

# Demand on you CARE: Communication Challenges: Vision, Hearing and Speech

## Chapter 3: Hearing, Listening and Communication in Older Adults

### ELDER009

# Overview

- **In this chapter, we shall discuss:**
  - What is hearing, listening and communication
  - Processes involved in listening and communication
  - The WHO International Classification of Functioning, Disability and Health (ICF) Model
  - Causes of hearing impairment in older adults
  - Assessment of hearing impairment
  - Interventions in coping with hearing impairment



# Hearing versus Listening

## Hearing

- You may know each alphabet without knowing the word
- You may know the word without knowing the phrase



## Listening

- You need the number (alphabet), the line (word) to form the outline and the combinations to form a cow (sentence)



# Listening to a song / a conversation

## At a concert

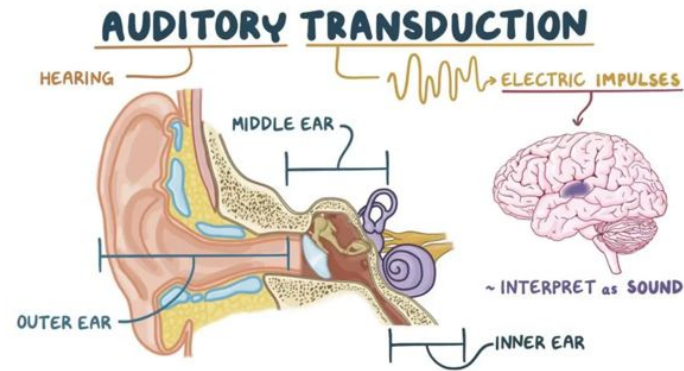
- A melody
  - Tone
  - Loudness
  - Tempo
- Relational (different instruments)
- Melody (chorus?) → Song
- Meaning of the song

## At conversation

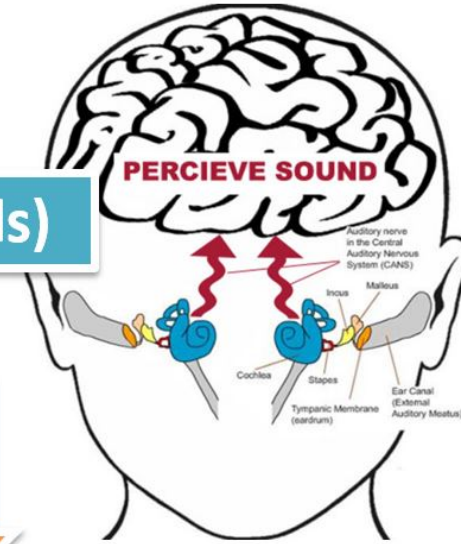
- A word / phrase
  - Vowel / Consonant → word
  - Frequency / Loudness / Duration
- Relational (environment)
- Spatial / interval → sentence
- High level interpretation

**Conversation for communication is more than hearing tones only**

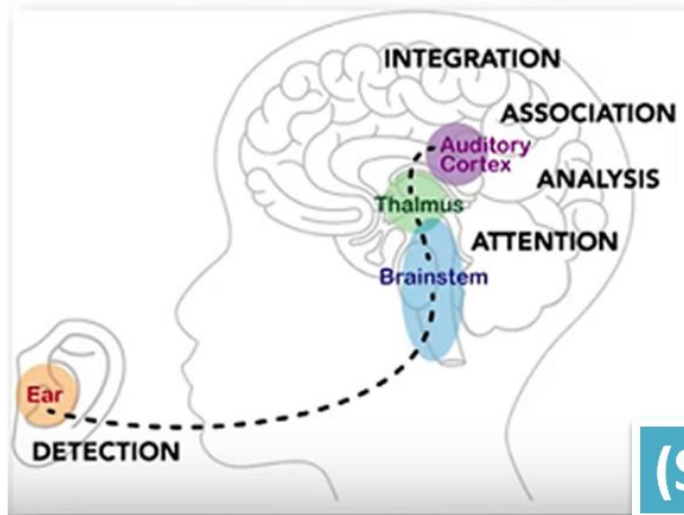
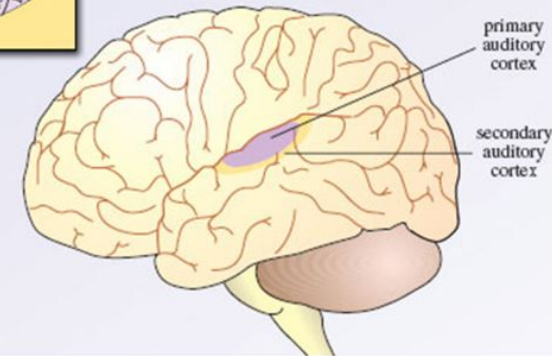
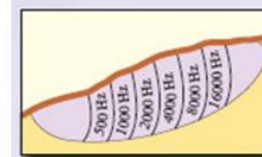
# Processes involved



