GN ReSound

OUR SENSE OF **HEARING**

HEARING IS A PRECIOUS GIFT

Our ears are among the most complex of organs. They can pick up air waves and translate them into sounds in our brain, they control our balance, and they define much of how we relate to the world around us. Our ability - or lack of ability - to hear has an impact on almost every aspect of our lives.

The aim of this brochure is to help you understand the nature of sound, how the ear works, what can cause a hearing loss, and what can be done about it.

THE NATURE OF SOUND

Sounds are waves of air, or vibrations, that can be sensed by a healthy ear and are measured in a unit called 'Hertz'. The more vibrations, the higher-pitched the sound. An example of a high-pitched sound might be a piccolo or a bird singing. Low-pitched sounds could be the rumble of distant thunder or bass tones in music. The rate at which a sound wave vibrates is also called its 'frequency'.

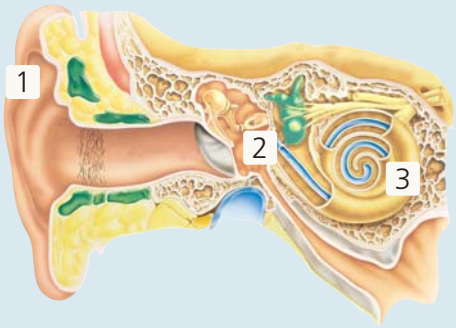
SOUND PRESSURE LEVEL (VOLUME)

The volume of sound is expressed in decibels or dB. The greater the volume, the further the sound travels and the louder it sounds. Volume, however, shouldn't be mistaken for loudness. For example, a high-pitched alarm clock will typically sound much louder than a growling dog - even if both sounds are at the exact same volume. Loudness, therefore, is subjective and cannot be absolutely measured.

COMPLEX SOUNDS

The characteristics of different sounds vary widely. Simple sounds such as pure tones contain one frequency only, while complex sounds consist of many frequencies. Most of the everyday sounds we hear are complex sounds. Speech, for example, consists of vibrations at different volumes and numerous frequencies, mainly in the range of 500 to 3000 Hz.

HOW THE EAR WORKS



The human ear receives and transmits sound waves to the brain where they are analyzed and interpreted. Perhaps the best way to describe the function of the ear is to describe the pathway sound takes through the different parts of the ear.

1 - THE OUTER EAR

Collects sound waves and directs them into the ear canal where they are amplified by its funnel-like shape and channeled on to the eardrum.

2 - THE MIDDLE EAR

The middle ear is an air-filled chamber connected to the nasal and throat passages by the eustachian tube, the purpose of which is to equalize the air pressure on both sides of the eardrum. The eustachian tube is usually closed but is opened naturally when you swallow or yawn.

On reaching the eardrum, the sound waves cause the eardrum to vibrate, transmitting the sound to the delicate bones of the ossicular chain. These tiny articulated bones - commonly referred to as the 'hammer, anvil and stirrup' - mechanically connect the eardrum to the oval window of the inner ear. The movement of this oval window transmits the pressure waves of sound into the inner ear.

3 - THE INNER EAR

The fluid-filled inner ear consists of the spiral-shaped cochlea (an ancient Greek word for the shell of a snail). The passageways of the cochlea are lined with about 20,000 microscopic hair cells that convert sound vibrations into nerve impulses which are then sent to the brain. Here, these impulses are interpreted as meaningful sounds.

In 90% of cases, a hearing loss occurs because the delicate hair cells in the inner ear either break or weaken - typically because of aging or exposure to loud noises. This is called a sensorineural (or 'perceptive') hearing loss.

The effects are almost always the same - it becomes harder to distinguish speech from noise, certain high-pitched sounds such as birdsong disappear altogether, people seem to be mumbling and you often have to ask them to repeat themselves.

The problem is that the brain doesn't receive all the sounds and frequencies it needs to make, for example, speech understandable. It's a little bit like removing all the high keys on a piano and asking somebody to play a well-known melody. Even with only 6 or 7 keys missing, the melody might be difficult to recognize and wouldn't sound right at all.

Once the hair cells in the inner ear are damaged, nothing can be done to repair them. A hearing instrument can, however, greatly improve your hearing ability. You can also help to prevent further deterioration to your existing hearing by avoiding over-exposure to loud noise.

WHAT HAPPENS WHEN YOU GET A HEARING LOSS?

OTHER TYPES OF HEARING LOSS

> CONDUCTIVE HEARING LOSS

This type of hearing loss involves an obstruction to sound waves reaching the inner ear. It can be caused by accumulation of wax in the ear canal, perforation of the eardrum, fluid in the middle ear or abnormal bone growth in the middle ear (otosclerosis). Often, a conductive loss is responsive to medical or surgical treatment.

> TINNITUS

Some people with sensorineural hearing loss also notice a constant ringing or rushing sound in their ears. This is called tinnitus. It is often permanent and not medically or surgically treatable.

WHAT CAN BE DONE ABOUT HEARING LOSS?

If your hearing loss is caused by an accumulation of wax in the ear canal, the 'plug' can easily be removed by an ear, nose and throat (ENT) specialist. A number of other conductive type hearing losses are medically treatable.

If, on the other hand, your hearing loss is caused by damage to hair cells in the inner ear, a hearing instrument is the right solution.

HEARING INSTRUMENTS HAVE COME A LONG WAY

Every hearing loss is individual, posing its own special challenges for the best amplification.

Fortunately, today´s hearing instruments can offer advanced solutions to these complex challenges. Digital hearing instruments, especially, can offer a number of high-tech features that provide better speech understanding in noisy environments and suppress unwanted sounds such as the hum of a refrigerator. They can also be programmed to closely compensate for each individual hearing loss.

Hearing instruments can help you to get the best listening enjoyment out of the hearing you still have - and provide substantial improvements to your quality of life.

WHERE TO GO FOR HELP

The first step is to see a hearing care professional for a hearing test. If you have a conductive loss, you'll be referred to an ENT doctor for further treatment.

If you have a sensorineural loss, you'll be advised which kind of hearing instrument would best suit your needs, whether you'll need one or two instruments, and how to get the most benefit from them.

GN ReSound

M100365-GB-04.08 Rev. A