Re/Habilitation of the Hearing Impaired

Better Hearing Philippines Inc.

Nature of Hearing Loss

- Decreased Audibility
- Decreased Dynamic Range
- Decreased Frequency Resolution
- Decreased Temporal Resolution
- Deficits in Combination

Decreased Audibility

- Hearing impaired people do not hear all sounds
- Difficulty in understanding speech because key parts of some phonemes are not audible
- Degree of Impairment usually worsens from 500Hz to 4000Hz

Decreased Audibility

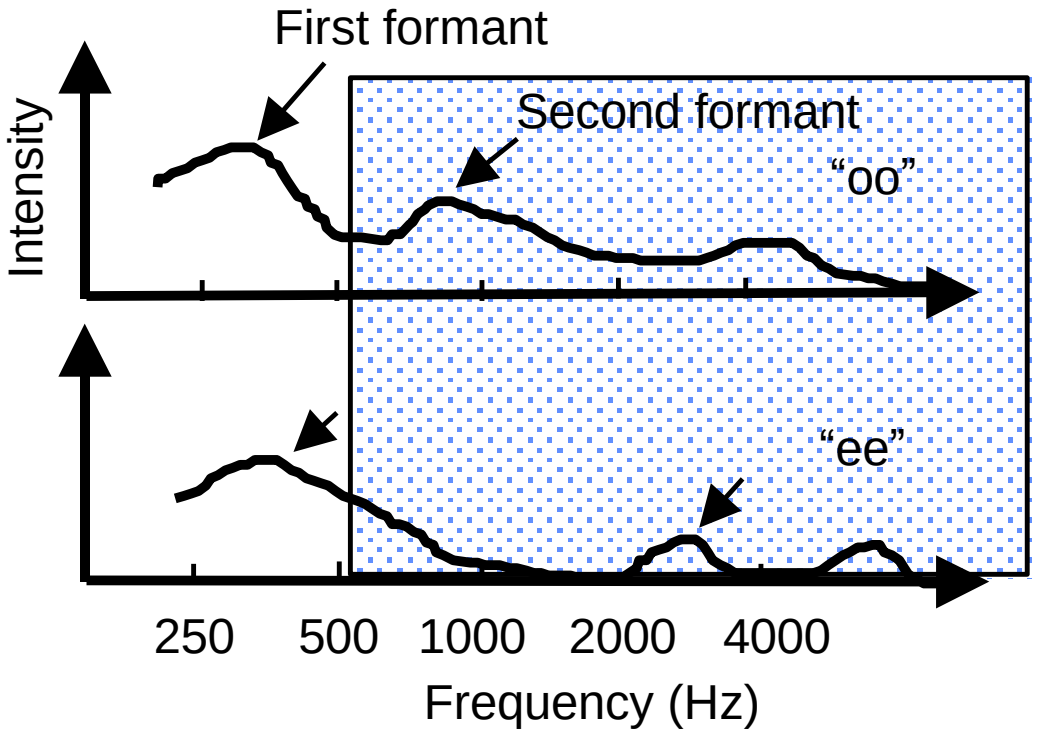


Figure 1.1 Similarity of the two vowels "oo"" and "ee" when the second formant is inaudible because of hearing loss (grey area).

