

Musicians' hearing protection

A review

Prepared by the **Health and Safety Laboratory**
for the Health and Safety Executive 2008

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The music and entertainment industry is unique in that high noise levels are often regarded as an essential element for the enjoyment of people attending concerts and live music events. However, there is a risk of hearing damage for people working in the music and entertainment industry, including musicians. One of the methods used to reduce noise exposure is the use of appropriate hearing protection. Many different types of hearing protection have been marketed for musicians including premoulded earplugs, custom-moulded earplugs and in-ear monitors. In order to support the Health and Safety Executive's (HSE) understanding of this issue, the types of hearing protection available to musicians were identified. Telephone interviews were then conducted with nineteen professional musicians to collect information on: the type of hearing protection (if any) musicians are currently using; musicians' attitudes to hearing protection including whether they think it is, or it can be, effective and whether it allows them to do their job effectively; and the factors musicians consider important when choosing hearing protection.

This report and the work it describes were funded by the Health and Safety Executive (HSE). Its contents, including any opinions and/or conclusions expressed, are those of the author alone and do not necessarily reflect HSE policy.

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First published 2008

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ACKNOWLEDGEMENTS

The author gratefully acknowledges those who assisted in this project, in particular the musicians who took part in the telephone interviews.

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EXECUTIVE SUMMARY

Objectives

The music and entertainment industry is unique in that high noise levels are often regarded as an essential element for the enjoyment of people attending concerts and live music events. However, there is a risk of hearing damage for people working in the music and entertainment industry, including musicians. One of the methods used to reduce noise exposure is the use of appropriate hearing protection. Many different types of hearing protection have been marketed for musicians including premoulded earplugs, custom-moulded earplugs and in-ear monitors. In order to support the Health and Safety Executive's (HSE) understanding of this issue, the types of hearing protection available to musicians were identified. Telephone interviews were then conducted with nineteen professional musicians to collect information on: the type of hearing protection (if any) musicians are currently using; musicians' attitudes to hearing protection including whether they think it is, or it can be, effective and whether it allows them to do their job effectively; and the factors musicians consider important when choosing hearing protection.

Main Findings

Semi-structured telephone interviews were conducted with nineteen musicians between June and October 2007 to gain an understanding of their attitude towards using hearing protection, and on the performance and usability of available hearing protectors. Although the sample was small it was well represented across the different types of instruments played, how long the musicians had played professionally, and the range of work experiences. The majority interviewed were classical musicians playing in large orchestras. However, the views of three freelance percussionists and two military band players provided some insight into the experiences of other types of musicians playing different styles of music and in different venues.

The findings presented in this report were obtained from telephone interviews with musicians and from discussions with, and information provided by, hearing protector manufacturers and suppliers.

Musicians most commonly use conventional foam and flange earplugs because they are easy to fit during a performance, and they are often the most readily available. However conventional protectors can provide too much protection when fitted properly, and they can cause musicians to mishear or overplay as a result of the lack of high frequency sound heard through the protectors. Musicians are most likely to wear conventional hearing protectors when they are exposed to very loud music generated by other musicians.

Premoulded musicians' earplugs provide moderate attenuation but preserve sound quality. They are a relatively inexpensive off-the-shelf earplug, and are reusable if kept clean. They can improve sound quality for those musicians working with or around amplified sound.

Custom-moulded musicians' earplugs use interchangeable filters to provide different levels of protection (9 - 25 dB), and have been designed to preserve a natural sound quality. They are expensive and difficult to fit, but they are also unobtrusive if aesthetics are an issue. Despite improved sound quality, orchestral musicians do not believe they can play properly when

wearing custom-moulded protectors. However they are more likely to use this type of protector when listening to other musicians.

Musicians are reluctant to wear any type of hearing protection when playing solo or exposed pieces of music, which require them to play at the highest possible standard. Principal musicians, and woodwind and brass musicians are likely to be the most resistant to wearing hearing protection.

