Group Leader Card

Tasks & Resources

Activity	**Resources Needed**
1. Hear the music	Tibetan bells or signal generator Plastic ruler/whirly tube/slinky
2. How do we hear sounds?	8 Decibel and 8 Sound pictures Ear diagram & 7 Ear labels "Parts of the ear" cards – (also supplied as info card)
3. Good & bad sounds	Recordings of sounds (Sound Matters PowerPoint) "Love it" and "hate it" labels at either end of a room
4. What makes a noise dangerous?	"Have I damaged my hearing?" cards "How long is it safe to listen?" info card
5. What is hearing damage?	Ear presentation (Sound Matters PowerPoint) Model ear Which Platform announcements Platform 1 -4 signs Destination cards Ear plugs to give out Ear plugs to look at
5a. Protect your hearing	Paper and pens Plasticise
6. Tell your friends & Presentations	Examples of public service announcements (PSAs) Recording equipment etc for groups to create their PSA.

Group Leader Card

Suggested Timetable

Time	**Length of task**	**Activity**
10am / 12.30	10 mins	1. Hear the music
10.10 / 12.40	15 mins	2. How do we hear sounds?
10.25 / 12.55	10 mins	3. Good & bad sounds
10.35 / 1.05	10 mins	4. What makes a noise dangerous?
10.45 / 1.15	30 mins	5. What is hearing damage?
11.15 / 1.45	10 mins	Break
11.25 / 1.55	10 – 15 mins	5a. Protect your hearing (optional)
11.40 / 2.10 (11.25 / 1.55)	20 mins	6. Tell your friends
12.00 / 2.30 (11.45 / 2.25)	30 mins	Presentations
12.30 / 3.00 (12.15 / 2.45)	2h 15m or 2h 30m	Finish

Group Leader Card

1 – Hear the music

Wave Demo

You can demonstrate these waves with the whole group in a circle, or with a group of 5+ volunteers at the front.

Script outline:

Sound is caused by vibrations. It travels through the air as sound waves.

There are different types of waves. We are going to demonstrate some now. So I need you to pretend you are particles in the air.

I (or a facilitator) am going to start the wave and I want you to do the same as the person next to you on your right/left.

You might have come across this first type of wave before! *Initiate a Mexican wave.*

This is like a **transverse wave** - the vibration moves up and down but the individual particles stay where they started. The wave moves in a different direction to the particles (e.g. light and radio waves).

Waves can have different frequencies. This means how often a vibration happens. We're going to demonstrate a low frequency wave. Low frequency sound waves have a low pitch, so I need you to hum in a low pitch while you do this. *Start a few waves with a long gap between so*

Group Leader Card

1 – Hear the music

there are a few "waves" going around the circle. Then demonstrate a high frequency wave (i.e high pitch humming and waves with a short gap in between).

The next wave is different and is more like a sound wave.

Tell everyone they need to be sensible – no shoving.

Everyone should face the back of the person in front of them. Gently push the first person who should push the next person and then come back to their place. Start a new one a short time later so there are a few "waves" going around the circle.

This is like a **longitudinal wave** - the vibration moves in the same direction as the direction of travel, but the individual particles stay where they started. This is a bit like how sound waves move.

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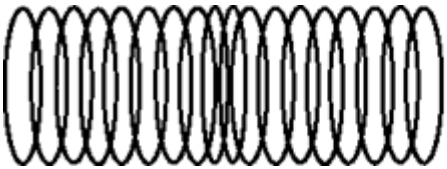
1 – Hear the music

You can also use a slinky to demonstrate how the waves move:

Transverse waves – have one student move their end of the slinky back and forth (left and right, like a snake crawling), perpendicular to its stretched length. The other student must hold their end of the slinky still. A series of transverse waves will be generated.

Transverse Waves

Longitudinal waves – have one student grasp and draw towards themselves several coils of a stretched metal slinky and then release the coils. The other student must hold his or her end of the slinky still. A longitudinal pulse will be generated and travel down the length of the slinky.



Longitudinal Waves

Group Leader Card

1 – Hear the music

Using the Signal Generator

If possible get everyone to sit in a circle.

Ask if anyone knows what the piece of equipment is.

Explain what the signal generator is: a piece of equipment that produces sound waves. You can move this button/knob to change the frequency of the sound. Demonstrate the effect of changing the frequency.

Get everyone in the room (including teachers/ facilitators etc) to raise their hands. Tell them you are going to play some sounds to them and they have to lower their hand when they can no longer hear the sound.

