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Characterization of sound pressure levels in fitness centers and complaints from instructors

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Abstract:

Aim: The present study aims at identifying auditory and health complaints of fitness instructors in fitness centers in Curitiba, and to evaluate the sound pressure levels (SPL) produced in fitness classes. SPL measurements were made following ABNT recommendations (Brazilian Technical Norms and Regulations Association - Norm 10151) and revealed levels that ranged from 73.9 to 94.2 dBA. **Study design:** Prospective clinical randomized. **Material and method:** 32 fitness instructors answered a questionnaire about their most frequent complaints related to SPL. **Results:** The most frequent complaints were: tinnitus (24%); ear fullness (15%) and poor concentration (15%). The classes in which sound pressure levels were investigated were: Step, Body Pump and Aerofitness. **Conclusion:** The results of the present research suggested the presence of high sound pressure levels in 66% of the evaluated classes.

INTRODUCTION

The present study intended to investigate the issue of sound pressure levels (SPL) in leisure activities, specifically in fitness centers. Music is an indispensable part of the gym classes and some instructors from the area believe that loud music enhances members' performance, keeping them motivated. However, such an exposure poses a risk to hearing and voice of professionals exposed to it many hours a day.

In the United States, the International Association of Fitness Professionals (1999), as a response to the growing concern of hearing loss risk, recommended that music played in gym rooms should not exceed 90dNSPL. The association also recommended that sound pressure level measures should be made in each room, checking the exposure of each different instructor.

In the States of Massachusetts, a bill that required the posting of banners informing that noise should not exceed 90dBSPL so as to protect subject hearing has recently been passed.

By reviewing the Brazilian legislation on urban noise, we noticed that there are no references to leisure activities, such is the case in some American states; nevertheless, the subject has attracted more and more attention of the researchers.

Fusco and Marcondes (1989) studied sound pressure levels in seven rooms of aerobic fitness centers in the city of Sao Paulo and detected mean sound pressure levels that varied from 82 to 162dBHL. According to the authors, these sound pressure levels may lead not only to hearing loss, but also to fatigue, malaise, irritation, intolerance and insomnia.

Deus and Duarte (1997) measured the sound pressure level in 14 fitness centers that provided aerobic classes with music and the results showed that 86% of the fitness centers had levels above the ones set forth by the legislation in force (85dBHL), and one of them had a 105dBHL level. In addition to noise, the authors identified that gym instructors at the fitness centers were used to the noise and not concerned about the

damage they could experience in the long run⁷.

However, these findings indicate that such sound pressure levels may become a risk to the body and hearing, since instructors are exposed to it for many hours a day and without any protection.

The purpose of the present study was to investigate organic and hearing complaints associated with the exposure to specific sound pressure levels of gym instructors of the city of Curitiba/PR and to assess sound pressure levels used in gym classes.

MATERIAL AND METHOD

In the present study, gym instructors were interviewed and sound pressure levels were measured during gym classes.

The sample consisted of 32 instructors graduated in Physical Education who demonstrated interest in participating in the study after being invited by a letter distributed in three fitness centers in Curitiba/PR.

Out of 32 instructors, 12 were female and 20 were male subjects. They ranged in age from 20 to 39 years (mean age of 27.6 years) and had been in this kind of job for 2.6 to 14 years (mean of 7.4 years). They normally worked from 9 to 40 hours a week (mean of 21.37 hours), had no previous history of hearing problems or exposure to industrial noise. Instructors taught classes of aerobics, step, aerolocal, street dance, bodybuilding, water gym, jazz, folk dance and body pump, all of them supported by music.

We presented a questionnaire with closed questions about personal identification, clinical history, audiological history, occupational activities, personal leisure activities that could impair hearing, and auditory and organic perception of music in their professional activity.

Sound pressure level was evaluated by an acoustic engineer during the gym classes in three fitness centers in Curitiba/PR. We used two sound pressure meters to ensure reliability of responses: an analog meter, brand Simpson, model 886-2, and another digital one, brand Lutron, model FL4011, in addition to an audio calibrator brand Simpson, model 890-2.

The criteria used to measure sound pressure levels were: A weighted curve, Slow detection mode, conversion rate similar to 5dB, criteria level similar to 85dBHL and duration of 8 hours.

In order to present the results we used the following values: equivalent mean level (Leq), time-weighted average or TWA, and mean level where the instructor used to stay (LOP).

RESULTS

In order to learn about the sound pressure level produced during a gym class with music, we measured the sound pressure levels of three fitness centers in Curitiba/ PR.

The results of sound pressure levels obtained in different points of the room during the classes ranged from 73.9 to 94.2 dBHL, and they are presented in Table 1.

