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Auditory Practice for EAS Recipients

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Learning Objectives

- Review candidacy for Electric Acoustic Stimulation (EAS)
- Review EAS
- Impact of mid to high frequency hearing loss
- Aural rehabilitation for EAS-practical ideas

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EAS Candidacy

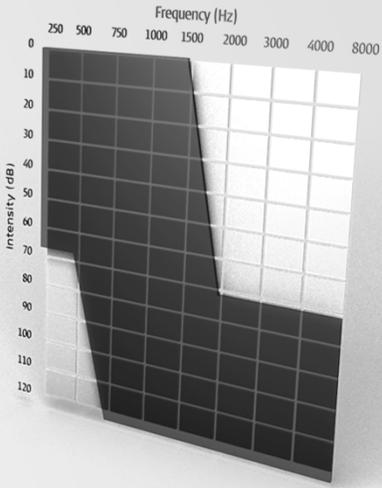
- EAS is especially designed to suit the needs of individuals who have residual hearing in the low frequencies and a significant high frequency hearing loss.

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EAS Candidacy

- FDA approved for candidates age 18+
- EAS candidates have normal hearing up to a moderate sensorineural hearing loss in the low frequencies, sloping to a severe-to-profound hearing loss in the high frequencies
- Single-word speech understanding scores are 60% or less in each ear (i.e., CNC words in quiet)



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EAS

- Provides acoustic stimulation that supports natural residual hearing by amplifying the low frequencies.
- For higher frequency sounds, the integrated cochlear implant technology automatically takes over and supplies the appropriate electric stimulation.
- Together, these technologies combine and can help a person hear all the sounds of speech.



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EAS

- Audio processor worn behind the ear and connected with a cable to a transmitter coil, which sits on the outside of the head, over the implant.
- During the operation, a flexible electrode is inserted into the cochlea in the inner ear.



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EAS

- The shorter EAS electrode only covers the basal region, the part that's responsible for high-frequency sounds, leaving the still-functioning apical region untouched.
- An ear mold, which directs sound into the ear canal, is connected to the audio processor.

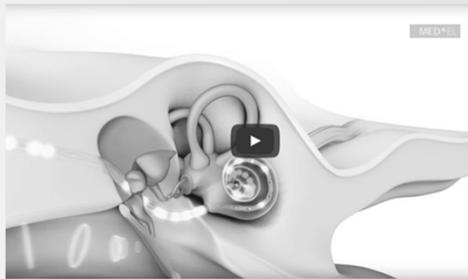


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What Happens?

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1. A microphone inside the audio processor picks up sound waves. Both high and low frequency sounds are processed simultaneously.
2. Low-frequency tones are amplified and sent through the ear mold into the ear canal.

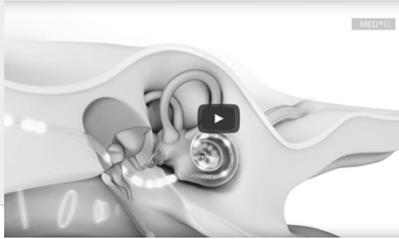


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What Happens?

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3. These low tones take the natural path to the cochlea, where hair cells in the apical region, which deals with low-frequency tones, receive the amplified sound signals.
4. At the same time, the audio processor digitally analyzes and codes the high-frequency tones into a special pattern of coded electrical signals.



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What Happens?

5. These signals are sent to the coil and transmitted through the skin to the implant.
6. The implant creates electrical pulses from the coded signals.



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What Happens?

7. These pulses are relayed to the relevant electrode contacts inside the cochlea.
8. The hearing nerve receives both acoustic and electric sound information at the same time and transfers it to the auditory cortex where it is interpreted as sound.



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Impact of Mid to High Frequency Hearing Loss

- Speech can be heard but may sound fragmented, muffled or distorted so is difficult to understand
- Men's voices easier to understand than women's or children's voices
- Difficulty understanding speech in background noise; hear fine in a quiet environment when speaking to one person but have problems following a conversation in a noisy environment

Impact of Mid to High Frequency Hearing Loss

- Difficulty understanding quiet voices
- Difficulty understanding voices from a distance
- Difficulty hearing high frequency sounds such as birds chirping, doorbell
- Difficulty with word endings (e.g., "map" may be heard as "ma")
- Difficulty with grammatical markers such as plurals, possessives, past tense 'ed'

Impact of Mid to High Frequency Hearing Loss

- Hear vowels but have difficulty hearing mid to high frequency consonants (depending on configuration of hearing loss)

Mid frequency sounds (1000 to 3000 Hz):

/ch, sh, p, h, g/

High frequency sounds (3000 Hz and above):

/k, t, f, s, th/

Impact of Mid to High Frequency Hearing Loss

- Difficulty discriminating mid to high frequency consonants (e.g.,: k-t, ch-sh)
- Some consonant sounds may be heard inconsistently (especially in noise)
- May affect speech production of these sounds

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Benefits of EAS

- Better understanding of speech – research shows that EAS system users scored 50% better in speech understanding and sound quality than they did with hearing aids before the surgery.
- Improved speech, as users are able to hear their own voice more clearly.

