EFFECTS OF THE MP3 PLAYER ON HEARING

Efeitos do mp3 player na audição

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ABSTRACT

Purpose: to investigate if there is damage and the extent of even using MP3 player. **Methods:** to get the best results on the extension of this harm, in addition to the Distortion Product Otoacustic Emission, the groups were also evaluated with Transient Evoked Otoacustic Emissions. They were asked to listen to MP3 players and divided into two groups, 15 of them belonged to the controlled group (medium intensity of 85 dBNA) and the others in the analysis group (medium intensity of 110 dBNA). The method used for the analysis was *inferencial* (test "t" to parallel samples). **Results:** the results showed that the controlled group has presented alterations in the frequency of 1,5kHz in the Transient Evoked Otoacustic Emissions and 6 kHz in the frequency of Distortion Product. While the study group showed alteration in the frequency of 2, 3, 4 kHz and also in the medium amplitude of all frequencies in the Transient Evoked Otoacustic Emissions and in the frequencies of 3 and 6 kHz in the Distortion Product. **Conclusion:** this study confirmed that those people exposed to intense noise, generated by the MP3 Player, showed a significant loss of their hearing extension, indicating a temporary change in their cochlea cells that might turn into a permanent loss when continuously exposed to it.

KEYWORDS: Hearing Aids; Music; Hearing Loss; Acoustic Stimulation

INTRODUCTION

The growth of urbanization and technological advances favor the increased noise levels on the streets, at work and at play [1,2]. In recent years, the use of devices MP3 players has increased dramatically. It is very common to see people listening to music on MP3 players, either in his morning walk, riding a bike, bus or working out, and often with a very high volume, ie the daily life of people has become a disturbing symphony. Often the volume of the device is further amplified when the user is in a noisy location [3], trying by increasing the intensity reflected in the headset, offset the external noise without concern about the level of action. Music is seen as a pleasant sound, and so it is usually associated with important events in the life of every individual, giving pleasure to those who hear, so it is seen as being unable to cause harm to humans. However, when used intensively and for a long period of exposure, can cause auditory disorder [4] .

The power of handheld devices can reach 120 decibels, the same power turbine of an airplane at takeoff [5]. Regulatory norm n º. 9, considers the action level value above which preventive actions to minimize the likelihood that exposures to environmental agents exceed the exposure limits should be initiated.

Observed that, then comes a very big concern for the health of people who use MP3 Player devices for hours, increasing the risk of a person has a hearing impairment. What people do not realize is that this musical outing, when at high intensity can cause cell damage, which may be temporary or permanent.

Hearing loss due to using headphone is discussed for years. Research in the U.S. showed that young people are losing their hearing sharply with the usual high volume use headphones. Some manufacturers already use a mechanism that warns the user that it exceeded the exposure limit. This technique, which relates to the volume usage time, based on the emission of sound whistles with frequencies that avoid masking the music. The user hears the whistle, which hinders the enjoyment of music and the volume decrease after the whistle ceases to exist.

This attenuation was previously practiced by shorter battery life on a Discman or the short duration

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of the old media (2 hours for K-7 tape and 80 minutes for CD), while today there are batteries that last up to 20 hours straight [6]. Besides the durability of the batteries, another aggravating factor is the design of the headphones [7]. Insert earphones are more dangerous because they intensify the sound.

When the sound source is external, there is a loss of vibrational energy in the path between it and the ear, however, with the earpiece in the ear, all the energy goes [6].

The headphones are considered by doctors because they carry the most harmful sounds up to 120 decibels directly to the eardrum, collaborating with the onset of tinnitus, even before causing any noticeable hearing loss [8]. A study at Harvard Medical School showed that the use of headphones type insertion increases levels of sound in 9 dB when compared to supra-aural headphones [9].

