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### Journal Entry: What do you know?

This is where I get to find out what you know before we start the lesson. We'll be learning about how children perceive their environment when they have a hearing loss. I would like to know, what do **you** know about that?

As best as you can, tell me what you know about the following:

1. What does the environment sound like to a child with a hearing loss?
2. What might a child miss hearing in his/her surroundings and world?
3. What areas of development would a hearing loss most significantly impact, and how?
4. What types of experience have you had in working with children with hearing impairments?

Please, don't look up information or spend time trying to research. It's not what this journal entry is about. Try to be as thorough as you can, but don't do research or read ahead for the answers. I will use this information to get an overall feel for the class, and design accordingly.

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**Last edited:** Monday, 3 October 2005, 07:40 PM (0 words)

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## How does a child perceive his/her environment?



This is one of the questions we will be coming back to again and again. More than likely, this question is not a new one to you.

As teachers, infant learning educators, and therapists (or other professional), we are consistently trying to understand how to help the children with whom we are working. One of the first things we need to understand is how the child interacts with the world. Based on their abilities: gross motor, fine motor, cognitive, sensory, etc., they explore and gain an understanding of their world.

But what if something was missing? How would they learn about their environment the way other children do? More specifically (and the focus of this unit) what if they had a hearing impairment?

*What if they didn't hear all the sounds that typically children hear?*

### 1. Imagine the child's perceptions based on simulations

Take a moment and go to the website listed below by Phonak. Read through all of the steps before you begin.

Phonak Hearing Simulations: <http://www.phonak.com/consumer/hearing/hearinglossdemo.htm>

1. While you are listening to these samples, **imagine** (as best you can) that you are a child, and this is all you've ever known. ALL you've ever known. How would you perceive your environment? What might you know/not know? It's okay if you don't understand the meanings of the terminology or jargon; we will get into that soon enough.
2. Start in the "Moderate Hearing Loss" category in the speech and environmental category. Listen to all the moderate hearing loss simulations. Note the overall quality and crispness of the sound, the types of sounds that you hear, and what you understand.
3. Once you've listened to all the "Moderate Hearing Loss" sounds, listen to the "Mild Hearing Loss" samples. Again, note the quality, types of sounds, and overall understanding. How does the Mild differ from the Moderate?
4. FINALLY (not first!) listen to the "Normal Hearing" samples.
5. **Discussion Board!** Discuss some of your thoughts to the above questions on the **discussion board**

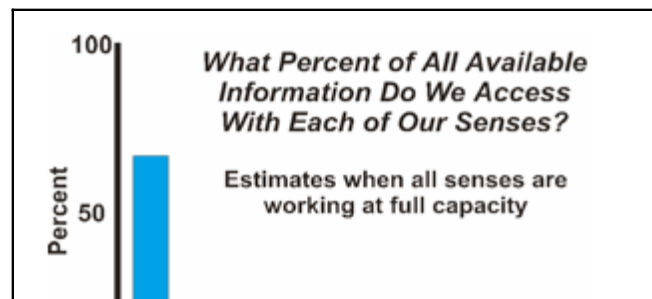
listed on this topic. Remember, no reactions, ideas, or questions are "stupid"; we're all here to explore ideas and learn. (When you see the image "Discussion Board", you'll know you will be needing to go to the discussion board. This image will be used throughout the unit.)

### 2. Again, *What if they didn't hear all the sounds that typically children hear? What areas does a hearing loss impact?*

As you might have already discussed, hearing is our perception.

Look at the graph to the right. Vision is stated to give us between 60-90% of the information about our environment. Hearing is stated to give us between 10-30% of information at any given time. Of course, there are certain instances where hearing is required more than others. Listening to a book on tape requires only hearing.

It has also been said, "Being blind may cut you off from objects or things, but being deaf cuts you off





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## Hearing

How we hear

Hearing loss

**Hearing loss demos**

Hearing test

Audiogram

Solutions

Downloads

Links

Obtaining a hearing instrument

Products

Testimonials

Care and Maintenance

Children

## Hearing loss demos

In this simulation you can discover how sensorineural hearing losses affect hearing. This type of hearing impairment is by far the most frequent and is caused by a dysfunction of the inner ear.

The first simulated hearing loss is a mild one and roughly reflects the average hearing loss of men at the age of 60. The second simulated hearing loss reflects a typical "sloping" (i.e., less hearing in the high frequencies) moderate hearing loss. (more [about hearing loss](#))

Click on the various links to compare the sounds (flash plugin needed - [get flash](#)).

### Hearing loss

#### Normal hearing



#### Mild hearing loss



#### Moderate hearing loss



### Speech

Single speaker

[play](#) (21 kB)

[play](#) (21 kB)

[play](#) (21 kB)

Dialog two speaker

[play](#) (23 kB)

[play](#) (23 kB)

[play](#) (23 kB)

Announcement in station

[play](#) (22 kB)

[play](#) (22 kB)

[play](#) (22 kB)

In a restaurant

[play](#) (23 kB)

[play](#) (23 kB)

[play](#) (23 kB)

In traffic

[play](#) (23 kB)

[play](#) (23 kB)

[play](#) (23 kB)

### Environmental

Birds singing

[play](#) (21 kB)

[play](#) (21 kB)

[play](#) (21 kB)

Frogs

[play](#) (6 kB)

[play](#) (6 kB)

[play](#) (6 kB)

Ducks

[play](#) (13 kB)

[play](#) (13 kB)

[play](#) (13 kB)

Industry

[play](#) (13 kB)

[play](#) (13 kB)

[play](#) (13 kB)

### Music

Piano

[play](#) (19 kB)

[play](#) (19 kB)

[play](#) (19 kB)

Clarinet

[play](#) (18 kB)

[play](#) (18 kB)

[play](#) (18 kB)

Classic: Beethoven

[play](#) (22 kB)

[play](#) (22 kB)

[play](#) (22 kB)

Children singing

[play](#) (36 kB)

[play](#) (36 kB)

[play](#) (36 kB)

Pop

[play](#) (20 kB)

[play](#) (20 kB)

[play](#) (20 kB)

### Background noise

Telephone

[play](#) (7 kB)

[play](#) (7 kB)

[play](#) (7 kB)

Country | Language

[Home](#) | [Contact](#) | [Search](#) | [Sitemap](#) | [Disclaimer](#) | [Impressum](#)

The hearing loss simulation is based on two algorithms which simulate recruitment [1] and spectral smearing [2].