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Benefits of EAS

- Using the telephone is easier due to improved speech recognition.
- Ability to hear the higher frequencies means it's easier to appreciate music.
- Improved quality of life – better hearing makes socializing in groups and environments with background noise easier.

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Aural Rehabilitation

- Data demonstrates that adults with hearing loss who have received a cochlear implant and participate in a rehabilitation program have more rapid progress and improved listening outcomes.
- Many EAS recipients have had this type of hearing loss for many, many years (possibly since early childhood); integrating high frequency sounds (hard for most CI users) may take a little longer for EAS recipients (possibly like a prelingual or long-term deafened individual).

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Auditory Training-Two Types

Analytic

- used to focus on missing sounds which are now accessible
- vowel and consonant auditory discrimination activities

Synthetic

- more natural approach to learning how to distinguish spoken language
- uses content and language knowledge to predict or derive meaning

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Auditory Practice Factors

- Closed to open set
- Familiar vocabulary, information to complex vocabulary, information
- Short to longer utterance
- Known topic to unknown topic
- Context to aid in understanding to no context
- Conversational level to quiet
- No background noise to background noise
- Visual cues to auditory only

Auditory Practice Activities

- Auditory bombardment focusing on listening to mid to high frequency sounds (analytic)
- Same-different (analytic)
- Auditory discrimination (analytic)
- Speech tracking (analytic)
- Sentence level-sentences loaded with mid to high frequency (synthetic)
- Paragraph-loaded with mid to high frequency sounds (synthetic)

Examples of Auditory Practice Analytic

Auditory Bombardment-words

- Focused auditory stimulation to increase awareness of target sound
- Can start with visual (look at words, sentences, paragraphs while someone reads aloud) and progress to auditory only

Auditory Bombardment-words

Words starting with /k/

catch king cage cold comb
coat cow cash cat corn

Words with /k/ in the middle

hockey speaker jacket weekend broken
because making pocket raccoon chicken

Words ending in /k/

kick rake look rock cheek
block fake sick luck quack

Auditory Bombardment-sentences

Words starting with /k/

The king and queen were cooking over the campfire.

Words with /k/ in the middle

The speaker was talking about the broken hockey stick.

Words ending in /k/

We had to look under a rock to find the sick duck that was quacking.

Auditory Bombardment-paragraph

Carrie and Ken went camping last week. Ken went fishing and caught catfish and a few carp-those he threw back into the lake. Carrie went hiking and took pictures of the wildlife. In the evening it was quite cold so they sat around the campfire every night. They enjoyed making s'mores with dark chocolate, marshmallows and crackers. However, they were quite sticky.

Same-Different

State if two sounds or words are the same or different (put in initial, medial and final position).

ush	uk
kow	chow
see	see
mighty	Mikey
shoe	shoe
match	mash

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Auditory Discrimination-word level

sun fun

chip ship

Sue zoo chew new two shoe

key tea bee me he see she pea fee

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Auditory Discrimination-sentence level

Sue zoo chew new two shoe

Draw a circle around chew and underline two.

Zoo should have an x on it and two should have a triangle around it.

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Write Series of Words

Provide listener with a category (known topic) and then list 10 words that are loaded with mid to high frequency sounds. Do again with no topic given.

Category: Buildings in Washington, D.C.

White House, Thomas Jefferson Memorial, Smithsonian Institution, Supreme Court Building, National Air and Space Museum, Treasury Building, National Gallery of Art, Ford's Theatre, Old Stone House, National Portrait Gallery

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Speech Tracking

Repeat verbatim the sentence heard.

The circus was in town on Saturday.

The forecast they heard on the news called for rain and possible hurricane force winds.

- Read from the newspaper, internet, blogs, book so is connected story.

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Examples of Auditory Practice Synthetic

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Answer Questions-use context to assist understanding

President Obama was in office for eight years. How many terms can the President of the United States have?

