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Noise in Leisure Activities

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Abstract

This paper presents a literature review of scientific production on the theme of 'noise in leisure activities.' Journals in the Virtual Health Library were examined on issues such as noise, occupational noise and noise in leisure activities. The publications reviewed in this study are divided into two categories: effects on hearing, and measurement of sound pressure levels. The findings of the literature review reveal the urgent need to adopt preventive measures and to raise the awareness of public authorities, health and leisure professionals, and the general public about the problem of noise. Simulations of the acoustic descriptor speech transmission index STI were performed in 4 gym academies, and the results show that the quality of communication range from bad to satisfactory, given that noise levels are high.

Keywords: Noise; Communication; Environmental; Pollution

Introduction

Noise pollution, a serious environmental problem in urban centers, is considered a public health problem by the World Health Organization. This type of pollution, which is one of the most common environmental problems in cities, is a cause of much annoyance and numerous complaints (e.g., [1-4]).

In fitness centers, instructors and students are exposed to high noise levels for several hours a day without any protection. This is of concern for mental and physical health, since noise affects the entire body, and one of the most relevant effects is the risk of hearing loss. Therefore, concern and efforts have focused increasingly on the elimination and/or control of this polluting agent [5]. In view of the above, the research question here is: What scientific knowledge has been produced about noise in leisure activities? To answer this question, this study aimed to determine the characteristics of articles that address the theme of "noise in leisure activities," published in scientific journals related to health.

Methodology

This work consists of a survey of the literature, classified as exploratory research, which aims to familiarize the researcher with the material that has been produced on the subject of choice. The literature survey was conducted in the Virtual Health Library available at the BIREME site. The databases consulted were: LILACS (Latin American and Caribbean Health Sciences) and SciELO (Scientific Electronic Library Online). The search involved the health sciences descriptors – DeCS – and the selected descriptors were: noise, occupational noise, and leisure activities.

Results and Discussion

In this research, a detailed reading of the articles allowed the results to be grouped by similarity of content, comprising two categories of analysis: effects on hearing, and measurement of sound pressure levels. Tables summarizing the findings and a discussion of each category are presented below.

Effects on hearing

Table 1 summarizes the investigated literature characterizing the effects of noise on hearing.

Author/year/journal/title	Effects on hearing
Martines CR, Bernardi APA, 2008, Rev. CEFAC, Differentiated perception of noise: a comparative study of young patrons and employees of nightclubs in São Paulo [6]	Ringing in the ears, earache and difficulty in hearing
Morata TC, Mendes MH, 2007, Rev. Soc. Bras. Fonoaudiologia, Occupational exposure to music: a review [7]	Tinnitus, hyperacusis and diplacusis
Russo et al., 1995, Rev. Bras. de Otorrinolaringologia, A comparative study on the effects of exposure to music and musicians of electric trios [8]	Temporary change in threshold, tinnitus and feeling of fullness in the ear
Pinto MP, Russo PCI, 2001, Rev. CEFAC, Study of the effects of exposure to loud music on the hearing of gym instructors [9]	Hearing loss and temporary change in threshold
Zucki et al., 2006, Rev. Soc. Bras. Fonoaudiologia, Perception of physical education students, professionals and undergraduate course coordinators about noise in their profession [10]	Earaches, ear fullness and tinnitus

Table 1: Distribution of articles that discuss hearing complaints, classified by publication, purpose and main results

Several studies have demonstrated auditory effects in musicians and other professionals exposed to music. According to Martines and Bernardi [6], reported effects are tinnitus, earache and hearing difficulties. On the other hand, the effects observed by Morata and Mendes [7] are: tinnitus, hyperacusis and diplacusis. It should be noted that tinnitus and the sensation of blocked ears after exposure may be the first signs of hearing loss induced in individuals who were

exposed for long periods of time to high noise levels generated by music.

Russo et al. [8] found that electric trio musicians suffer a temporary change in threshold and tinnitus. Pinto and Russo [9] found hearing loss and temporary change in threshold in fitness gym instructors. Zucki et al. [10] found profession-related earaches, ear fullness and tinnitus in physical education students, professionals and undergraduate course coordinators.

Measurement of sound pressure levels

Table 2 summarizes the literature investigated pertaining to the instruments used for measurements, as well as measured sound pressure levels.

