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Tinnitus, Diploacusis, Hyperacusis, Dysarmonic Paracusis and Deafness in the Musicians

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Introduction

All the texts of Musical Education in Schools of all levels defined The Music "the art of sound ". For Le Petit Robert, music is "the art of combining musical sounds, according to rules (depending on the time and place), of organizing a duration with sound elements. In the Book of Music, Paul Augé wrote that "Music is the art of combining pleasant sounds with the ear." The sound for physics is a periodic acoustic phenomenon and usually pleasant to listen, the noise instead is not periodic and is unpleasant ". The noise corresponds to an irregular, non-periodic pressure wave, which oscillates Individual play and orchestra practice do not generate the same genes, thanks to an instinctive protection of the ear due to the stapedian reflex (The stapedial reflex, also called acoustic reflex, is the involuntary contraction of the two muscles of the middle ear, the stapedian muscle (from the Latin stapia: stirrup) and the hammer muscle, by making the chain of ossicles more rigid, it attenuates the level of the sounds transmitted to the inner ear). with many different frequencies. Sounds distribute their acoustic energy in several frequency bands called harmonics. The musical sounds have a fundamental frequency that corresponds to its height, as well as many harmonics whose frequencies are multiples of the fundamental frequency. Thus, the piano 3 has a fundamental frequency of 440Hz, while those of its harmonics are 880Hz 1320Hz, 1760Hz, 2200Hz, 2640Hz, 3080Hz. The distribution of the acoustic energy at these different frequencies contributes to creating the particular timbre of the instrument. The sound of a musical note, on the other hand, corresponds to a pressure wave with a periodic intensity profile, which repeats itself regularly over a certain period of time [1].

To damage the hearing, it is often "the overall sound level to which one is exposed (sound energy)": in this sense it is important "to determine the equivalent continuous sound level" and not so much the peak level which, "although much higher, has a very short duration ". She can exist therefore a conflict between music and damages on the hearing, between noise and fruition of the music [2]. We can consider insofar the hypothesis of an oxymoron or rather that rhetorical figure that it tries to unite two opposite. The effects that exposure to noise determines on man are dependent on many variables, such as the physical characteristics of the phenomenon, the timing and modes of manifestation of the sound event, the specific sensitivity of the exposed subject, and are commonly classified as (Cosa et al., 1990): - damage effects, that is to say of non-reversible or not completely reversible alterations, objectivable from the clinical and/or anatomopathological point of view; - disturbing effects, i.e. temporary alterations of the psychophysical conditions of the subject, which are clearly objectivable, resulting in well-defined pathophysiological effects; - feeling of general annoyance (annoyance) [3].

Historically Bernardino Ramazzini was the first to highlight this link and this percolosity. (You cannot find any kind of exercise so healthy and so harmless that, making it an immoderate use, does not produce serious damage. This fact is known by music masters, singers, preachers, monks who make their churches resound in their churches psalms). The musicians are exposed to high sound levels during the personal and group tests that increase the time of exposure to noise compared to the official performance [4]. In slow, gradual and progressive way, the auditory system of the musician's professionals you/he/she can go to sovraesposition stress and, therefore, in suffering [5].

Tinnitus and hyperacusis are thought to be two compensatory phenomena. Hyperacusis is explained by the fact that the superior auditory system compensates peripheral sensory loss by amplifying sound, People with a diplacus sound hear the same sound differently in both ears, either with a different tone or sound quality [6]. This is a problem reported mainly by the musicians. Although it is sometimes transient, it is very disturbing for the musicians [7].

The atypical nature of work and the difficulties of evaluation lead to real difficulties throughout Europe, where musical activity is not contemplated. It is important to evaluate carefully:

A. Anterior state of the injured

B. Control during the tests (both personal and general)

C. Occasionality of some performances (Indicatively it can be considered occasional that condition that involves exposures higher than the lower values of action but for less than 3 weeks a year and / or for less than 12 days a year)

D. Epidemiological underestimation

E. Little consideration of the musicians themselves

F. Expectations of the public (low volume rock concert ???)

G. Suitability for specific tasks

H. Phonometric data

I. Atypicality of some professional figures (band players, amateur musicians, etc.)

Because of their inadequate knowledge, most musicians never use protective devices to avoid damage to the auditory system. Also, the absence of sound-absorbing panels between the orchestral sections can represent a risk factor.