[1] Moore, Brian, and Glasberg, Brian (1993): Simulation of the effects of loudness recruitment and threshold elevation on the intelligibility of speech in quiet and in background of speech. J. Acoust. Soc. Am, 94(4), 2050:2062

from people." Now, there are many, especially of the Deaf community, who would disagree. But do you see why one would say that people with a hearing loss might be more cut off from people? Having a hearing loss does inhibit your ability to gain information from your environment. **In particular, the environment which you cannot see or have difficulty seeing.** What are these "other environments"?



### 3. Listen to the sounds around you. What information are you getting from hearing alone?

Take a moment. Just for a second, sit and listen to the sounds around you, in particular the ones you can't see. What information are you getting? As for myself, I know a plane just flew overhead, possibly a military plane. I also know traffic is quite busy, and my clock is still working. My upstairs neighbor is busy in his kitchen, and I just got an email in the other room. Try that now.

If you were deaf (or Deaf—we will explain that later), you missed out on all that information. If you were hard of hearing, perhaps you missed some, understood some, and misunderstood one sound for another.

What is a baby's normal routine like? What would they encounter in the room, out of the room? And what about the experience of communicating with their parents?

From a hearing loss quiz on [e-Michigan](#),

"Only about 30–35% of the English language is visible on the lips and many speech sounds look the same on the lips. Take for instance the words: bump, mump, pump, or mad and bad. Say these words in a mirror and you will see that b, m and p all look the same to the speechreader. In addition, many characteristics about a speaker (i.e. mustache, lip movement, rapid speech) interfere with speechreading."

As you know, communication is so important during these first three years of life. As you can see from the above paragraph, just looking at someone's lips could be very confusing! For children with hearing loss, sounds can be missing, softer, muffled, sound exactly the same as others, and even distorted.

But remember: they don't have our prior hearing experience to "iron out" the meaning! They aren't aware that anything is wrong. If they are older (two years) and a significant hearing loss has still not been detected, the children will often begin to throw tantrums. Any wonder why?

### 4. For an infant or toddler, what do you think is the 20-30% of information that the child might be missing?

**Discussion Board!** List on the discussion board some ideas you come up with. Again, we're discussing and brainstorming. Don't be afraid to discuss your ideas aloud and share. Give some examples, either imaginary or real.

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Update this Forum

Everyone can choose to be subscribed  
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Use this area to post your responses to the Topic 1 questions. What is expected in this forum?

1. Thoughtful replies.
2. Your reasoning supported by evidence based on the readings or other research you have encountered.
3. An insight as to how a child might perceive the world around him/her, and how it could possibly affect his/her development.
4. Discussion amongst each other.

Add a new discussion topic

Discussion	Started by	Replies	Last post
<a href="#">Percentage of Information</a>	<a href="#">Krista Galyen</a>	1	<a href="#">Rob</a> Wed, 26 Oct 2005, 02:36 PM
<a href="#">Phonak Simulations</a>	<a href="#">Krista Galyen</a>	0	<a href="#">Krista</a> Sun, 18 Sep 2005, 10:40 AM

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Percentage of Information

by [Krista Galyen](#) - Monday, 3 October 2005, 07:53 PM

For an infant or toddler, what do you think is the 20-30% of information that the child might be missing? In other words: What might this child not be hearing in his/her environment and world?

Let's help you by using an example. A child is being fed by her mother in the kitchen. The child has 3 siblings, each doing their own thing either in the living room, bedroom, and sometimes both! The father isn't there, but should be home any minute. They have nice furniture and a big screen TV. They love showing cartoons. Think of the above question and think about this child: what is the 20-30% of information this child might be missing in this scenario? Try to include developmental and social impacts of this missing piece.

[Delete](#) | [Reply](#)

Re: Percentage of Information

by [Rob LeFebvre](#) - Wednesday, 26 October 2005, 02:36 PM

**I think that is great.**

[Show parent](#) | [Split](#) | [Delete](#) | [Reply](#)[sesadistance\\_ed](#) » [ceehi\\_ITHL](#) » [Forums](#) » [Topic 1 Discussions](#) » [Percentage of Information](#)

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Phonak Simulations

by [Krista Galyen](#) - Sunday, 18 September 2005, 10:40 AM

Pick one of the levels of hearing loss you just listened to (Moderate, Mild). If you were a child with that type of hearing loss, comment on how you might perceive your environment. Include communication and relationships. If you would like, you can also add on an additional disability (one from your particular specialty) and comment on how that might also impact their ability to perceive the environment around them (and communication, relationships).

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Up to this point, what do you know about how hearing works? And how does it affect what people can hear? How would an impairment different parts of the ear affect an infant or toddler's hearing?

Write down what you know about this subject following these two questions (a paragraph or two).

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As we continue through out the unit, the questions we have brought up so far and that you should continue to assimilate into your understanding will be listed at the very top of the page, as today.

Questions to continue thinking about:

- How does a child perceive his/her environment?
- What if a child didn't hear all the sounds that children typically hear?

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## How Hearing Works

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### What?

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**What we will be learning:** Anatomy of the ear, how hearing works, and how you can use this knowledge to plan better strategic interventions.

### Why?

---

**Purpose:** Why would we spend the time to learn about the anatomy of the ear and how it functions? Well, as you will learn, there are many types of hearing loss. Different types of hearing loss can result in different messages being sent to the child's brain. And as we know, the child's interpretations will affect how they perceive the world, how they understand those around them. Number one impact: Language.