Decreased Dynamic Range

- The level difference between discomfort and the threshold of audibility

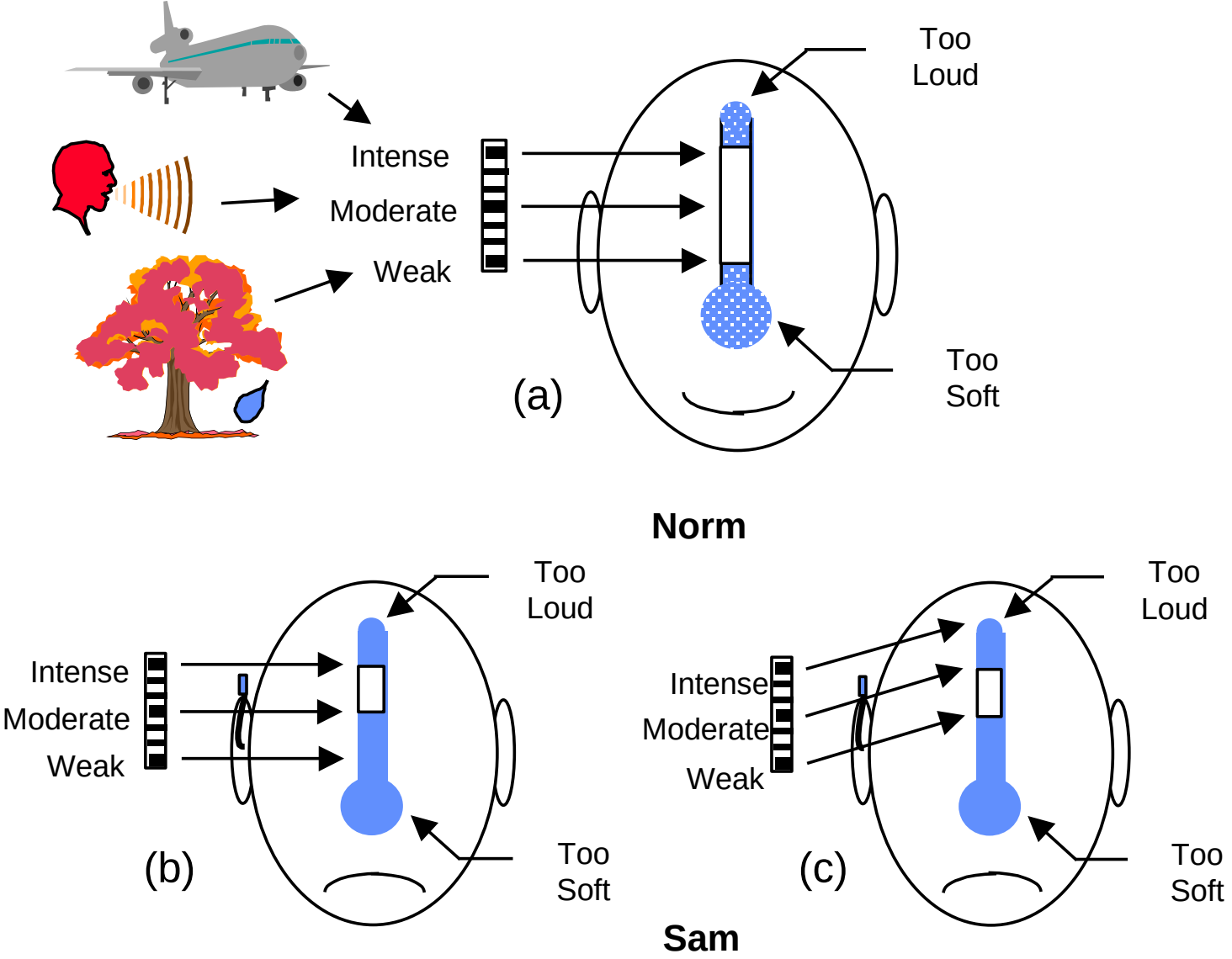


Figure 1.2 The relationship between the dynamic range of sounds in the environment and the dynamic range of hearing for (a) normal hearing, (b) sensorineural hearing loss without amplification, and (c) sensorineural hearing loss with a constant amount of amplification for all input levels

Decreased Frequency Resolution

- A clearly defined region of relatively strong vibration at one position on the basilar membrane which produces a clearly defined region of activity within the auditory cortex

