Noise Exposure of Music Teachers:

Hearing Loss, Noise Exposure and the Law

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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/ for an introduction to the whole series.

Associated documents

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When I began my research into noise exposure of music teachers I was struck by the poor match between their - our - working patterns and some assumptions underlying Occupational Health and Safety (OHS) regulations. Our irregular working hours seemed particularly problematical.

In the end, determining annual noise exposure of people with irregular work patterns proved to be straightforward enough in theory, measuring it to any desired accuracy is just a matter of collecting enough data, and there are resources on the net which make it relatively easy for anyone to estimate their own noise exposure over a day or a week. The best of these, to my knowledge, is the Health & Safety Executive 'Noise-Exposure Calculator' (see *Links*). It can help you determine your daily and, from that, weekly exposure. If you work 40 weeks in the year rather than 50, you can then simply deduct 1 dB to convert weekly exposure to annual exposure - and, realistically, 1 dB is such a small amount compared to the probable measurement errors that we can ignore it.

However, even as I was discovering means of calculating annual exposure I was finding deeper problems which raised doubts about the usefulness of the results. This short article points to some of those problems without attempting to resolve them.

The causes of hearing loss

The more one reads about the causes of hearing loss, the murkier the picture becomes. There is little general agreement on the mechanisms of hearing loss or their relative importance. [1]

The reality seems to be that people's hearing deteriorates either through noise exposure or through ill-health, though these may interact with each other in ways that are poorly understood. Health usually deteriorates with age and damage from noise exposure is gradual, so

deterioration from both causes can seem to be age-related; whether there is any significant hearing loss due purely to aging seems to be an open question.

No-one seems to have quite sorted out all the contributory factors, but Toppila seems to have come as close as anyone and his thesis [2] would be a good starting point for further reading.

There is, of course, no difference as far as our ears are concerned between noise in the workplace and noise outside it.

The science behind the law

OHS literature usually attributes hearing loss to 'age-related hearing loss' (ARHL) or to 'noise-induced hearing loss' (NIHL), and considers that most or all NIHL is occupational. 'Presbycusis' is also mentioned; it is generally taken to be synonymous with ARHL. It is possible that what most OHS literature calls ARHL would be more correctly thought of as health-related hearing loss plus non-occupational noise-induced hearing loss, and NIHL as occupational noise-induced hearing loss.

OHS statistics are based on long-term (multi-year) exposure to relatively constant workplace sound levels: the hearing of workers exposed to high noise levels is compared to that of workers exposed to lower levels but noise exposure outside the workplace is treated as negligible. Different kinds of workplace noise (steady, variable or impulsive), different shift lengths and different exposure/recovery cycles are all reduced to 'equivalent' values.

OHS legislation based on these statistics then sets a limit in such a way that, on average, most workers will not lose much of their hearing at work so long as their exposure is under that limit ('most' and 'much' being determined primarily by the political willpower where and when the regulations were drawn up).

The final OHS legislation, in Australia at least, then regulates *daily* exposure. That is perfectly reasonable for those who work under the same conditions every day of the year, since their daily exposure will equal their annual exposure, but introduces another source of potential error for the rest of us.

There are unknowns, compromises and approximations at every step along this path.

Aural health and legal liability

As individual musicians we need to know risk factors, inside *and* outside our workplaces, so that we can minimise them. My procedure in *Defining the Problem* was to develop the best approximation of annual exposure that I could, since total annual exposure (whatever its source) seemed, and still seems, the best indicator of the risk of noise-related hearing damage. In spite of all the uncertainties I stand by my statement there that an annual exposure of 80 - 85 dB is cause for concern and 85 - 90 looks likely to cause harm.

We can protect our hearing by ensuring that our annual exposure is below these levels, but when we call on OHS legislation for support we have to play by a different set of rules: we move from considering our aural health to considering the employer's legal liability for injury sustained at work. The paradigms are fundamentally different, so some mismatch between outcomes seems inevitable.

My reading suggests that the difference has skewed OHS research and that a public health approach to NIHL might produce more realistic results than the current legal liability approach. Pursuing the issue further is beyond my resources. Fortunately, it is also beyond my present

needs: we (as workers) and our employers must comply with the OHS legislation so questions about its basis are, pragmatically, irrelevant.

To continue, then: when we move from 'risk' to 'regulations,' we find our employers are required to ensure that our exposure on any one day is less than an 8-hour equivalent of 85 dB. The effect will be to reduce annual exposure for workers with irregular work regimes, since it means that over-exposure one day per week cannot be 'traded off' against low exposure on the other days but must be reduced. This is actually to our benefit, since the net effect will be to reduce our annual exposure in the workplace to an equivalent of less than 85 dB.

On the other hand, our often-high quasi-professional exposure outside the workplace will not be taken into account at all under OHS regulations, no matter how essential it is to our work.

If we are sensible about our out-of-hours activities, one effect will compensate for the other and our hearing will be adequately protected by the legislation.

Our OHS standards may not reflect the real risks of our highly variable working conditions with any great accuracy. They are, however, the best available and the only legal basis for our protection.

Notes

See *Links* page for details of all references.

1 Summaries of the literature by Esko Toppila (*A Systems Approach to Individual Hearing Conservation*, especially pp 13 - 23) and Patrick Hayes (*Noise induced hearing loss in music educators*, especially pp 5 - 11) make this clear. I am not relying only upon these two, but comparative quotations from other reading would take more space than their usefulness would justify.

2 *A Systems Approach*