Learning this information will help you to better and more efficiently understand **how** this child's hearing loss is impacting their hearing. Although we will be progressively learning about impacts throughout this class, our groundwork begins here.

### Wiki....What????

---

Some of you might have heard of a **wiki** (wick-ee) before. Some might not have. But what does it mean?

A "wiki" is:

"A website that allows content to be added and edited by its users."

Yep, that's exactly what it means! So...what does this have to do with our infant and toddler hearing loss module?

The nice thing about a wiki is that it's never just ONE person's knowledge. A person puts information on it, another may revise that information and add to it. In the end, it's basically an encyclopedia of collected knowledge! **And what we're about, especially in this field, is collaborating in order to know more, know better, and then do better as a collaborative unit.** 😊 You'll be able to return to this resource of collective knowledge regarding this unit for questions as well as your own contributions.

Whenever you see this sign:

# Wiki

That means it's time to contribute some of your knowledge to the wiki. Our wiki is at the very top of the topics page. The wiki holds the history of the information. You'll also see a "Sandbox" wiki. Use this as a place to practice and try out new things so you don't feel intimidated when trying to go into our Hearing Loss wiki.

### How do I edit and use a wiki?

Before we begin, try a few of these things:

1. Go to the Sandbox wiki.
2. When you write information on one page and want a word to link to a NEW page, you enclose it in [brackets]. Write about yourself, and include your name in [brackets.] For example: "[Krista] enjoys guitars." (Yes, it can be as simple as that!)
3. Click on the question mark by your name, and type information about yourself in the page you created.
4. Don't fret if you feel overwhelmed by this new technology. That's why we're starting early. Just try a few small things to get comfortable. You'll find yourself comfortable with this in no time. 😊

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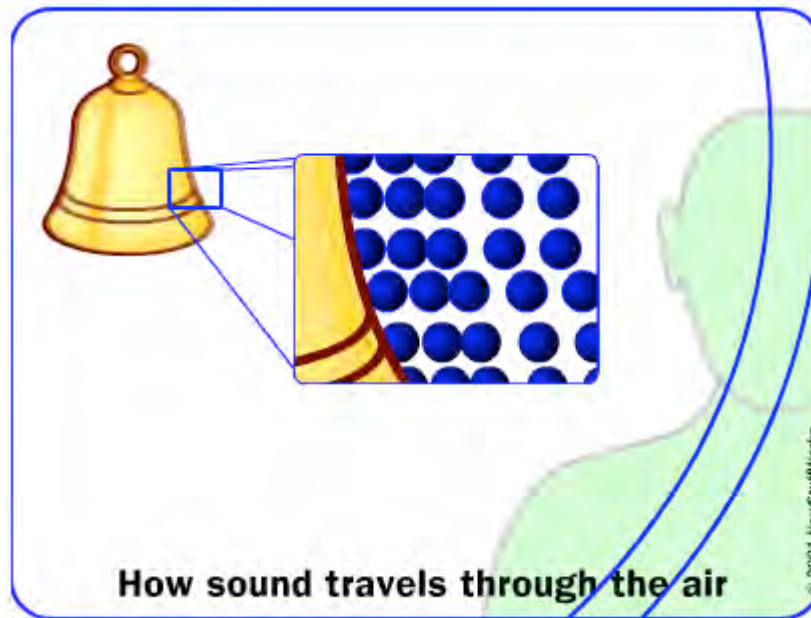
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## What is Sound?

You've all heard the question, "If a tree falls in a forest, but nobody is around to hear it, does it make a sound?" Well not to spoil the joys of the question, but in reality it depends on how you define the term "sound".

First of all, as you are well aware, our air is not empty. Molecules of nitrogen, oxygen, and carbon dioxide make up much of our air. We can go ahead and just think of them as tiny balls. As parts of the air get pushed by an object, they hit each other and continue travelling, just like dominoes might. We often think of sound as an entity itself, but it's not: sound is the word we use to describe molecules bouncing and eventually hitting our eardrums.

In the example below, a bell is shaken. The vibration of the bell sends vibrations through the air (the molecules are bouncing off of each other). Eventually, the bouncing molecules hit our eardrum, which makes our eardrum vibrate. Our brain interprets this as sound.



So.....if a tree falls in the forest, and nobody's around to hear it, does it make a sound? 😊 I guess that depends: is the sound you're talking about the sound waves travelling through the air, or is it the perception of sound you are talking about?

Let's take a look at [Howstuffworks](#) and their description of what sound is. (Look at this first page only.) Then come back and resume the lesson.

## Frequency

The page on Howstuffworks you just looked at mentioned the following:

"A higher wave frequency simply means that the air pressure fluctuation switches back and forth more quickly. We hear this as a higher **pitch**. When there are fewer fluctuations in a period of time, the pitch is lower."

Okay. What does THAT mean?

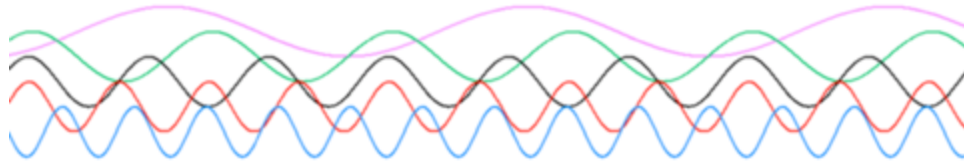
First, what other ways do you use the word "frequency"? How about these sentences:

- "The frequency of visits will be 2 times a week."
- "What is the frequency of Joey's therapy?"

In each sentence, what does *frequency* mean? That's right, it's pretty straightforward. It means *how often*.

With sound, it's the same thing. However, we're referring to the air. **How OFTEN do the air particles vibrate?** Do they vibrate really fast? Are they barely vibrating at all?

