Drawing the (Guide)Lines: The Requirement for Sufficient Noise Exposure (R2) in the Coles (2000) and Moore (2022) NIHL Guidelines

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Those practising in the field of noise induced hearing loss ("NIHL") will be familiar with the Coles, Lutman and Buffin Guidelines 2000 (the “CLB Guidelines”) and the later Lutman, Coles and Buffin Guidelines 2015 (the "LCB Guidelines") published to assist medical and legal practitioners in the diagnosis and quantification of hearing loss, respectively.

In February 2022, a new co-authored paper was published, proposing modifications to the CLB/LCB methods for diagnosis and quantification and of NIHL: “The Moore, Lowe and Cox Guidelines for Diagnosing and Quantifying Noise-Induced Hearing Loss (2022)” (the "MLC Guidelines").

This blog post deals with the first aspect of that paper: the proposed modifications to the requirement for sufficient noise exposure (“R2”) i.e. the required lifetime noise immission level (“NIL”) in the context of industrial deafness.

Every individual will experience a degree of age-related hearing loss (“AAHL” / presbycusis) as they age. The common difficulty for the court is how to determine whether an individual has suffered NIHL, as distinct from presbycusis or any other organic cause of hearing loss.

The CLB Guidelines

The solution proposed by the authors of the CLB Guidelines is a threefold methodology:

First, to determine whether the individual has suffered a high-frequency hearing impairment. The hair cells in the cochlea most likely to suffer noise damage are those that translate high-frequency impulses (in particular, the 4kHz frequency) (R1).

Secondly, to determine whether an individual has been exposed to noise of a level capable of causing material hearing loss in the majority of individuals (R2).

Thirdly, to compare the individual’s hearing threshold levels (“HTL”) to the average HTLs measured from a sample of a non-noise exposed population (based on the ISO7029 (1984) data set) and ascertain whether there is any excess loss. The excess loss is often in the form of a large excess at 4kHz forming a “*notch*” on the audiogram, however if the individual has also suffered hearing loss from the natural process of aging, it is often in the form of an excess loss spread across the higher frequencies (typically 3-6kHz) forming a “*bulge*” on the audiogram (R3).

Naturally, the presence of hearing loss in excess of that expected by age alone does not mean that it has been noise-induced. It may simply be part of that individual's pattern of hearing or there may be other explanations for non-AAHL (such as consumption of ototoxic drugs or repeated and unresolved ear infections). It is not controversial that the susceptibility of any given individual to NIHL cannot be predicted and is highly variable.

The MLC Guidelines

The authors of the new MLC Guidelines propose two modifications to requirement R2:

1. First, the required lifetime noise immission level ("NIL") should be reduced to 90dB(A) in respect of exposure to steady broadband noise, or 86dB(A) if the individual was exposed to impulsive sounds i.e. hammering (for individuals who have participated in any active military service there is an assumption that they have been exposed to sufficient noise to cause hearing damage – not discussed in this post).

This differs from the CLB Guidelines which state that at least 50% of individuals exposed to 100dB(A) NIL (R2(a)) will be likely to have suffered a measurable degree of hearing loss. However, it was recognised that "*substantial amounts of NIHL can be caused in a minority of persons exposed to <100dB(A) NIL*" and for those more than averagely susceptible individuals whose audiometric evidence of noise damage is stronger (a 20dB notch or bulge), a less stringent noise exposure requirement is applied, of 90dB(A) NIL.

2. Secondly, that there is no lower limit on the noise to which the individual has been exposed.

This differs from the CLB Guidelines in which it is explained in Note 7 that "$L_{EP,d}$ *noise levels below 85dB(A) in fact cause very little NIHL. With low noise levels, the noise immission calculations tend to over-estimate the potential auditory hazard*." Therefore any noise dose below 85dB(A) is discounted from the NIL calculation.

The Lifetime Noise Immission Level (NIL)

Steady Broadband Noise

It is to be noted that the authors of the MLC Guidelines declare in the introduction to their paper that their motivation for writing the paper is their perception that the diagnostic criteria applied by the courts (the CLB Guidelines) are unfair as many Claimants who claim a history of noise exposure are unsuccessful in their claims.

The authors of the MLC Guidelines suggest that criterion R2 is "*excessively stringent*" because "*If a given NIL is sufficient to produce NIHL in 50% of individuals, then it follows that at least some individuals would experience NIHL for lower exposure levels. Fairness to a Claimant requires only that the noise exposure should be sufficient to produce NIHL in a reasonable proportion of individuals.*" They suggest that "*a NIL of 100dB(A) is probably higher than the NIL required for 50% of individuals to experience NIHL*" and propose a "*NIL of 90dB(A) is appropriate, since this will lead to NIHL in a small proportion of individuals*".

