

# Noise in physical education activities

Sá M. M.<sup>1</sup>; Azevedo R.<sup>2</sup>; Malcata Â.<sup>1</sup>; Machado O.<sup>2</sup>

<sup>1</sup> CIDESD - Centro de Investigação em Desporto, Saúde e Desenvolvimento Humano. Portugal/ ISMAI – Instituto Superior da Maia. Maia, Portugal

<sup>2</sup> CATST- Centro de Apoio Técnico à Segurança no Trabalho, ISMAI, Maia, Portugal

## Summary

The aim of this study was to evaluate the occupational noise exposure of the physical education teachers. For such a sample of eight gymnasium and 70 teachers were involved. Through a questionnaire it was collected information about the facilities, the professional teacher's characteristics, the kind of work developed, the duration of each activity and several other relevant factors. The noise level measurements were recorded using a Bruel & Kjaer sound level meter, type 2260. Based on the noise level and time load of the different activities, the professional staff daily noise exposure,  $L_{EX^{28h}}$ , was calculated. According with it, 91% of professionals had a value of  $L_{EX^{28h}}$  above the lower exposure action value, and 10% were above the personal exposure limit values (ELV). Based on these data, one can conclude that physical education professionals are, among other risks, under the risk of hearing loss.

## Introduction

Noise is one of the causes for work disturb, a barrier to verbal and sound communications, it might even cause common tiredness [Crandell et al., 1997] and, in extreme cases, hearing loss and extra hearing physiological changes [Arezes et al., 2002].

Hearing loss is one of the sensorial privations that raise more difficulties on the communication process.

In Portugal, most of the physical education professionals work in gymnasiums or indoor classrooms, that is, enclosed reverberating spaces where sound propagates in every direction. In addition, any typical lesson of body Jump, Body Combat, Step, Cycle, Hydrogymnastics, has loud and excessively paced music that goes along with the exercise and helps its rhythm. By being so, the physical education professionals are exposed to high noise levels for several hours during their working day.



Figure 1 - Bruel & Kjaer sound level meter

## Materials and methods

The existing sound levels were measured in 8 places where sports are held, such as schools, gymnasiums and pools. They were measured in 16 distinct activities, from Physical Education in primary and secondary schools to fitness lessons (Indoor cycle, Step, aerobic gymnastic, body jump...) including pool sports and others. Summing up, 150 noise level measures were made involving 70 physical education teachers.

At the same time one questionnaire was given to all the professionals, in order to get more information about the activities that are taught, the work load per week and other information related with their health and noise perception. In the end, 48 questionnaires were accepted as valid containing the requested information.

To measure the noise levels was used a Bruel & Kjaer sound level meter, type 2260 (Figure 1). The equivalent continuous A-weight sound pressure level,  $L_{Aeq}$ , was determined for each activity. The measures had the length of the class, ensuring, this way, a better representation on the results. 5 measures took place for each class of the same teacher. Bearing in mind the limitations that exist due to the characteristics of each sport, the measures were done as close as possible to the teacher's action space.

The professionals that took part in this study were informed about the aim of the study and also about the confidentiality of the information obtained both in the work field and in the questionnaires.

## Results

*Questionnaire's results:* the sample composed by 54 Physical Education teachers (54% male and 46% female) shows an average age of 32 years old, with a bottom limit of 24 years old and top limit of 55 years old.

