

MUSIC, NOISE AND HEARING: HOW TO PLAY YOUR PART

A GUIDE FOR MUSICIANS – SUMMARY

HOW'S YOUR HEARING?

- Do you avoid parties and noisy restaurants because you can't hear conversations?
- Do you often have to ask people to repeat things, or spell things out?
- Do people say you have the TV on too loud?
- Do you listen to music or podcasts on public transport?
- Do you ever worry you're playing / singing out of tune? Or too loudly / too quietly?

Whatever the state of your hearing, the message is the same: you must look after your ears. For you as a musician they are your most important tools of the trade, and your hearing health is vital to your quality of life.

This guide is for musicians playing acoustic instruments and singers working with orchestras, as well as being a reference tool for ensemble and venue managers, sound engineers and teachers. It shows how you can look after your hearing inside and outside your noisy workplace. It's about how you can maintain the highest artistic standards and ensure a long, healthy career as a musician.

GOOD HEARING IS VITAL FOR YOUR CAREER AS A MUSICIAN AND FOR YOUR QUALITY OF LIFE

You only get one chance with your ears. But there are many things you can do to look after the hearing you have:

- Get into good habits – protect your hearing inside and outside work.
- Invest in your hearing health and learn more about your ears.
- Don't ignore any problems.
- Talk to your colleagues. Sharing the responsibility makes things easier.

SOUND, HEARING AND THE MUSICIAN'S EAR

WE HEAR WITH OUR BRAIN, NOT WITH OUR EARS

- Outer ear (*pinna*): captures vibrations and sends them down the ear canal to the ear drum; two for stereo sound.
- Middle ear: eardrum oscillates and three tiny bones transmit vibrations to the inner ear; stapedius muscle and Eustachian tubes located here.
- Inner ear (part of the brain): cochlea translates signals and sends them to the brain; vestibular system for balance.

AGE AND NOISE: A POTENT COCKTAIL

- Ageing: you lose the ability to hear the higher frequencies as you get older. You can't do anything about that.
- Noise: you lose the ability to hear 4-6kHz (including the consonants in speech); noise can trigger tinnitus or hyperacusis. You *can* do something to prevent the effects of noise.
- The combination of age and noise will exacerbate hearing problems.

OUTER AND MIDDLE EAR PROBLEMS

- Conductive hearing loss
- Ear infections and perforated eardrum

INNER EAR PROBLEMS

- Auditory fatigue
- Temporary and eventually permanent threshold shift
- Sensorineural hearing loss

HEARING PROBLEMS AND WHAT YOU CAN DO ABOUT THEM

- Act sooner rather than later if you have any concerns.
- Get the most out of your occupational health provider, GP and/or audiology service.
- By all means use the internet to learn about hearing, but remember it is not specific to your particular case and it is not a substitute for medical help.

DON'T PLAY RUSSIAN ROULETTE WITH YOUR EARS

You can reduce the likelihood of damaging your hearing if you:

- reduce the volume of the sounds to which you are exposed
- reduce the duration of the exposure (by giving yourself breaks, and by saving up your allocation for when it really matters)
- mark up the score
- wear hearing protection whenever you can.

YOU CAN'T SWITCH YOUR EARS OFF

- We often don't realise what our noise exposure is.
- Though we may like the music we make, we can't assume it's not harming us.
- If we don't like it we can become more fatigued and stressed by it.

DESCRIBING AND MEASURING 'SOUND'

- The *sensory* experience that can't be measured but can be described subjectively.
- The *physical* phenomenon that can be measured in terms of pitch, sound energy (intensity) and duration.
- Sound can be measured in terms of pitch, intensity and duration.

PITCH ESSENTIALS

- Pitch is measured in *Hertz* (Hz) or cycles per second.
- The human hearing range is 20-2,000Hz (less as we get older).
- Noise-induced hearing loss (4-6kHz) means missing out on upper harmonics in music and consonants in speech.
- High frequencies are easier to block out.
- Certain sounds can tire you (eg. a pure tone or a dissonance).