The frequencies that capture the sounds (3-6 kHz) are more fragile, so often hearing loss first affects the perception of treble. This characteristic is reported as induced by high sound pressure levels hearing loss, described in the literature as permanent threshold shift resulting from overexposure to noise, the sensorineural type, usually bilateral and symmetrical, irreversible[10,11,12,13,14,15,16,17], mild and severe at low frequencies at high frequencies, with typical audiometric configuration (V-shaped notch) in the frequency range of 6000, 4000 and / or 3000 Hz, which progresses slowly at frequencies of 8000, 2000, 1000, 500 and 250 Hz and reaches its maximum level at higher frequencies, in the first 10-15 years of stable to high sound pressure level (SPL) exposure and stops its progression once exposure stops[12].

Pure tone audiometry is the universally adopted method and the one suggested by Ordinance No. 19 of the Ministry of Labour and Employment, however, is not the best means of assessing the disturbances produced by noise, it is a fallible test, dependent directly of responses the subject under review. Another disadvantage is its low sensitivity to detect subtle cochlear changes that occur before that hearing loss is manifested on the audiogram[18]. The best investigation for the detection of an injury is the examination of otoacoustic emissions (OAE), but has greater sensitivity to observe outer hair cell lesions, which are the first to be affected [19].

An estimated 25 million Brazilians have some hearing loss. This population are from people who were born with hearing impairment or are suffering from any disease that affects the auditory system, the case of diabetes, even those who, because they are frequently exposed to excessive noise, suffered injuries. One reason for that hearing impairment is manifest that society has become accustomed to exposure to sounds exaggerated. It is known that the auditory system can tolerate without risk of injury, exposure to 85 decibels for eight hours, and every five decibels more, the tolerance is reduced to half the time.

One symptom that something is not right with the ears, in addition to tinnitus, is the difficulty to understand what people say, or not satisfied with the volume of a song even being already at a high volume.

Currently occupational noise are not the only sources of concern, leisure noise objects are increasingly constant study, for which the risk of injury to the inner ear can be minimized. Therefore, the objective of this research was to evaluate through Transient otoacoustic emissions (TEOAE) and otoacoustic emission distortion product (DPOAE) the extent of damage caused by Induced Hearing Loss High Sound Pressure Levels in leisure activity, such as using MP3 Player.

METHODS

The data collection for this study was performed at the University Polyclinic Reference Centre Vila Velha, in 2007.

Held explanatory research in order to ascertain the effects of the MP3 Player device in the hearing of its users. To carry out this sampling, thirty otologically normal subjects were evaluated (by otoscopy), with the result passes the exam Transient Otoacoustic Emissions, aged 17-53 years old, female, and age and gender were not used as selection criteria.

The volunteers were divided into two groups: Control Group (CG) composed of fifteen volunteers, which made use of fifteen-minute Mp3 player, with an average intensity of 85 dB HL.

Analysis Group (GA) consisting of fifteen volunteers, which made use of for fifteen minutes Mp3 player, with an average intensity of 110 dB HL.

The pass criterion used was that the subjects had a response to Transient Otoacoustic Emissions with signal to noise greater than 6.0dB for 2, 3, and 4 kHz All (which is the average of all frequencies) and greater than 3.0dB for 1 and 1.5kHz, is not as important to achieve this result for the last two frequencies mentioned. The Transient otoacoustic emissions were performed three times and recorded in a table (Figure 1) and were later transcribed into another table already with the result of the average of the three frequencies collected and the results of otoacoustic emission distortion product (Figure 2). Statistical analysis was based on an average of each frequency in Transient otoacoustic emissions and the values found in the distortion product, with results both before and after exposure.

Research Protocol of Otoacoustic Emissions

Name: ________________________________ Date of birth: ____/____/_______
Exam date: _____/_____/____ ____ _

Before the exhibition:

Transient Evoked Otoacoustic Emissions

	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0	3.0	3.0	3.0	4.0	4.0	4.0	ALL	ALL	ALL
OD%																		
S/N																		
AMPL.																		
OE%																		
S/N																		
AMPL.																		