Factors influencing the effects of noise on humans are:

a) sound pressure: injury bands, emission modes, presence of impulsive components, masking effect;

b) exposure time: exposure level, recovery time, period of the day in which exposure occurs;

c) emission frequency: spectral characteristics, presence of tonal components, presence of infrasound / ultrasound.

d) sensitivity and individual responsiveness,

e) sensory saturation,

f) the noise stamp, -

g) the possibility to control the sound emission,

h) the motivational attitude of the exposed subject,

i) the number and the spatial distribution of the sources,

j) the identifiability of the nature of noise and the location of the source,

k) the age,

l) auditory acuity

m) according to some studies, even the sex of the exposed subjects.

On average, the sound power generated in the middle of an orchestra can reach 110dB, that is to say the same noise as a jack hammer located at 1m [8]. The orchestra does not play at the same power for hours, but it is the repetition of these peaks of large volumes that can cause lesions. It is necessary to combine to this, the different places in which one plays music. The more musicians are confined to small orchestra pits, the greater the risk [9].

The musicians are not all equal before the risks, says the specialist. "A first violin, located next to the conductor, will be more protected than a musician located just in front of the drums or the brass. Idem for a cellist of the last rank placed just in front of the small harmony". The periods of sound rest are also important to allow regeneration of the filaments that connect the eyelashes of the hair cells of the inner ear. These eyelashes make it possible to transform the sound waves into electrical energy, which will be assimilated by the auditory nerve, explains the researcher. They are interconnected by small filaments that can be broken by exposure to noise [10].

The ciliary organization then becomes disordered and transmits the mechanical energy of the sounds less well, which results in temporary deafness. These filaments, however, have the ability to regenerate in a few hours during periods of rest. "If you re-expose yourself to noise without giving your hearing system time to regenerate and return to its original state, you increase the risk of becoming permanently deaf, Noise inside the ear causes oxidation reactions that continue for several hours after exposure and lead to the accumulation of oxidizing substances that damage the structures of the inner ear. Fortunately, our body produces natural antioxidants that neutralize oxidative compounds. But when we expose ourselves to noise for a very long time, our natural abilities eventually run out [11]. Generally, the ear acquires a temporary deafness during the first two hours of exposure to a high noise level. And to regain its anterior hearing acuity, it will be necessary to reserve a time of rest sound - in a relatively silent environment - two times longer than the duration of exposure, because it takes a long time to eliminate the oxidants, the periods of rest sound are also important to allow the regeneration of the filaments that connect the eyelashes of the ciliated cells of the inner ear [12]. These eyelashes make it possible to transform the sound waves into electrical energy, which will be assimilated by the auditory nerve, explains the researcher. They are interconnected by small filaments that can be broken by exposure to noise [13].

The average sound levels for stringed instruments are 86-91 dB (A), 90-94 dB (A) for wind instruments, 83-94 dB (A) for brass instruments and up to 98 dB for percussion instruments.

The bibliography however on this issue is not yet homogeneous and unambiguous.

The hearing losses induced by music seem to be caused by:

I. Years of exposure

II. Position of the musician in the orchestra

III. Position of the musician inside the orchestral "hole"

IV. Position near loudspeakers

V. Repertoire

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VI. Instrument played

VII. Local acoustics

In many cases it has been seen that the main effect of noise exposure is tinnitus, associated or less to a hearing loss.

Numerous studies have shown that the incidence of hearing loss in orchestral musicians is equivalent to that of the population not exposed to noise according to the ISO-1999 standard.

The main activities for risk management, in a manner consistent with what is achieved in other operations, can be summarized as follows:

a) risk assessment

b) training and information

c) availability of DPI (personal protective equipment) for musicians

d) health surveillance

The use of DPI (personal protective equipment), in many cases not used in any ear or only in one because held not comforting and for reported distorsions of the quality of the sound, you/he/she should strongly be promoted in every musical performance also increasing the awareness in the musicians of the auditory risks in case of brief exposures to the noise. They are in commerce a vast number of specific systems of protection for the "professionals of the hearing", type passive or type active. These systems of protection are custom, and they reduce the entry of the sound in proportional way on all the frequencies, in such way that the sound perceived from who wears them you result natural, but less intense. Besides with these special systems his/her own voice doesn't result distorted [14].

It is necessary to prepare more controls in Conservatories and Music High Schools, greater controls in theaters and in outdoor areas, maximum severity in the application of noise pollution limits We conclude with a quote, taken from the Philosophical Aphorisms, by Victor Hugo, father of French Romanticism and author of the Miserables. The French author claimed that "Music is a noise that thinks". We like to think that in a poetic and philosophical way he understood the subtle link that unites music with the limbic system, the seat of emotions. Music is culture, emotions, joy, amazement, afflatus of the soul. All this cannot and must not damage the musician or the public. The real big current problem is the fruition of Music. The concept of comfortable audibility is applicable not only by law but also by common sense. It is necessary to explain in detail that the excess sound can damage important health [15]..

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