(Alphabets) → (Words)



Primary (words) to  
Secondary (sentences)



(Sentence to meaning)



# Factors affecting Listening and Communication

- Bodily function and structure
  - Sound perception
  - Neural conduction time
  - Memory and cognition
- Participation / personal factors
  - Apathy and lack of interests
- Environmental
  - Competing noise (reduce discrimination of words / auditory cues)
  - Distractions

# The WHO ICF Model



- Adoption of bio-psycho-social-spiritual model of health





## Bio-psycho-social Model of Functioning, Disability and Health

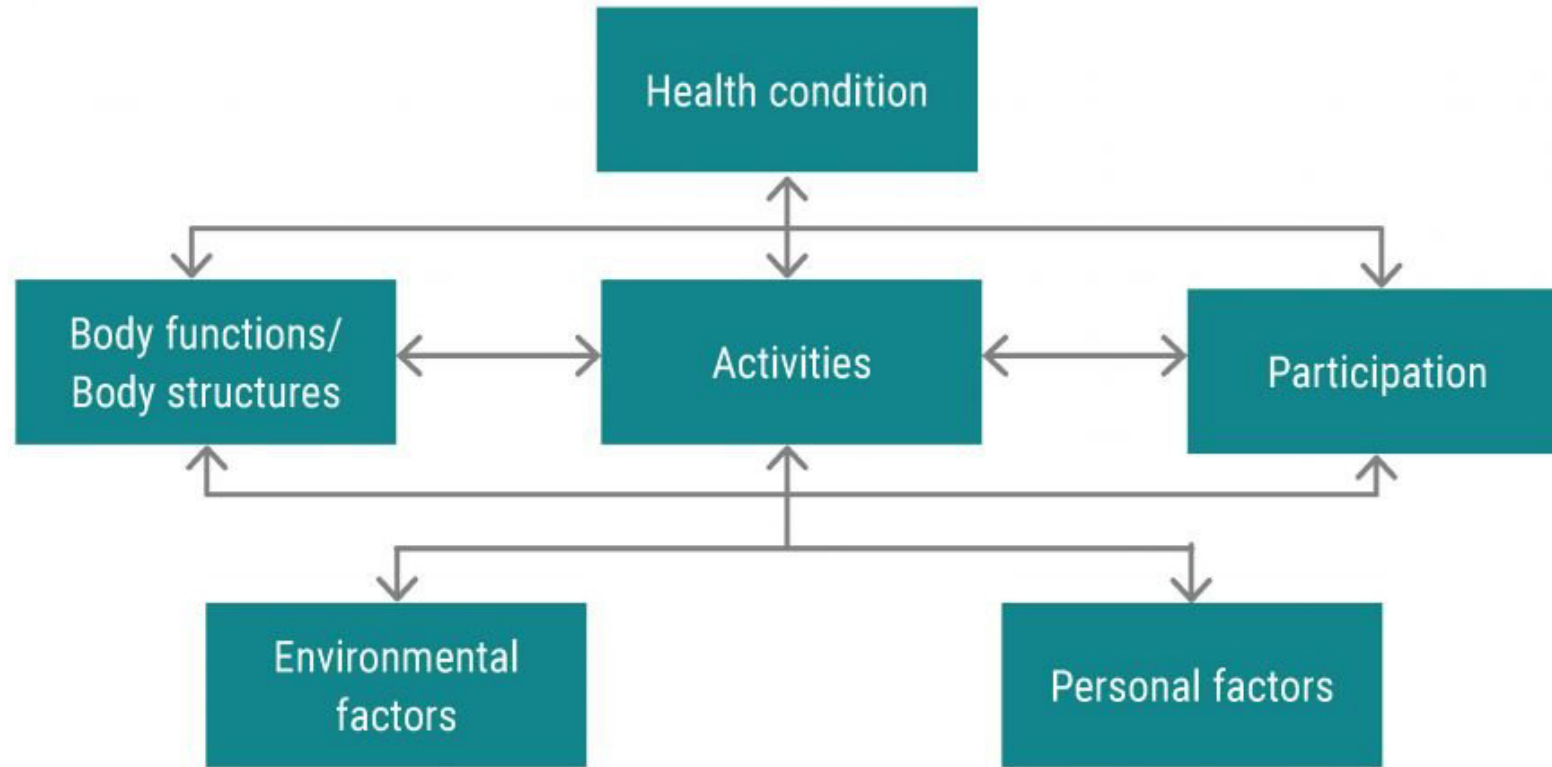


Figure 1: Bio-psycho-social model of the International Classification of Functioning, Disability and Health (ICF)

[https://www.icf-casestudies.org/images/intro/gfx/CS-Introduction\\_2015-03-04\\_03\\_DB\\_Seite\\_07.jpg](https://www.icf-casestudies.org/images/intro/gfx/CS-Introduction_2015-03-04_03_DB_Seite_07.jpg)

**Centre point is on activities.**

**Different domains serve as contributing factor to activities maintenance**

# The different levels of WHO ICF Model: An illustration

Levels	Interpretations	Potential action (3Rs)
