Noise exposure
Noise exposure

This factsheet is part of our **Ears and ear problems** range. It is written for people who would like to know how to protect their hearing and prevent hearing loss and tinnitus caused by excessive noise. You may also find this factsheet useful if you have noise-induced hearing loss or tinnitus and would like to know more about your condition.

Read this factsheet to find out:
- How do we hear?
- What are the different types of hearing loss?
- How does noise cause hearing loss?
- How can I tell if sounds are too loud?
- How does noise exposure affect your hearing?
- What can I do about noise-induced hearing loss and tinnitus?
- How do I protect myself from noise exposure at work?
- What about noise exposure outside work?
- How can I protect my children’s hearing?
- What kind of equipment can protect my hearing?
- Can I get compensation for noise damage to my hearing?
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- Where can I get further information?

If you would like this factsheet on audio tape, in Braille or in large print, please contact our helpline – see front page for contact details.

**How do we hear?**

The ears are your organs of hearing and balance. They have three sections: the outer ear, middle ear and inner ear.

Soundwaves enter the outer ear (the pinna and external ear canal) and travel down the ear canal until they reach the eardrum. The sound makes our eardrum vibrate, and this passes the soundwaves into the middle ear. The middle ear is an air-filled space that links the outer ear with the inner ear.

Within the middle ear there is a chain of three tiny bones stretching from the eardrum to the cochlea (the hearing organ within the inner ear). It is these three bones that pick up the
vibrations of the eardrum and mechanically conduct the soundwaves through the middle ear to the cochlea.

The cochlea is a fluid-filled chamber that looks a bit like a snail shell. When the soundwaves enter the cochlea, the fluid moves and tiny sensory cells called hair cells pick up the movement and trigger an electrical signal in the auditory nerve. There are more than 15,000 hair cells in the cochlea and they get their name from tufts that stick out of the top. Different hair cells pick up different parts of the sound spectrum depending on where they are positioned in the cochlea. The auditory nerve then passes electrical signals to the brain, which recognises them as sounds.

What are the different types of hearing loss?
There are two main types – conductive or sensorineural. Some people have both conductive and sensorineural hearing loss, known as mixed hearing loss. There are also different degrees of hearing loss, ranging from mild to profound.

Conductive hearing loss
Conductive hearing loss is due to a mechanical blockage or failure preventing sound vibrations from passing freely through the outer or middle ear. For example, sound will not be passed to the cochlea properly if the eardrum or middle ear bones are damaged, or if there is a build-up of wax in the ear canal.

Sensorineural hearing loss
Sensorineural hearing loss is caused by damage to the hair cells in the cochlea. These cells cannot be repaired or replaced. Another cause of sensorineural hearing loss is damage to the auditory nerve, though this happens very rarely.

One effect of sensorineural hearing loss is ‘recruitment’. This means that you find it difficult to hear quiet sounds, yet find loud sounds uncomfortable. For more information, see our factsheet Hyperacusis.

How does noise cause hearing loss?
Noise can damage the sensitive hair cells in the cochlea. The loss of hearing is likely to become permanent if your exposure to noise is long or is repeated on a regular basis.
Temporary hearing loss
This is sometimes referred to as a ‘temporary threshold shift’. You are likely to notice this as a temporary dullness in your hearing after you have been exposed to loud noise. Your hearing may recover, normally within about two days. But this can vary depending on the loudness of the noise, and how long you were exposed to it. Temporary dullness of hearing is a sign that you have put your hearing system under stress. If you continue to expose your ears to such high noise levels, you risk permanent damage and permanent hearing loss.

Permanent hearing loss
Otherwise referred to as a ‘permanent threshold shift’ – if your hearing does not recover completely within two days, the remaining loss is considered to be permanent. Your hearing can be affected permanently due to either long exposure to noise or sudden acoustic trauma.

Noise-induced hearing loss
This happens when you have been regularly exposed to damaging levels of noise over a long period of time. You gradually get a sensorineural hearing loss that is usually most severe in the high frequencies (pitches). The hearing loss will be similar in each ear and will get worse if you continue to be exposed to the noise. Sometimes, you will not notice the effect on your hearing until years after you were first exposed to the noise.

Acoustic trauma
This happens when you are exposed to a very high sound level for a short time – for example, to an explosion or a gunshot. This type of sound can cause sudden hearing loss that is often more severe in the ear closest to the sound. Any resulting hearing loss will usually be sensorineural. In some cases, a very intense sound can perforate your eardrum (cause there to be a hole in it). However, there is a good chance this will heal in time.

