5/25/2010

Music, Spoken Language, and Children with Hearing Loss: Using Music to Develop Spoken Language

Christine Barton, M.M., MT-BC (Music Therapist-Board Certified)

"Daddy, I hear music in my dreams!"

—Cooper, age 4, bilateral cochlear implant user

Introduction

Music and childhood are like peanut butter and jelly. It is hard to imagine one without the other! While the latter combination may not exist in every corner of the world, music certainly does. Every known culture embraces a musical heritage. Every known culture embraces a language. They are quintessential human behaviors. In fact, they may be the key to what defines us as human (Patel, 2008). Remarkably, neither music nor language training is needed for children to gain the rules that govern the syntax of both domains (Marin, 2009). They are merely absorbed through the child's interactions with their culture on a daily basis. By the time children are ready for kindergarten, they will be able to speak and sing in their native language, and no one will have taught them. Instead, as one child put it, "I teached myself!" The one caveat is this: *Children need exposure to both music and language of their own culture from an early age.*

Spoken language surrounds the majority of children with hearing loss. However, it is not known how much music these children are exposed to. If the biggest predictor in successfully learning music is having it present in the child's environment from an early age (Gordon, 2003), then this is a concern. A study by Bergeson, Miller, and McCune (2006) revealed that mothers of infants who had a cochlear implant (CI) used the same kind of infant-directed (ID) singing—*motherese*—that they used with their hearing infants. This is good news because it is this higher-pitched, lilting, expressive style of speech that conveys emotional intent to the infant and sets the stage for future language *and music* learning.

This article will make a strong case for the inclusion of music into the lives of children with hearing loss. It will address particular challenges these children may face as they process music through their amplification devices, and will provide music activities and resources to support those who seek to enrich the musical lives of children with hearing loss.

Why Music?

Music pervades our culture. It sustains us from the "cradle to the grave." It helps us celebrate the good times, and binds us together when we falter. It gets our bodies moving and stimulates our emotions. It provides comfort when words fail. It enhances life. And, as someone misquoting Shakespeare once said, "It hath charms to soothe the savage beast!"

The debate over which came first—music or language—has been quietly raging among the world of musicologists, anthropologists, and philosophers. Perhaps we will never know the truth. But what is certain is that the "instinct to sing" is just as powerful as the "instinct to speak," and the two are inextricably linked (Mithen, 2006, p. 5). It is this deep-seated connection that can be used as an advantage to support spoken language and music development in children with hearing loss.

Music to Impaired Ears

All children pass through certain milestones on their way to acquiring language, but the path, though similar, will be delayed for children with hearing impairment (see Barton, 2010a article for developmental milestones). Children learn language and music by first hearing it, then speaking/singing it, then reading it, and finally writing it. This "sound-before-sight-before-theory" is a universal learning sequence (Bluestine, 2000, p. 39). In other words, before we can run, we must first learn to crawl. So, the first question to ponder is how do children with less than perfect ears hear music?

The answer is, differently. To hear a simulation of what several instruments might sound like to an individual with varying degrees of hearing loss, the reader can visit a website provided by Phonak, a hearing aid manufacturer. Play close attention to how the unique signature sounds of each instrument changes with the degree of hearing loss. www.phonak.com/us/b2c/en/hearing/understanding_hearingloss/how_hearing_loss_sounds.html

News & Information

» News
» Articles
» Interviews
» Ask the Expert
» Submissions

Researchers at the House Ear Institute have developed simulations of music and speech as it *may* sound to a CI user. Caution is advised when listening because they are simulations based on what the degraded signal sounds like through the device and not necessarily to the CI user.

www.hei.org/research/aip/audiodemos.htm

Users of cochlear implants and users of hearing aids have advantages and challenges in experiencing music. The next section will address these advantages and challenges.

Hearing Aids

The job of a hearing aid (HA) is to amplify natural, acoustic sounds and deliver them to the user in a way that is audible and comfortable. At the same time, it should preserve the integrity of those sounds in all kinds of listening situations (American Academy of Audiology, AAA; 2003). HAs, like CIs, are designed to input speech, so the technology required to replicate the complex requirements of music is still evolving. However, next to speech, music remains the most desired acoustic stimulus in the lives of individuals with hearing impairment (Drennan & Rubenstein, 2008).

