

What Happens in Normal Hearing?

We live in a very noisy world. From the moment we awake we are exposed to many sounds and noises.

We hear the creaking of the bed as we arise, the swishing sound from rolling back the covers, walking across the floor, the noises as we open the bathroom door, etc. In fact, our every motion causes noises. The noise from the keys of the computer keyboard as this manual is typed and the rustling of paper of the finished product exists, even in a fairly quiet setting. Clothing noise, and even the rubbing of hands together can be heard. Indeed, our world is a very noisy world.

Those who have normal hearing are constantly exposed to noises and sounds which can be heard. These change from room to room and are louder or softer depending on what has created the noise.

Outside, the noises and sounds are much louder depending on the amount of traffic and the amount of wind. Different working conditions

cause different sounds. *There is an unlimited amount of different sounds and noises that can be heard when hearing is normal.*

Under usual circumstances, if we hear speech normally we hear the other sounds as well.

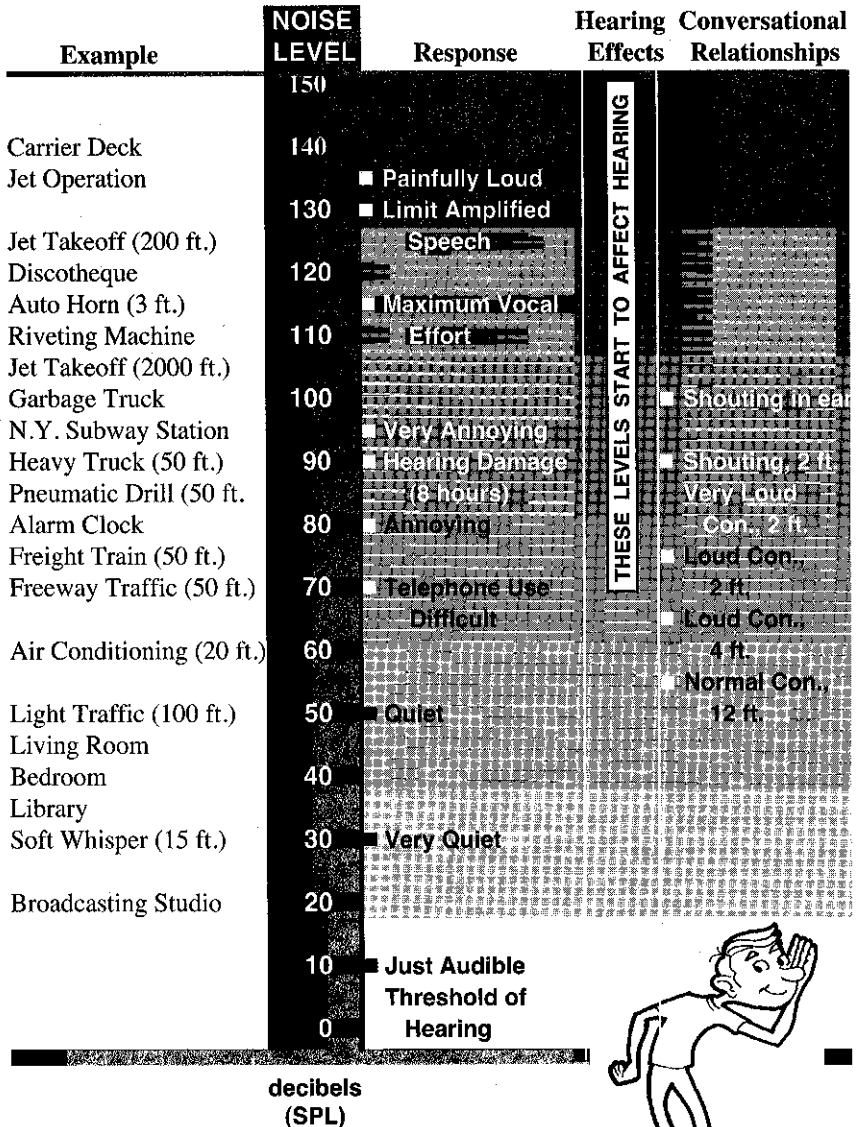
In fact, *to hear speech properly, we must be capable of hearing the softest sounds and the loudest sounds as well.* What this means is that if our hearing is normal and we can hear speech well, then we also hear all the surrounding sounds and noises.

Many times, **if anything goes wrong with this system, warnings may not be detected.** Fortunately, most warnings reach us through our ears - which function 24 hours a day - a fact we generally take for granted. Yet, what if we were to cross the street and not hear a motorist's horn warning us of potential disaster?