Decreased Frequency Resolution

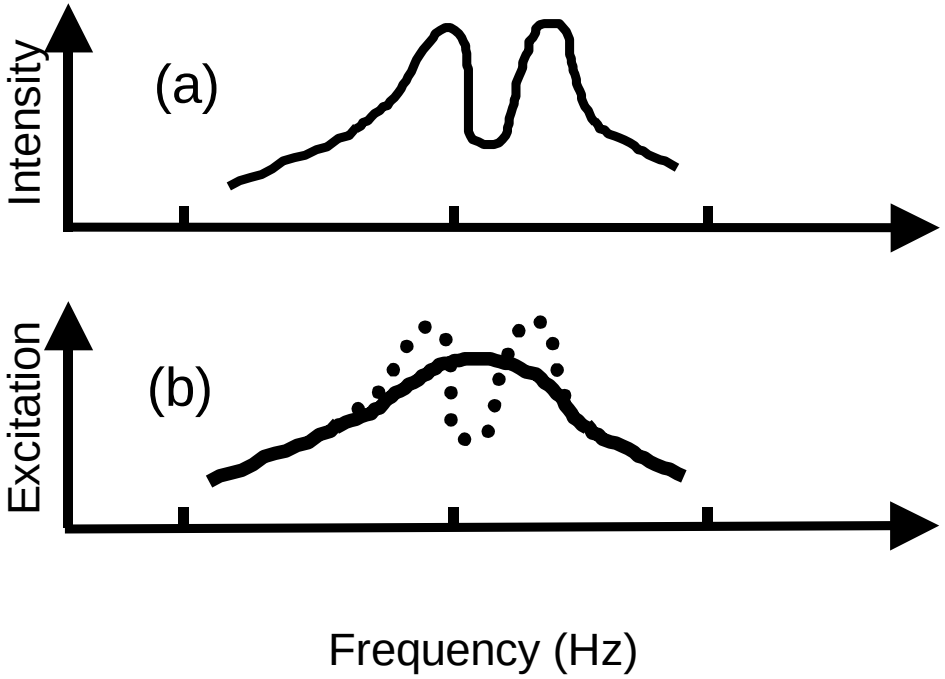


Figure 1.3 (a) Sound spectrum, and (b) representation in the auditory system for normal hearing (dotted line) and sensorineural hearing impairment (solid line).

Decreased Temporal Resolution

- Difficulty in extracting useful information during the weaker moments of the background noise

Function of Hearing Aids

- Sound is picked up from environment by the microphone and converted into electrical signal
- Electrical signal is amplified by the amplifier
- Amplified signal is delivered to the earphone

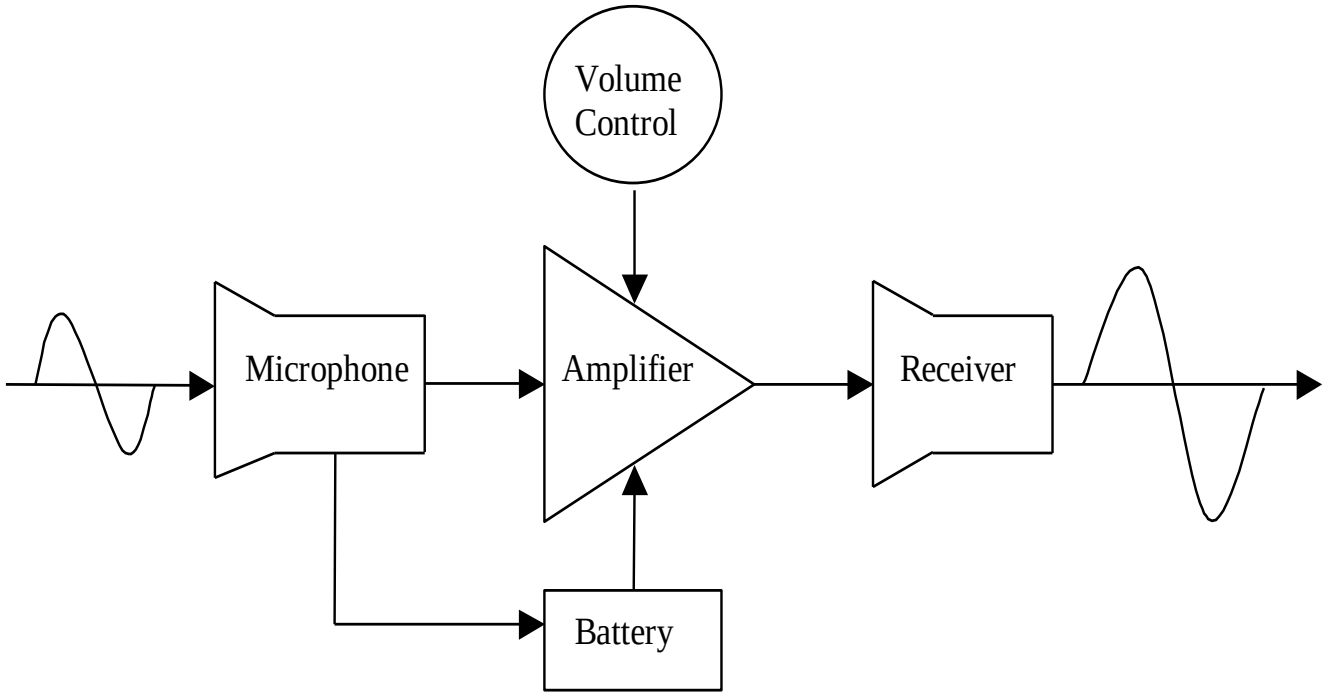
Function of Hearing Aids

- Earphone converts amplified electrical signal back into sound
- Sound is then delivered to the ear canal via the earmold system

Hearing Aids

- The amplifier is also generally equipped with a gain control (volume control) operable by the user
- It may also provide for other adjustments such as frequency and maximum output controls that can be preset
- The hearing aid system is powered by a battery