The authors reference the 1974 Passchier-Vermeer meta-analysis in support of this proposition, specifically citing that a noise dose of 85dB(A)$L_{EP,d}$ for 10 years (a NIL of 100dB(A)) correlated with a median hearing loss at 4kHz of 17dB and a noise dose of 80dB(A)$L_{EP,d}$ for 10 years (a NIL of 90dB(A)) correlated with a median hearing loss of 11dB at 4kHz on the 10th percentile. It is worth observing (as indeed it is observed later in the paper) that a lower percentile corresponds to poorer than typical hearing, so 90% of individuals will have better hearing than the 10th percentile.

The fact that, as the CLB Guidelines explain, a "*minority of persons*" might experience NIHL with a lower noise dose is not ignored in the CLB Guidelines and they are accounted for by the drafting of separate criteria. The Passchier-Vermeer (1974) meta-analysis had been around for decades when the CLB Guidelines were formed, was referenced in the CLB Guidelines, and forms the basis of the LCB (2015) quantification method.

The majority are assessed by reference to the criterion R2(a), reflective of the reality that the majority of individuals will have experienced some measurable hearing loss after exposure to a total lifetime noise immission level of 100dB(A).

The exceptional minority who are more than averagely susceptible to hearing damage from exposure to a much lesser noise dose than would typically be required to cause damage, are assessed by reference to the criterion R2(b). R2(b) requires determination that the individual is more than averagely susceptible to hearing loss i.e. they display a large, 20dB notch or a bulge, before the less stringent exposure requirement is applied.

It is the writer's view that it would be illogical to apply this less stringent criteria to all cases when it is recognised by the authors of both papers that it is only a small minority of persons who will suffer damage to their hearing as a result of a much lower noise dose amounting to 90dB(A) NIL.

It is interesting that the authors of the MLC Guidelines have proposed a method which simply draws a lower line than the CLB Guidelines, as opposed to a sliding scale approach between 90 and 100dB(A) NIL, which, in the writer's experience, is not uncommonly advocated for in medical expert reports tendered on behalf of Claimants. Such an approach would undoubtedly introduce more complexity into causation arguments centring on R2 and lacks the certainty of the 100dB(A) and 90dB(A) NIL "cut offs". On both sides of the argument there is an inclination to draw a hard line somewhere, so that the question for the courts is whether there is sufficient evidence to move away from methodology which has been followed in the absence of any new scientific evidence.

Impulsive Sounds

There is then a further proposition that the requirement for noise exposure be reduced in cases where individuals have been exposed to impulsive sounds (e.g. hammering) as this can be liable to cause more damage.

It is recognised by the authors of the MLC Guidelines that there is no agreed consensus on how to measure and quantify noise exposure from impulsive sounds. Nonetheless a 4dB reduction in the lifetime noise exposure requirement is proposed based on a review of existing data (Shi et al. (2021)).

There are perhaps more questions than answers with this suggested modification. Take, for example, Claimant 1 who worked in a factory perhaps hammering a metal sheet for an hour a day every day of the week, striking the hammer, say, once every 5 seconds. Then take Claimant 2 who worked in a motor vehicle garage using an impact wrench on and off during the day but perhaps only 16 times in a day when he did use it, which might have only been one day a week. Have both Claimants been exposed to noise which is so much more damaging than steady broadband noise so as to warrant reducing the requirement for sufficient noise exposure?

Then let us assume that Claimant 1 only did this work for a year or two, perhaps in an internship, before changing into a role where he did not use a hammer (but still alleged exposure to excessive noise), and that Claimant 2 decided after 5 years that being a motor vehicle mechanic wasn't for him and he retrained as a lathe operator (again, still alleged exposure to excessive noise). Are they both treated as having been exposed to noise which is so much more damaging than, say, Claimant 3 who worked his entire life in a textiles factory, so as to be subject to the lower 86dB(A) NIL requirement suggested by the MLC Guidelines?

Or what about Claimant 4 who worked as a general construction labourer for a council, sometimes using a breaker, sometimes driving diesel powered vehicles and other times using hand power tools – does he qualify for the lower exposure requirement given that some of the noise he was exposed to was impulsive?

It is the writer's view that this proposed modification introduces unworkable uncertainty into the issue of medical causation which is already fraught with technical arguments around the calculations performed and the interpretation of evidence.

The Noise Dose Lower Limit

On first reading, it is easy to miss that the authors of the MLC Guidelines "*recommend an NIL of 90dB(A), with no lower limit on $L_{EP,d}$, in all cases of exposure to broadband steady noise*". There is little explanation and no analysis of why the authors deem it appropriate to include all 'steady broadband noise' to which an individual has been exposed in their lifetime and practical difficulty in determining the same.

In fact, whether there should be a "cut off" for the noise dose to be included within an NIL calculation has previously

been considered by the courts.