**Fast vibrations result in a higher pitch** (our perception of frequency), and **slower vibrations result in a lower pitch** (our perception of frequency). Like the following:



Above: [Sine](#) waves of various frequencies; the lower waves have higher frequencies than those above. Source: [Wikipedia.org](#).

### Decibels = Loudness

Returning to the idea of molecules bouncing against each other, the overall concept of decibels (dB) is pretty simple: **the harder the molecules bounce, the louder the sound is**. The harder the molecules bounce, the higher decibels (measurement of loudness) it is.

Just think of when you hit something and it makes a sound. When you hit it harder, is it louder? Of course.

If you want to learn more about Frequency and Decibels and how they work, there's lots of information on the internet. For now, this basic conceptual framework will work for us.

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## Collecting Sound: It's all Mechanical

It's that an amazing statement? Just as we can see a machine working, the way our ear collects sounds is completely like a mini-machine. In fact, our middle ear bones are the smallest bones we have in our body! Our ear collects and responds to the vibrating air pressure by moving with that vibration.

Take a look at Howstuffworks' page on ["Catching Sound."](#)

## The Outer Ear

The outer ear consists of the pinna, ear canal, and eardrum.



The pinna collects sounds and helps to bring them to the ear. You might not think the pinna would make a difference, but try this:

Place a cupped hand behind your ear, as if you are trying to "hear better." Do you notice a difference? Especially if a sound source is directly in front of you, you should notice a slight difference (increase) in the sound you receive.

The ear canal brings sounds to the eardrum, which is a very fine, thin piece of tissue. It's quite amazing that even the slightest movements in air pressure move this piece of tissue, which is attached to the middle ear bones.





Take a glance at Howstuffworks' analogy of this part of the ear being the [Drum Set](#).

### The Middle Ear

The middle ear bones, as you can see above, are the **hammer, anvil, and stapes (or malleus, incus, and stapes)**. They are tiny little bones that are connected together. The hammer, or anvil, is connected to the eardrum. When the eardrum vibrates, this vibration travels along this middle ear path.

You might notice what is called a "Eustachian tube" exiting out of the middle ear space. This serves to regulate the air pressure inside of the middle ear. It's important for the air pressure to be close to that outside the eardrum. What do you think would happen if the air in the middle ear were closed and was not able to move? You're right--the eardrum would have a hard time moving as well! That's why it's important that the Eustachian tube be able to open and close. If you've ever "popped" your ears after a plane flight, you've opened your Eustachian tubes to equalize the pressure between the middle ear space and the outside air.

Let's take a look at Howstuffworks' site [Bone Amplifier](#).

**When a hearing loss occurs in either the outer or middle ear, it is called a [Conductive Hearing Loss](#). Since it is all mechanical, surgery can usually correct this type of hearing loss.**

### The Inner Ear

The stapes connects to the cochlea via the oval window to the cochlea. The stapes vibrates and in turn, vibrates the membrane inside of the cochlea.

The cochlea is fluid-filled, and also has reed-like hair cells throughout. Certain hair cells vibrate at specific resonant frequencies, with the higher frequencies being towards the front of the cochlea and the lower frequencies being towards the back of the cochlea.

When these hair cells vibrate, there is a "spark" that hits the auditory nerve, which transmits that now electrical signal to the brain.

**Did you notice that? Through the hair cells in the cochlea, mechanical vibrations get transmitted to electronic impulses for the brain to interpret.** Quite amazing! Depending on where it sparks (certain hair cells), the brain interprets them as different frequencies (pitch). The intensity (strength) of the "spark" tells the brain how loud to interpret the sound.

**When a hearing loss occurs in the cochlea, it is called a [sensorineural hearing loss](#). Sensorineural hearing losses occur when there is damage in the cochlea. Up to this point, sensorineural hearing losses cannot have surgery to correct the hearing loss.**

Howstuffworks' site [Fluid Wave](#).

Howstuffworks' site [Hair Hearing](#), as well as the [movie on the page](#). The movie on this page will serve as a nice summary as well as quick review on all aspects up to this point.



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## So...how does it affect sound?

Now you've learned about sound, the ear, and how it functions to send signals to the brain, what does it sound like when something isn't working quite right?

### Conductive Hearing Loss

Remember, a conductive hearing loss is when something is not working quite right with the outer ear (pinna, ear canal, eardrum) or the middle ear (Eustachian tube, middle ear space, hammer, anvil, stapes). Some common things that occur are:

- Missing outer ear
- Middle ear fluid (otitis media)
- Malfunctioning Eustachian tube
- Missing middle ear bones
- Closed ear canals

When something is wrong mechanically, it's blocking a fair amount of sound. (We'll get into more specific details later on in this unit.) But for right now, you can think of conductive losses more along the lines of a set of really good earplugs. It's harder to hear, you may not even hear some things, but there isn't really any distortion of the sound itself.

### Sensorineural Hearing Loss

Sensorineural losses, as you recall, occur when there is something wrong inside of the cochlea. Let's say that the hair cells that were responsible for high frequencies were damaged. What frequencies would you no longer hear? (Or not hear well)?

The sounds we hear around us may sound high or low, but for the most part are made up of several different frequencies. When only part of the frequency hits your ear, this actually causes distortion. In a really broad sense, Sensorineural hearing loss means that the hearing is slightly distorted. A person might be missing all of their hearing, or a person might only have a very mild hearing loss. But most of the time, they will be missing more of certain frequencies than others.

### Mixed hearing loss

A mixed hearing loss means you've got a little bit of both worlds. A child with a mixed hearing loss will have **both a conductive hearing loss along with a sensorineural hearing loss**. Quite often, this can be middle ear fluid on top of a sensorineural hearing loss.



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## One Last Bit of Review

Before we go on to really putting it all together, let's go for one last review with this Flash animation. Once we get through the instruction on the cochlea, we'll stop. (It gets more in depth.) We'll save the rest for later!