Impairment	Paraplegia with LL power 0/5	(Restoration) Training to improve power
Disability	Cannot stand or walk	(Re-enablement) Exoskeleton, walking aids
Handicap	Cannot travel Lack of social participation	(Re-integration) Travel with aids Environmental support required

**Restoration if possible.  
If not possible, re-enablement for  
re-integration / social participation.**

**Improve hearing if possible.  
If not, improve listening for  
effective communication.**

# Epidemiology

- Hearing impairment among age >65
  - World-wide : About one-third (WHO)
  - Hong Kong : 117 600 (HK CSD, 2013)
    - Age 65-69 : 5%
    - Age >70 : 14.2%
- Community screening program
  - Among ~1000 community living elders (age > 60) (CUHK, 2003)
    - Normal : 20%
    - Mild hearing loss : 43%
    - Moderate : 23.5%
    - Moderately severe : 9.4%
    - Severe to profound : 4.2%

# Common manifestations

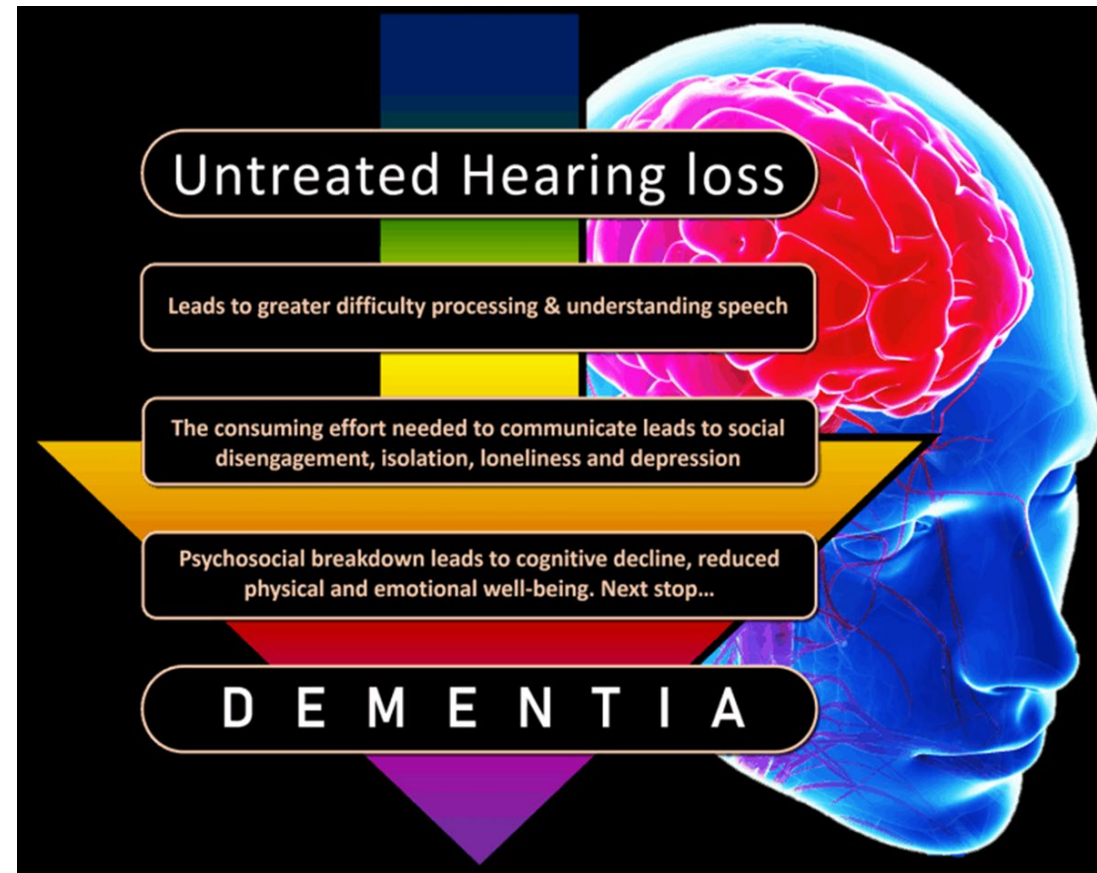
- Unable to hear under less favorable environment (e.g. background noise)
- Always asking others to repeat
- Speaking louder and louder subconsciously
- Unable to hear unless seeing face of the person