DECIBEL ESSENTIALS

- Sound intensity is measured in *decibels (dB)*.
- A reduction or increase of 3dB is a halving or doubling of sound intensity.
- Key figure to remember: 85dB(A) over an eight-hour period.
- Some examples – typical sound levels taken over a short duration:
 - 20dB(A) – rustle of leaves in a forest
 - 80dB(A) – *solo* piano, cello, double bass
 - 85dB (A) – *solo* violin, oboe playing *mf*
 - 90dB(A) – *solo* trumpet, horn playing *mp*
 - 130dB(C) – cymbal crash.

DURATION ESSENTIALS

- Leq (or LAeq) refers to the level over a given period of time (T).
- Lepd is exposure calculated over an eight-hour day: aim for 85dB(A) Lepd.

MAKE FRIENDS WITH THE 3DB RULE

3dB is a doubling or halving of the sound pressure level.

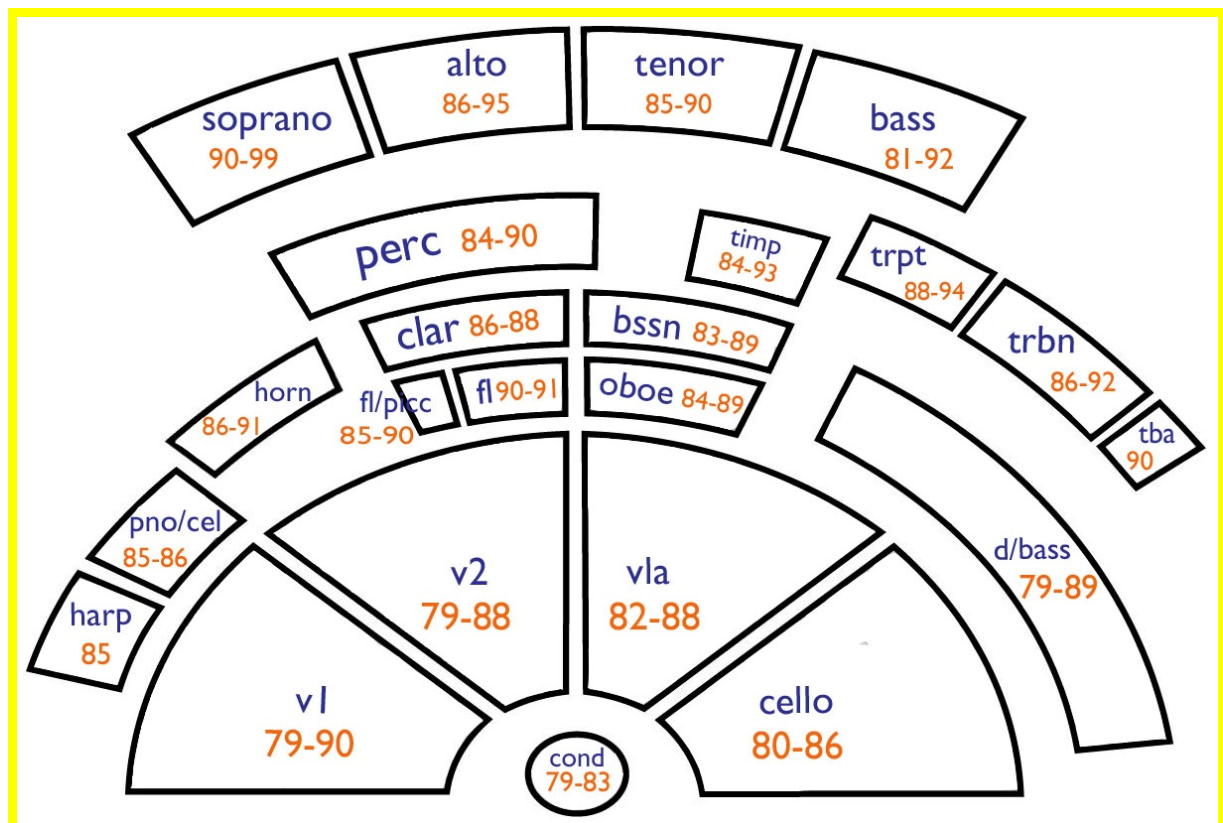
- *Doubling* the number of (identical) sound sources *increases* the level by 3dB:
 - if 1 trumpet @ 1m distance = 93dB
 - 2 trumpets @ 1m distance = 96dB
 - 4 trumpets @ 1m distance = 99dB.
- *Doubling* the distance from a single sound source *reduces* the level by c.3dB:
 - if 1 trumpet @ 1m distance = 93dB
 - 1 trumpet @ 2m distance = 90dB
 - 1 trumpet @ 4m distance = 87dB.