Authors	Measuring Instruments	Measured sound pressure level dB(A)
Anjelo and Zannin [11]	Brüel & Kjaer 2238 class 1 sound level meter	74.3 to 85.5
Palma et al. [5]	Ono Sokki LA-220S portable sound level meter	74.4 dB(A) to 101.6 dB(A)
Marcon and Zannin [12]	Brüel & Kjaer 2238 class 1 sound level meter	58 dB(A) to 75.5 dB(A)
Caldas et al. [13]	Four noise dosimeters (unspecified brand)	83 dB(A) to 108 dB(A)
Deus and Duarte [14]	MAS 695090 Type 2 sound level meter	90 dB(A) to 105 dB(A)
Lacerda et al. [15]	Two instruments: a Simpson 886-2 analog and a Lutron SL 4011 digital sound level meter	73.9 dB(A) to 94.2 dB(A)

Table 2: Distribution of articles dealing with measurements of sound pressure levels, classified by author, instruments and measured sound pressure levels

Zucki et al. [10] stated that leisure activities generate high sound pressure levels which may be harmful to human beings. Data above show how critical is the condition of exposure to noise of the workers (physical educators and personal trainers) that spend many hours in such gyms. Noise levels reach values above the exposure limit for occupational noise in industrial environments, of 85 dB (A). This limit value is adopted in several countries, according to the book "Occupational Exposure to Noise: Evaluation, Prevention and Control", published on behalf of the World Health Organization [16]. Anjelo and Zannin [11] evaluated fitness gyms and found an extremely worrying situation with regard to measured sound pressure levels, as indicated in Table 3. The data listed in this table were recorded in a time interval of 49 minutes. Anjelo and Zannin [11] also evaluated the reverberation time, RT, and speech transmission index, STI, based on simulations performed with Odeon version 9.2 software. Table 3 shows the results of their simulations. Table 4 describes the quantitative and qualitative assessment of STI according to the IEC 60268-16 standard [17].

Ananthaganeshan and Gastmeier [18] recommend a value of 1.5-2 sec for the reverberation time. Observing data in Table 3, it is possible to see that those gyms in which noise levels measured were not over 85 dB (A) display RT of 1.6-1.9 sec, and the speech transmission index, which evaluates the quality of spoken words, is considered satisfactory. Gym #2 displays noise levels of 85.5 dB (A), and RT of 2.6 sec: speech transmission index is thus "poor". Therefore, a relevant indicator for gyms is to keep noise levels below 85 dB (A), providing a more healthy acoustical environment for both physical educators and their clients.

	Acoustic Parameters		Qualitative Assessment IEC 60268 – 16 (2003)	Measured sound pressure Level
	Reverberation Time RT	Speech Transmission Index STI	STI	Leq dB(A)
Gym 1	1.8	0.52	Satisfactory	82
Gym 2	2.6	0.43	Poor	85.5
Gym 3	1.6	0.53	Satisfactory	74.3
Gym 4	1.9	0.51	Satisfactory	80.1

Table 3: Simulation of RT and STI using Odeon software [19]

Quantitative assessment of intelligibility STI	Qualitative assessment of intelligibility
0.75-1.00	Excellent

0.60-0.75	Good
0.45-0.60	Satisfactory
0.30-0.45	Poor
0.00-0.30	Bad/Very bad

Table 4: Quantitative and qualitative assessment of the Speech Transmission Index – STI, according to the IEC 60268-16 (2003)

Final Remarks

Table 2 show that sound levels measured in leisure activities such as fitness centers are high. This finding indicates that the sound levels commonly found in these environments today are comparable to those measured in industrial environments, e.g., in the metalworking industry, and are unsuitable in environments where individuals focus on health and relaxation. In several countries the limit level of exposure to noise in industrial work places is of 85 dB(A). This value is overcome in several gyms, according to data provided in Tables 2 and 3. Lower noise levels allow a speech transmission index at least satisfactory (Table 3), allowing for better communication and long-term health in gymnastic environments. Another highly relevant aspect of this situation is the fact that physical education instructors who work in gyms are constantly subjected to the high noise levels found in these environments.

This literature review revealed that the articles address issues pertaining to the effects of noise on hearing and to the magnitude of the sound pressure levels measured in leisure environments. In view of these findings, the following palliative measures are considered necessary and urgent: 1) the adoption of measures to reduce sound pressure levels in environments such as fitness gyms; 2) awareness raising of professionals involved in leisure activities about the adverse effects of prolonged exposure to high sound levels, which are harmful to both hearing and voice; 3) implementation of hearing conservation programs, since auditory changes can be permanent and irreversible; and 4) implementation of voice quality conservation programs for professionals who use their voice as a working tool.

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