# Common manifestations

- “He hears you when he wants to”
  - Possible reasons / functional impairment (*remember the process of conversation at overview*)
    - Impaired sensitivity → hearing deficit
    - Derange loudness perception / decline in discrimination → difficult in hearing speech
    - Impaired sound localization → not able to focus on source of sound especially in noisy environment

# Consequence of uncorrected hearing loss

- Reduced listening selectivity → alarms not alerted
- Poor quality of life
- Social isolation
- Paranoid tendency / anxious
- Reduced adherence to healthcare advice
- Depression
- Reduced higher cognitive function



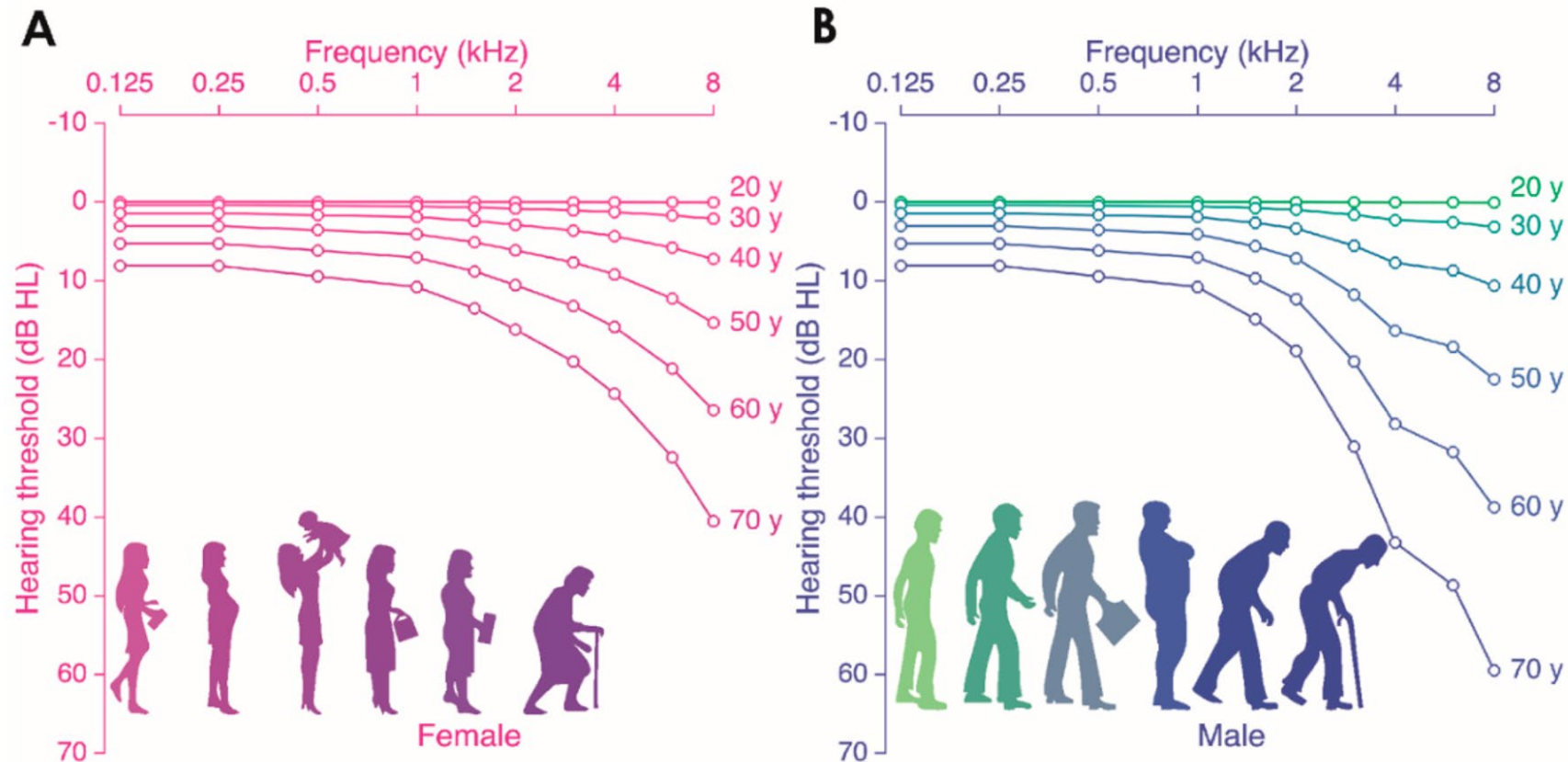
# Causes of hearing impairment

- **Presbycusis**
  - Age-related sensorineural changes
