

# Noise Exposure of Music Teachers: Hearing Protection

Malcolm Tattersall, December 2005  
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## About this document

- **This is a 2023 pdf version of an older web page**, part of a series.
- Neither content nor links have been updated. Links may not work.
- Please visit [malcolmtattersall.com.au/music/noise-exposure-of-music-teachers/](http://malcolmtattersall.com.au/music/noise-exposure-of-music-teachers/) for an introduction to the whole series.

## Associated documents

- *Noise Exposure of Music Teachers: Introduction*
- *Defining the Problem*
- *Teaching Strategies to reduce noise exposure*
- *Approximating Noise Exposure in small-group woodwind teaching*
- *Hearing Loss, Noise Exposure and the Law*
- *Hearing Protection for music teachers*
- *Links*

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*See introductory page for important information about this article.  
For the sake of brevity I have referred only to 'earplugs' in what follows,  
but the discussion applies equally to other kinds of hearing protection.*

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I have to begin by saying I see more problems than benefits with frequent, routine use of earplugs in music education.

The fundamental philosophical problem is that, in my opinion, there is virtually no educational justification for working in groups which are dangerously loud but plenty of justification for avoiding such groups; see 'On Loudness.'

The fundamental practical problem is that, by definition, they block out some of the sound that is our whole reason for what we are doing.

However, there will be situations where we can't control the sound levels and do therefore have to resort to hearing protection. That being so, we should do it as effectively as possible.

## On loudness

There are some performance situations where the music must be dangerously loud for non-musical reasons. (See Keefe's study of US marching bands. If you open my *Links* page, which will come up in a new window, you can check these references without losing this page.) There are also musical settings such as nightclubs where the music is *always* too loud and the individual musician can't change the culture (see Leitmann's study).

In the first of these situations, earplugs are the only realistic option and are highly desirable. They won't detract from the subtlety of the performance (there is none) and they will save the

players' hearing. In the second, earplugs could be good, for the same reasons, but in-ear monitors may be even better.

*These situations should never arise in music education!*

Such a flat statement may seem extreme but it is firmly based on educational values:

- We should not expose our students to harm in the course of their education.
- We should not encourage behaviour which will lead them to harm themselves in later life. If we encourage healthy eating, we should encourage healthy listening.
- There is nothing musically important or, therefore, educationally useful in volume for its own sake. Certainly, loud passages are musically important, but only because they contrast with quiet ones. A steady level of 110 dB conveys no more musical information than a steady level of 80 dB.
- As an old dictum says, individual playing improves small-group playing and small-group playing improves large-group playing but the converse is not true. That being the case, the best learning occurs in smaller groups. In particular, an ensemble that is too big for the teacher/conductor to hear every individual student provides a less-than-ideal *learning* environment, whatever its advantages as a *performing* group: students who go unheard go uncritiqued, unadvised and unencouraged.

The limit of the small-is-beautiful approach, of course, is that some kinds of ensembles have to be fairly large, and in turn fairly loud, to be complete: a full orchestra with double wind needs a certain strength of strings to balance the wind. But still, two medium-sized orchestras (or concert bands) will provide better learning for each member than one big one.

Exceptions? Perhaps the occasional performance of a large group for a large audience. Even for this, most rehearsals do not need to be particularly loud (and if they are not in a large space they should not be at performance dynamic levels).

The barriers to this approach, i.e. sound level reduction by programme redesign, are not usually going to be educational but financial (e.g. paying the teacher to conduct two bands instead of one), promotional (e.g. 'We have the best concert band in the district - look how big it is!') and perhaps motivational (e.g. 'I was in the senior concert band last year - why have I been put down to the new intermediate band?') but are far from insoluble.

## Earplugs

### The downside

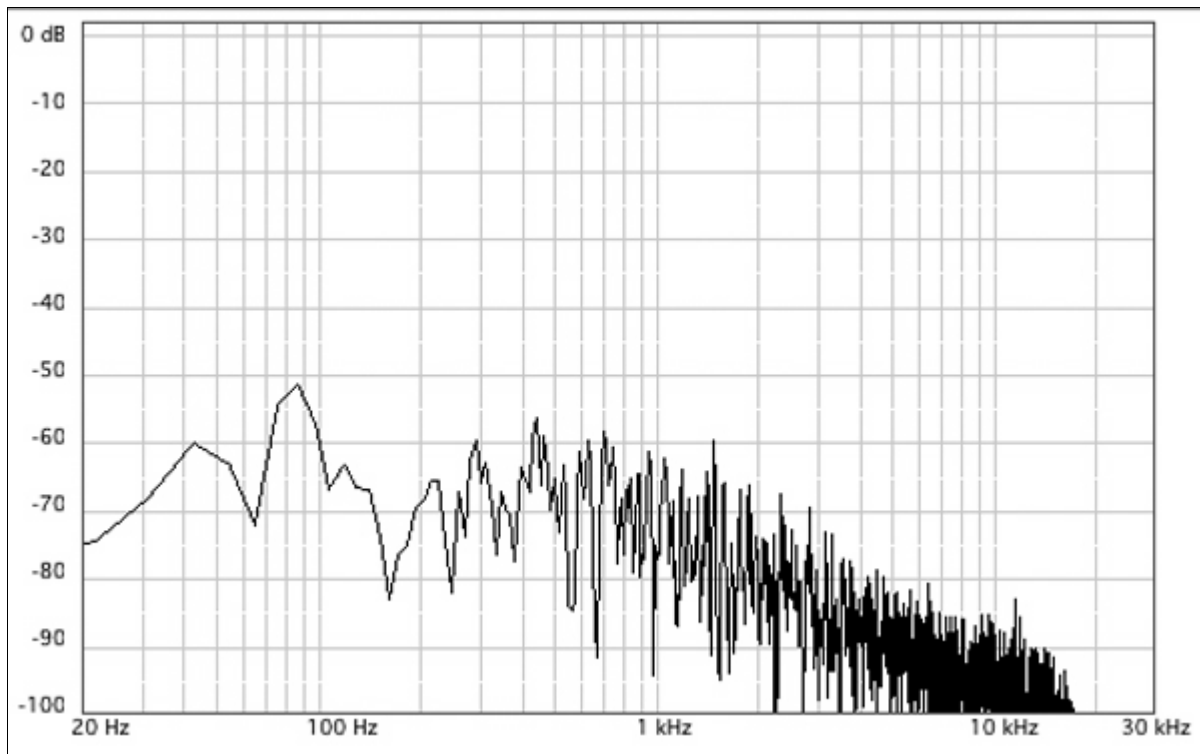
**Inability to hear quieter sounds.** The threshold of hearing is defined as 0 dB; wearing earplugs rated at 15 dB raises it to, you guessed it, 15 dB, which is equivalent to moderate hearing loss. That's for people with perfect hearing, of course; the same earplugs would give people with moderate hearing loss a foretaste of severe hearing loss while protecting them from that fate.