Speech perception places fewer demands on the listener than music does. Speech production and perception are fairly predictable across speakers and languages. And, the ability to balance speech loudness with speech clarity has been the essence of what a HA is capable of reproducing. Music has several elements that present challenges to the HA and its user (Drennan & Rubenstein):

- *Pitch*, otherwise known as *frequency* and located on a spectrum from low to high, is at the heart of music. Melody or harmony do not exist without it. To identify a familiar melody, the listener must be able to discriminate among the different pitches and understand their relationships to each other. In *acoustic hearing* (through the HA), the lower frequencies are enhanced, which is important to pitch perception (Kong, Stickney, & Zeng, 2005).

- *Timbre* (rhymes with *amber*) is the term used to discriminate the *tone color* of one instrument from another played at the same volume and pitch. For example, a violin sounds like a violin because of its wide range of frequencies and harmonics, particularly in the higher range. Contrast that with a clarinet, which sounds at a much lower frequency.

- *Intensity*—or *loudness*—can vary greatly among and within instruments. Speech intensity is limited by the vocal chords and vocal tract, but instruments can have peaks and valleys that may cause hearing aids to distort. This distortion, in turn, can affect timbre and cause an instrument to lose its "signature" sound and become unrecognizable to the listener.

There are a limited number of studies that examine music perception through HAs in adults. A study by Looi, McDermott, McKay, and Hickson (2008) found that compared with CI recipients, HA users with similar levels of hearing loss were better at pitch and melody perception. Rhythm and instrument identification were similar between the two groups. Another study (Kong, Stickney, & Zeng, 2005) found an advantage in music perception in CI users who were aided on the *contralateral* (i.e., opposite) side.

Cochlear Implants

CIs, like HAs, were originally developed to enable good speech perception in individuals with severe-to-profound hearing loss. The devices have been very successful in accomplishing that goal. However, the difference is that HAs amplify the natural sound, whereas a CI converts that sound into electrical impulses that are then interpreted by the brain (*acoustic* [HA] versus *electric* [CI] hearing). This changes the way a CI user hears sounds.

Music has posed a particular challenge to many of these listeners. Fortunately, the manufacturers are addressing the issues of music enjoyment. Fine-structure processing and current steering have enhanced the spectral resolution of the current generation of CIs. Advanced Bionic's Harmony® Hi-Res® and Med-El's Maestro (note the musical names) have improved the music listening experience for many users. While still not perfect, it is a step in the right direction. Looking again at the same three domains through *electric hearing* (CI):

- *Pitch* perception is difficult for many CI users because the implant enhances the higher frequencies necessary to decode speech, not music (Kong et al.). According to Drennen and Rubenstein (2008), at least 64 channels are necessary for melody recognition.

- *Timbre* also provides challenges to the CI user because the *compression* of the dynamic range changes the spectral shape of the acoustic sound, which is what helps define the unique sound of any instrument.

- *Intensity* gives a musical composition varying dynamic effect. When intensity is compressed, as in the case of the CI, pitch can be affected, so not only will the piece lack an emotional charge, but the pitch may also be difficult to decipher (Drennen & Rubenstein, 2008).

The good news is that timing discrimination, which affects the encoding of rhythm, is nearly normal in CI recipients. So, musical rhythm is perceived almost as well as in hearing individuals (Gfeller et al., 1997). There is also some evidence for the benefit of music training in CI-mediated music listening (Donnelly & Limb, 2009).

> *It is also important to note that music to the post-lingually deafened adult is not the same as it is to pre-lingually deafened children. It is this author's belief that young children who are implanted have a very different and more positive music experience.*

Music Training Studies

There are a number of compelling studies that have examined the effect of music training on other areas of development and functioning for children who have typical hearing. They are as follows.

1. Chan, Ho, and Cheung (1998) found that music training in childhood may have long-term positive effects on verbal memory.

2. Marin (2009) discovered that children with musical training demonstrated enhanced language abilities and increased phonological working and sentence memory.

3. Schellenberg (2004) found that music lessons enhanced general IQ.

4. Moreno et al. (2008) showed that after music training, children had enhanced reading skills and better pitch discrimination in speech.

5. Wong et al. (2007) found that neurologic development is affected by music training and has a positive affect on the way a person encodes sound.