Tinnitus caused by noise
Tinnitus is a medical term to describe noises that people can hear in one ear, both ears or in the head, such as ringing, buzzing or whistling. The sounds heard can vary from person to person, but the common link is that they do not have an external source.

Sometimes tinnitus is the first sign that your ear has been damaged by noise. You may get tinnitus before you notice any effect on your hearing. The tinnitus can occur suddenly or very gradually. For some people it can be temporary, but continued exposure to loud noise
may make it permanent. Contact our helpline for information about how to manage noise-induced tinnitus, or see our range of tinnitus materials on the website.

**How can I tell if sounds are too loud?**

If you can’t talk to people about two metres away without shouting because of background noise, this could mean noise levels are hazardous.

If you have been to a club, gig or concert and found you cannot hear properly or had ringing in your ears for a few hours afterwards, that is a sign the sound was loud enough to damage your ears permanently if you go to these places often. You may already have developed a slight, but permanent, hearing loss. If the level of sound hurts your ears, you should leave.

Noise levels are usually measured in dB(A), a decibel scale that reflects the sensitivity of human ears to different levels and pitches of sound. Here are some examples:

- 20dB(A) – a quiet room at night
- 40dB(A) – a quiet sitting room
- 60dB(A) – ordinary spoken conversation
- 80dB(A) – shouting
- 110dB(A) – a pneumatic drill nearby
- 130dB(A) – an aeroplane taking off 100m away
- 140dB(A) – the level at which noise causes pain for most people, although some people may find lower levels painful too

Long exposure to sounds over 80dB(A) can damage your ears.

**How does noise exposure affect your hearing?**

When you have a hearing test, the chart that shows your hearing levels is known as an audiogram. If your hearing loss is caused by exposure to noise, tests will produce a characteristic pattern. The typical pattern consists of a ‘dip’ in your hearing in the high frequencies (at around 3-4 kHz), which means that you can’t hear these pitches as well as others. If the noise exposure continues, this dip in your audiogram will spread and affect lower and higher frequencies too.

You may not notice your hearing loss, particularly to begin with. As it gets worse and affects a wider frequency range, you will find it difficult to follow conversations if there is
background noise. Later you may find it difficult to follow what someone is saying even in a quiet room.

**Age-related hearing loss (presbycusis)**

Most people find their hearing gets worse as they get older – this is called age-related hearing loss or presbycusis. If you have a noise-induced hearing loss and you develop presbycusis too, the combination may mean that your hearing loss is worse than it would have been just from getting older. Because of the noise exposure, you will also probably notice your loss of hearing much earlier than someone who was not exposed to noise, and so it will have a greater effect on your life.

For more information, contact our helpline – and if you are at all worried that you might be losing your hearing, you should go to your GP.

**What can I do about noise-induced hearing loss and tinnitus?**

It is almost always worth trying hearing aids if you have hearing loss that affects your quality of life. They could improve your hearing in a range of everyday situations, make conversations easier and reduce your awareness of any tinnitus. However, hearing aids cannot restore your hearing to normal. They are amplification devices that enhance sound levels in a sophisticated way, but they can’t do the work of an ear.

Once your cochlea has been damaged permanently, treatment or surgery cannot reverse it, so it is important to prevent your hearing from being damaged by noise in the first place. Wherever you are, loud sounds can damage your hearing, especially if you listen to them for hours at a time. Try to avoid them at work, at home or when you go out.

Loud noise is a feature of everyday life, so you will not be able to cut it out completely, but you can do some things to reduce the risk of noise damage.

**How do I protect myself from noise exposure at work?**

Employers have a legal duty to protect your hearing. There are laws that aim to protect your hearing, called the Control of Noise at Work Regulations (2005) – details are available on the HSE website. The regulations say that if you are exposed to loud noise at work, your employer must have noise levels assessed, and keep a record of the assessment.
You will know that an assessment is needed at work if you have to shout to communicate with someone who is two metres away from you. You may also be concerned if your work involves listening to loud sounds through headphones or earpieces for much of the time.

