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Hearing Loss Caused by Portable Music Players

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Over the past few years, portable music players (individual sound equipment) have surged in popularity, including mobile telephones. As a result of this growth, the exposure of young people to high-volume music has also increased drastically, with risks of damage to their health keeping pace.

Personal music players reproduce sounds at the same intensity as loud music played at shows, nightclubs and bars, constituting a potentially dangerous source of recreational noise. Volume levels at rock shows have been recorded at 120 to 140 dB, while bars and nightclubs may well top 95 dB.

Used by more than 64% of middle-class students in São Paulo and some 100 million people all over the world, MP3 or MP4 players can easily reach 120 dB. This intensity is sufficient to cause loss of hearing, when used daily for less than five minutes. We know that listening to music has always been a very common behavior in adolescents, but currently we came across an unusual situation so far: the continuous exposure of the inner ear at high intensities and for periods of time much greater than those previously. In the past, young people, who always liked listening to loud music, stopped a few times to change records or cassette tapes, or more recently, CDs. Such interruptions sometimes changed the course to another activity. This has totally changed with the MP3: long battery life associated with the possibility of having in your equipment thousands of songs, being able to listen to them, one after another, without ever repeating them, for hours or even days, awake or asleep, brings an unprecedented situation for our delicate hearing organ. Many adolescents like to listen to loud music, especially when studying, which is a habit criticized strongly by their parents for generations.

A study published in the *Brain Research* journal issues a warning to avoid children being exposed to very loud sounds. Conducted with rats, an experiment concluded that loud noises may affect the memory and learning mechanisms of developing animals. Rats were used (as their nervous system is similar to that of human beings, in many aspects) between fifteen and thirty days old (corresponding to the human age bracket of six to twenty two years old). They were exposed to noise at volumes of between 95 and 97dB, higher than the



level of 70 to 80dB rated as safe, but still lower than the volume produced by a music show - for example - of some 110dB. After two hours of exposure, the rats suffered irreversible damage to their nerve cells. Anomalies were noted in the hippocampus (a region associated with associative memory and spatial processes). This was the first time that such morphological alterations have been detected in the brain.

As a result of this study, teachers who are already complaining about the way that new technologies can distract their students, now have another argument to discourage the use of gadgets in the classroom.

However, although the evidence produced with this experiment with rats may suggest that this could also occur with human beings who are developing, it is hard to prove, as we cannot expose youngsters to this type of experiment. Nevertheless, it may be inferred, from this experiment with rats, that the noise levels to which youngsters are exposed when clubbing or listening to loud music through earphones, may have adverse effects on their memory and consequently on their learning curves.

Nevertheless, a warning must be issued against drawing precipitate conclusions, as the sound used in the above mentioned study was white noise (with all sound frequencies), perceived as similar to a poorly tuned television set. It is important to determine the "molecular mechanism" through which loud noise might affect the hippocampus cells. We know that the damage is caused directly by sound vibrations or activating neurotransmitters that give rise to the problem.

It is already known that the exposure to loud noise may cause some type of hearing damage, in addition to related alterations (cardiovascular, endocrinal, stress and irritability). Exposure to high-volume noise may result in assorted auditory alterations, such as loss of hearing, dizziness, otalgia, buzzing, ringing and / or a feeling of blocked ears, which may be noted when leaving a show, a party or a nightclub, or even when following a music float (*trio eléctrico*) during carnival parades.

According to the survey conducted by MTV in the USA, most (61%) people spending time at such locations mentioned buzzing or ringing and 43% reported temporary hearing loss. However, most youngsters are unable to report back adequately on the undesired effects of loud sound on their hearing capabilities.

Young people are concerned more with sexually transmissible diseases, drug and alcohol consumption, depression, smoking, nutrition, weight and acne. However, all of them using digital music players at inappropriate volumes are potentially able to cause irreparable damage to the inner ear.

A survey conducted in the USA showed that a third of university students used individual players at top volume. Another study showed that 76% of young people believe that they would not lose their hearing until they started to age.

Hearing loss caused by music is not due only to high volume, but also to the duration of the exposure to loud stimuli and individual susceptibility. It is important to stress that this damage may be reversible only in the initial stages. Exposure to noise may trigger behavioral alterations, some of them long-lasting.

The most common finding at advanced stages is a noise-induced hearing

loss (NIHL) characterized by sensorineural hearing loss at frequencies of 3 to 6 KHz, initially. Injury to the hair cells in this frequency range may be related to the resonance of the external and middle ears, mechanical and anatomical characteristics, as well as blood supplies to the cochlea; the main cause is oxidative stress, with no possibility of recovery.

Consequently, there is no treatment for hearing damage caused by such exposure, with individual protection against loud music usually recommended at intensities of 85 dB (A) or more. Once exposure to this type of noise ceases, hearing loss does not worsen.

Warning

A survey conducted by Deafness Research (UK) estimates that today’s youngsters are going deaf thirty years earlier than their parents. The main reason for this disastrous forecast is the lack of knowledge of the harmful effects of loud noises – including music – on human hearing.

Protecting the ear

If young people are made more aware of potential permanent hearing loss, encouraged by medical practitioners, they could wear earplugs at shows, as they would then know that these earplugs could protect their hearing while not curtailing their enjoyment. Parents are the group most likely to recommend the use of earplugs. Furthermore, social influences such as friends, public examples and television could also steer such behavior

In order to identify the ideal volume for individual devices, the earphones should be placed in the palm of the hand, extending the arm. If the music cannot be heard at this distance, the earphones may be used at this volume with no major risks.

| Volume & maximum duration for using MP3 players | |
|---|-------------------------------------|
| According to a study conducted by the University of Colorado, these limits are based on the average volume that these MP3 players can generate. | |
| % volume control | Length of time before damage occurs |
| Up to 50% | No limit |
| 60% | 18 hours |
| 70% | 4,6 hours |
| 80% | 1,2 hours |
| 90% | 18 minutes |
| 100% | 5 minutes* |

Proper earphones

In-ear phones are on average 5.5 dB louder than earphones fitting over the ear. Consequently, the latter may be used for slightly longer. However, new made-to-measure earphones are designed to block the outer ear channel against outside noises, meaning that music can be enjoyed at lower volumes.

When to seek medical advice

Ear, Noise and Throat (ENT) physicians specialize in the prevention, diagnosis, and treatment of hearing problems.

Seek medical advice in case of: buzzing or ringing, dizziness, feeling of blocked ears, any hearing problem or hearing loss.

Further information

www.iapo.org.br

www.otorrinopediatria.com.br

Recommended readings

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