- Doubling the duration increases your exposure by 3dB, so to halve your daily dose you need to halve the exposure time:
 - 85dB over 8hrs is the equivalent of:
 - 88dB over 4hrs (time to reach 85dB Lepd)
 - 91dB over 2hrs
 - 94dB over 1hr
 - 97dB over ½hr (eg solo trumpet; if you reach these levels so quickly you must consider what other exposure you have during that day).

IT ALL ADDS UP

- Consider measuring your noise dose inside and outside the workplace.
- Your ears don't differentiate between 'at work' and other exposure.
- You *do* have some control over your daily exposure.
- You can reduce your daily dose by using earplugs.
- By taking off 3dB you halve your daily dose.

WHAT'S YOUR DOSE? SOME TYPICAL EXPOSURE FIGURES



Ranges given above are based on typical daily doses (Lepd) for two-session days in BBC Maida Vale studios or Studio 7, Manchester, of rehearsals or studio concerts of classical repertoire (not recording sessions, not concert-hall concerts and not amplified repertoire). String readings come from tutti players; violin I upper figure is high because some readings were taken from in front of percussion or piano.

Some typical noise measurements for non-work activities (Leq over a period):

Cycling (½hr in Central London)	77dB(A)
Motorbike (½hr on A40)	93dB(A)
Quiet coach on a train	79dB(A)
Tube in rush hour (1hr on Central Line)	83dB(A)
iPod levels (figure to add when listening on public transport)	Add 4-10dB(A)
Busy canteen (1hr)	85dB(A)

THE NOISE REGS AND YOU: PUTTING IT INTO PRACTICE

THE NOISE REGULATIONS ARE FOR YOU

- Take advantage of them to help you to look after your hearing (and that of your colleagues and pupils), whilst maintaining the highest artistic standards.
- They apply whether you are employed on a contract or as a freelancer.

WHAT DO THE NOISE REGULATIONS SAY?

- Regulation 4 sets out the exposure levels.
Five Regulations require action on the part of the employer, but to translate them in terms that relate to you as a musician...
- Assessing risk: how to identify what might go wrong? (Reg 5)
- Controlling noise: what can be done about it? And what can you do? (Reg 6)
- Hearing protection: what are your options? (Reg 7)
- Hearing health surveillance: how can you invest in your hearing? (Reg 9)
- Instruction, information and training: how do you find out more? (Reg 10)

THE FIGURES

- Daily dose (Lepd) over an eight-hour working day:
80dB(A) = LEAV (Lower Exposure Action Value)
85dB(A) = UEAV (Upper Exposure Action Value)
87dB(A) = ELV (Exposure Limit Value) (with hearing protection).
- Peaks:
135dB(C) = LEAV
137dB (C) = UEAV
140dB (C) = ELV
- LEAV: *at the Lower Exposure Action Value the employer must provide information and training and make hearing protection available.*
- UEAV: *at the Upper Exposure Action Value the employer is required to do as above plus implement reasonably practicable measures to reduce noise exposure, to enforce the wearing of hearing protection and provide hearing health surveillance.*
- ELV. *The Exposure Limit Value is what you need to aim below when taking into account the effects of hearing protection.*

HEALTH SURVEILLANCE ESSENTIALS

- Invest in your hearing health and learn how best to protect yourself.
- Take advantage of regular hearing tests if your employer offers them.
- Don't put off a visit to your GP or an audiologist.
- Ask as many questions as you need to at the hearing test.
- If you have a problem, help is available and you *can* carry on making music.