[Review Flash Animation](#)

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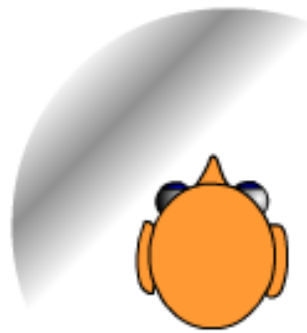


# One Last Bit of Review:

## Flash Animation

### Lecture 9: Hearing

Copyright  
Tutis Villis  
University of Western Ontario  
London Canada  
Created 1999  
Revised 2005



Start Sound Ossicles Inner Ear Direction Cortex Language End





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## Putting it All Together...

Now, let's put this all together by seeing HOW we would use this information on the job with our kids. We won't be discussing interventions at this point in time, but we will be attempting to understand how a malfunction in the hearing mechanism can possibly affect a child's hearing and perception of sound.

I'll be giving you several examples of what you might see in a report or encounter in the field. Using the knowledge of what you have learned here as well as other things you might have to look up, write about the following:

1. Where is this hearing loss occurring? (Outer ear, middle ear, inner ear)
2. What parts of the anatomy might be affected? (eardrum? cochlea?)
3. What kind of a loss is this? (conductive? sensorineural? mixed?)
4. How might this hearing loss (in a very general way) affect the child's perception of loudness (perception of decibels) and certain frequencies (highness and lowness of sounds)?

**Discussion Board!** On the discussion board, (there's a link in Topic 2), is a discussion entitled "Putting it all together: Discussion." There will be several different examples of which you will pick at least 2.

1. Note which example you are replying to in the subject heading.
2. Make sure you hit on all 4 questions mentioned above. (They will also be listed in the discussion board.)
3. Reply and brainstorm with others.
4. Just as in the field, you might see terms you need to look up. This is fine! Nobody knows everything, and the internet can be one of our best mediums to quickly find and locate medical terminology.
5. Remember: It's a place to learn, and don't feel like you have to be "right" the first time or that there is ALWAYS one right answer! The more we toss ideas back and forth, the more we'll learn.

**See you on the discussion board!**

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3. An insight as to how a child might perceive the world around him/her, nad how it could possibly affect his/her development.

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Putting it all together...

by [Krista Galyen](#) - Saturday, 12 November 2005, 05:19 PM

1. Where is this hearing loss occurring? (Outer ear, middle ear, inner ear)
2. What parts of the anatomy might be affected? (eardrum? cochlea?)
3. What kind of a loss is this? (conductive? sensorineural? mixed?)
4. How might this hearing loss (in a very general way) affect the child's perception of loudness (perception of decibels) and certain frequencies (highness and lowness of sounds)?

Example 1:

A child has microtia and sensorineural hearing is completely intact.

Example 2:

A child has moderate bilateral sensorineural hearing loss as diagnosed recently by an audiologist. She has a loss of 30 dB in the lower frequencies, but has up to a 55 dB loss in the higher frequencies.

Example 3:

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## Troubleshooting Hearing Aids

### First of all, why would you want to know any of these things?

(In other words, why is this so important for the child, and how does knowing this benefit my work with the child?)

1. If a child is able to hear speech with the assistance of any of the above devices, the number one helper, above any therapist, is the daily consistent usage of hearing aids. The hearing aids are this child's link with the sounds of the world. You, as the early interventionist, are in the role to make sure that this happens.
2. If the child's aids are properly maintained, your therapy will have far greater impact than if they were not maintained.
3. If the hearing aids don't work, the child does not receive the access to language s/he would have had if they had been properly maintained.
4. YOU, being one of the primary educators/therapists in the child's weekly (or monthly) routine, can have an impact on **helping the family maintain and consistently use** these aids.
5. It is important to know what can readily be fixed or maintained by you, and what needs to be immediately send to the audiologist for repair. The family may be believing the aids are working properly when in fact they are not.



Does this sound good to you? Helping the child have access to available sound AND helping to make your therapy have greater impact! I'd say this is extremely well worth your while to learn and keep on hand.

First, in order to know how to troubleshoot, you need to know how these aids work. The device you will undoubtedly see most often, is the behind-the-ear (BTE) hearing aid and the conductive hearing aid. BTE hearing aids and conductive hearing aids with bands are used with our agegroup (birth to three) because their ears are growing. It would be too expensive to fit a child with in-the-canal hearing aids as the entire aid would have to be resent to make a new casing. Children's ears can sometimes change in 6 weeks time! But we'll talk about how to see when a child needs new earmolds a little later.

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## HEARING AIDS

### Parts of the Hearing Aid: Air Conduction



These are really the major parts of the hearing aid you will need to know. Children with sensorineural hearing losses (the majority of children you will be working with) will be wearing these behind-the-ear (BTE) air conduction hearing aids. They call them air conduction aids because they transfer sound through the air and to the child's hearing system (outer ear, middle ear, inner ear). **Bone conduction** aids, as we will see below, transfer the sound through vibrations sent to the bone (skull).

- The **microphone** collects the environmental sound
- The **volume control** turns the volume up or down. (The audiologist will have written an optimal setting (written as a number) for the child to wear the aids. Sometimes there is a volume guard to prevent the child from accidentally turning the volume up or down. The on/off switch has 3 settings: O for off, T for telecoil (for use near headphones or other telecoil devices...don't worry about this one at all for now), and **M** for Microphone. "**M**" basically means "on.")
- The **battery compartment** holds the battery
- The **tone hook** sends the amplified sound to the earmold. The tone hook can twist off the earmold if you want to take it apart.

Here is an example of a hearing aid with an **earmold** attached:



The earmold is attached to the tone hook with flexible tubing. Sometimes the audiologist will glue the tubing to the earmold so it doesn't pop out very easily. No matter what, it really shouldn't be able to pop off of the tone hook with great ease. (It should take a bit of effort.)