The work load per week changes between 10 and 60 hours. 28% of the profes-

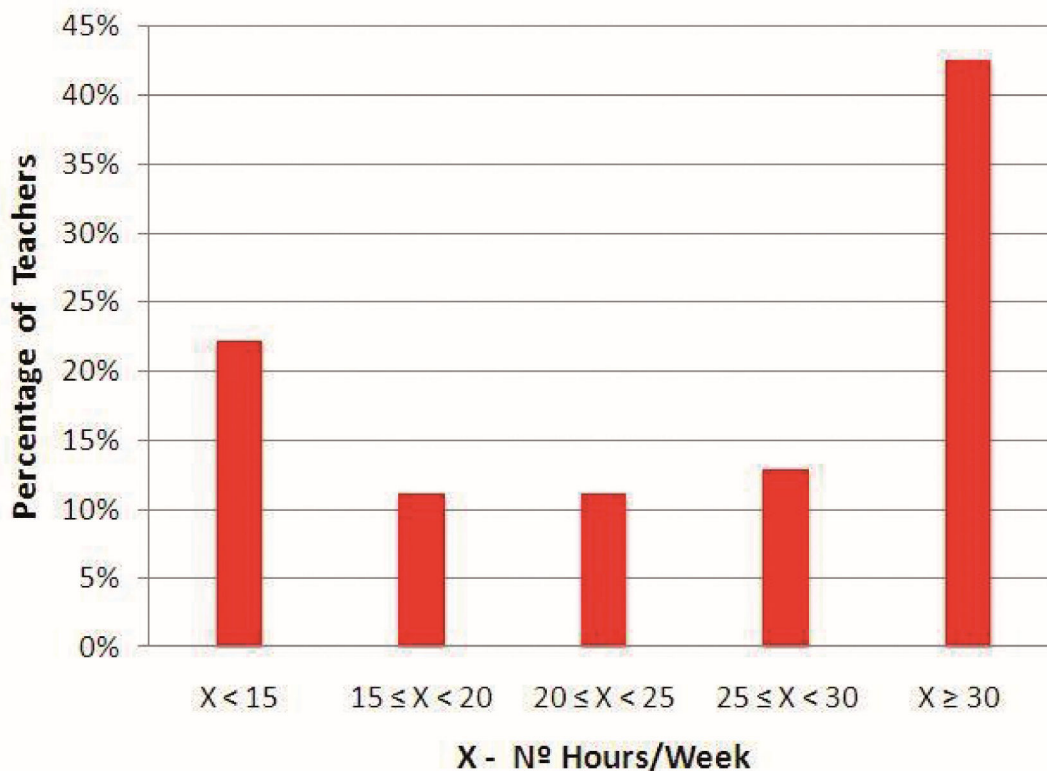


Figure 2 - Work load per week of a teacher

sionals show a work load per week above 35 hours and 22% show a work load per week less than 15 hours (Figure 2). The average work load per week is 31 hours.

**Measure's results:** The recorded levels of sound pressure show important changes between the different activities, the lowest value recorded was 70 dB(A) in Bodybuilding/ Cardio fitness and the highest value was 97 dB(A) in Indoor Cycle. Concerning the medium values recorded, Indoor Cycle, Body Combat and Jump Fit, show the highest values, 92 dB(A). The minimum, mean, and maximum values of the equivalent continuous sound level record for the different sports are represented on Table 1.

The calculation of the noise exposure level normalized to a nominal 8 hour working day,  $L_{EX,8h}$  for all the teachers according with the Directive 2003/10/EC and the ISO 9612:2007, was based on the information collected through the questionnaires given to the teachers. Namely, the daily taught activities and length of each activity and the recorded sound level for each activity.

According with the obtained values of  $L_{EX,8h}$ , one can see that 9% of the professionals are exposed to a noise level inferior to 80 dB(A), 54% are exposed to noise level between 80 and 85 dB(A), 27% are exposed to a noise level between 85 and 87 dB(A) and 10% are exposed to a noise level higher than 87 dB (A).

## Conclusions

The Directive 2003/10/EC establishes a Lower and an Upper Exposure Action Value,  $L_{EX,8h}$ , of 80 and 85 dB(A), respectively. That Directive defines also the per-

Table 1 - Minimum, mean and maximum values of  $L_{Aeq,T}$  registered for the different activities

Lessons	$L_{Aeq,T}$ min	$L_{Aeq,T}$ mean	$L_{Aeq,T}$ max
Cycle	84	92	97
Step	87	91	95
Jump Fit.	80	92	96
Body Pump	82	87	91
Step Local	80	84	85
Local	73	84	89
Body Combat	86	92	93
Dance & Rhythms	75	90	96
Aerobic	83	87	89
Bodybuilding and Cardio Fit.	70	79	83
Body Vive	83	83	83
Hydrobike	73	87	91
Hydrogymnastics	78	86	93
Swimming	71	81	85
Primary school	81	84	86
Secondary school	83	85	86

sonal exposure limit value (ELVs),  $L_{EX,8h}$ , of 87 dB(A) – that should not be exceeded in any circumstances.

Based on the information collected, one can conclude that only 9% of these professionals don't face the risk of hearing loss, 54% of the professionals are exposed to a moderated risk of hearing loss, and the 37% left face a high risk of having hearing damage (reduction of hearing sensitivity and in extreme cases hearing loss) and extra hearing damage (increase of stress level, hypertension, sleep changes and others).

## References

- AREZES, P., MIGUEL, A., "A exposição ocupacional ao ruído em Portugal". Revista Riscos Ocupacionais, 20(1), 2002;
- CRANDELL, C., SIEBEIN, G., HASELL, M., GOLD, M., ABBOTT, P., HERR, C., LEE, H., LEHDE, M., "Pilot studies of speech communication in elementary school classrooms". The J. of the Acoustical Soc. of America. 101( 5): 3069 , 1997.
- DIRECTIVE 2003/10/EC of 6 February, Official J. of the European Union, 38-42, 2003.
- ISO 9612, Acoustics – Determination of occupational noise exposure – Engineering method, 2007.