Sound Choices™

Hearing Conservation for Children
### DANGER ZONE

<table>
<thead>
<tr>
<th>dB</th>
<th>Sound Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>Jet Airplane</td>
</tr>
<tr>
<td>150</td>
<td>Helicopter</td>
</tr>
<tr>
<td>140</td>
<td>Rock Concert</td>
</tr>
<tr>
<td>130</td>
<td>Ambulance Siren</td>
</tr>
<tr>
<td>120</td>
<td>School Dance</td>
</tr>
<tr>
<td>110</td>
<td>Power Saw</td>
</tr>
<tr>
<td>100</td>
<td>Cement Mixer</td>
</tr>
<tr>
<td>90</td>
<td>Lawn Mower</td>
</tr>
</tbody>
</table>

### SAFE ZONE

<table>
<thead>
<tr>
<th>dB</th>
<th>Sound Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>City Traffic</td>
</tr>
<tr>
<td>70</td>
<td>Small Party</td>
</tr>
<tr>
<td>60</td>
<td>Normal Speaking Voice</td>
</tr>
<tr>
<td>50</td>
<td>Car Horn</td>
</tr>
<tr>
<td>40</td>
<td>Refrigerator Motor</td>
</tr>
<tr>
<td>30</td>
<td>Whisper</td>
</tr>
<tr>
<td>20</td>
<td>Rustling Leaves</td>
</tr>
<tr>
<td>10</td>
<td>Normal Breathing</td>
</tr>
<tr>
<td>0</td>
<td>Threshold of Normal Hearing</td>
</tr>
</tbody>
</table>
Ears never sleep. Your ears and hearing are important every hour of every day and they must last your whole life.

We live in a very noisy world. Doctors and audiologists are seeing permanent hearing problems because of noise exposure. The hearing problems are being detected in more and more children and at earlier ages. This type of hearing loss is called Noise Induced Hearing Loss (NIHL).

After completing the Sound Choices lessons and learning about noise induced hearing loss, you should know:

- The basic parts of your ear
- How sound is measured
- Why loud sound causes permanent damage
- When sound is too loud
- Good ways to protect your hearing

I hope you listen well and remember all you are about to learn. Pass it on to your friends, too!

Dr. Laura Brady
Pediatric Audiologist
There is too much noise if:

• You must shout to be heard only a few feet away
• Your ears ring or feel “full”
• After listening, your hearing sounds muffled.

10 STEPS TO REDUCE NOISE

1) Turn it Down
   - and do not use noisy equipment in small, enclosed spaces.
2) Move Away
   - from the source.
   It’s one of the easiest things to do!
3) Use Earplugs
   - they are inexpensive and easy to find at most drug stores. Keep them at home and in the car in case you need them.
4) Cover Your Ears
   - with your hands or push the little flap in front of your ear canal backwards with one finger.
5) Install Carpets & Drapes
   - and acoustical tile to absorb sounds that would otherwise bounce off bare floors, walls, and ceilings and reverberate.
6) Place Rubber Mats
   - under noisy or vibrating appliances.
7) Enclose Noisy Machines
   - with materials that absorb sound. Many commercial products are available.

How do we hear?

Sound waves enter the outer ear and travel down the ear canal (auditory canal) where they bump into the ear drum. The ear drum begins to vibrate and this vibration moves the three middle ear bones (malleus, incus, stapes). The three bones are in an air filled cavity and the last bone is connected to the window (membrane) of the cochlea. The cochlea is filled with fluid and when the last middle ear bone pushes on the membrane of the cochlea, the fluid inside the cochlea begins to move. There are also thousands of small hair cells (cila) in the cochlea and when the fluid moves, it stimulates the hair cells, making them move the way wind blows tall grass. The movement of the hair cells sends a signal to the hearing nerve (auditory nerve), which takes sound to the brain. This is how we hear all the sounds around us!
Familiar Sounds Audiogram

Loudness measured in decibels (dB)

Pitch measured in Hertz (Hz)

low
growth

high

Normal Limits
Mild
Moderate
Moderately Severe
Severe
Profound

125 250 500 1000 2000 4000 8000

0

10

20

30

40

50

60

70

80

90

100

110

120

130

140

Z V Ph G K

F Th S

I M D B I

NG E L O A R

U

Loudness measured in decibels (dB)

Familiar Sounds Audiogram

Pitch measured in Hertz (Hz)

low

high

Soft

Soft

Soft
There is noise all around us. Many of the games, toys, and machines we use everyday make noise that puts your hearing at risk. How many of these machines do you or your family members use or encounter in your life?

When you are hanging out
- mp3 players
- Televisions and video games
- Amplified musical instruments
- Radio

At Home
- Vacuum
- Power saw
- Leaf blower
- Lawn mower
- Chain saw
- Blow dryer
- Blender/Mixer

At Work
- Jackhammer
- Farm equipment
- Factory equipment

On the Move
- Airplane
- Motorcycle
- Subway train
- Emergency Sirens
- Honking horn
- Boat motor
If you are wearing earbuds/headphones and someone can hear your music from arms reach away (about 3 feet), it is too loud.

