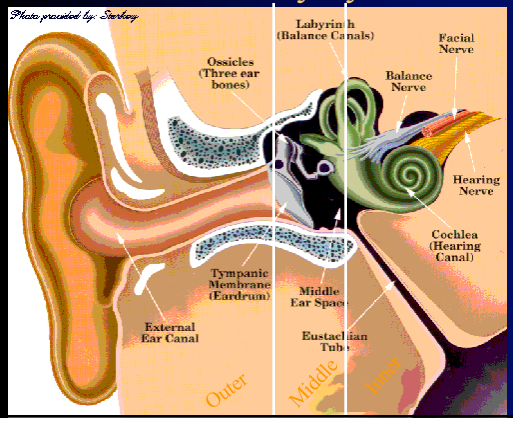


The Auditory System

- Environmental Monitor
  - distance
  - location
  - danger
- Facilitates Communication

http://www.youtube.com/watch?v=3yQzm_36DMY

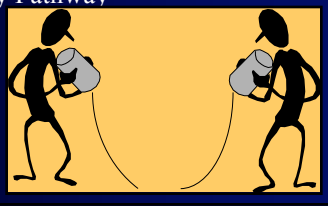
The Auditory System



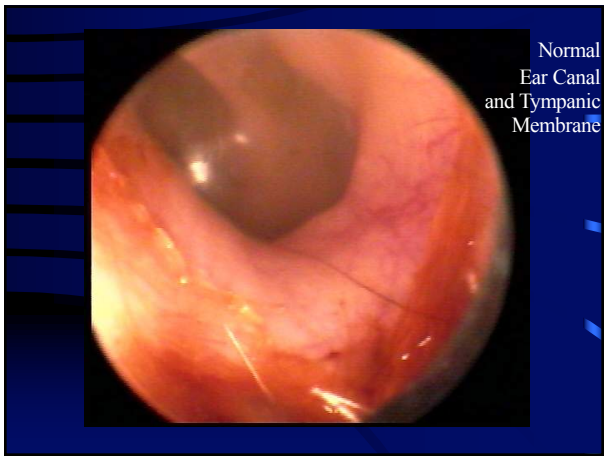
Tour of the Ear

Disorders

- Outer Ear
- Middle Ear
- Inner Ear
- Central Auditory Pathway

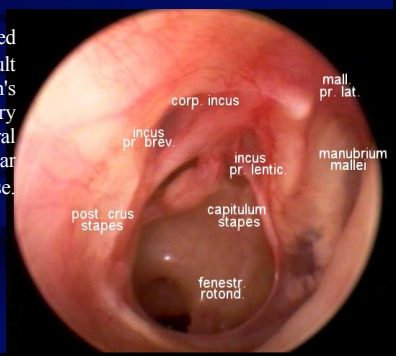


Congenital Atresia

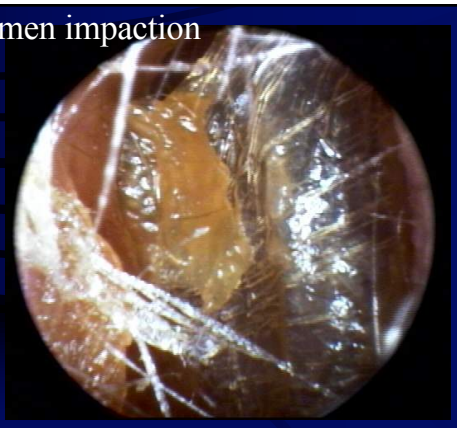


TM perforation

This image was obtained from a 52 year old adult male patient with Down's Syndrome and a history of long-standing bilateral chronic middle ear disease.



Cerumen impaction



Bug on TM

Presbycusis

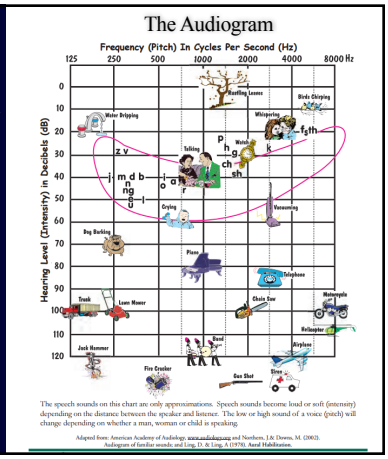
- A decline in hearing as a part of the aging process
  - results from degeneration along the entire auditory pathway
  - reduced hearing sensitivity
  - reduced speech clarity

Measuring Hearing

- Audiometer simulation

https://www.counselear.com/Controls/Pages/Public/Index.aspx?page=Simulator/Audiometer