A handful of studies have shown that music training for individuals with hearing loss can have positive effects in cognitive, linguistic, memory, and music perception domains (Abdi, Kahlessi, Khorsandi, & Gholami, 2001; Galvin, Fu, & Nogaki, 2007; Peterson, Mortenson, Gjedde, & Vuust, 2009; Yuba, Itoh, & Kaga, 2007).

A handful of studies have shown that music training for individuals with hearing loss can have positive effects in cognitive, linguistic, memory, and music perception domains (Abdi, Kahlessi, Khorsandi, & Gholami, 2001; Galvin, Fu, & Nogaki, 2007; Peterson, Mortenson, Gjedde, & Vuust, 2009; Yuba, Itoh, & Kaga, 2007).

Using Music to Stimulate Spoken Language in Children with Hearing Loss

In another article—"Music, Spoken Language, and Children with Hearing Loss: Definitions and Development" (Barton, 2010)— the milestones that typical children pass through on their way to learning music and language were presented. In that article, a table was provided with developmental music milestones along with spoken language milestones. The following table highlights music milestones and offers activities that support and nurture the development of those skill sets.

Table 1. Activities to Support the Development of Music Milestones

Age	Music Milestones in Children Who Hear Typically	Music Activity
Birth–3 months	Alerts and calms to music; prefers infant directed singing; soothes	Sing lullabies; gently rock and pat to music
3–6 months	Musical babbling; repetitive movements in response to music; turns to the source of music; prefers higher pitched voices	Imitate baby's babbling; provide shakers, bells, and simple rhythm toys; bounce gently to music
6–9 months	Occasionally matches pitch; makes larger repetitive movements; recognizes familiar melodies; uses descending vocalizations	Imitate spontaneous songs; play pitch matching games using "hi-lo" or "loo-loo;" play easy fingerplay songs; say nursery rhymes with movements
9–12 months	"Sings" spontaneously; recognizes and attempts to sing along with familiar songs	Provide songs for different activities like wake-up time, bath time, bedtime; etc.; provide a variety of recorded music, drums, and xylophones
12–18 months	Dances to music; pays attention to lyrics; sings snippets of learned songs; more pitch matching; starting to match movements to music	Dance baby on your feet; sing simple songs/chants/nursery rhymes; sing songs with a repetitive chorus like B-I-N-G-O and B-I-N-G-O
18–24 months	Looks for dance partners; spins; marches to music; sings spontaneous songs with steady rhythm; imitates songs with lyrics more accurate than pitch	Experiment with different voices (big/little high/low); make sounds with your voice to encourage vocal range (storms, birds, animal noises)
2–3 years	Learns singing vs. speaking voices; sings in different keys and meters; matches pitches consistently; discriminates some instruments	Play guessing games with familiar songs and instruments; provide repetitive rhythmic accompaniment to singing; sing sequential songs like "If You're Happy and You Know It"
3–4 years	Begins to discriminate between familiar instruments; uses rhythm instruments to accompany their songs; melodic contour is intact; makes up songs	Play marching band with rhythm instruments; play high/low; up/down; play/stop; fast/slow; loud/soft; play nonsense songs; read books based on familiar songs
4–5 years	Makes larger purposeful movements; sings imaginative songs and stories; begins to recognize familiar melodies without lyrics; matches beat to others	Play rhythm stick games; since movement songs using scarves, ribbons, etc.; sing story songs; provide group music experiences with xylophones, tone bars
5–6 years	Maintains steady beat while moving to music; sings melody with pitch accuracy; plays melodies on simple instruments; remembers songs as head; begins to read and write rhythmic notation	Sing rounds like "Row, row, row your boat;" practice singing; provide diverse genres and styles of music recordings/ songs/games
6–7 years	Develops tonal center*, starts to sing harmony and rounds; focuses vocal range around 5–6 notes; expands rhythmic and melodic written notation	Build a repertoire of familiar songs; provide opportunities for music improvisation, reading, and writing notation; provide music lessons
7–9 years	Expands vocal range; uses more complex meters and harmonies; demonstrates music preferences	Offer individual and group music experiences, provide music games (computer, board) that focus on music terminology, notation, and discrimination

* Tonal center is the home key. When a child has a sense of tonal center, he or she can sing all the way through in the same key.
Sources for music milestones: Campbell, S. Scott & Jeanne (1991), Gordon (2003), MacDonald (1976), Young (1976), The National Association of Music Education (MENC) (2010), Schwartz (2008)

Click Here to View Larger Version of Table 1

Since children develop and grow at varying rates, the charted timeframes may vary slightly, but the developmental sequence follows these established patterns. For children who are deaf/hard-of-hearing, the timelines may need to be adjusted but the skill sequence is the same.