After exposure:

Transient Evoked Otoacoustic Emissions

	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.0	3.0	3.0	3.0	4.0	4.0	4.0	ALL	ALL	ALL
OD%																		
S/N																		
AMPL.																		
OE%																		
S/N																		
AMPL.																		

Figure1 - protocol used for annotation of results obtained in tests of Otoacoustic Emissions, accomplished three times, before and after use of the Mp3 Player

Search Protocol Transient otoacoustic emissions and for Distortion product

Name: ______________________________________ Date of birth: ___/___/______

Before the exhibition:

Transient Evoked Otoacoustic Emissions

Ear	Reprodutibilidade					
	1.0	1.5	2.0	3.0	4.0	All
OD%						
S/N						
AMPL.						
OE%						
S/N						
AMPL.						

Distortion product otoacoustic emissions

Ear	2.0	3.0	4.0	6.0	8.0
OD					
level					
s/n					
OE					
level					
s/n					

After exposure:

Transient Evoked Otoacoustic Emissions

Ear	Reprodutibilidade					
	1.0	1.5	2.0	3.0	4.0	All
OD%						
S/N						
AMPL.						
OE%						
S/N						
AMPL.						

Distortion product otoacoustic emissions

Ear	2.0	3.0	4.0	6.0	8.0
OD					
level					
s/n					
OE					
level					
s/n					

Figure 2 - Protocol with the average of the results obtained in tests of Otoacoustic Emissions and the results found on distortion product otoacoustic Emissions

The Otoacoustic Emissions test was performed on the device Capella Madsen, Measurement July 31, 2007, with 80 dB stimulus to perform Transient Otoacoustic Emissions and 65 dB for Product Otoacoustic Emissions Distortion with a difference of 10 dB. Both tests were performed before and after exposure to noise.

After reassessment, TEOAE and DPOAE, volunteers from both groups answered a questionnaire on symptoms arising from that moment of noise exposure (Figure 3).

Questionnaire for post Application exposure

Name: ____

1. After getting exposed to the sound of the MP3, you felt any inconvenience or hearing change?

( ) Yes, tinnitus.
( ) Yes, ear fullness.
( ) Yes, dizziness.
( ) Yes, pain in the ear canal due to the phone.
( ) No.

Figure 3 – questionnaire applied to participants of the two groups after using the mp3 player

The intensities of the Mp3 devices were obtained by measuring with audiodosímetro (noise dosimetry in 1 headset - Serial No.: QC0110110) in an environment with 65 dB of ambient noise, giving an average intensities for each device:

- Apparatus Mp3 Foston; Volume 30; Medium intensity: 110 dB.
- Apparatus Mp3 Sony; Volume 23; Medium intensity: 85 dB.

The most appropriate method for measuring the true intensities provided by appliances Mp3 directed the ear is through the use of an artificial head, which approximately simulates the anatomical dimensions of an adult person, including a model of your hearing tract (pinna and ear canals). Certain situations may also require the addition of artificial head using a torso that composes a more appropriate model of the human being is required. However, the study of artificial head and torso in Brazil is still incipient.

The study was approved by the Ethics Committee of the University Vila Velha - UVV, recorded as 21/2007. Statistical analysis was performed using the computer program: SPSS 11.5 for Windows. The “t” test for paired samples was used to check whether there is a statistically significant difference between the variables under study. The significance level was set at 5%, so “p-value” of less than 0.05 indicates a significant difference between the variables.

RESULTS

The results obtained through examination of Transient otoacoustic emissions (Table 1) and otoacoustic emission distortion product (Table 2), performed before and after exposure in the control group, ie the group that was exposed to the sound of Mp3 with average intensity of 85dB, it can be noted a statistically significant difference only in the frequency of 1.5 kHz in the right ear. In this group only had abnormal frequency of 6 kHz, the frequency range where this test provides more accurate information.