**What should employers do?**

Employers should take the following steps to reduce noise exposure in the workplace if noise levels regularly reach 80-85dB:

- **Reduce noise produced by machinery or other equipment.** When employers are buying new machinery, they should ask about noise levels; the amount of noise the machinery makes could influence their decision about what to buy. They may also decide to enclose machinery to contain the noise it makes or, if possible, put it in a separate room. It may be possible to fit silencers to some equipment.
- **Reorganise work patterns,** to reduce the number of employees exposed to noise and shorten the periods when they are exposed to high noise levels.
- **Introduce ear protection** and keep it in good working order.
- **Arrange for you to have your hearing tested regularly.** Your employer must make sure you are told about the results of your test and keep records of the test results. They must also make sure you get medical advice if you have hearing loss.
- **Provide education** about the dangers of exposure to excessive noise and the benefits of protecting your hearing in noisy areas or for noisy activities.

**Daily noise level of 85dB(A) or more**

If the daily noise level reaches 85dB(A), the law says you must wear ear protectors. It is up to your employer to make sure you do. If your employer doesn’t do this, they can be taken to court. Daily or weekly personal exposure levels should never be above 87dB(A) and sound levels must never peak above 140dB(C) at someone’s ear.

Your employer must also keep the ear protectors in good condition and clearly mark ear protection zones – areas where you must wear them. If you do more than one noisy job, this may mean you are exposed to loud noise for longer, which increases the risk of hearing loss.

**What about noise exposure outside work?**

Hearing loss can be caused by exposure to loud noise outside work, such as music at events or through headphones, shooting, motorcycle riding and power tools. The louder the noise is, and the longer you are exposed to it, the higher the risk to your hearing. You can protect your hearing by reducing the noise volume, reducing the time you are exposed to it, and using earplugs or earmuffs.
What volume is safe to listen at when I use my MP3 player?
There is no simple answer to this question, as it depends on the make and model of music player, the type of headphones you are using and on your susceptibility to hearing damage. As a rule of thumb, if the music is uncomfortable for you to listen to then it’s too loud. If you can’t hear external sounds when you’ve got your headphones on, again, it’s probably too loud.

But that is not the complete picture, because noise damage is caused by two factors – the volume you listen at and how long you listen for. When you vary the volume, the length of time you can ‘safely’ listen for changes too. Simply put, the higher the volume the shorter time you should listen for.

How can I protect my children’s hearing?
Some toys, such as cap guns and electronic toys, can produce dangerously loud sounds if they are held close to a child’s head. You should stop your children from playing with toys that make a loud sound close to their ears. You should also limit the amount of time they spend in noisy environments and use appropriate hearing protection if necessary.

What kind of equipment can protect my hearing?
Earplugs, earmuffs and canal caps can protect your ears from loud noise by reducing the level of sound reaching your ears. If you are exposed to noise that cannot be stopped, reduced or avoided, you should use earplugs or earmuffs. We tell you more about equipment to protect your hearing in the sections that follow.

Noise attenuation
Attenuation is the term used to describe the extent to which ear protectors – earplugs and earmuffs – reduce sound.

Ear protectors must provide enough attenuation if they are to protect your hearing. Attenuation levels are measured in decibels (dB). The level of attenuation that protectors provide for different frequencies is shown on their packaging.

Most ear protectors give greater protection at higher frequencies (4-8kHz) than at lower ones – and it is these higher frequency sounds that are potentially more damaging. However, it is a good idea to remember that in real situations, the attenuation is probably less than that measured by the manufacturers, as they will have tested in ideal circumstances using brand-new protectors that fit well.
Attenuation can also be expressed as a single simplified noise-level reduction (SNR) figure. For example, most industry-standard earplugs carry an SNR of between 25 and 32dB.

**Comfort and protection**

Earplugs are probably best for long-term use, but if noise levels are high, you will need to wear high-attenuation earmuffs. Earmuffs and canal caps are easier to put on and take off, so are more convenient if you are exposed to noise now and again. For very high noise levels, earmuffs and earplugs can be worn together. This usually provides an extra 10 to 15dB protection than if either is used alone.

If you would like to buy ear protectors, see our list of suppliers on page 12.

**Earplugs**

To make sure earplugs give you enough protection against noise, choose ones with an SNR figure of at least 20dB. Make sure that the earplugs are designed for hearing protection. Many earplugs sold by pharmacies and sports shops are designed for swimming or to reduce irritating background noise, and do not protect effectively against damaging levels of noise.