Generate a signal that gradually increases in frequency (Start at around 10kHz).

Point out that sometimes the room can interfere with how people hear the sound. In some rooms, like a lecture theatre, sound travels to the back of the room better than the front.

Then

Sort the participants into groups of 8-10 and send them to sit with their facilitator who will discuss this activity with them.

Group Leader Card

1 – Hear the music

Using the Tibetan Bells / Chimes

If possible get everyone to sit in a circle. Hold up the bells and ask if anyone knows what they are. Explain that Tibetan bells and singing bowls are used by Buddhists in meditation.

Hold the cord just above each chime so both bells are flat. Use one chime to strike the other from above. You can then circle the bells around each other (with out touching) to get an interesting effect.

Get everyone in the room (including teachers/facilitators etc) to raise their hands. Tell them you are going to strike the bells and they have to lower their hand when they can no longer hear the sound.

Strike the bells with a single tap.

Point out that sometimes the room can sometimes interfere with how people hear the sound. In some rooms, like a lecture theatre, sound travels to the back of the room better than the front.

Then

Sort the participants into groups of 8-10 and send them to sit with their facilitator who will discuss this activity with them

Group Leader Card

3 – Good and bad sounds

Set up the PowerPoint so the slide entitled "Good good and bad sounds" is up. To play the sounds, click on the speaker icon for each sound.

Explain to the group that you are going to play different sounds to them. After they have heard each sound they need to vote on how much they liked it.

Label one end of the room as "Love it" and the other end "Hate it". If they loved the sound they should go and stand right by the wall with the label "Love it"; if they really hated it they should go and stand by the wall with the label "Hate it". If they were completely indifferent they should stand in the middle of the room. If they liked it a bit, towards the loved it wall etc. Ensure everyone understands how to vote.

Reassure the students that there are no right or wrong answers, they should just listen and think about the sound.

After each sound and ask the students to vote.

Ask a couple of people why they: loved it, or hated it, or voted how they did.

Ask if anyone can guess what the sound is.

Tell them what the sound is and ask if they want to change where they are standing.

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3 – Good and bad sounds
The Sounds

Sound 1 - Dawn chorus[1]

This was recorded in 2007 in Chernobyl by Peter Cusak[2], a sound artist. The towns surrounding Chernobyl have been evacuated, allowing nature to return, resulting in some of the most species-rich dawn choruses that Peter has ever recorded. You can hear Peter talk about what it is like in Chernobyl in the file *peter cusak.mp3.*

The explosion and fire at the Chernobyl nuclear plant in April 1986 was the world's worst nuclear accident[3]. It spread a cloud of radioactive particles across a huge part of Europe. Several million people still live in contaminated areas. Tens or hundreds of thousands of deaths caused by cancer (numbers disputed).

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[1] NB We have permission to use this recording for this debate, but it should not be used more widely without permission.

[2] http://www.lcc.arts.ac.uk/17617.htm

[3] http://news.bbc.co.uk/1/hi/world/europe/4917526.stm

Group Leader Card

3 – Good and bad sounds
The Sounds

Sound 2 - Buses and trams in Piccadilly Gardens, Manchester.

Piccadilly Gardens is a large square in Manchester city centre with few cars but lots of buses and trams (the horn is the Metrolink trams). The sound of traffic drowns out other noises such as birdsong in cities (birds have had to learn to sing louder and at other times to overcome this)

Although cars are generally getting quieter, the number of cars on the roads is increasing, so overall the average noise level in cities hasn't changed much in recent decades.

The sound of the metrolink horn is one of Manchester's favourite sounds: www.favouritemanchestersounds.org probably because it is a symbol of the regeneration of the city.

Sound 3 - An indoor café.

Many people like the sound of human activity (babble), they find it reassuring.

Restaurants are often badly designed so it is difficult to communicate and you have to shout.

It is nice to hear babble, but if it is too loud, it makes it difficult for you to hold a conversation

Group Leader Card

5 – What is hearing damage?

The model ear can also be used along with the PowerPoint presentation to reinforce the anatomy of the ear.

Option 1 – with ear camera

You will need the PowerPoint presentation "Ear Ear".

Hold up the ear camera and ask if anyone knows what it is. Explain it is a camera that allows you to look inside someone's ear.

Show the slide "Inside an ear" to show what you might see with an ear camera.

Ask for a volunteer who would like to show the group the inside of their ear. Welcome them to the front and ask them to stand still whilst you look in their ear.