1. **Turn it Down**
   If you are wearing earbuds/headphones and someone can hear your music from arms reach away (about 3 feet), it is too loud.

2. **Use Noise Cancelling Earphones**
   These will allow you to set the listening level at a lower volume if you are in a noisy place and still hear what you want to hear.

3. **Limit Listening Time**
   The louder the sound, the less time it takes to damage your hearing. The next steps will help you limit exposure to loud sounds.

4. **Move Away**
   Move away from the source of the loud sound. It's one of the easiest things to do! Also, do not use noisy equipment in small enclosed spaces.

5. **Use Earplugs**
   Earplugs are inexpensive and easy to find at most drugstores, sporting goods stores, and hardware stores. Keep them at home, in your backpack, or in the car so you have them when you need them.

6. **Cover Your Ears**
   Use your hands or use one finger to push the little flap in front of your ear backwards to seal off the ear canal.

7. **Block the Sound**
   Close the door, close the window!
Safe Hearing

Hints for Adults

1. Install Carpet and Drapes
   Fabrics and acoustical tile help absorb sound that would otherwise reverberate and bounce off bare floors, walls, and ceilings. Using rugs/drapery helps make a noisy environment quieter.

2. Place Rubber Mats
   When used under noisy or vibrating appliances, rubber mats reduce the noise you hear.

3. Enclose Noisy Machines
   Use materials that absorb sound. Many commercial products are available.

4. Maintain Equipment
   Oil the equipment as recommended and keep loose parts from creating noise.

5. Choose Quieter Models
   When replacing food blenders, dishwashers, heating and cooling systems, choose those that are quieter.

6. Plant Leafy Shrubs
   Putting plants around houses and buildings at window height can absorb traffic noise.

Quiet Please!

There are lots of fun things to do that do not involve loud noises. How many can you name?

For more Information

www.dangerousdecibels.org
www.nidcd.nih.gov/health/wise
www.noisyplanet.nidcd.nih.gov/
www.listentoyourbuds.org
www.chchearing.org/noise-center
**Audiogram** – Chart used to record results of a hearing test. Shows loudness from top to bottom and pitch from left to right.

**Auditory Canal** – Part of the outer ear and is also known as the ear canal. Sound travels through the tube-like ear canal and then makes the eardrum vibrate.

**Auditory Nerve** – A bundle of specialized hearing cells that connect the ear to the brain.

**Cochlea** – The organ of hearing. Part of the inner ear that is shaped like a snail shell and is about the size of a pea. Inside the cochlea there are sensory cells (hair cells, called cilia) that convert mechanical energy to electrical energy that travels along the auditory nerve to the brain.

**Decibels (dB)** – The unit used to measure the volume or loudness of sound. Named after Alexander Graham Bell.

**Ear Drum** – Also known as the tympanic membrane. It is a very thin membrane that marks the end of the outer ear and the beginning of the middle ear. When sound waves strike this membrane, it moves and causes the bones of the middle ear to move, creating mechanical energy.

**Eustachian Tube** – The tube that connects the middle ear to the space behind the nose.

**Hertz (Hz)** – The unit used to measure the frequency or pitch of sound.

**Middle Ear Bones** – The three smallest bones in your body! They are the Malleus, Incus, and Stapes. Due to the shape of the bone, each has another name. They are sometimes called the “hammer,” “anvil,” and the “stirrup.”

**Noise Induced Hearing Loss (NIHL)** – Hearing problems caused by loud sounds/noises as opposed to other causes. NIHL is permanent and cannot be fixed, but it can be prevented.

**Pinna** – This is the outer part of your ear that everyone can see; also called the auricle. It helps to ‘collect’ sound waves and funnels them into the ear canal.
Across
2. One of our senses
3. Inventor of the telephone
4. Shell shaped organ of hearing
8. Sound over 85 dB
11. Why some sounds need to be loud
13. Another name for the outer ear
14. Ringing in the ears
15. Hearing doctor

Down
1. Unit used to measure loudness
5. Electronic device used to assist hearing
6. Any type can damage hearing
7. Unit used to measure pitch
9. Unwanted sound
10. Located at the end of the ear canal
12. Tiny hair cells in the cochlea
Help sound reach the cochlea safely!
Venn Diagram

1). Using the list below, write the names of the sounds that can **hurt** your hearing, in the left circle.

2). In the right circle, write the names of the sounds that are **usually safe**.

3). In the overlapping circle, write the names of the sounds that **could damage** your hearing.

- Airplane engine
- Friend whispering
- Music player
- Jackhammer
- School lunchroom
- Television
- Video game
- Leaf blower
- Reading
- Riding your bike
- Roller skating
- Crickets
Listen for all the sounds around you and write them down.

Sounds in school


Sounds outside


Sounds at home


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