The TuneUps Approach to Music

This next section is designed to give a framework for including music in the habilitation process of young children with hearing loss. It is based on a collection of principles developed over time by this author and her colleague, Amy McConkey Robbins, CCC-SLP (Barton & Robbins, 2007). It is called the TuneUps Approach, an improvisatory method integrating music, spoken language, and listening activities within the therapeutic setting. This technique is also useful for parents of children with hearing loss.

Tune-Up Tips

Eight TuneUps Tips follow. The links to music and activities to accompany the tips link to The Listening Room™, a website provided by Advanced Bionics.

1. ***Your voice is the most important instrument you can own!***
   It is not necessary to be able to play an instrument when singing with children. In fact, for kids with hearing loss, it may be difficult to separate instrument from voice at first. Remembering that infants are attracted to the sing-song nature of their mother's voice, incorporate that style into playtime or intervention with young children. It is important for children to understand that they have two distinct voices: speaking and singing. Label each for them as you sing and talk. Try singing their name using the children's "teasing song." For example, sing to the tune "Ring Around the Rosie," and insert the child's name: An-nie, An-nie, An-nie. If you do want to introduce an instrument, take the time to let the child explore how the sound is made (strummed or hit); what it is made of (wood, metal, plastic); key features (neck, body, keys) and what it sounds like by itself, before combining with the voice.
   Song: Put Your Ears On
   www.hearingjourney.com/userfiles/File/EARS001.WAV
   Lyrics:
   www.hearingjourney.com/userfiles/File/putyourearson12_18.pdf

2. ***Don't reserve singing for "music time."***
   A child's day offers many opportunities to break into song: wake up, bedtime, car rides, snack time, changing diapers, you name it! Use it often, like seasoning, intersperse it throughout the day.
   Song: Sleep Tight
   www.hearingjourney.com/userfiles/File/SLEEP002.WAV
   Lyrics:
   www.hearingjourney.com/userfiles/File/sleeptight.pdf

3. ***Use music purposefully and not as "background."***
   It is one thing to play soothing music when getting ready for bed, but quite another to leave the radio on all the time. Since background noise can complicate the sound field and create poor signal-to-noise ratio, it is best to use it as a listening strategy.

4. ***Always introduce the CD player and any other electronic device before using it.***
   When using electronic equipment of any kind, be sure to introduce the device before you start the activity. So many times, children with hearing loss are left in the dust as the teacher puts in a CD and the music appears out of nowhere. Take them through every step from opening the CD case to inserting it into the player. Cue the child to listen for when the music starts, as well as when it stops. Again, as in the case with acoustic instruments, teach the child how an electric instrument works and that unless it is turned on, it won't make a sound.

5. ***Experiment with using different voices.***
   For instance, what if you sang a familiar song in a voice like a lion or a kitten, a big or little dog, or a mommy or daddy? Children find this so comical. What you are actually doing is teaching them about discrimination, timbre, and the fact that each voice has its own signature sound. This will help them recognize each other's voices based on certain characteristics, what are referred to as "indexical features" of speech. The ideal is better prosody and more expressive, spontaneous language from children with hearing loss.

6. ***Turn-taking is essential.***
   One of the foundational skills of communication that children learn through music is turn-taking: "I speak or sing…then you speak or sing." Many songs provide turn-taking opportunities and are known as echo or call and response songs. Sometimes use of a prompt, such as a plastic microphone, can be used to indicate when it is time for the child to give a verbal response. Be sure to wait longer for a response than you might for a typical hearing child. An expectant look with direct eye contact can also be useful in indicating "We're waiting on you…it's your turn."
   Song: What Does the Kitty Say?
   www.hearingjourney.com/userfiles/File/KITTY001.WAV
   Lyrics:
   www.hearingjourney.com/userfiles/File/whatdoeskittysay.pdf