**Distortion by altering the frequency balance.** Normal earplugs attenuate (cut) high frequencies much more than low frequencies. The effect to a musician is to dull the sound (you can mimic it by turning the treble control on your stereo right down). To compensate, a conductor or music teacher wearing such plugs will tend to ask for a brighter tone from everyone and perhaps more volume from the higher instruments in the ensemble; a player will tend to force a brighter, edgier tone from his instrument. Both are undesirable.

'Musicians earplugs' are designed to avoid this. The best of them are very good, but they still cut

high frequencies a little more than low; the difference is 5 - 10 dB over the 150 - 6000 Hz range, and greater above that. Again, people with perfect hearing are not affected by this as badly as those with a pre-existing hearing impairment: noise induced hearing loss affects the high frequencies more than the low, so even musicians earplugs tend to exacerbate an existing high-frequency deficit rather than counterbalance it.

Do the very high frequencies really matter? Well, the highest actual note in the orchestra is about 4000 Hz, but the overtones which give each note its characteristic timbre and attack go well above that. The spectrum of a standard CD recording of a concert band (below) goes all the way to about 17 000 Hz; normal hearing response goes only a little higher. (One might ask why neither ear tests nor specifications of musicians earplugs ever seem to go above 8 000 Hz, but that's another subject.)



*Spectrum of a CD recording of a concert band (screen shot from 'Sound Studio').*

**Loss of awareness of actual sound levels.** A musician playing in an ensemble judges his dynamic level by comparing it with the other instruments he hears around him; earplugs should not change that relationship and probably don't. (Reed players may be the exception. The player's teeth on top of the mouthpiece provide an excellent bone-conduction pathway for his sound. This will not be affected by earplugs, so the perceived relationship between the player's own sound and others' sound is likely to change.)

A teacher or conductor with noise-induced (or earplug-induced) hearing loss may be able to balance levels within the ensemble almost as accurately as ever but her sense of the overall volume has been altered. She will tend not to ask for the very lowest dynamic levels (because she can't hear them and assumes the audience can't either) and may be unaware that the volume she is demanding at other times is in fact excessively high.

**Incidental noise.** I have worn custom moulded musicians earplugs while playing flute and found that every little jaw movement to adjust and control the sound created rustling, crackling noises, presumably as my outer ear flexed around the plugs. Those noises were loud enough to interfere unpleasantly with the instrumental sound. The problem would obviously not affect a conductor or anyone who played strings, keyboards, guitar or percussion. It's possible, of course,

that other woodwind and brass players do not experience it either, so other users' comments would be appreciated.

**Nuisance value.** Earplugs may be just as useful as reading glasses but they will be annoying in the same kinds of ways too: 'Excuse me while I put my earplugs in.' 'Sorry, I missed that - wait a minute while I take my plugs out and tell me again.' 'Where are they now?'

**Cost.** Plan on \$100 or more for fitted musicians plugs. Other types are much cheaper and some may be just as suitable.

## The upside

**Protection.** Protection. Protection. There is really no other reason for having earplugs, except that merely having them around may be a regular reminder of the possibility of hearing damage. If they save you from a career-ending hearing loss, they are more than worth every negative side-effect.

**Cost.** Even if they cost you \$100 they are a lot cheaper than hearing aids.

## Optimising the upside by minimising the downside

Minimising the downside will encourage the wearing of hearing protection and that will make it more effective.

Most of the downside is worse if attenuation is greater, so getting the lowest-attenuation plugs that will protect you in a given situation is a good idea. In most unamplified musical situations we would want to bring levels down from the mid to high 90s (typical for concert bands and orchestras) to the mid or low 80s (depending on duration of exposure) so the attenuation should not need to be greater than 15 dB; 6 - 10 dB may be enough. (WARNING! These are very 'fuzzy' figures. Measure your exposure and seek expert advice relevant to your own situation.)

Chandler's overview of types of hearing protection (see *Links*) is not specifically written for musicians but is otherwise an excellent starting point for further investigation. 'Getting My New Earplugs' by Kathy Russell (the second of two articles at <http://www.larrykrantz.com/hearing.htm>) is purely anecdotal but may be of interest.

In a properly designed educational programme, student exposure should not be great enough to require protection. Teacher exposure may still be a little high for safety but identifying the loudest groups in the week's routine and protecting against them (if they can't be changed) seems better than either ignoring the risk altogether or wearing earplugs unnecessarily.