Table 1 - Test T (control group)- Otoacoustic Emissions – (dependent) *

Right Ear

	t	Value-p	Result
% (1.0)	2,137	0,51	There is no difference between the groups
AMP (1.0)	-,638	,534	There is no difference between the groups
S/N (1.0)	1,740	,104	There is no difference between the groups
% (1.5)	2,533	,024	Is there a difference between groups
AMP (1.5)	-,344	,736	There is no difference between the groups
S/N (1.5)	1,336	,203	There is no difference between the groups
% (2.0)	-,140	,891	There is no difference between the groups
AMP (2.0)	-,134	,896	There is no difference between the groups
S/N (2.0)	,265	,795	There is no difference between the groups
% (3.0)	,054	,958	There is no difference between the groups
AMP (3.0)	-,241	,813	There is no difference between the groups
S/N (3.0)	,750	,466	There is no difference between the groups
% (4.0)	1,840	,087	There is no difference between the groups
AMP (4.0)	1,426	,176	There is no difference between the groups
S/N (4.0)	1,851	,085	There is no difference between the groups
% (ALL)	1,911	,077	There is no difference between the groups
AMP (ALL)	-,045	,965	There is no difference between the groups
S/N (ALL)	2,054	,059	There is no difference between the groups

Left Ear

	t	Value-p	Result
% (1.0)	1,480	,161	There is no difference between the groups
AMP (1.0)	-,190	,915	There is no difference between the groups
S/N (1.0)	,987	,340	There is no difference between the groups
% (1.5)	-,240	,814	There is no difference between the groups
AMP (1.5)	-,274	,788	There is no difference between the groups
S/N (1.5)	,052	,959	There is no difference between the groups
% (2.0)	1,600	,132	There is no difference between the groups
AMP (2.0)	,304	,765	There is no difference between the groups
S/N (2.0)	1,620	,128	There is no difference between the groups
% (3.0)	1,245	,233	There is no difference between the groups
AMP (3.0)	1,243	,234	There is no difference between the groups
S/N (3.0)	,569	,578	There is no difference between the groups
% (4.0)	1,146	,271	There is no difference between the groups
AMP (4.0)	-,318	,755	There is no difference between the groups
S/N (4.0)	1,325	,206	There is no difference between the groups
% (ALL)	1,612	,129	There is no difference between the groups
AMP (ALL)	,681	,507	There is no difference between the groups
S/N (ALL)	1,895	,079	There is no difference between the groups

*** Dependent On:** represents the same individual in both tests conducted, i.e. the before and the after, and if present in the tables of 1 to 4.

Table 2 - Test T (control group)- distortion product otoacoustic Emissions – (dependent) *

Right Ear

	t	Value-p	Result
Level (2.0)	1,658	,120	There is no difference between the groups
S/N (2.0)	,232	,820	There is no difference between the groups
Level (3.0)	,532	,603	There is no difference between the groups
S/N (3.0)	,672	,512	There is no difference between the groups
Level (4.0)	,922	,372	There is no difference between the groups
S/N (4.0)	1,724	,107	There is no difference between the groups
Level (6.0)	2,236	,042	Is there a difference between groups
S/N (6.0)	3,212	,006	Is there a difference between groups
Level (8.0)	-,045	,965	There is no difference between the groups
S/N (8.0)	1,344	,200	There is no difference between the groups

Left Ear

	t	Value-p	Result
Level (2.0)	,328	,748	There is no difference between the groups
S/N (2.0)	-,867	,401	There is no difference between the groups
Level (3.0)	1,338	,202	There is no difference between the groups
S/N (3.0)	1,005	,332	There is no difference between the groups
Level (4.0)	1,333	,204	There is no difference between the groups
S/N (4.0)	,324	,751	There is no difference between the groups
Level (6.0)	1,459	,167	There is no difference between the groups
S/N (6.0)	1,282	,221	There is no difference between the groups
Level (8.0)	,361	,724	There is no difference between the groups
S/N (8.0)	,910	,378	There is no difference between the groups

In the comparison of the results found in the Analysis Group, exams Transient Otoacoustic Emissions (Table 3) and otoacoustic emission distortion product (Table 4), one can notice changes in the frequencies of 2, 3 and 4 kHz and All (average tested frequencies) bilaterally.