  - Most common in older adults
  - **Typically**
    - Slow onset
    - Progressive
    - Bilateral
    - Symmetrical
  - Four sub-types patterns
    - **High tone involvement most common**
- **Others**
  - Commonly unilateral
    - Trauma
    - Neoplasm
    - Vascular cause
    - Infection
  - Commonly bilateral *(though one may be affected more than the other)*
    - Wax impaction
    - Metabolic cause (DM, hypothyroid)
    - Ototoxic drugs
    - Excessive noise

# Age-related changes in Pure Tone Audiometry

(PTA -- to detail later)

**High tone (>1000 Hz) impairment  
Male > female**



Source: *J. Clin. Med.* 2020, 9, 218; doi:10.3390/jcm9010218

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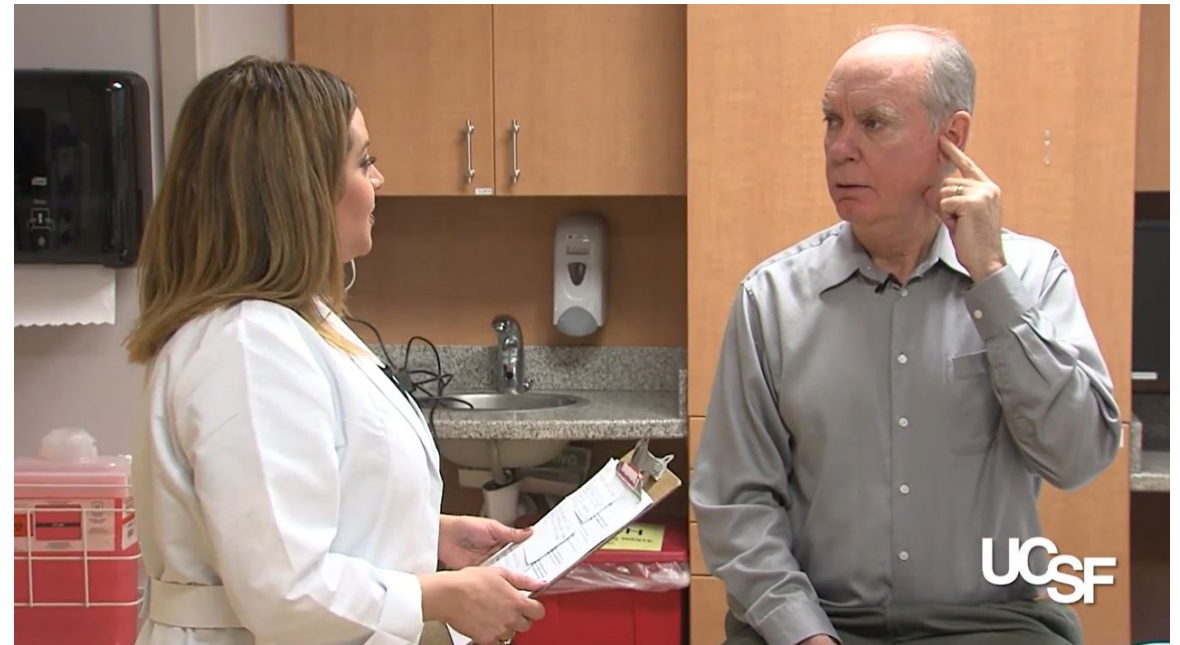
# Other common functional impairment / manifestations