### Parts of the Hearing Aid: Bone Conduction

Bone conduction aids are used with conductive hearing losses, or losses that occur in the outer or middle ear. A modified BTE hearing aid is used to collect the sound then transmit the signal to a bone vibrator. The bone vibrator is tightly held to the child's head with a band. The sounds vibrate the skull, which in turn vibrates the hair cells in the inner ear, which then sends the sounds to the brain.



Above this modified BTE hearing aid is held to the child's ear with an earmold. The earmold here does not have sound passing through it; it only serves to keep the BTE aid from bouncing around.



Above shows the modified BTE hearing aid with the attached cord to the bone vibrator. The headband has pockets to hold both the BTE aid, cord, and vibrator. The cord gets replaced/lengthened as the child's head grows.



Here is an example of a child wearing a bone conduction hearing aid. The bone vibrator is placed behind her ear on the mastoid bone.

## Hearing Aids: How do they work?

### Air Conduction hearing aids

Take a look at the process hearing aids use to amplify sound.

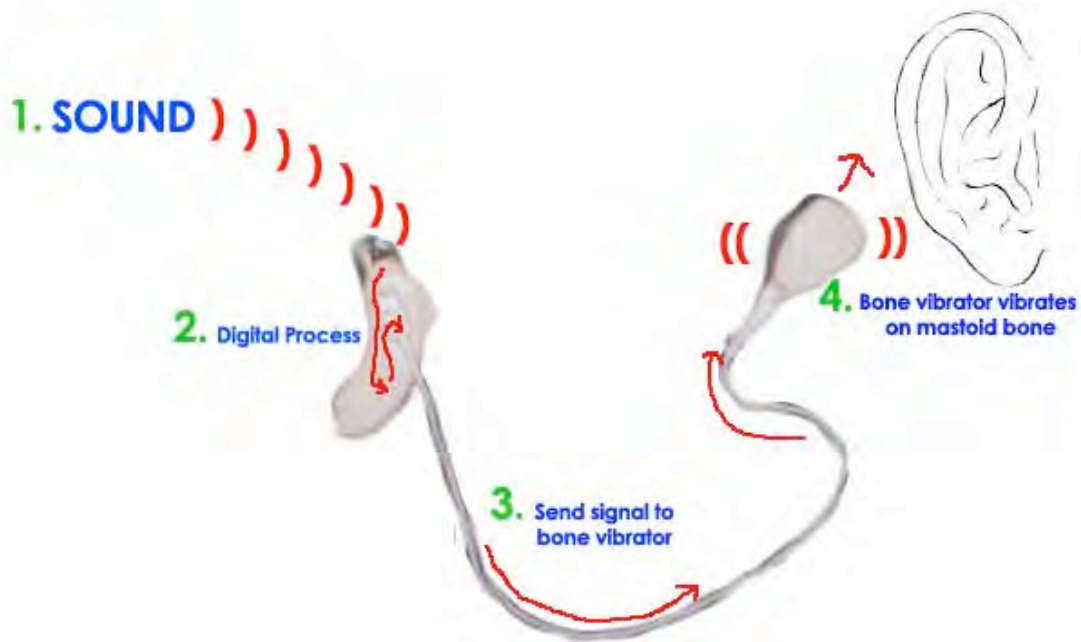


1. The **sound hits the microphone** at the top of the hearing aid.
2. The **microphone sends the acoustic sound** to the hearing aid where it is **processed into digital sound** and amplified according to the child's hearing loss.
3. It is then **sent out of the hearing aid**, out the tone hook, and through the earmold to the child's ear canal.

**IMPORTANT:** Children's sensorineural losses are hardly ever what we might call "flat" losses. They might hear some pitches better than others. Hearing aids serve the main purpose to amplify sounds. **Thus, they don't correct the child's hearing, they just give him or her greater access to the sounds in his or her environment.**

### Bone Conduction hearing aids





1. Sound is collected by the **microphone**. This modified BTE is usually on the opposite side of the bone conduction aid.
2. **Sound is processed** and the signal is electronically sent.
3. The electrical signal **travels through the cord** to the bone vibrator, which usually sits on the mastoid bone.
4. The small **bone vibrator sends signals** through the bone to the inner ear.

**Note:** If the child only has a conductive hearing loss (not a mixed loss), the hearing aid doesn't really amplify sounds. It just sends them to the cochlea (actually, the bone which shakes the cochlea!)

Sometimes children can get sore from the conductive aids. The headbands can be tight, and the bone vibrator can sometimes be irritating. It's okay to not force the child to wear it at times if she/he is uncomfortable. The main thing is **consistency in usage**.

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## Hearing Aids, cont'd

### Maintaining Hearing Aids

Now that you know the parts of the hearing aid and how it works, it's time to know how to **maintain the hearing aids and make sure they are in good working order**. After we learn about maintenance, we'll move on into the last category of hearing aids: troubleshooting problems.

### Hearing Aid Care Kit: A must!

Before you start, you should always have on hand a hearing aid care kit. You will use this to help the parents maintain the hearing aids as well as troubleshoot. The kits may look slightly different, but will always have these components (and so should you!):



- Dehumidifier
- Air Puffer
- User Guide
- Battery Tester
- Listening Tube
- Kids Clip
- Stickers

Here is an example of a hearing aid care kit.

You should make sure you have at least the following on hand (looks of product may differ slightly):

-  Air puffer, or air blower.
-  Battery tester
-  Dehumidifier, or dri-aid
-  Kids clip (clips the hearing aid to their clothes if the hearing aids fall off!)
-  Listening tube (you may also see listening stethoscopes, which will be in the following examples. They work the same.)

## 1. Daily listening check

At first this may seem a bit cumbersome, but after you get used to this, it will go quite quickly. The purpose of the daily listening check is to see if sound is coming out of the hearing aids, and if so, what the quality of the sound is.