When noise is low intensity, as in the control group, there is a decrease in both the amplitude and the signal / noise ratio, but does not occur at all frequencies. You Review Group, the decrease occurred more frequently due to high intensity sound to which individuals were exposed. Only the signal / noise ratio of 1 kHz in the left ear did not show modifications.

Besides the analysis of the tests, was applied to the participants a questionnaire, it was described that the incidence of symptoms after exposure to Mp3 device in the Control Group and Group Analysis (Figure 4).

Among the fifteen participants who constituted the control group reported no tinnitus or dizziness after exposure; only one participant reported ear fullness; one described pain at conduit due to the use of insert earphones; and thirteen people reported no abuse.

However, the Review Group, composed of fifteen other participants reported more bothersome when compared to the control group: two people complained of tinnitus after exposure; four people reported ear fullness; no person complained of dizziness; only one person described pain in conduit due to the use of insert earphones; and ten people showed no reported complaints in the questionnaire.

Table 3 – T Test (Analysis Group)- Otoacoustic Emissions – (dependent) *

Right Ear

	t	Value-p	Result
% (1.0)	,227	,824	There is no difference between the groups
AMP (1.0)	1,201	,250	There is no difference between the groups
S/N (1.0)	,359	,725	There is no difference between the groups
% (1.5)	,149	,884	There is no difference between the groups
AMP (1.5)	,658	,521	There is no difference between the groups
S/N (1.5)	1,097	,291	There is no difference between the groups
% (2.0)	,525	,607	There is no difference between the groups
AMP (2.0)	3,706	,002	Is there a difference between groups
S/N (2.0)	1,183	,257	There is no difference between the groups
% (3.0)	1,706	,110	There is no difference between the groups
AMP (3.0)	8,256	,000	Is there a difference between groups
S/N (3.0)	2,902	,012	Is there a difference between groups
% (4.0)	-,486	,635	There is no difference between the groups
AMP (4.0)	3,694	,002	Is there a difference between groups
S/N (4.0)	,180	,860	There is no difference between the groups
% (ALL)	1,914	,076	There is no difference between the groups
AMP (ALL)	3,661	,003	Is there a difference between groups
S/N (ALL)	2,743	,016	Is there a difference between groups

Left Ear

	t	Value-p	Result
% (1.0)	1,177	,259	There is no difference between the groups
AMP (1.0)	1,314	,210	There is no difference between the groups
S/N (1.0)	-,324	,751	There is no difference between the groups
% (1.5)	1,228	,240	There is no difference between the groups
AMP (1.5)	1,039	,316	There is no difference between the groups
S/N (1.5)	1,043	,314	There is no difference between the groups
% (2.0)	,741	,471	There is no difference between the groups
AMP (2.0)	2,171	,048	Is there a difference between groups
S/N (2.0)	,760	,460	There is no difference between the groups
% (3.0)	2,460	,028	Is there a difference between groups
AMP (3.0)	3,679	,002	Is there a difference between groups
S/N (3.0)	2,542	,023	Is there a difference between groups
% (4.0)	1,761	,100	There is no difference between the groups
AMP (4.0)	3,382	,004	Is there a difference between groups
S/N (4.0)	1,562	,141	There is no difference between the groups
% (ALL)	1,513	,153	There is no difference between the groups
AMP (ALL)	4,526	,000	Is there a difference between groups
S/N (ALL)	1,896	,079	There is no difference between the groups

Table 4-T Test (Analysis Group)- distortion product otoacoustic Emissions – (dependent) *