Out of 32 gym instructors, nine (28%) did not present complaints concerning exposure and 23 (72%) presented at least one complaint represented in Graph 1.

Table 2 represents the distribution of the sample according to time in the job and total number of complaints related to exposure.

In the present study, we noticed that, in general, instructors had not been informed about audiological care in the workplace, although they considered the sound pressure level as very intense but necessary to stimulate the participants of the gym classes. Another important factor was that 11% of the instructors presented vocal fatigue and were referred to voice therapy.

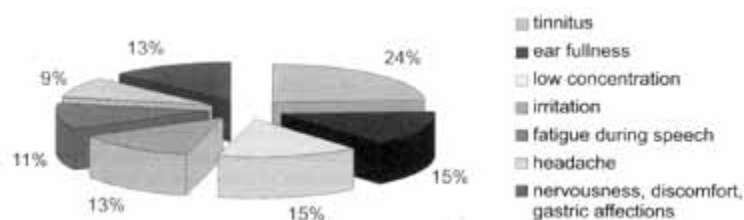
Table 1. Results of measurement of sound pressure levels in dBHL, according to type of class in fitness centers A, B and C.

Fitness center A		Fitness center B		Fitness center C	
Step	Aerofit	Step	Body Pump	Step	Body Pump
80.5	75.8	90.0	86.5	92.2	92.1
80.2	75.7	89.7	86.2	93.2	91.3
77.4	73.9	90.1	87.4	92.4	94.2

Key: Leq = equivalent level; TWA = time weighted mean; LOP = mean level in the place where the instructor stayed.

Table 2. Distribution of subjects according to time in the job and total of complaints concerning exposure.

Complaints	Up to 5 years		6 a 10 years		11 a 15 years		Total	
		%		%		%		%
None	4	12	4	12	1	4	9	28
Up to 3 complaints	9	28	6	19	6	19	21	66
> 3 complaints	1	3	1	3	0	-	2	6
Total	14	43	11	34	7	23	32	100



Graph 1. Distribution of complaints concerning sound pressure level after exercise; classes.

DISCUSSION

High sound pressure levels observed in the present study had already been reported in other national studies^{6,7,8}. If we compared the sound pressure levels described in Table 1 with the maximum limit of tolerance for occupational exposure set forth by the NR15 (Norms and Rules), annex 1, Labor Ministry, instructors in the fitness center A for the step type class could be exposed for 16 hours and at fitness center B, for four hours. As for body pump classes, instructors could be exposed for 8 hours. For teacher at fitness center C, maximum limits of tolerance would be four hours for the two evaluated modalities.

Considering that gym is a leisure activity, results showed that sound pressure levels were higher than the acoustic comfort levels defined by the Norm 10151 of ABNT, which recommend acoustic comfort levels of 40 to 55dBHL for indoor activities, such as music shows and sport events.

We may state that existing sound pressure levels in gym classes may impair the hearing of instructors if they are exposed to it for many hours.

As to perception of instructors; 47% considered that noise levels in the workplace are very high and 53% believed they were moderate, which was compatible with the results of SPL measures made in the fitness centers.

High sound pressure levels associated with physical activities may unfavorably interact and compromise the hearing organ, as observed in previous studies^{1,12,14}.

It was observed that teachers presented organic and auditory complaints possibly related to sound pressure levels. The most frequent complaints were tinnitus, ear fullness and concentration problems, in accordance with studies carried out in musicians and industry workers, exposed to high sound pressure levels^{2,11,16}. Tinnitus and ear fullness are symptoms associated with temporary threshold shift¹⁰.

Table 2 revealed that the shorter they had been working in the area, the higher the number of complaints they presented. It may happen because of the fact that instructors were not used to so high sound pressure levels at the beginning of their professional life. It is also possible that those who were more disturbed with the sound levels would not stay longer in the profession.

To conclude, we suggest that the role of the speech and hearing pathologists in this kind of program is to instruct all the involved people concerning their hearing, as well as to create actions aimed at raising the awareness and preserving the hearing and vocal integrity of the subjects.

CONCLUSION

Based on the previous observations, the authors concluded that:

- sound pressure levels in fitness centers were higher than the limits set forth by ABNT-Norm 10151 and are potentially harmful when compared to NR15;
- 47% of the instructors considered the sound pressure levels in their workplace as very high and 53% as moderate;
- 72% of the instructors presented at least one complaint;
- tinnitus (24%), ear fullness (15%) and low concentration (15%) were the most frequent complaints;
- the shorter the people had worked in the area, the more complaints they had;
- the use of measures that reduced SPL in fitness centers may positively influence the health of instructors, staff and members of the centers.

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