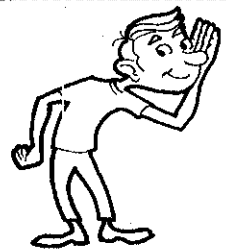
How Loud Are Sounds?



Sound Levels and Human Response



decibels (SPL)



How We Hear Speech:

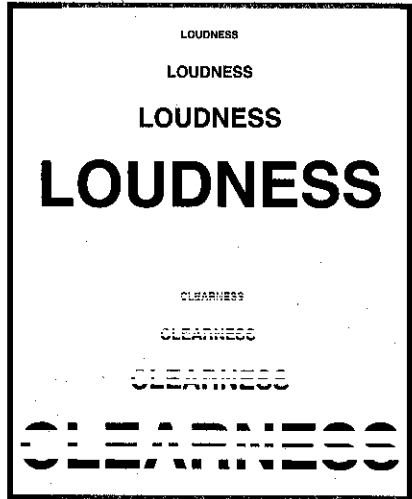
Hearing the spoken word is a function of two faculties:

- Ability to *detect* speech sounds. If sounds are not heard, they can have no meaning.
- Ability to *interpret* the message that speech contains. Difficulty in *understanding* speech is due in large part to a loss of high-pitched sounds - the consonants. Consonant sounds are used to distinguish one word from another. For example, "thin" from "fin."

The Levels at Which We Hear:

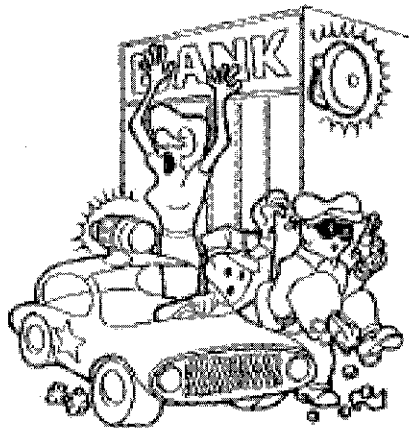
- **Primitive.** These are the constantly changing background noises to which we pay no attention unless our interest is consciously aroused. For example; birds singing, motors running, etc.
- **Warning.** These are the signals that must be responded to in some way. For example; the telephone ring, the door bell, an ambulance siren, etc.
- **Symbolic.** This is the use of sounds for the purposes of communication.

The symbolic level is usually addressed during hearing aid rehabilitation. However, **many of the problems of hearing-impaired people are associated with primitive and warning level sounds!**



If the only problem is in **detecting** sounds, just making them louder would be all that is needed - above, the word, **LOUDNESS**.

However, if a problem in **understanding** also occurs, even making the sounds louder will not provide normal hearing - above, the word, **CLEARNESS**.



When We Don't Hear Well:

Hearing impairment is classified in three complementary ways: by type, degree, and configuration.

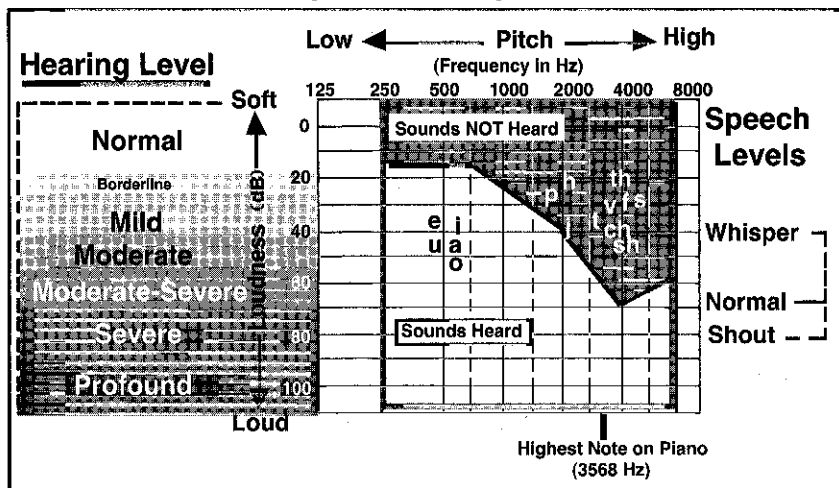
- **Type** refers to the part of the auditory system that is affected.
- **Degree and configuration** are ways to describe the range and volume of sounds that are not heard.

Degree is the *most obvious aspect* of hearing impairment. It is, essentially, the volume above the normal level needed for sounds to be heard. This is also the most common way that we speak about hearing loss, for example by describing someone as having a "mild" or "moderate" loss.

