

THE SOUND EXPOSURE OF THE AUDIENCE AT MUSIC FESTIVALS

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Introduction Concern has been expressed in recent years that excessive sound levels during leisure time activities, in particular those associated with rock and pop music, may cause widespread hearing damage. In a recent review Maassen et al (2001) estimated, according to ISO 1999, that after ten years exposure to music played on personal cassette players (PCPs) and through attending discotheques and concerts, about 10% of young people will suffer irreversible noise-induced hearing loss in both ears of at least 10 dB at 3 kHz. Our previous survey studies (Mercier et al 1998, Mercier and Hohmann 2002) carried out at two vocational training centres showed that around 70% of young people suffered from tinnitus following attendance at loud music events. In addition our measurements detected hearing loss among tested groups significantly higher than that which would be expected according to ISO 1999 for a non-exposed group. In Switzerland, a regulation implying sound level limits of 100 dB(A) at concerts or festivals and 93 dB(A) in discotheques came into force in 1996. Despite this regulation, the actual sound exposure (sound dose) of an audience during a typical concert or festival is generally unknown. Such information would be important in estimating potential hazard to the auditory system.

Methods During each evening of a six-day music festival ten different volunteers circulated around the various festival events each evening. Each volunteer was equipped with a small sound level meter Larson-Davis LD 705 or 805, which continuously monitored their sound exposure as L_{eq} in dB(A), L_{max} “Fast” in dB(A), and $L(Peak)$ in dB(C) every minute. The volunteers also had to give their views on sound volume and quality, and provide information on the wearing of ear plugs. In addition an audience survey was done. One hundred visitors were interviewed every evening. They were also asked to judge the volume and sound quality, provide information on their use of ear plugs and advise if they had experienced any post-exposure tinnitus (PET) and, if so, how long the condition persisted.

Results

The sound level exposure: Most concerts lasted between one and two hours and there were at least three concerts held at each of the four different music stages every evening. The volunteers spent between 4 and 12 hours per evening at the festival. The individual sound exposures per evening varied between 87.3 and 103.8 dB(A) with an average exposure of 95.1 +/- 3.1 dB(A). Eight percent of the volunteers' exposure exceeded the 100 dB(A) limit value fixed by the Swiss regulation. By analogy to the sound exposure permitted at the workplace we calculated the equivalent sound exposure over both an 8 hour period (one working day) and a 40 hour period (a working week). The L_{eq} over 8 hours varied between 87.3 and 103.6 dB(A), with an average of 95.5 +/- 3.4 dB(A) while the L_{eq} calculated over 40 hours was 7 dB(A) less (for volunteers exposed only for a single evening).

The appreciation of sound level and quality and use of ear plugs: Seventy percent of the volunteers considered the sound volume was “good” while 25% thought it “too loud”. These opinions were independent of the sex of the volunteers. When the average sound level during a concert reached 100 dB(A), the proportion of volunteers who considered the sound level too

loud rose to 40% while 55% still judged the level as just right. Only 5% continued to think it too low. Concerning sound quality, again around 70% of the volunteers were of the opinion that the sound quality was good. However some 25% judged the quality of the sound just "so-so" while 4% considered it to be bad. In only 14% of all concerts had the volunteers made use of the ear plugs that were provided by the organisers of the event.

Survey study: The audience survey showed that, taken all round, the volume at the concerts satisfied 80% of the festival visitors. Only 15 % found the music too loud. More women judged the sound level too loud than did the men. Around 90 % of the audience interviewed found the sound quality good. Some 58 % of the festival visitors never used ear plugs while 34% said they used them sometimes. Only 5% claimed to have used ear plugs at most concerts and 3% used them always when close to speakers. Thirty-six percent of the 601 people questioned in the survey indicated that they had experienced post exposure tinnitus (PET). For 86% of them, the tinnitus disappeared after 24 hours although in two cases the tinnitus had become permanent.

Conclusion The sound exposure of the volunteers was highly dependent on their behaviour and listening patterns in the festival arena. Individual exposures per evening varied between 87 and 104 dB(A) with the average exposure being 95 dB(A). This average value corresponds to the weekly dose limit in the workplace. From the point of view of occupational health, such exposure could be tolerated for just one evening per week, providing that for the rest of the week the visitors to the festival avoided exposure to high sound levels. However visitors to the festival normally attend more than just once per week, indeed attending three evenings or more is usual. Consequently their exposure increases and in tandem, the risk of noise-induced hearing loss. While the use of ear plugs would reduce exposure by at least 10 to 15 dB, unfortunately the results of the audience survey showed that only 5 % of the visitors use ear plugs regularly. As the greatest exposure to noise during leisure activity arises when listening to music, young people should be better informed of the risk to their hearing and be strongly advised to modify their listening habits. This is especially the case for those already exhibiting noise induced hearing loss, for those complaining of tinnitus and for those who frequently suffered otitis during childhood. Furthermore, maximum sound levels should be strictly limited at concerts employing electronically amplified music and also at discotheques. The average sound level L_{eq} of 100 dB(A) should not be exceeded. In addition, it would be of value to begin to take measures to harmonise sound level limits at the international level.

Keywords: music sound level exposure, music festivals, sound level measurements

References

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