**Learning Objectives**

1. Describe common sources and settings for noise exposure for pediatric patients.
2. Discuss the adverse effects of noise exposure on physical health, psychological health and cognition.
3. Explain preventative measures and interventions that may be relayed to at-risk pediatric patients and their parents.

**Why Talk About Noise-Induced Hearing Loss at a Pediatric Symposium?**

- It is no longer just adults with noise-induced hearing loss
- Noise induced hearing loss is a growing and serious problem with consequences that last a lifetime
- Some smart phones and personal music players can reach up to 115 decibels
- Even slight hearing loss can impact a child's language development and overall academic achievement
- Lack of education to parents and children

**Sources & Settings of Noise**

**Young Children**
- Toys
- Environmental noise at daycare or school

**Teen & Tweens**
- Playing musical instruments
- Attending concerts
- Personal music players/mobile phones
- Lawn mowing
- Hunting or target shooting
- Sporting events
- Car stereos

Children are often more vulnerable than adults due to lack of ability to control the environment and may not recognize the dangers of noise

<table>
<thead>
<tr>
<th>Noise Source</th>
<th>How long can you listen without protection?</th>
<th>Noise Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jet take off</td>
<td>0 seconds</td>
<td>180 dB</td>
</tr>
<tr>
<td>Music concert</td>
<td>1 minutes</td>
<td>104 dB</td>
</tr>
<tr>
<td>Car horn</td>
<td>1.5 minutes</td>
<td>104 dB</td>
</tr>
<tr>
<td>Band practice</td>
<td>10 minutes</td>
<td>106 dB</td>
</tr>
<tr>
<td>School dance</td>
<td>10 minutes</td>
<td>107 dB</td>
</tr>
<tr>
<td>Conversation</td>
<td>5 hours</td>
<td>60 dB</td>
</tr>
<tr>
<td>shouting</td>
<td>1 hour</td>
<td>85 dB</td>
</tr>
</tbody>
</table>

Top Noisy Toys of 2018

Spin & Sing Alphabet Zoo
Bright Starts Safari Beats
Musical Toy

Adverse Effects From Excessive Noise Exposure

Direct Effects
- Noise induced hearing loss
- Noise induced threshold shift
- Tinnitus

Indirect Effects
- Physiological effects
- Psychological effects
- Impaired Cognition

Main hearing loss categories

Effect on Outer Hair Cells

Types of Hearing Loss from Noise Exposure

Conductive: Eardrum and middle ear ossicles damaged due to intense noise (unlikely)
Sensorineural/Neural: Damage to the inner/outer hair cells in the cochlea

Indirect Adverse Effects

Stress-related somatic effects
- Stress hormone
- Blood pressure
- Muscle spasm

Psychological effects
- Annoyance/isolation
- Sleep disturbance
- Mental health

Cognitive effects
- Reading
- Concentration
- Long term memory
- Attention
Physiological Effects of Noise

What is our Role?

Raise awareness for noise-induced hearing loss
- Provide age-appropriate materials to parents and patients
  - i.e. Sound Sense, Dangerous Decibels, provide activities or games for education
Assess for high-risk activities, especially in older patients
- Personal listening device usage
- Lawn mowers, leaf blowers, recreational use of firearms
Provide information on appropriate use of hearing protection for each age
- Earmuffs versus foam plugs
- Custom protection
Referral for a complete audiometric evaluation if hearing loss is suspected

How Loud is Too Loud?

1. If you must raise your voice or yell to be heard when you are only 2-3 feet away from someone.
2. When you are no longer in noise, sounds around you sound muffled or dull.
3. After being exposed to noise, you have pain or ringing in your ears.
4. When you cannot hear a person talking to you from 2-3 feet away.
5. If you must take your headphones off to be able to hear the person speaking to you.
6. When your device is set at more than 50 percent of the maximum volume.

Prevention is Key

1. Avoid loud sounds or noise whenever possible
2. If sound cannot be avoided:
   - Use earmuffs or earplugs to protect your hearing
   - Limit the amount of time you are exposed to the noise
3. Look for options with a volume control or an off/on button when buying toys
   - Limit the amount of time children are exposed to louder toys
   - Consider removing the batteries if necessary
4. Educate children about hearing loss then lead by example
5. Keep all devices set to no more than half volume
   - Don’t be afraid to ask others to turn down the music
   - If this is not an option, come prepared with hearing protection

Review of Learning Objectives

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Remember, noise-induced hearing loss is usually gradual and painless, but it is PERMANENT. Once destroyed, the hearing nerve and its sensory nerve cells do not repair.
Questions?

Ashton Lampe, Au.D.
Phone: (402) 559-7742
Email: alampe@nebraskamed.com

References