People with mild losses may only have difficulty perceiving certain sounds, may lose track of soft conversational speech, or may have difficulty hearing across a distance. Moderate to severe hearing loss makes speech difficult to understand, even in a quiet environment. At a distance beyond 3-5 feet, particularly when the speaker's back is turned, verbal information may be lost.

Configuration describes the *range of pitches* (or frequencies) at which the loss has occurred, and this factor particularly *influences the ability to hear speech sounds*. Normal speech varies considerably in loudness and

Audiogram (Hearing Chart)



The graph above illustrates a fairly typical hearing loss (dark line) as plotted on an audiogram. The loss is considered to be a mild-to-moderate, high-frequency hearing loss. With hearing at these levels, most high-frequency consonant sounds would **not** be heard. However, the vowel sounds would be heard easily. Hence the statement, "I can hear, but I can't understand."

pitch, even within each word. Vowels are strong, low-frequency sounds that travel fairly well across distances and seem to penetrate background noise. Consonants, by contrast, tend to be weaker and higher in pitch. They get lost in background noise and fade out at a distance. At a volume allowing easy comprehension of vowels, some consonant sounds (such as *s*, *sh*, *th*, or *f*) may not be perceived at all, and others (such as *p* and *t*) can be easily confused.

Many people with hearing impairment perceive environmental sound at relatively low volumes but do not hear all frequencies equally well. Yet *the ability to discriminate speech depends on hearing a broad range of frequencies, particularly the higher ones, because consonants occur four times more frequently in English than vowels.*

Types of Hearing Disorders:

1. Conductive Impairment

In the chapter on *Causes of Hearing Loss*, conductive hearing impairment refers to those **conditions which lead to a blocking of the signal from the sound source to the inner ear**. The blockage occurs in the outer or middle ear. The following statements are symptomatic of conductive hearing impairments:

- A subdued sensation in the sounds heard. The quality of sound may be about the same, but the **loudness or intensity will be reduced**.

- **Familiar sounds will not seem as loud** as they once were.

- **Less intense sounds** may not attract attention at all.

2. Sensorineural Impairment

Sensorineural impairment results from **damage to the inner ear and upward, toward the brain**. The following statements are symptomatic of sensorineural hearing impairments:

- **Words seem loud enough but difficulty occurs in understanding** what is being said, especially in a noisy environment.

- Because the cochlea and its associated neural structures are affected, the listener's **ability to hear speech clearly usually is permanently affected** (even when speech is made louder).

- An **inability to hear high-pitched sounds** such as the ticking of a watch, the dripping of a faucet, or the high notes of a violin.

- A continuous **"hissing" or "ringing"** as a background to the real sounds may occur.

- Words may have a **rumbling, "fuzzy" quality**, and it may sound like people are **slurring their words**.

- **High-pitched sounds tend to be the first to fade.**

- Loss is **about the same in both ears.**

- Some sensorineural impairments act as though a barrier had been placed across the path of hearing. Sounds too weak to penetrate this barrier may be severely reduced or not even heard; **sounds loud enough to penetrate it may seem abnormally loud.** This effect is called "recruitment." Recruitment becomes a serious problem when the barrier is so high that the only sounds heard are those which are disturbingly loud.

- Hearing and understanding may be fairly good in quiet environments and when good visual contact occurs with the person who is speaking; but a great deal more **difficulty occurs when the speaker is at a distance, when multiple speakers are talking at the same time, or when there is other noise in the background.**

- **Loud speech.** The person raises their voice in conversation to overcome their loss and monitor the loudness of their speech. The loss causes them to talk louder.

- The hearing loss **either stays the same or gets worse.** Almost never does it get better.

- The loss can be across **all or part of the pitch range.**

- The listener's perception of **loudness and pitch** are affected.

- The listener's ability to **tolerate loud sounds** is reduced.

- Listening in the presence of background **competing sounds** is very difficult.

- Have difficulty in **appreciating and enjoying music** and a variety of other auditory experiences.

Most of the above reactions can be explained on the basis of the hearing loss.

VERY FEW ARE DEAF

The word "deaf" has pretty much disappeared from our vocabulary today. To be deaf means to be without any hearing. Few persons lose all their hearing. The majority merely have hearing losses of some degree.

If you can hear at all, you are not deaf!

Summary

If you suspect you or someone you love has a hearing problem, arrange to have a hearing test or visit a local hearing professional. **The sooner a hearing problem is detected the sooner a solution can be found.**