**A. Turn the hearing aid on.** (Yes, you may think this is a funny first step, but it will surprise you how many times you may forget to do this!) Make sure the switch is on "M" and NOT "T".



**B. Check for sound production.** You can do this by cupping the hearing aid in your hands to create feedback (sound emitted being amplified over and over again resulting in an unpleasant squeal). If you hear feedback, the hearing aid is working. If your child has a very mild loss, you may have to cup your hand

tighter to result in feedback; stronger hearing aids may not even need to be cupped to produce feedback. (Select the picture to have a larger view.)



**C. Check the quality of the sound through the Ling 6-sound test.** The Ling 6 sounds covers a majority of the speech frequencies. If you can't remember the sounds, that's okay. Just talk into the microphone. The important thing here is to listen for any crackling, popping, cutting in and out of sound, or any other type of distortion to the sound. Simply attach your listening stethoscope to the child's earmold and speak into the microphone. (click on the picture for the video example. 228 kb [Quicktime](#) video.)

## 2. Check battery power.

Perform a 10-second load test on the battery; it should stay at "ok" or "green" or "good." Hearing aid batteries maintain their strength until they are used up, then they are ready to be replaced.

## 3. Clean the earmold.

Done weekly with a solution of soap and water, simply wash the earmold and let it dry. You don't want earwax to build up in the earmold as this could block sound as well as irritate the child's ear. In addition, don't clean the earmold with alcohol. This will deteriorate the earmold.

## 4. Keep the hearing aid dry.

There should not be any wetness in the tone hook or earmold. If you've been in any humidity, place the hearing aids in hearing aid dryers that come with your hearing aid care kit. The water can not only cause damage inside of the aid, but can interfere with the quality of sound that comes out of the hearing aid. Make sure you clean out any droplets you may see by blowing air through the tubing or earmold with the blower (also in your care kit.)

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# The Ling 6 Sound Test



## Hearing Aids

### Troubleshooting Hearing Aids

Believe it or not, you now have most of the tools needed to perform basic troubleshooting of hearing aids. It's now just a matter of practicing how and when to use all that skill and knowledge.

Just to make sure you've had ample opportunity to see the tools and their uses for troubleshooting hearing aids, take a look at these tiny clips which show the tools in action:

### Examples of troubleshooting

Before we go off on our own trying to solve various hearing aid issues you may encounter with your children, let's take a look at some ways some typical problems have solved. After we look at these examples, we'll go to the discussion board with our observations.

While you look at each of these examples of troubleshooting an issue with a hearing aid, think about the following:

1. Is there a particular order in which the educator goes about troubleshooting? What things usually come first? Which things tend to come later?
2. If you do find an order, is this important? Why or why not?
3. Lastly, think about each particular issue with the aid. How would this hinder a child's hearing, in particular his/her listening to the environment?

We'll bring these questions up again.

1. [Example 1 \(600 kb\) Problem: Feedback](#)
2. [Example 2 \(1.6 Mb\) Problem: Child isn't responding as much as s/he used to](#)
3. [Example 3 \(900 kb\) Hearing aid sometimes has feedback, sometimes doesn't work. Been in lots of temperature fluctuations.](#)

### Discussing the Worked Examples: It's your turn!

#### Discussion Board!

Remember the questions above you were supposed to think about while watching the clips? We're going to discuss those very answers on the board. So think about what you noticed, how you would usually go about checking an aid, and how an improper working aid might affect the child's listening ability.

As collaborators with audiologists in helping the family maintain proper hearing care for their child, it's good to review and practice this skill of troubleshooting them. On the discussion board are some examples of a problematic aid. For example, you could see something like:

Problem: Constant Feedback.

1. Check earmold. (If not fit, child needs to get appt. for new earmold. If okay, go to step 2.)
2. Make sure the volume is not up too loud. (If too loud, turn down. If okay go to step 3.)
3. Check the inside of earmold and tubing. (If dirty, clean out earmold and dry out tubing if necessary. If fine, go to step 4.)
4. Check for any holes and visually inspect the aid. (If holes, notify audiologist for repair. If no holes, notify audiologist as there is nothing else you can check at this point.)

But that's not all we will discuss! When we talk about troubleshooting, you'll actually be writing about these four

things:

1. How you would go about troubleshooting the aid (what you might do first, second, third, etc.)
2. What the possible causes might be and how you would know (what troubleshooting technique would reveal this problem)?
3. What would the steps be to fix the aid?
4. What would the child be perceiving if the aid were left as it was? What would be the impact?

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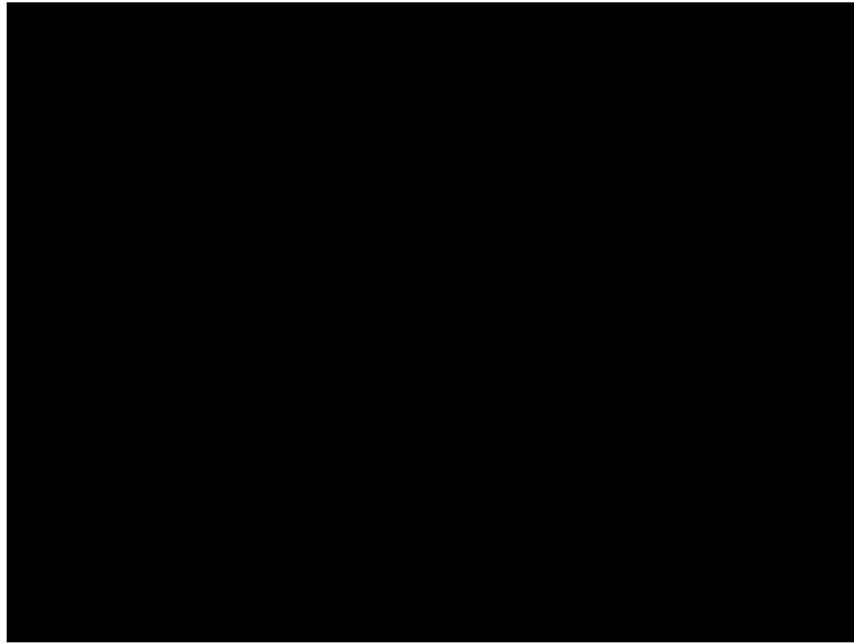


