[N192] Sound Levels Measurements at Leisure Activities

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ABSTRACT

As very often the young people are exposed to high sound levels at their leisure activities, dangerous for their hearing acuity, it is important to know exactly the sound immission during the participation in such entertainments which requires the use of suitable measurement techniques. The aim of this paper is to describe in detail the techniques especially implemented and equipments appropriately calibrated employed for measuring the sound immission levels during the principal recreational activities of two groups of adolescents: attendance to discotheques and use of walkman/discman, along four years. It was performed in the frame of an interdisciplinary longitudinal study on the hearing effects in adolescents by non-occupational noise exposure and its relationship with physical and psychosocial variables developed in Córdoba (Argentina). In the case of discotheques, besides the well-known dosimeter, a miniaturised measurement instruments chain powered with battery and transportable in a hidden way were used. The measurements of real ear levels by using walkman and/or discman were carried out with the aid of instrumental line –mankin-technique- complying standards IEC 60959 and 60711. The systems employed allowed adjusted descriptions to the real sound situations through statistical noise descriptors, frequency analysis, noise dose, etc. fulfilling with the required accuracy.

KEYWORDS: Adolescents, Attendance to discotheques, Use of walkman/discman, Measurement techniques, Sound immission levels, Noise dose.

INTRODUCTION

In occupational noise environments there are regulations concerning to sound levels, ear protection, maximum exposure time, and so forth. In non-occupational activities, in spite of the high sound immission in some of them, no legislation or organisations are responsible for checking on hearing or sound levels. There is a widespread lack of knowledge about harmful sounds and their effects on hearing and the well-being [1].
In general, the young people participate frequently in noisy recreational activities and especially, they are exposed to high level music by attending to discotheques and live concerts or using walkman or discman [2], [3], [4], [5], [6], [7].

Studies published within the past two decades concerning the exposure to music in discotheques and rock concerts show a mean of all measured sound levels of 103.4 dBA [8]. The measurements performed in Córdoba (Argentina) some years ago showed values between 105 dBA and 109 dBA with peaks up to 119 dBA at some discotheques [9]. So, in general, it is reasonable to conclude that attendees at rock concerts or noisy discotheques are routinely exposed to sound levels above 100 dBA. As usually, 85 dBA is considered the boderline between “safe” and “dangerous” noise exposure, all the measurements fall in the “dangerous” category. Because the exposure to non-occupational noises means a potential injury for the auditory system, it is important to get a real sound description of the situation, as accurate as possible, for establishing valid relationships with the auditory function [10] and to legislate about of the appropriate sound levels for such activities.

The aim of this paper is to show in detail the systems, some of them arranged ad hoc, employed for measuring of sound immission during leisure activities and its results in the frame of an interdisciplinary four-year study on the hearing effects of the exposure to non-occupational noise of two groups of adolescents —boys and girls— and their relationship with psychosocial variables, presented also at this event. It was supported by the Federal Ministry for Economic Cooperation and Development (BMZ) via the Physikalisch-Technische Bundesanstalt (PTB) of Germany at the Centre for Research and Transference in Acoustics at the National Technical University - Regional Faculty of Córdoba – Argentina.

**MATERIAL AND METHODS**

**Subjects**

The subjects were all the adolescents —boys and girls— participants of an interdisciplinary four-years study on the hearing effects of the exposure to non-occupational noise and their relationship with psychosocial variables.

**Non-occupational Noise Measurements**

The sound immission of non-occupational noise in two kind of entertainment activities were measured: discotheques and use of walkman/discman. In both cases it is difficult to obtain values, which describe the real sound situation. It requires the use of techniques specially implemented and equipments appropriately calibrated. The systems implemented allowed adjusted descriptions to the real sound situation and also they comply with the correctness and accuracy required.

**I - Measurements at Discotheques**

The possibility of carrying out hidden measurements is a fundamental condition for the assessment of the real sound situation at discotheques, as it must be avoided that the persons responsible of those places change the music levels. Two systems were used for this purpose that comply with the condition stated above: an instruments chain implemented ad hoc and a personnel dosimeter of noise.

**A) Instruments chain**

It is composed of a miniaturised measurement instruments chain powered with battery, altogether transportable and difficult to identify as such:
- High-quality condenser microphone, Norsonic type 1220
- High-quality microphone preamplifier, Brüel & Kjaer type 2639
- Measuring amplifier, adjusted by programmed steps, Norsonic type 336