- Abnormal loudness perception
  - Hypersensitive to high intensity
  - Loudness recruitment phenomenon
  - Intolerable sound that limits use of hearing aids
- Tinnitus
- Wax
  - Typically impair low frequency

# Quick screening: Whisper Hearing Test

- Subjects sitting comfortable
- Stand about 2 feet behind subject
- Advise subject to repeat your words when heard
- Cover one ear
- Whisper 3 syllables / words after full expiration
- Pass if all correct with two attempts

➤ <https://www.youtube.com/watch?v=jkMVz8qcBzw>



# Quick Screening

## Hearing Handicap Inventory for the Elderly – Chinese version (HHIE-C)

70% accuracy in assessing > 40 dB hearing deficit

Also useful in assessing handicap &  
Monitor improvement with intervention

(1) 在遇見新相識的人時，聽力問題有否讓你感到尷尬？

(6) 聽力問題有否令你參加宗教或其他活動較你希望能參加的為少？

(2) 在和家人交談時，聽力問題有否讓你感到受挫折？

(7) 聽力問題有否令你和家人或朋友吵架？

(3) 當別人囁囁細語時，你有否感到聆聽困難？

(8) 聽力問題有否令你聆聽電視或收音機時感到困難？

(4) 聽力問題有否令你感到殘缺？

(9) 你認為任何的聽力問題有否影響你的個人或社交生活？

(5) 聽力問題有否令你在探望朋友,家人或鄰居時感到困難？

(10) 和家人或朋友在餐廳時，聽力問題有否令你感到困難？

# Exclude

## Warning features Against Presbycusis

- Sudden onset
- Unilateral
- Ear discharge
- Ear pain
- Early onset
- Recent trauma
- Cognitive impairment
  - Can be result of long standing hearing problem, or
  - Share common feature of “not hearing”

**Early specialist consultation is necessary**

# Another common cause of hearing impairment – ear wax impaction

- Normal secretion with proper functioning
  - no special attention unless causing hearing impairment
- **Exclude warning symptoms (or special precautions if previous ear procedures)**
- Can try with **cerumen-removing /softening drops** if NO previous ear surgery or a perforated eardrum
- **AVOID** ear candle / cotton-tipped swabs

# Other preliminary workups

- Rinne and Weber Test
  - Use tuning fork
  - For localization and nature of problem (conduction / sensorineural defect)
- Otoscope examination
  - Direct visualization



# Detail Assessment

- Commonly measured by Pure Tone Audiometry (PTA) or Speech Audiometry (SA)
  - PTA: use pure tone with changing intensity
  - SA: use undistorted test words above threshold intensities
- Quiet, acoustic protected setting
- One ear after the other
- Threshold of hearing (dB)

# Limitations of PTA in Assessment

## At a concert

- A melody
  - Tone
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  - Tempo
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- Meaning of the song

## At conversation

- A word / phrase
  - Vowel / Consonant → word
  - Frequency / Loudness / Duration
- Relational (environment)
- Spatial / interval → sentence
- High level interpretation

**PTA only assess frequency and loudness**

**Not others that are also important for conversation**



# Limitations of SA

“Let’s eat Grandpa” or  
“Let’s eat, Grandpa”