7. ***Turn any important phrase into a song.***
   Think of the phrases you say over and over again every day: Open the door; There it is; Where is it?; Oh-oh, I dropped it! Now try adding a simple melody and use it every time you repeat the phrase. Don't force the child to repeat it, just model it consistently.
   Song: What's in the Bag?
   www.hearingjourney.com/userfiles/File/BAG001.WAV
   Lyrics:
   www.hearingjourney.com/userfiles/File/whatsinthebag12_18%281%29.pdf

8. ***Rhythm is a powerful cue for spoken language.***
   As in the case of melody, adding a rhythmic pattern to a spoken phrase that a child is trying to master will increase his or her attention, give order and structure to perception, and enhance memory. Directions to activities can be put into rhythmic phrases easily. For example, when passing out rhythm sticks to students, say: "Take two sticks and pass the rest (clap, clap)." This avoids problems with reluctant or hesitant students holding up the process. Another favorite when asking children to sit on the floor is to use this fun rhyme: "Criss-cross applesauce (3xs), pepperoni pizza." By the time you've chanted it a couple of times, everyone is in place. When modeling a rhythmic phrase, combine it with a movement, or tap/clap it out.

TuneUps Toolbox

Every home and early childhood center should have a box of rhythm instruments available for music making. Here are some items that should be included:

Figure 1. Rhythm Instruments

Instruments like these are all available from West Music. Their early childhood instruments are well made and musically appealing. They have several music therapists on staff willing to assist anyone who may have questions about specific instruments appropriate for children with hearing loss.

Resources

There are three cochlear implant manufacturers in the world. Each offers a wealth of information available at their respective websites: Advanced Bionics, Cochlear Americas, and Med-El.

There are many hearing aid companies that also offer personal FM systems: Oticon, Phonak, Starkey are just a few.

The TuneUps CD, winner of the 2009 MVP Award from Therapy Times, was developed by Amy McConkey Robbins, CCC-SLP, and this author as a music program designed to foster communication development. There are 19 songs and activities, a booklet for parents and teachers/therapists as well as a music listening game included in the package. For ordering information, go to www.bionicear.com

The Listening Room ™, sponsored by Advanced Bionics, offers free listening, language, and learning activities. Developed by Dave Sindrey, M.Cl.Sc., LSLS Cert. AVT, these activities change weekly and monthly. This author regularly contributes music activities to the site.

Summary

This article provides readers with an understanding of the importance of providing a musically rich environment for young children with hearing loss. The notion that one's voice is the most important instrument an individual can own and that music should be integrated into the daily lives of all children is at the core of music therapy. Current research regarding the limitations of CIs and HAs to accurately represent music should be balanced by clinical observations of young children with hearing loss engaged in and clearly enjoying music. There is optimism in knowing that music appreciation and perception is at the forefront of what cochlear implant manufacturers strive to accomplish going forward. *Until that day truly arrives, why would we choose to deny any child with a hearing loss the opportunity to hear music in their dreams?*

References

American Academy of Audiology (AAA). (2003). *Pediatric amplification protocol.* Retrieved from www.audiology.org/resources/documentlibrary/Documents/pedamp.pdf

Abdi, S., Khalessi, M. H., Khorsandi, M., & Gholami, B. (2001). Introducing music as a means of habilitation for children with cochlear implants. *International Journal of Pediatric Otorhinolaryngology, 59,* 105-113.

Barton, C. (2010). *Music, spoken language, and children with hearing loss: Development and definitions.* Retrieved from www.speechpathology.com

Barton, C., & Robbins, A. M. (2007). *TuneUps: A music program designed to foster communication development.* Valencia, CA: Advanced Bionics.

Bergeson, T. R., Miller, R. J., & McCune, K. (2006). Mothers' speech to hearing-impaired infants and children with cochlear implants. *Infancy, 10,* 221-240.

Bluestine, E. (2000). *The ways children learn music: An introduction and practical guide to music learning*

theory. Chicago: GIA Publications.

Campbell, P. S., & Scott-Kassner, C. (1995). *Music in childhood: From preschool through elementary grades.* New York: Schirmer Books.

Chan, A. A., Ho, Y.C., & Cheung, M. C. (1998). Music training improves verbal memory. *Nature, 396,* 128.

Chasin, M., & Russo, F. A. (2004). Hearing aids and music. *Trends in Amplification, 8*(2), 35-47.

Donnelly, P. J., & Limb, C. J. (2009). Music perception in cochlear implant users. In J. Niparko (Ed.), *Cochlear implants: Principles and practices* (pp. 223-228). Philadelphia: Lippincott, Williams, & Wilkins.