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# Troubleshooting Hearing Aids:

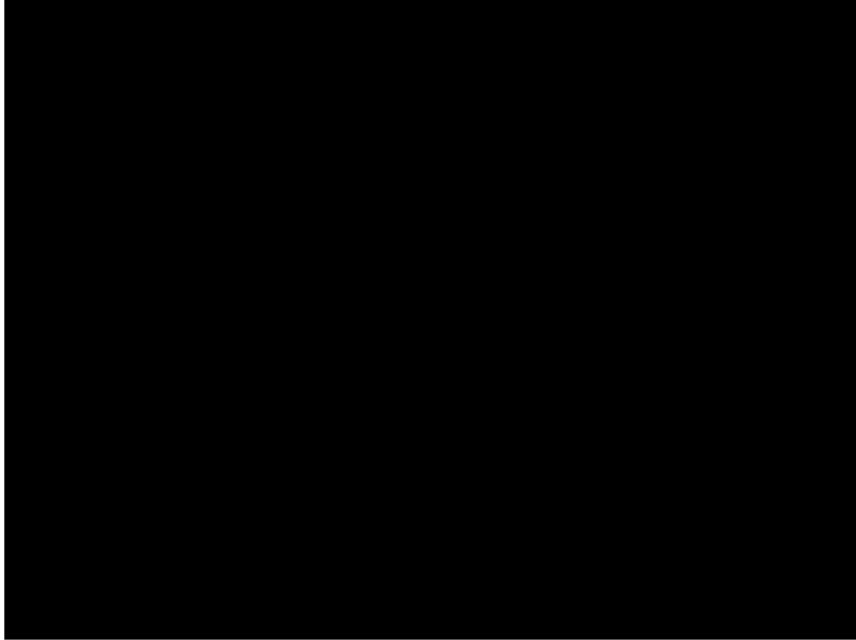
## Worked Examples





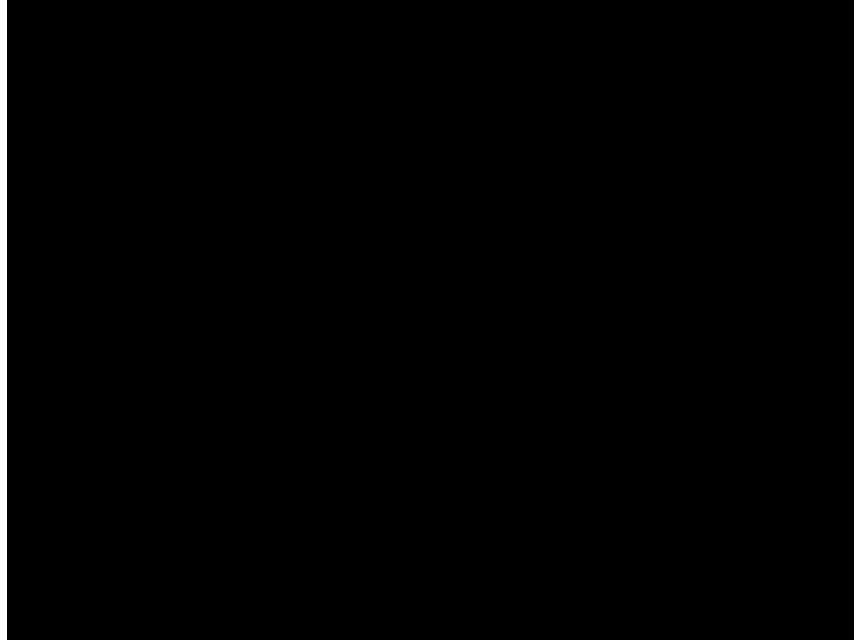
# Troubleshooting Hearing Aids:

## Worked Examples



# Troubleshooting Hearing Aids:

## Worked Examples





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1. **How you would go about troubleshooting the aid (what you might do first, second, third, etc.)**
2. **What the possible causes might be and how you would know (what troubleshooting technique would reveal this problem)?**
3. **What would the steps be to fix the aid?**
4. **What would the child be perceiving if the aid were left as it was? What would be the impact?**

-----  
 Example 1: Aid is not sending out any sound at all.

Example 2: The aid just got stepped on, and they want to know if it still "sounds okay."

Example 3: The child wears the aids, but she's not responding to noises.  
 -----

No, you will not know the exact answers. Yes, there are multiple possible causes for each scenario. Your job is to pre-plan a method for troubleshooting, and list what the possible problems may be. Answer at least 2 of the three, with answering all 4 questions listed above. Have fun!

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## Troubleshooting Hearing Aids

### Summing it up for yourself AND the caregivers: Assignment

We've been discussing the way to maintain and go about troubleshooting hearing aids. However, we all know that the real job of an early interventionist is also to empower the family and caregivers of that child. But...how will you best go about doing this? And even more importantly, how will you convince them that this is worthwhile knowledge to have for your child?

Your next job is to sum up for parents, in a visual and "non-wordy" sheet, how to maintain their aids and why, and another sheet (visual and "non-wordy" as possible) for how to troubleshoot their aids and why they would want to. Be sure to include how it can affect their child's perception of the sounds around him/her.

Think of the parents you have now (or caregivers)...what would THEY want as a resource to help them? Would they want something they could tape to the refrigerator? Would they want a card to look at? Make this for you and for your parents in mind.

When these two sheets (or whatever written piece you choose for your parents) are completed, upload them in PDF form.

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### Summing it up for yourself AND the caregivers: Assignment

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