己所不欲 勿施於人 or  
己所不欲勿 施於人

“I like cooking my family and my dog” or  
“I like cooking, my family, and my dog”

**Does not address on time factor that influence understanding of speech**

# Assessing Hearing Impairment

Level of Impairment	Threshold (PTA)	SPEECH equivalent
Within normal	<26dB	
Mild impairment	26-40dB	Some difficulties but somewhat louder voice can be heard
Moderate	41-55dB	Difficulty in hearing quiet voice
Moderate Severe	56-70dB	Considerable difficulties in hearing normal conversation May need lip reading Still understanding
Severe	71-90dB	Impossible to hear normal conversation Needs lip reading Difficulties in understanding
Very severe	>91 dB	Not understand even with loud voice Difficulties in communication

**Disabling hearing loss refers to hearing loss greater than 40dB in the better hearing ear**

# Assessing Activities Limitation

## From Impairment to Handicap

- Aim to improve communication
- Improve listening is an intermediate process only

Hearing Handicap Inventory for the Elderly – Chinese version (HHIE-C):

- Useful to monitor response to hearing aids / management

(1) 在遇見新相識的人時，聽力問題有否讓你感到尷尬？	(6) 聽力問題有否令你參加宗教或其他活動較你希望能參加的為少？
(2) 在和家人交談時，聽力問題有否讓你感到受挫折？	(7) 聽力問題有否令你和家人或朋友吵架？
(3) 當別人囁囁細語時，你有否感到聆聽困難？	(8) 聽力問題有否令你聆聽電視或收音機時感到困難？
(4) 聽力問題有否令你感到殘缺？	(9) 你認為任何的聽力問題有否影響你的個人或社交生活？
(5) 聽力問題有否令你在探望朋友,家人或鄰居時感到困難？	(10) 和家人或朋友在餐廳時，聽力問題有否令你感到困難？

# Reducing Disability (Re-enablement) : Hearing Aids (HAs) and Assistive Listening Devices (HALD)

## Mobility Aids



## Hearing Aids



# Basic Components of HAs

- A microphone
  - Sound to signal
- A Processor / Amplifier
- Receiver
  - Signal to sound
- Earmold / tubing to deliver sound to ear



# Key Variations

- Amplifier / Processor
  - Digital type
    - Programmed (at site) to allow adjustment on pitch (frequency) selectivity and intensity, direction of sound
    - Allow tinnitus masking
  - Analog
    - Programmable to different environment

# Other variations

- Size, cosmetics, color




<p>(a) Behind-the-ear type: This is a very popular type of hearing aid. The components are held in a shell behind the ear which is connected to the outer ear by a plastic earmold that fits inside the ear.</p>	 <p>Behind-the-ear</p>
<p>(b) Body -worn- aid: The hearing aid is connected to the ear by a wire and can be attached to a belt/ pocket and wear on the chest.</p>	 <p>Body worn aid</p>
<p>(c) In-the-ear and In-the-canal types: They are small and easy to handle. The hearing aid is custom-made to fit completely in the ear, this helps to focus the sound and allow for better sound amplification</p>	 <p>In-the-ear</p>
<p>(d) Spectacle combined type: A specially designed spectacle combined with hearing aid for those people who also need to wear glasses.</p>	

image source from : [https://www.elderly.gov.hk/english/common\\_health\\_problems/others/hearingimpairment.html](https://www.elderly.gov.hk/english/common_health_problems/others/hearingimpairment.html)

# TYPES OF HEARING AID

## Behind the Ear (BTE)

Fits behind the ear and is attached to a custom ear piece.



## In the Ear (ITE)

Made to fit within the external ear.



## Open Fit

Ultra thin tubing is virtually invisible.



## In the Canal (ITC)

Small enough to fit almost entirely in your ear canal.



## Receiver in the Canal (RIC)

The smallest BTE instrument.



## Completely In the Canal (CIC)

Fits deeply inside your ear canal.