**Disposable earplugs**

Disposable earplugs should be soft and fit comfortably in your ear. They are usually made of foam, mineral wadding, or soft silicone. Most disposable earplugs need to be rolled between your fingers, inserted into the ear and held in place until they expand to fill and seal the ear canal.

Ordinary cotton wool is a very bad noise protector and is not recommended for this purpose.

**Reusable earplugs**

Reusable earplugs are made from foam, soft plastic, or rubber. They can be washed and used again. Pre-moulded, re-usable earplugs are very hardwearing and do not need to be rolled to fit in your ear. But they may not fit as snugly as custom-made earplugs and are unlikely to give quite as much protection.

**Earplugs for the catering industry**

If you work in the catering industry, you can get earplugs that can be detected using a metal detector if they fall into food.
Custom-made earplugs
Earplugs can also be custom-made to give a better fit in your ear canal. Because they use a mould of your ear canal, they tend to be expensive. However, with the better fit they should attenuate noise more effectively and be more comfortable. They may last for several years and so may be cheaper than disposable earplugs for regular, long-term use.

Musicians’ earplugs
Ordinary earplugs provide greater attenuation for higher frequency sounds, making sounds appear muffled. Musicians’ earplugs have acoustic filters to reduce noise at specific pitches by required amounts, so music is heard at normal but safe levels. This means that the earplugs protect from the damaging effects of loud sounds, but preserve the sound quality.

For more information about music and noise levels, contact the Musicians’ Union or the British Association for Performing Arts Medicine (see page 14 for contact details).

Shooters’ earplugs
You can get earplugs that protect from sudden explosive noises such as gunshots. These allow normal hearing at non-harmful levels, but attenuate all high-intensity sounds to a safe level. Some are electronic, while others contain special types of materials or special filters.

Earmuffs
Earmuffs, or ear defenders, look like large headphones. Hard cups fit over your ear and are sealed to your head with soft cushions on their rims. Standard models provide a similar degree of protection to standard earplugs but you can get earmuffs that give higher levels of attenuation. Some earmuffs are designed to provide similar attenuation at all frequencies, allowing you to hear speech and alarms more clearly.

You can also get earmuffs with folding headbands, which can be carried around or stored more easily, and earmuffs with neckbands, which can be worn with face shields or helmets. It is also possible to get earmuffs that attach to a helmet, rather than a headband.

Some earmuffs are only activated when loud noise is present. These earmuffs are usually electronic and act in a similar way to shooters’ earplugs. Earmuffs are also available with built-in radio or audio systems for communication.
Canal caps
Canal caps are attached to a head-band or chin-band, which can be carried round your neck and placed onto your ears when you need them. Canal caps are useful for noise that comes and goes.

Can I get compensation for noise damage to my hearing?
Making a personal injury claim
If you feel that your current or previous employer has failed to take enough steps to protect you in the workplace, and this was the cause or part of the cause of damage to your hearing, then you can try to get compensation from your employer. If your hearing is damaged outside work, you may be able to get compensation from the party that caused the injury. Compensation is not a social security benefit, but a civil or common-law claim. To get this, you will need to bring a successful claim for personal injury through the civil courts.

You are strongly advised to get legal advice if you want to take out a personal injury claim.

Industrial Injuries Disablement Benefit (IIDB)
IIDB compensates people who have become disabled as a result of an industrial disease or an accident at work. It is non-contributory, which means that it doesn’t matter how much National Insurance you have paid. IIDB is not means-tested, which means that you can claim for it regardless of any income or savings you have – in fact, you can claim it even if you are still working. However, it is restricted to certain occupations that are known to be noisy. For more information, see our factsheet Industrial Injuries Disablement Benefit (IIDB).

War pensions
If you have hearing loss due to service in the armed forces, you may be able to claim a War Disablement Pension, but there are very strict rules about deafness. Some civilians affected during wartime are also covered.

The Armed Forces Compensation Scheme has replaced the War Disablement Pension for people who have become disabled (including hearing loss) while serving in the armed forces on or after April 2005.
Recent changes in the law mean that many deafened veterans can now get priority health treatment. For more information, see our factsheets War pensions and priority health treatment for veterans and The Armed Forces Compensation Scheme.

Where can I buy ear protectors?
You can buy some ear protectors from sports shops and pharmacies. However, these are often only suitable for light domestic use, and will not provide proper protection against damaging levels of noise. For this you need industrial-use earplugs and earmuffs, which are sold by DIY stores and by shops listed under Gunsmiths, Safety Equipment and Industrial Protective Clothing in the Yellow Pages.