PROTECTING YOUR HEARING

- Your ears are an important tool of your trade – invest in them:
 - at work (rest, earplugs),
 - on tour (noise-cancelling headphones, especially when flying),
 - at leisure (protect your ears during noisy hobbies and when swimming).

EARPLUG ESSENTIALS

- Use just enough protection (don't reduce your exposure more than you need to).
- Find something that suits you (your ears, your instrument).
- Always carry your earplugs around with you.
- See it as a long-term project. Don't expect to get used to them immediately; your brain needs time to adjust.
- Don't expect to cope if you stick them in just before you go on stage.
- Use them for private practice and rehearsals.
- Use them to protect your ears in other situations (plane, tube, amplified concerts).

TYPES OF HEARING PROTECTION

- Foam disposable (cheap, but can over-protect)
- Pre-moulded re-usable (more subtle protection)
- Custom-moulded (vented version also available).

RISK ASSESSMENT: DOING YOUR BIT

- A risk assessment is more than a form; it's the practical steps that are being taken to protect your hearing.
- Everyone has a role to play in health and safety.
- Be an extra pair of eyes and ears.
- Remember, you have a unique perspective on the noise risks in a project.
- Speak up if you have concerns.

CONTROLLING NOISE: WHAT CAN YOU DO?

- There is rarely one single solution.
- Two things to aim for: actual reduction in dBs *and* giving your ears a rest.
- Technical solutions: screens, layout.
- 'Soft' solutions: marking up the score, breaks, careful practice and warming up, communication.
- Earplugs as a last resort.

ACOUSTIC SCREENS

- Typical reduction: 3-6dB(A) if used properly. Take care not to convert your own reduction into an increase for the player behind you.

SHIFTING YOUR POSITION SLIGHTLY

In theory, 3dB reduction for every doubling of distance from the sound source.

MARKING UP THE SCORE

It won't affect Lepd but you can avoid peaks of 120dB and over (you can also use it as a cue to put your earplugs in).

HOW YOU SPEND YOUR BREAKS

You could reduce your daily exposure by 1-2dB if you made a choice to spend your breaks quietly.

HOW YOU WARM UP/DOWN/PRACTISE

Don't overdo it. Spare your ears (and those of your colleagues) and find other ways of practising.

COMMUNICATION

Can take many forms, for example, a 3dB reduction for any conversation that results in a doubling of distance. There are also benefits to workplace harmony if you discuss potential problems and how you might be affected.

REDUCING YOUR NOISE EXPOSURE OUTSIDE WORK

Noise reduction figure varies but reducing your non-work exposure means you can save up your noise exposure for when it matters most.

LOOKING TO THE FUTURE

It won't make a difference to your own hearing, but you can help the next generation of musicians and encourage them to get into good habits from the outset.

TRAINING AND INFORMATION ESSENTIALS

- It's vital to be aware of your noise exposure and its effects.
- Employers are obliged to provide information and training related to noise and hearing.
- Music, noise and hearing are fascinating subjects and vital to your career as a musician. Learn more, and spread the word.

WHAT YOU SHOULD FIND OUT FROM YOUR MANAGERS

- Likely noise exposures.
- What's being done to reduce exposure.
- What can you do for yourself (earplugs, screens, mark up the score).
- What to do if there is a problem.

WHAT YOU SHOULD FIND OUT FOR YOURSELF

- Your other non-work exposure.
- Your family hearing history.
- How we hear and how to look after your ears.


JUDGING THE VALUE OF INFORMATION

Ask:

- Who wrote it?
- Why?
- Is it relevant for your circumstances?

FINALLY ...

Health and safety is everyone's responsibility. The Noise Regs were introduced to protect you, and though they focus on managers' responsibilities, there's a lot you can – *must* – do for yourself. And you should take opportunities to pass on good habits to colleagues and the next generation of musicians.



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