Right Ear

	t	Value-p	Result
Level (2.0)	1,553	,143	There is no difference between the groups
S/N (2.0)	,503	,623	There is no difference between the groups
Level (3.0)	3,461	,004	Is there a difference between groups
S/N (3.0)	1,604	,131	There is no difference between the groups
Level (4.0)	1,532	,148	There is no difference between the groups
S/N (4.0)	1,250	,232	There is no difference between the groups
Level (6.0)	2,880	,012	Is there a difference between groups
S/N (6.0)	,553	,589	There is no difference between the groups
Level (8.0)	1,111	,285	There is no difference between the groups
S/N (8.0)	,062	,951	There is no difference between the groups

Left Ear

	t	**Value-p**	**Result**
Level (2.0)	1,075	,301	There is no difference between the groups
S/N (2.0)	1,328	,206	There is no difference between the groups
Level (3.0)	3,338	,005	Is there a difference between groups
S/N (3.0)	1,272	,224	There is no difference between the groups
Level (4.0)	2,011	,064	There is no difference between the groups
S/N (4.0)	-1,104	,288	There is no difference between the groups
Level (6.0)	1,027	,322	There is no difference between the groups
S/N (6.0)	-,184	,856	There is no difference between the groups
Level (8.0)	-,384	,707	There is no difference between the groups
S/N (8.0)	,639	,533	There is no difference between the groups

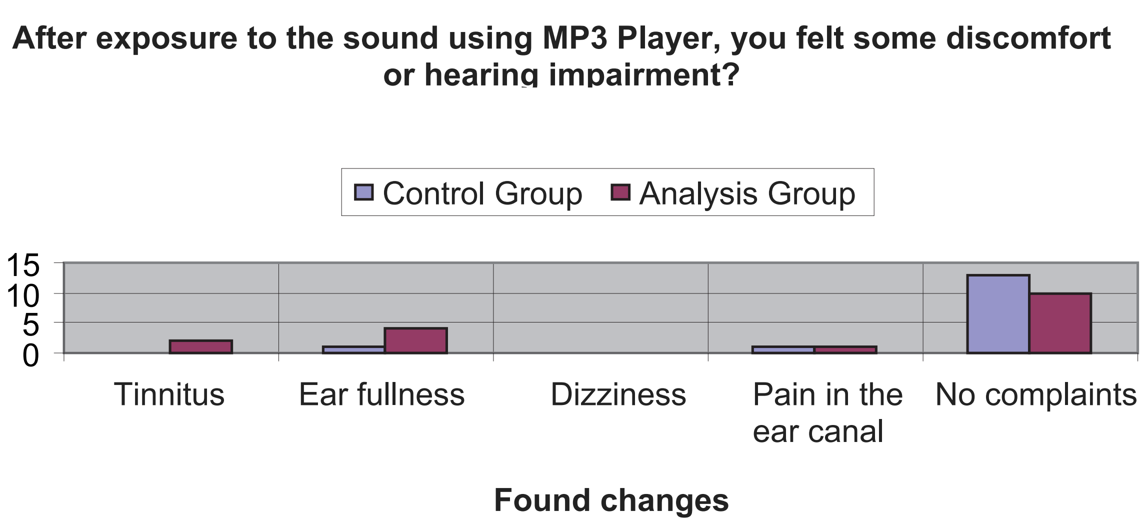

Figure 4 – graphic on the changes found after using the Mp3 device reported by two groups

DISCUSSION

Noise is, in most countries, the most prevalent noxious agent in the workplace. His presence in industrial activities and urban environments adds to its widespread dissemination in social media, especially in leisure activities. This almost universal spread of noise in social and work environments, generates greater concern when one considers that the auditory damage it caused is irreversible, and that exposure produces other disorders: organic; physiological and psycho-emotional, resulting in an obvious decline in the quality of life and health of the population [20].

Individual devices with headphone revolutionized the way we listen to music. Are practical and portable accessories have become almost indispensable in everyday life. This modern habit has mobilized researchers to study the negative impact of inappropriate use of such equipment on hearing [1].