Hold the camera in their ear and capture the image on to the screen. Send the volunteer back to their seat. Tell them their ear looks lovely and healthy.

Explain what you can see using the notes provided below for option 2.

Group Leader Card

5 – What is hearing damage?

Option 2 – without camera

You will need the PowerPoint presentation "Ear Ear".

Causes of hearing loss: Mention that there are many different types of hearing loss, some are genetic or caused by disease, whilst some can be caused by noise in our environment. The one we have been talking about today is noise-induced hearing loss

Show the slide "Inside an ear" to show what you might see with an ear camera.

The following pictures show you what you might see inside an ear.

Entrance to the ear canal: You can see hairs around the entrance. These hairs help to stop dirt entering the ear.

The ear canal: Who can guess what the yellowy stuff in the picture is? It's earwax, it's normal to see some wax in everyone's ears.

Ear wax is produced by glands in the outer ear canal. It is very useful and traps dust and other small particles to stop them reaching the eardrum. Normally wax dries up by itself and falls out of the ear along with any trapped dust or debris. You should never try to clear wax out of your ear using cotton buds or anything else. These actually push wax further into your ear and may cause a blockage.

The Ear drum (tympanic membrane): The normal eardrum is a membrane (layer of tissue) stretched across the ear canal. It separates the outer ear from

Group Leader Card

5 – What is hearing damage?

the middle ear. You can see the mallus bone (part of the ossicles) behind the eardrum. It is the whitish structure that appears to hang down from the top to the middle of the eardrum with blood vessels visible over the top of it.

Click slide to make perforated eardrum picture appear.

A perforated eardrum can be caused by:

- infection in the ear – pus builds up behind the eardrum causing it to become so tight it bursts
- trauma such as a fall on the side of your head or a stick that goes deep into your ear
- rapid changes in pressure, like with scuba diving (you can feel your ears pop when the pressure changes when you go up in a fast lift or when a plane lands or takes off)
- a slap to the side of the head or falling on water.
- lightning blasts
- blast waves from guns, fireworks or other loud noises
- sports injuries.

If the eardrum is perforated it may be very painful or you might feel as if your ear "isn't right". The eardrum helps to amplify sound so if it is damaged it might change your hearing or make it harder to hear.

A doctor can use an otoscope (a magnifying lens with a light) to look inside the ear and see if the eardrum has an hole or a tear in it. You can see the difference in the pictures here. A burst eardrum usually heals itself in about two months.

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5 – What is hearing damage?

Hair cells in the inner ear: The cochlea is the part of the ear that transmits sounds to your brain. Your brain makes sense of the sounds coming from the world around you.

The cochlea is lined with tiny sensitive hair cells. These pick up the vibrations that are sound and transfer the sound to the nerves in the ear. The nerves send the sound to the brain.

The picture on the left shows an image from an electron microscope. It is inside the cochlea and shows the rows of tiny hair cells that respond to sound vibrations. You can see 4 rows of cells all together. There are 3 outer rows close together and 1 inner row.

These tiny hair cells can be damaged by:

- loud sounds
- some medicines
- disease such as meningitis
- aging.

On the right the two pictures show hair cells that have been damaged by sound. They were damaged by 120 decibels for 12 minutes. The top picture shows the 3 outer rows. The top row of hair cells have been but the next two rows are still ok. Flattened hair cells might recover if given enough time. The bottom picture shows more hair cells in a different part of the same cochlea. Some of the hair cells are missing altogether, these will never be replaced.

Damage to these hair cells causes permanent hearing loss and can also make it difficult to balance because these hairs also help with balance.

Group Leader Card

5 – Which platform?

Set up the room so each corner/wall is a platform.

Give out one of the four station cards to each student. They are at Birmingham New Street train station. They need to listen carefully to the train announcements to find out which platform they must catch their train from. There are different tasks so they cannot just follow their friends!

Briefly explain what has been changed in each recording before playing it.

Announcements:

1) Normal conditions.
2) When the ear cannot respond to higher frequencies.
3) A whooshing sound to simulate tinnitus.
4) When people have trouble understanding speech when background noise is present. This is especially a problem for people with hearing loss in one ear.

You can repeat the activity with the "clean" version of the announcement. Then find out if anyone was at the wrong platform.

A debrief can be done as a large group or in smaller facilitated groups (see facilitator card).

Answers:

Platform 1 = Newcastle
Platform 2 = Manchester
Platform 3 = Nottingham
Platform 4 = Southampton