We have listed a selection of suppliers below. Inclusion of a product or a supplier's details in this factsheet does not imply a recommendation by us, or suggest suitability for you. Do carry out your own enquiries before buying any items sold by suppliers listed in this factsheet. For more information, please contact the supplier or manufacturer of the equipment you are interested in.

Where can I get further information?
Action on Hearing Loss
We sell a range of equipment for people with hearing loss and tinnitus. Visit our online shop to see our range of products. Or you can request a copy of the Solutions catalogue by contacting us directly.
1 Haddonbrook Business Centre, Orton Southgate, Peterborough PE2 6YX
Telephone 01733 361 199 Textphone 01733 238 020 Fax 01733 361 161
solutions@hearingloss.org.uk www.actiononhearingloss.org.uk/shop

3M
A range of hearing protection products.
3M Centre, Cain Road, Bracknell RG12 8HT
Telephone 08705 360036
www.3m.co.uk

Advanced Communication Solutions
A range of hearing protection products, including for classical music performance.
Unit 22-23 Beaumont Close, Banbury OX16 1TG
Telephone 01295 266665 Fax 01295 259093
info@hearingprotection.co.uk www.hearingprotection.co.uk
All earplugs
Offers a range of earplugs and accessories.
Jarman House, 42 High Street, Redbourn, Nr St Albans, Hertfordshire AL3 7LN
Telephone: 01582 794171
help@allearplugs.com          www.allearplugs.com

Audi-Lab
A range of ear defenders, including the Sportsmaster customised electronic hearing protector that can cut out sounds like gunshots.
Unit 1, Hilltop Shopping Centre, Raheny, Dublin 5
Telephone +35 31 8511911
info@audi-lab.com          www.audi-lab.com

BR Distribution
Can give you more information about Doc’s Proplugs.
Telephone 01207 282 806          Fax 01207 282 007
www.brdistribution.co.uk

Green Leopard
Makes custom-made earplugs.
215 Wood Street, Kettering, Northamptonshire NN16 9SD
Telephone 0845 330 4153          Fax: 0871 433 7441
info@greenleopard.co.uk          www.greenleopard.co.uk

Guymark UK
Makes Sound Censors earplugs.
St Luke’s House, Upper High Street, Cradley Heath, West Midlands B64 5HX
Telephone 01384 410 848          Fax 01384 410 898
www.guymark.com

Honeywell
Produces the Bilsom and Howard Leight range of hearing protection products.
Unit 3 Elmwood, Chineham Park, Basingstoke RG24 8WG
Telephone 01256 693 200
www.sperian.com/uk

JSP
Sells a range of earmuffs and earplugs.
Worsham Mill, Minster Lovell, Oxfordshire OX29 0TA
Puretone
Makes a range of musicians’ and shooters’ earplugs.
9-10 Henley Business Park, Trident Close, Medway City Estate, Rochester, Kent ME2 4FR
Telephone 01634 719 427 Fax 01634 719 450
www.puretone.net

Scott Safety
Information about the Protector hearing protection range.
Pimbo Road, West Pimbo, Skelmersdale, Lancashire WN8 9RA
scott.sales.uk@tycoint.com
Telephone 01695 711 711
scott.sales.uk@tycoint.com www.scottsafety.com

Where can I get further information?

British Association for Performing Arts Medicine (BAPAM)
Information about the occupational risks to hearing for musicians.
Totara Park House, 4th Floor, 34-36 Gray's Inn Road, London WC1X 8HR
Telephone 020 7404 5888
enquiries@bapam.org.uk www.bapam.org.uk

Health and Safety Executive (HSE)
Provide details of noise regulations.
HSE Infoline, Caerphilly Business Park, Caerphilly CF83 3GG
Telephone 0845 345 0055 Fax 0845 408 9566 Textphone 0845 408 9577
hse.infoline@connaught.plc.uk www.hse.gov.uk

Musicians’ Union
Provides information about health and safety for musicians.
60-62 Clapham Road, London SW9 0JJ
Telephone 0207 840 5534
info@themu.org www.musiciansunion.org.uk

Further information from Action on Hearing Loss
Our helpline offers a wide range of information on many aspects of hearing loss. You can contact us for further copies of this factsheet and our full range of factsheets and leaflets – see the cover page for contact details.

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