STEM Program

Rinne's and Weber's Test

Sound Waves - How Do We Hear?

Ever wondered how an audiologist tests your hearing? Investigate how we hear and the different ways our ears receive sounds using clinical hearing assessments.

Suited to Section

Joey Scouts
Cub Scouts
Scouts
Venturer Scouts
Rover Scouts

Challenge Area

COMMUNITY
PERSONAL GROWTH
OUTDOORS
CREATIVE

Key SPICES Growth

SOCIAL
PHYSICAL
INTELLECTUAL
CHARACTER
EMOTIONAL
SPIRITUAL

Likely Scout Method Elements

COMMUNITY INVOLVEMENT
LEARNING BY DOING
NATURE AND THE OUTDOORS
PATROL SYSTEM
PERSONAL PROGRESSION
PROMISE AND LAW
SYMBOLIC FRAMEWORK
YOUTH LEADING, ADULTS SUPPORTING

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Plan

1. Investigate the structure of the ear. What is the purpose of each part of the ear?
2. Investigate sound waves and how they are detected by our ears. Can you think of any creative ways to visualise sound waves?
3. Learn about the two routes sounds can reach your inner ear: air conduction and bone conduction. Which do you think will be more sensitive? Why?
4. Investigate sensorineural and conductive hearing loss. What can cause these types of hearing loss?
5. Read the safety requirements and discuss with your leaders what supervision and safety measures might be needed.

Do

1. To perform Rinne's test, strike a tuning fork against your palm and quickly place the bottom of the tuning fork on the bone behind your ear. When you can no longer hear the sound, quickly place the prongs of the tuning fork next to the opening of your ear to see if you can still hear the sound.
2. To perform Weber's test, strike a tuning fork against your palm and place the base of the tuning fork in the middle of your forehead. Note whether the sound is the same or different in each ear. Next try blocking one ear and performing the test again.
3. Make sure you record your observations along the way.

Review

1. What type of sound conduction were you using at different time points during these tests? Did you find air or bone conduction to be more sensitive? Why do you think one was more sensitive than the other?
2. What parts of the ear made either air or bone conduction more sensitive? Can you think of a creative way to model the action of these parts of the ear?
3. What have you learnt about hearing loss while doing this challenge card? How might your unit learn more about deafness and the deaf community? What could you do to make Scouting at your group more accessible to deaf Scouts?
4. Using a diagram of the ear to help, what do you think could cause these different types of hearing loss?

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Variations

- If you don't have access to a tuning fork, experiment with using smartphone vibrations for Weber's test.
- A larger program can be built using other 'How Do We Hear' or sound wave challenge cards.

Safety Tips

- Never put any objects into your ears, as you may cause damage. Remember the rule, never put anything smaller than your elbow in your ear!
- Sound warning: If you are participating in this challenge card and find the sounds too loud or causing any pain, do not continue testing on yourself. This challenge may not be suitable for noise sensitive individuals.
- It is important to note that while these tests are used by audiologists to test their patients' hearing, what you will be doing is not a proper hearing evaluation. Do not interpret any of your findings as clinical results or measures of your hearing ability. If you have concerns about your hearing, you should speak to your doctor.

Why Does This Happen?

You should have found when doing Rinne's test that you could hear the sound longer next to your ear than behind it. This is because when you held the tuning fork next to your ear, sound waves were travelling to your ear using air conduction, as opposed to bone conduction behind your ear. To understand why this happens we have to look at the structure of the ear. With bone conduction, the sound message skips past your eardrum, whereas air conduction has to pass through the ear drum. The ear drum's role is to amplify sounds which is why air conduction was more sensitive than bone conduction. Rinne's and Weber's tests are used to check for sensorineural and conductive hearing loss. Sensorineural hearing loss occurs in the inner ear, while conductive hearing loss is from problems in the outer and middle ear.

SciScouts Physics of Waves

The SciScouts Physics of Waves is a National Science Week project, undertaken in collaboration with Fizzics Education. These instructions were prepared by Scouts for Scouts. This National Science Week project is supported by the Australian Government.

Scouting has always been strong on STEM skills. Maths to calculate catering quantities and navigate, the science of water purification, the physics of abseiling, and the engineering of pioneering structures – they all have their place. In the current program for our youth members, STEM and Innovation forms one of six Special Interest Areas that enable Scouts to set goals and pursue their own ideas.

SciScouts PHYSICS

Fizzics Education Since 2004 Innovative Science Shows & Workshops!

national science week 2022

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