Drennan, W. R., & Rubenstein, J. T. (2008). Music perception in cochlear implant users and its relationship with psychophysical capabilities. *Journal of Rehabilitation Research & Development, 45*(5), 779-790.

Galvin, J. J., Fu, Q. J., & Nogaki, G. (2007). Melodic contour identification by cochlear implant listeners. *Ear & Hearing, 28,* 302-319.

Gfeller, K., Woodworth, G., Robin, D. A., Witt, S., & Knutson, J. F. (1997). Perception of rhythmic and sequential pitch patterns by normally hearing adults and adult cochlear implant users. *Ear & Hearing, 18*(3), 252-260.

Gordon, E. (2003). *A music learning theory for newborn and young children.* Chicago: GIA Publications.

Kong, Y. Y., Stickney, G. S., & Zeng, F. G. (2005). Speech and melody recognition in binaurally combined acoustic and electric hearing. *Journal of Acoustical Society of America, 117*(3), 1351-1361.

Kraus, N., Skoe, E., & Parbery-Clark, A. (2008). Auditory processing of pitch, timbre, and time: Implications for language and music. In 2008 *Research Symposium: Hear our voices: New mechanisms in auditory discrimination and speech in deafness research symposium* (pp. 13-17). Washington, DC: Alexander Graham Bell Association for the Deaf and Hard of Hearing.

Looi, V., McDermott, H., McKay, C., & Hickson, L. (2008). Music perception of cochlear implant users compared with that of hearing aid users. *Ear & Hearing, 29*, 421-434.

Marin, M. M. (2009). Effects of early musical training on musical and linguistic syntactic abilities. *Annals of the New York Academy of Sciences, 1169,* 187-190.

McDonald, D.T. (1979). *Music in our lives: The early years.* Washington, DC: National Association for the Education of Young Children.

Mithin, S. (2006). *The singing Neanderthals: The origins of music, language, mind, and body.* Cambridge, MA: Harvard University Press.

Moog, H. (1976). *The musical experience of the pre-school child.* London: B. Schott.

Moreno, S., Marques, C., Santos, A., Santos, M., Castro, S. L., & Besson, M. (2008). Musical training influences linguistic abilities in 8-year-old children: More evidence for brain plasticity. *Cerebral Cortex, 19*(3), 712-23.

The National Association for Music Education (MENC). (2010). Performance standards for music: Prekindergarten (Ages 2-4). Retrieved from www.menc.org/resources/view/performance-standards-for-music-standards-publications

Patel, A. D. (2008). *Music, language and the brain.* New York: Oxford University Press.

Peterson, B., Mortenson, M. V., Gjedde, A., & Vuust, P. (2009). Reestablishing speech understanding through musical ear training after cochlear implantation. *Annals of the New York Academy of Sciences, 1169,* 437-440.

Schellenberg, E. G. (2004). Music lessons enhance IQ. *American Psychological Society, 15*(8), 511-514.

Schwartz, E. (2008). *Music, therapy, and early childhood: A developmental approach.* Gilsum, NH: Barcelona Publishers.

Yuba, T., Itoh, T., & Kaga, K. (2007). Unique technological voice method (the YUBA method) shows clear improvement in patients with cochlear implants in singing. *Journal of Voice, 23*(1), 119-124.

Wong, P. C., Skoe, E., Russo, N. M., Dees, T., & Kraus, N. (2007). Musical experience shapes human brainstem encoding of linguistic pitch patterns. *Nature Neuroscience, 10,* 420-422.

CEUs/Hours:

SpeechPathology.com is approved by the Continuing Education Board of the American Speech-Language-Hearing Association (ASHA) to provide continuing education activities in speech-language pathology and audiology. **See course information for number of ASHA CEUs, instructional level and content area.** ASHA CE Provider approval does not imply endorsement of course content, specific products or clinical procedures.

This course is offered for 0.1 ASHA CEUs Introductory Level, Professional Area.

Certified members of the Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA) can accumulate continuing education equivalents (CEEs) for their participation with SpeechPathology.com. One hour of coursework equals 1 CEE. All CASLPA members are encouraged to participate in on-going education.

CASLPA-ACOA

Simply purchase the course and pass a simple multiple choice test to earn your CEUs!