The use of portable equipment takes place in various noisy environments such as traffic, school, college, street, gym, etc. In general, in these locations, the noise level is high which causes the users to increase the volume to mask extraneous sounds [21]. In environments where young people usually are like bars, clubs, concerts, etc., usually the sound intensity is greater than 100 dB HL and individual mobile devices with headphones may even exceed this intensity [22,23].

The concern of health professionals with induced high levels of sound pressure in the workplace hearing loss began to extend to leisure activities [24], primarily with sports in gyms and / or academies, the frequency at nightclubs and the use of portable equipment with headphones [25]. Many studies are conducted on the occupational noise, but not so many studies with youth exposed to high noise levels in the same proportions, however, hearing their integrity may be related to your lifestyle and preferences in leisure activities [26]. In academies, mainly in fitness classes, the sound intensity is very high, since many teachers believe that high-volume increases student achievement [27].

Studies indicate the importance of otoacoustic emissions and distortion products in the early diagnosis of induced high levels of sound pressure and hearing loss confirmed this thesis in works that show the probability of occupational noise exposure cause changes in the records of the product otoacoustic emissions distortion [28]. The use of transient evoked otoacoustic emissions in the early diagnosis of hearing loss caused by noise can be very effective, as it detects temporary threshold shifts compared to high sound pressure levels [29].

Described in 1979 by David Kemp, otoacoustic emission distortion products are evoked in response intermodulation two simultaneous pure tones close frequencies (F1 and F2), called strokes, and have the ability as a differential behavior by frequency . It is characterized by being an objective fast, noninvasive, painless test, easy application [2] and sensitive [30]. Otoacoustic emission distortion products are obtained as the results of vibratory energy generated at the cochlea, which can be measured using a microphone coupled to the ear of the individual tested [31]. Thus, cochlear changes resulting from exposure to high sound pressure levels can cause early changes in the amplitude of otoacoustic emission distortion products, that originate in the organ of Corti, the outer hair cells [32]. Transient otoacoustic emission responses are usually caused by brief acoustic stimulus, such as the click, which is a stimulus that covers the frequency range from 500 to 6,000 Hz [33].

Some authors suggest the utility of otoacoustic emissions and distortion product, the early identification of cochlear changes that precede the installation of noise-induced hearing loss, but this work shows that the changes found in otoacoustic emissions are also important to show the relevance of this test in cases of loss by noise.

One study looked at 338 volunteers before and after exposure to noise, and it was observed that while the mean amplitude of otoacoustic emissions decreased significantly, the average audiometric thresholds did not change; the authors concluded that otoacoustic emissions may therefore be a predictor for the diagnosis of noise-induced hearing loss [17].

Comparing the results in this study of transient emissions before then with the control group, the only statistically significant difference in the frequency of 1.5 kHz in the right ear, can only be considered as a variable of voluntary or device. Thus, it is considered significant, only the alteration observed in the frequency of 6 kHz.

This group was exposed to an intensity of approximately 85 dB. If there was a change in the frequency of 6 kHz, it means that there was damage, so it is necessary to rethink the relationship described in the Ministry of Labour Table, which says that the individual can be exposed to a sound of 85dB up to eight hours. One should also take into consideration that this group was actually exposed to this intensity as the MP3 Player has insert earphones, which make the sound get straight to the ear canal, unlike what happens in an open environment. The literature does not question the possibility of such 85dB generate a lesion in the cochlea. The work, however, shows that this injury happened.

The hearing loss by noise exposure primarily occur reversibly, through temporary threshold shifts in the frequency range 2000-6000 Hz, and these changes in greater or lesser degree, indicate a prognosis of susceptibility to permanent hearing losses. Is it any wonder then, if even after fourteen hours of rest, indicated for when the individual is exposed to high sound pressure levels, this change would cease even temporarily, not excluding, in course of time, permanent damage. The indicated would reevaluate the volunteers after the break, however, this is not the focus of the research.