The American flag has stars and stripes. What three colors are on it?

Let's talk football. Who is the quarterback for the Green Bay Packers in Wisconsin?

I grow carrots in my garden. What is your favorite vegetable to grow in your garden?

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Sentences-Correct or Incorrect

Say a sentence and listener states if correct or incorrect. If incorrect, listener provides appropriate word.

I sat in the brown leather share. (chair)

I was at the farm yesterday and saw a new calf.

I bought a brand new tar yesterday. (car)

I am going to the barbers today to get a chaircut.
(haircut)

The room is a complete mess.

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Fill in the Missing Word Paragraph Practice

Thousands of northern Californians were told to leave their homes _____ evening as an emergency _____ in the countries _____ dam was in danger of failing and _____ floodwaters on _____ below.

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Fill in the Missing Word Paragraph Practice

Thousands of northern Californians were told to leave their homes Sunday evening as an emergency spillway in the country's tallest dam was in danger of failing and unleashing floodwaters on towns below.

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Listening to Paragraph of Information

Auditory Recall

Prince was a singer-songwriter, multi-instrumentalist, and record producer who was born in Minnesota. He has sold over 100 million records worldwide, making him one of the best-selling artists of all time. He was inducted into the Rock and Roll Hall of Fame in 2004. Multiple choice: When was Prince inducted into the Rock and Roll Hall of Fame?

a.) 2000 b.) 2004 c.) 2010 d.) 2013

- Open-ended: What is Prince famous for?

- Recall and retell

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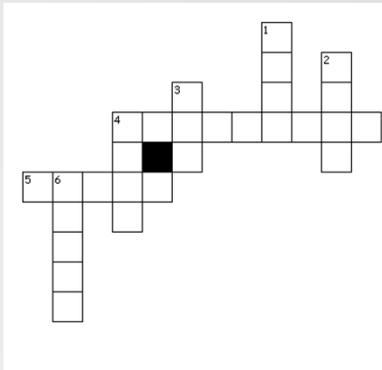
Crossword Puzzles-visual clues then only as auditory clues

Across

- Fats Domino fruity song '____ Hill'.
- The Isley Brother's loud song.

Down

- Johnny Cash's straightforward song-I Walk the _____.
- Jerry Lee Lewis had a hot song 'Great Balls of _____'.
- Buddy Holly's song about 'Peggy _____'.
- Carl Perkins had colorful shoes.
- Elvis Presley's canine song '____ Dog'.



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Word Search

weather

F	K	S	H	C	H	L	X	E	W	N	N	X	Q	N	O	J	S
R	O	F	T	J	U	Q	I	C	X	I	D	S	C	O	Z	K	T
O	V	K	M	Y	R	L	Q	G	L	I	N	C	L	L	J	C	O
S	E	U	D	Q	R	G	C	X	H	O	T	D	H	E	E	R	R
T	R	C	Q	B	I	G	S	S	X	T	U	H	S	I	E	A	M
O	C	U	D	N	C	F	T	U	N	O	E	D	U	I	L	T	R
B	A	X	L	W	A	S	I	N	H	O	T	N	S	N	C	L	N
D	S	Y	Q	L	N	N	C	N	O	C	X	T	I	I	D	E	Y
T	T	O	U	A	E	O	K	Y	S	O	V	H	N	N	H	E	B
G	S	P	H	T	J	W	Y	K	Z	L	A	A	X	U	G	K	R
F	R	E	E	Z	I	N	G	D	A	D	S	W	V	Y	V	T	H
M	P	D	O	B	L	U	E	S	K	Y	Z	V	V	O	G	Q	C

Find the following words in the puzzle.
Words are hidden

LIGHTENING HURRICANE OVERCAST FREEZING THUNDER BLUESKY
CHILLY STICKY CLOUDS WINDS CLEAR SUNNY SLEET FROST STORM
THAW SNOW COLD HOT ICE

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Key Points

- EAS recipients will have had difficulty with mid to high frequency sounds.
- Aural rehabilitation allows recipients to practice listening.
- Auditory practice should focus on sounds that were previously difficult for the recipient.
- Auditory practice will assist the recipient in adjusting to new sounds and maximally benefit from their device.

Conclusion

For rehabilitation, the goal is to:

- stimulate listening skills of sounds that previously may not have been heard or were difficult to hear
- facilitate listening using analytic and synthetic activities
- enhance listening skills in a fun and motivating way



Thank you

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