Custom-moulded vented earplugs are available, which are designed to provide significant high frequency attenuation and very little low frequency attenuation. A hole through the length of the earplug reduces the occlusion effect. These earplugs may be useful for musicians who play low frequency instruments, and for those who blow into their instrument (eg woodwind and brass players). However none of the musicians interviewed for this study were aware of, or used, custom-moulded vented earplugs.

In-ear monitors provide musicians with a method for controlling the level of incoming sound when used with a personal mixing desk, and the earpiece provides some isolation. There are currently no standard tests for governing the performance of custom-moulded electronic earplugs.

A range of noise control methods other than hearing protectors is available for reducing musicians' noise exposure. These include the use of screens and risers, regularly rotating musicians within the orchestra, increasing the separation between players, and sound limiting on electronic systems. However reflected sound makes the use of screens unpopular, and the lack of space in many orchestra pits and studios can make it difficult to implement many of the other control measures.

Recommendations

It is essential that suitably qualified professionals take and manufacture all ear-moulds to a high standard. Poor ear-moulds can result in earplugs that are uncomfortable, or that block out too much sound, and which are therefore unlikely to be used.

Musicians should ensure that the hearing protectors they use are CE marked and supplied with attenuation data according to BS EN 352, which describes and verifies the performance of the protector.

A good education programme is needed for both employed and self-employed musicians. It should include information on the requirements of current noise legislation clearly identifying employer's and employee's responsibilities, typical noise exposures and the associated risk to hearing, the signs and symptoms indicative of hearing damage, and the types of hearing protectors available and the advantages and disadvantages of each type.

Training on the selection and proper use of hearing protection is also essential to ensure that the use of hearing protectors is an effective measure for controlling musicians' noise exposure. Musicians need wear earplugs during rehearsals and performances so that, with time, they hear the attenuated music as normal, especially with musicians' earplugs that are designed to preserve sound quality. If earplugs are worn throughout a performance the fact that they are difficult to fit, or that fitting them during a performance spoils the continuity of the music for the musician, will no longer be a problem.

It is essential that methods used to control noise be given consideration when designing or refurbishing venues in which live music is played, so that musicians do not have to rely on hearing protection.

2 HEARING PROTECTOR TYPES

This section briefly describes the wide range of hearing protectors that are generally available. Further information can be found in BS EN 458: 2004 and in Controlling Noise at Work: The Control of Noise at Work Regulations 2005 (HSE, L108). The advantages and disadvantage of each type of protector are described, and where appropriate the usefulness of the protector for musicians is identified.

2.1 EARMUFFS

Earmuffs consist of hard plastic cups, which fit over and surround the ears. The cups are sealed to the head by cushion seals usually filled with soft plastic foam or a viscous fluid. Tension to assist the seal is provided by a headband. The inner surfaces of the cups are lined with a sound-absorbing material, usually soft plastic foam.

Earmuffs are generally cheap and easy to use, they can provide high levels of protection in high noise environments when worn correctly, and the occlusion effect is less significant compared with earplugs, especially for earmuffs with large (high-volume) cups. [Note: The occlusion effect occurs when the ear canal is blocked which causes sound to be reflected back towards the eardrum. The occlusion effect increases the loudness perception of a person's own voice and can boost low frequency noise in the ear canal.]

The disadvantages associated with using earmuffs are that they are heavier and more obtrusive than earplugs, they typically provide higher levels of attenuation at high frequencies than low frequencies, they can be uncomfortable in hot, humid conditions, and their effectiveness can be compromised when the seal is broken by glasses, jewellery, long hair and facial hair.

2.2 EARPLUGS

Earplugs are hearing protectors that are inserted and worn in, or which cover, the ear canal in order to seal its entrance. They can be disposable or reusable, and are available in many different forms. Figure 1 shows a selection of earplugs. Earplugs may not be suitable for all wearers because of medical conditions.



Figure 1: Earplugs

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