Case Law

In the landmark Nottinghamshire and Derbyshire Textile Deafness Litigation, heard by HHJ Inglis in the Nottinghamshire District Registry of the High Court in 2006, the medical literature regarding hearing loss from noise damage was provided to the court, which also heard evidence from a number of well-known experts including Mr McCombe, Dr Rajput, Dr Yeoh, Mr Jones, Mr Parker and Professor Lutman (co-author of the CLB 2000 paper).

One of the issues for consideration was whether noise exposure between 80 and 85dB should be taken into account in the calculations for diagnosis of NIHL; the CLB Guidelines authors' position being that it should not.

Before HHJ Inglis, there was no sound evidence of what risk there was to hearing at levels of exposure between 80 and 85dB(A)$L_{EP,d}$ (it was accepted that there was no material risk below 80dB(A)$L_{EP,d}$). On the one hand it is obvious, given the graded risk from 85dB(A)$L_{EP,d}$ upwards, that the risk of hearing damage moves in a continuum and it cannot necessarily be ascertained at what particular decibel there is no risk to any given individual; on the other hand, there must be a biophysical line somewhere because a hypothetical individual, only ever spoken to in whispers will not be noise deafened.

HHJ Inglis concluded (*obiter*) as follows ([26]-[27]):

"*What is plain is that the risk of identifiable hearing loss from noise at those levels is very low, and there is a degree of uncertainty about whether the figures are robust enough to translate into actual losses to be expected in individual people at all.*

…

Nonetheless, the description given to the risk to hearing of exposure below 85dB(A) by Professor Lutman in one of the publications set out above as "minimal" is one that I accept and adopt.

The view I have reached has implications both for diagnosis of hearing loss in individual cases, and for breach of duty at exposure under 85dB(A). The identification of particular noise levels has no part in the way that the Claimants put their case. However Mr Hendy QC recognised that if the court came to a conclusion about the degree of hearing loss expected at such noise levels, it might express that conclusion first, thereby in effect confining the case on liability to noise levels of 85dB(A) and above. I do come to such a conclusion, so that in an area where the hearing loss to be expected can be regarded as marginal, or minimal, or so small as not to be identifiable in individuals but only in a statistical sense there could in my view be no liability at common law for breach of duty in exposing employees at such levels."

When the case was appealed to the Supreme Court, the Judge's comments were noted ([30]-[31]):

"The statistically identified risks at levels between 80dB(A)$L_{EP,d}$ (currently, at least, identified with no risk) and 90dB(A)$L_{EP,d}$ do not enable any easy distinction to be drawn within that bracket, if the elimination of all statistical risk is taken as a criterion.

... the respondent did argue before the judge that 80dB(A)$L_{EP,d}$ was the only acceptable limit. But, despite this, the judge concluded that any risk below 85dB(A)$L_{EP,d}$ was minimal (para 26), and that the risk between 85dB(A)$L_{EP,d}$ and 90dB(A)$L_{EP,d}$ was at the relevant times an acceptable risk for reasonable employers without greater than average knowledge to take. The judge, correctly, did not resolve the issues before him by considering statistical extrapolations at low levels of exposure, but by forming a judgment on the whole of the expert, documentary and factual evidence adduced before him."

The Regulations

There are, of course, "cut offs" within the statutory regulations governing occupational noise exposure. The Noise at Work Regulations 1989 (in force from 1 January 1990 to 5 April 2006) introduced two "*action levels*" (reg 2) of 85dB(A) ("the first action level") and 90dB(A) ("the second action level") to frame the duties owed by employers to their employees. They imposed a duty on employers, where employees had a daily personal noise exposure at or in excess of 85dB(A), to take steps including providing employees with hearing protection upon their request (reg 8).

The Control of Noise at Work Regulations 2005 came into force on 6 April 2006, changing and reducing the action levels to a daily or weekly personal exposure of 80dB(A) and peak sound pressure of 135dB(C) ("the lower exposure action value") and 85dB(A) and peak sound pressure of 137dB(C) ("the upper exposure action value"). The result is that employers since have been under a duty, where employees have a personal daily or weekly personal noise exposure at/in excess of 80dB(A) to, provide hearing protection upon their request: for employees with a personal daily or weekly personal noise exposure at/in excess of 85dB(A), hearing protection must be provided (reg 7).

The current noise regulations reflect the known risk of damage to hearing from personal daily/weekly noise exposures at or in excess of 85dB(A) but reflect the uncertainty of risk to hearing from personal daily/weekly noise exposures of 80-84dB(A), suggesting precautionary measures to be adopted in this range.

To disregard exposure to noise below 85dB(A) may well not reflect the true reality of risk of hearing damage between 80 and 85dB(A). However, as both papers' authors recognise, the line must be drawn somewhere. Parliament and the courts are well used to drawing lines, which, in many cases, are far more arbitrary or ill-justified than the evidence-based approach of disregarding noise exposure below 85dB(A) when performing calculations to ascertain the presence of NIHL.