Speech Understanding



- Hearing Loss Demo

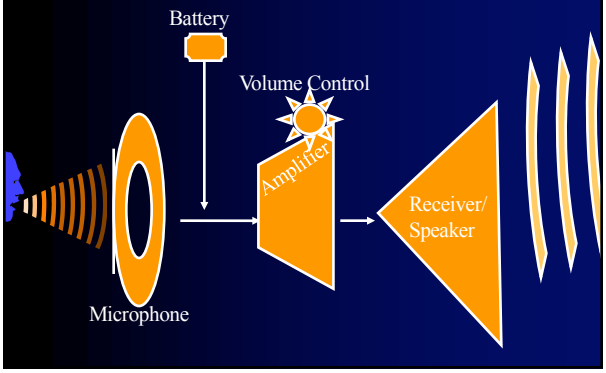
Consequences of Hearing Loss

- Psychosocial/Health
  - reduced participation in life activities
  - depression
  - withdrawal
  - social isolation
  - family/marital discord
  - financial loss
  - Reduced QOL
- Occupational
  - difficulty on telephone
  - difficulty in meetings
  - safety threatened with inability to hear alarm
- Medical
  - Poorer provider communication
  - Health outcomes
    - cancer, diabetes

Challenges with Hearing Loss

- Overcoming Clarity
  - hearing loss in different frequency regions
  - damage to inner hair cells = poor speech clarity
- Overcoming Noise
  - noise = masking
  - reverberation = distortion of the signal
- Overcoming Reduced Dynamic Range
  - Need for amplification of speech signal
  - Reduced tolerance for loudness

Hearing Aid Components



Hearing Aid Types

- Behind the Ear (BTE)
  - earmold
  - power
  - flexibility
  - telephone coil

In-the-Ear

- More or less cosmetically acceptable
- handles fairly high gain
- easier to get in and out

In-the-Canal

- More discrete
- Can have T coil or use telephone acoustically
- Requires little finger/hand dexterity

Completely in the Canal (CIC)

- Currently very popular
- virtually invisible
- can't have T coil
- use on phone normally
- high maintenance
- takes advantage of natural gain from auricle and EAM

Open Fit

Small size BTE (OTE)

Uses "thin" tube

Nearly invisible

Off the shelf or custom mold

No T coil, memories

Made for baby boomers

Oticon • Delta

Hearing Aids/Hearing Loss Simulation

Examples:

- http://www.starkey.com/hearing-loss-simulator
- http://facstaff.uww.edu/bradleys/radio/fm/

Hearing Aid Development/ Features

- Programmability
- Multiple Memories
- Linear vs. Wide Dynamic Range
- Digital vs. Analog
- Directional Microphones
- Data Logging, Data Learning
- Integration with Remote Microphones, Inputs
- Thin tube, small cases
- $$$$$ Prices $$$$$
- Frequency Shifting
- Iphone enabled hearing aids, bluetooth enabled devices

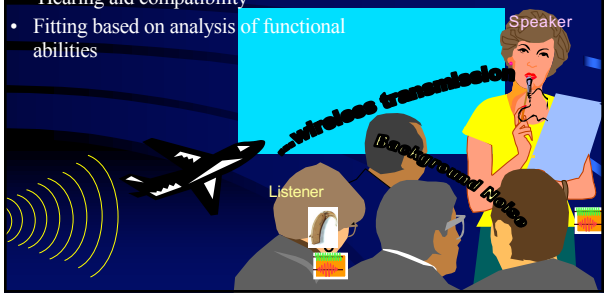
Assistive Devices for Hearing Impairment

Devices to Enhance Hearing Ability

Signaling and Alerting Devices

Assistive Listening Devices

- Why fit?
  - Improve distance from signal to microphone
  - Improve S/NR at microphone
- Hearing aid compatibility
- Fitting based on analysis of functional abilities



FM for classroom instructors

- http://www.youtube.com/watch?v=M4lBkdRereE

Wireless Connection

- https://www.youtube.com/watch?v=aceBleYj_XM
- Cell phone to hearing aid
- Reduced electromagnetic interference
- Adapted for reception from other audio sources

Captel phone

- https://www.youtube.com/watch?v=Wuq5FcmVtCM

Substitution of Audition

- Conversion of speech signal to text or sign language

Alerting Devices

- Alerting Devices
  - smoke detector
  - siren alarm
  - doorbell
  - baby cry
  - telephone ring
  - motion sensor
  - alarm clock
- Reception
  - shaker
  - strobe light
  - flashing light
  - visual display
  - amplified sound
  - hearing ear dog

Mrs. N's HAT demo…

Communication Strategies to Use with Hard of Hearing Listeners

- Get the listener's attention before you speak
- Talk face to face, remind them to watch you
- Speak at a normal level, clearly and slowly
- Don't chew or smoke when speaking
- Reduce background noise e.g. radio,TV
- When misunderstood you should rephrase, not repeat
- Clue the listener in to your topic e.g. "I'm talking about…"
- Use assistive listening devices when available…keep a "Pocketalker" handy!

Thank You

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