The outer hair cells are the first to be affected in acoustic trauma, considers the OAE examination fairly straightforward to detect the lesions of the inner ear. One study evaluated the use of otoacoustic emissions as a quantitative index of the functional integrity of the outer hair cells in the mechanism of the temporary threshold shift or temporary threshold shift (TTS) caused by loud music. And through this, verified the usefulness of the distortion products in the assessment and monitoring of these changes, which were more evident in the next frequency of 4,000 Hz, consistent with the findings of this study regions, which show significant difference in frequency of 3,000 Hz.

Besides hearing implications, noise-induced hearing loss also causes extra hearing disorders as well as psychosocial disorders characterized by isolation, stress, difficulty sleeping, decreased self-esteem, depression; well as neurological disorders, vestibular, digestive, cardiovascular and hormonal [34], dizziness [35], intolerance to loud sounds, ear ache and mainly tinnitus [36,37].

Some of these symptoms have been reported as a complaint by the participants, mostly from the Analysis Group. Beyond the buzz, as described in the literature, ear fullness and pain in the channel due to the use of insert earphones were also reported.

The main symptoms of noise-induced hearing loss is tinnitus unilateral or bilateral; the difficulty in understanding speech as it occurs advancing the deficit to lower frequencies; earaches by exposure to loud sounds (earache) and ear fullness [38].

Tinnitus is an auditory sensation perceived by the individual in the absence of an external sound source [39]. It is surely one of the complaints of the most common ear problems, and often comes associated with dizziness and deafness [40]. Can be considered a sequel of some aggression suffered by the ear, and is considered a symptom no established cure. However, treatment is possible, especially if finding the cause.

Based on the findings of this study, demonstrating the inferential analysis of the results of Otoacoustic Emissions Transient otoacoustic emissions and distortion product associated with the results of a questionnaire applied to all volunteers, we can observe significant changes in the Group analysis, showing a predominance of changes in high frequencies. When comparing the two groups, it can be noticed that the incidence and frequency changed items in Group Analysis is much higher than in the control group.

CONCLUSION

The study showed that people exposed to intense noise, even in leisure activities, present a significant decrease of amplitude, suggesting cochlear injury. The same, cannot be confirmed, because it was not the goal study perform audiometry. Therefore, it is clear the importance to educate people about the leisure noise, in particular, the use of Mp3 Player. There is often concern only with the noise in the workplace, forgetting that in other situations there is also exposure to noises that are harmful.

RESUMO

Objetivo: investigar se há dano e a extensão do mesmo com o uso de MP3 player. **Métodos:** aplicação do exame de Emissões Otoacústicas por Produto de Distorção e Emissões Otoacústicas Transientes, em 30 indivíduos expostos ao MP3 Player, sendo 15 deles no grupo controle (intensidade média de 85 dBNA) e 15 no grupo análise (intensidade média de 110 dBNA), ambos expostos por 15 minutos. O método utilizado para análise estatística foi inferencial (teste "t" para amostras pareadas). **Resultados:** o grupo controle apresentou alteração na frequência de 1,5kHz nas Emissões Otoacústicas Transientes e na frequência de 6kHz no Produto de Distorção. Enquanto o grupo análise apresentou alteração nas frequências de 2, 3, 4kHz e na amplitude média de todas as frequências, nas Emissões Otoacústicas Transientes e nas frequências de 3 e 6kHz na Produto de Distorção. **Conclusão:** o estudo mostrou que pessoas expostas a ruídos intensos, sendo o aparelho de MP3 Player fonte deste estudo, apresentam diminuição significante da amplitude, que indica alteração temporária das células da cóclea, podendo tornar-se uma lesão permanente caso a exposição seja contínua.

DESCRITORES: Auxiliares de Audição; Música; Perda Auditiva; Estimulação Acústica

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