<https://www.snehahear.com/hearing-aids>



# In general

- Body worn HAs
  - Less feedback
  - Greater amplification
  - More effective for bone conduction problem
  - More suitable for severe to profound deafness
  - Less cosmetic
- From BTE to ITE/ITC type
  - more demanding in application and maintenance
  - BTE: more to severe deafness
  - ITE/ITC: mild to moderate deafness

# Hearing Aids – bilateral or unilateral

- Binaural recommended (for bilateral hearing impairment)
  - Balanced hearing
  - Localization of sound
  - Understands speech better in noisy environment
  - Increase overall loudness and allow reduce volume of individual HA (problem of feedback)

# HAs Maintenance / Trouble shooting

- “Volume” low
  - Battery reserve / properly placed
  - Ear wax (ear mold / ear canal)
  - Volume control adjusted
- In-the-ear type
  - Dry with soft cloth
- Behind-the-ear type
  - Soap ear mold with mild soap and water. Do NOT use alcohol
  - Replace tubing every 3-6 months

# Issues of HAs in older adults

- Intrinsic problems of HAs
  - Partially adjusted with digital type
    - Selectivity on pitch / intensity
    - Much costly
  - Universal amplification at different setting
    - Construction site, railway, concert, home
  - Cannot differential voice with noise
  - Speech discrimination scores might not improve
    - Temporal, amplitude not adjusted

# Issues of HAs in older adults

- Intrinsic problems
  - Problem of auditory process >> hearing problem  
*(reference to Overview section)*
  - Not perceived on the need
    - Elevated voice / louder sound system as compensation
  - Abnormal loudness perception *(reference to earlier slides)*
    - Hypersensitive to high intensity
    - Loudness recruitment phenomenon
  - Cognitive factor
    - Learning / memory on appropriate use and maintenance of HAs  
*(see previous slide)*
  - Psychological factors
    - Self esteem, stigma

# Issues of HAs in older adults

- Problems with HAs and elderly interface
  - Hand Dexterity, Tactile sensation in manipulating the HA
    - The smaller the size (cosmetic reason), the higher the requirement on hand dexterity
    - On – off switch, switch between modality, volume control
    - Wear on-wear off
    - Change of battery
  - Cumulating Ear wax → whistling
  - Dry / wrinkled skin → irritation when using ear mold / difficulty fitting
  - Changing body structure → new earmold required
  - Allergy to the mold → otorrhoea

# Alternatives to HAs: Simple Amplifier / Assistive Listening Device (ALD)



# Assistive Listening Devices

- Instead of direct HAs, and obvious external amplifier system /communicator is used
  - Direct hardwire
  - Wireless: FM / Infrared system
- Advantage
  - Easy on – easy off: use only as required
  - Easier to adjust / handle
  - Can be one to many
  - **Suitable to use at institution**



# Assistive Listening Devices

- Others
  - Telephone amplifier / built-in volume control
  - Loop Induction System
    - Requires special setting and pairing with external Has / devices
    - Available at many public services (barrier free facilities under LCSD)



# Choose a hearing aid / assistive hearing device

Hearing aids should be chosen according to the individual listening needs, subjective preferences, age, dexterity, cosmetic concern, severity and nature of the hearing loss.

Wearing a hearing aid at first time:

- Give older adult 3-6 months to adapt. They should get used to using a hearing aid in a generally quieter environment before gradually using hearing aids in other difficult listening environments (such as small groups or noisy environments).
- If the older adult still has hearing difficulties after wearing the hearing aid for a period of time, it is advised to consult audiologist for a hearing test to adjust the hearing aid.

# Others (surgical procedures)

- Bone anchored hearing aids
- Implantable hearing aids
- Totally integrated cochlear amplifier
- Cochlear implants

**CONSULT ENT specialist**



# Re-enablement beyond HA/ ALD (Environment)

- Enablement factors for communication  
*(cross reference: communication process in previous section)*
  - Environment
    - quiet room (less distractive)
    - Lighting to facilitate visual clues for lip speaking
    - (Institutions): LED information / Visual Alarms

# Enablement factors for communication (Communicator)

- Attention
  - Draw attention first
  - Speak in front of subject
- Speechreading
  - Proper lip and facial expression
- Rate
  - Avoid talking fast to allow central processing
- Speech clues
  - “Newspaper” instead of “paper”
  - “Headlines” to start with
- Modulated voice
  - Avoid shouting
  - Avoid dropping loudness of voice at end of a sentence
  - Avoid exaggerating words (distorted speech)
- Comprehension
  - “Headlines”
  - Short phrase / sentences
  - Rephrase

# Summary



- End of Chapter 3 -

# Extended Reading

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