Hearing Aid Block Diagram



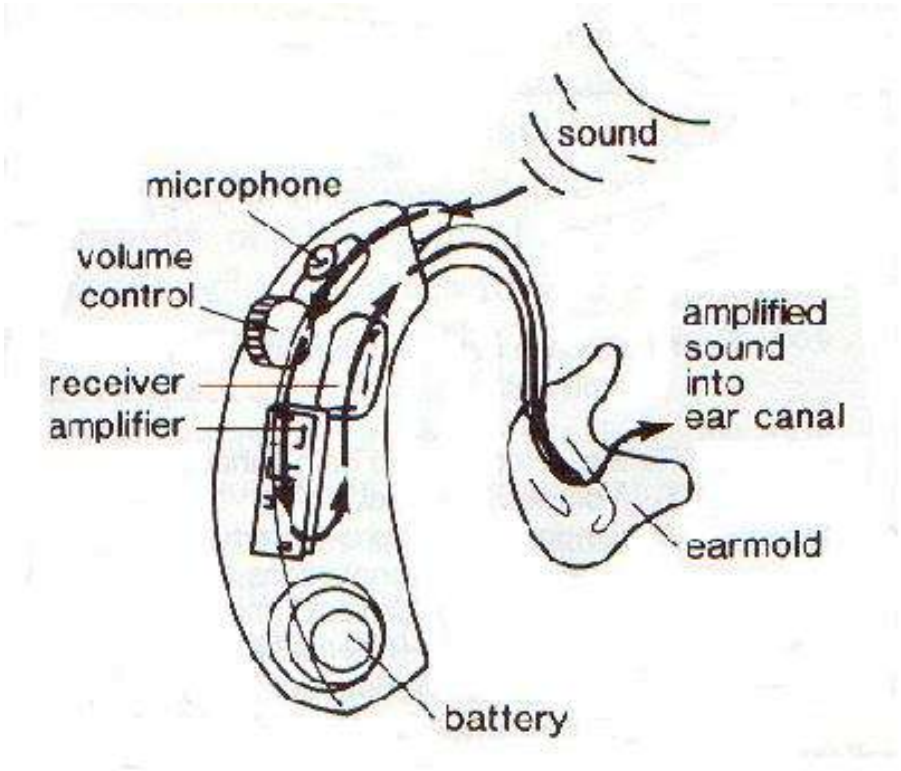
Body-type Hearing Aids

- Use a separate button receiver connected by a cord
- Uses earmold with metal socket that clips to receiver
- Powerful hearing aid – good for profound losses

Body-type hearing Aids

- Large controls easy to manage
- Receivers generally don’t have as much high-frequency range as other hearing aid types – usually not a problem for profound hearing losses
- Uses AA batteries – may be easier to obtain
- Can be quite inexpensive hearing aid

Behind-the-ear Hearing Aids



- Connected via earhook and tubing to earmold
- Earmold easily replaceable as required
- More comfortable and less cumbersome than body aid

Behind-the-ear Hearing Aids

- Wide range of features and amplification range (mild to profound hearing losses)
- Easily serviceable

In-the-ear Hearing Aids

- Includes in-the-ear (ITE), in-the-canal (ITC) & completely-in-the-canal (CIC)
- Generally more expensive than BTE hearing aids
- More difficult to service
- Less adjustments available due to size

In-the-ear Hearing Aids

- Not recommended for children – require multiple remakes as ears grow, concha physically not large enough for hearing aid
- Cannot be fitted with discharging ears
- Less wind noise and better directionality than BTE if deep in ear
- More cosmetically appealing

Eyeglass Hearing Aids

- Hearing aid is built into eyeglass handles
- Sound directed to ear via tubing and earplug
- Bulky
- If hearing aid breaks then without eyeglasses and vice versa

Bone Conductor Hearing Aids

- Hearing aid uses bone-conductor receiver rather than air conduction receiver
- Used mainly for cases where patient has chronic discharge or where partly/fully obstructed external auditory canal

CROS Hearing Aid

- Generally used where patient has no useable hearing in one ear
- Sound on side of unaidable or “dead” ear is picked up by microphone on that side and routed good (or better) ear
- Two hearing aids connected by wire
- Eliminates head shadow effect

Limitations of Hearing Aids

- The hearing aid does not compensate fully for the loss. It is only a little help if the hearing loss is very great
- Hearing aid users may have speech discrimination problems especially in noisy conditions even with the best hearing aid