Theory-Based, Systematic Approach

Listening—the process of hearing, perceiving, and interpreting sound—is a fundamental and valuable tool for language and learning (Bellis, 2003; Clark, 2008; Flexer, 1999; Kelly, 2004; Johnson et al., 1997; Nevins & Garber, 2006; Roeser & Downs, 2004; Sharma et al., 2009; Stredler-Brown & Johnson, 2004). In the early years of life, much language learning is incidental for children. They learn language by overhearing and making sense of the sounds around them rather than by direct teaching. Listening skills begin to develop prenatally, but they become more refined, complex, and sophisticated with each new listening experience.

Essential Auditory Processing Skills

The term ***auditory processing*** refers to how the brain perceives and interprets sound information. Several skills determine auditory processing ability—or listening success. They are developed in a general four-step hierarchy, but all work together and are essential for daily listening. Although researchers do not agree on the exact hierarchy of skills, they generally agree on what skills are essential for auditory processing success (Cochlear Americas, 2009; Johnson et al., 1997; Nevins & Garber, 2006; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004).

Step 1: Auditory Awareness

- **Auditory Awareness** – the ability to detect sound
- **Sound Localization** – the ability to locate the sound source
- **Auditory Attention/Auditory Figure-Ground** – the ability to attend to important auditory information in the midst of competing background noise

Step 2: Auditory Discrimination

- **Auditory Discrimination of Environmental Sounds** – the ability to detect differences between sounds in the environment
- **Auditory Discrimination of Suprasegmentals** – the ability to detect differences in non-phoneme aspects of speech including rate, intensity, duration, pitch, and overall prosody
- **Auditory Discrimination of Segmentals** – the ability to detect differences between specific speech sounds

Step 3: Auditory Identification

- **Auditory Identification (Auditory Association)** – the ability to attach meaning to sounds and speech
- **Auditory Feedback/Self-Monitoring** – the ability to change speech production based on information you get from hearing yourself speak
- **Phonological Awareness (Auditory Analysis)** – the ability to identify, blend, segment, and manipulate oral language structure

Step 4: Auditory Comprehension

- **Auditory Comprehension** – the ability to understand longer auditory messages, including engaging in conversation, following directions, and understanding stories
- **Auditory Closure** – the ability to make sense of auditory messages when a piece of auditory information is missing; filling in the blanks
- **Auditory Memory** – the ability to retain auditory information both immediately and after a delay
- **Linguistic Auditory Processing** – the ability to interpret, retain, organize, and manipulate spoken language for higher level learning and communication

Step 1 – Auditory Awareness

Auditory Awareness

The development of listening and oral language is a natural process for most children. For children with normal hearing acuity, sound awareness develops during gestation (Abrams, 1995; Arabin & van Straaten, 2006; Blackburn, 2007; Gomes et al., 2000). Fetal response to sound begins as early as the fourth or fifth month of pregnancy (Arabin & van Straaten, 2006; Blackburn, 2007; Gomes et al., 2000). Research suggests that babies respond to their parents' voices and may benefit from music they hear before birth (Abrams, 1995; ASHA, 2009; Gomes et al., 2000). After birth, newborns will startle to loud noises, quiet when they hear their mothers' voices, and begin to recognize their own cries, gurgles, and coos (ASHA, 2009; Rhoades, 2003).

Sound Localization

Infants with normal hearing acuity begin turning their heads to search for sounds between three and six months of age, although some research suggests auditory orientation begins as early as the first days of life (ASHA, 2009; Gomes et al., 2000; Rhoades, 2003). At this point, infants begin to move their eyes and heads to try to pinpoint the origin of sounds (ASHA, 2009; Gomes et al., 2000; Rhoades, 2003). For example, they begin recognize and search for their parents' voices or the rattle of a favorite toy.

Auditory Attention/Auditory Figure-Ground

Auditory attention is the ability to attend to sound (Gomes et al., 2000). Auditory figure-ground includes attention to sound in the midst of background noise (Roeser & Downs, 2004). The ability to attend to important auditory information with competing background noise is essential for daily living and conversing (2004). Although there is no specific age reported in which auditory attention/auditory figure-ground develops, research shows that it begins to develop in early infancy but later becomes dependent on other factors such as motivation, voluntary direction, and self-regulation (Gomes et al., 2000). Although listening with background noise is difficult for everyone (e.g., talking on the phone while watching television), for those with auditory attention deficits, the background noise of a fan or a pencil writing on paper can be too distracting to concentrate on a teacher's voice.

Step 2 – Auditory Discrimination

Auditory Discrimination

The ability to hear differences in sounds may begin developing as early as the gestational period, but continues to develop and become refined into the school years (Gomes et al., 2000).

Auditory Discrimination of Environmental Sounds

At its most basic level, auditory discrimination includes the ability to hear the difference between environmental sounds (e.g., vacuum cleaner versus a dog barking; Gomes et al., 2000). Further refinement of this skill happens as a child recognizes differences between sounds that are more similar, such as hearing knocking on the door and distinguishing it from hammering.

Auditory Discrimination of Suprasegmentals

As auditory discrimination ability develops, infants begin to detect differences in suprasegmental aspects of speech (Bellis, 2003; Gomes et al., 2000; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). Suprasegmental aspects of speech are also known as speech prosody and include features like stress, length/duration, pitch, tempo/rate, loudness/intensity (Ball & Müller, 2005). Infants begin to respond differently to changes in tone of voice between birth and 4 months of age (ASHA, 2009; Gomes et al., 2000; Rhoades, 2003).

Auditory Discrimination of Segmentals

The most sophisticated skill of auditory discrimination is the ability to detect differences in speech sounds (Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). These differences may include manner of articulation (e.g., fricatives versus stops), voicing (i.e., voiced versus voiceless), and place of articulation (e.g., front of the mouth versus back of the mouth). This ability is essential for later comprehension and production of speech, because a single sound change in a word (e.g, milk vs. silk) can change its entire meaning.

Step 3 – Auditory Identification

Auditory Identification (Auditory Association)

The ability to attach meaning to sounds and words begins in infancy (ASHA, 2009; Bellis, 2003; Cochlear Americas, 2009; Gomes et al., 2000; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). At the most basic level, this includes an infant anticipating a bottle after hearing the microwave beep or later on, knowing that the jingle of keys means he/she is going somewhere. As infants continue to develop, they begin to understand the meaning of vocal tone changes (e.g., anger versus happiness; ASHA, 2009; Bellis, 2003; Gomes et al., 2000; Roeser & Downs, 2004; Stredler-Brown and Johnson, 2004). Eventually as they near and enter toddlerhood, infants begin to recognize and identify spoken words, labels, and simple speech (ASHA, 2009; Bellis, 2003; Gomes et al., 2000; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004).

Auditory Feedback/Self-Monitoring

Auditory feedback and self-monitoring begins when a child is able to discriminate differences in speech sounds (ASHA, 2009; Rhoades, 2003; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). Infants or toddlers first begin to turn vocal play into intelligible speech when they try to mimic adult productions of words. Then, they listen to their own productions of the words, and try to modify their speech to sound more like adult speech (ASHA, 2009; Rhoades, 2003; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). This skill is essential for articulation.

Phonological Awareness (Auditory Analysis)

Auditory analysis is the ability to hear and judge the structure of spoken language (Roeser & Downs, 2004; Torgesen, 2002; Torgesen et al., 1994). More commonly known as *phonological awareness*, it includes the ability to identify, blend, segment, and manipulate sounds (Catts, 1991; Schuele & Boudreau, 2008; Sterling-Orth, 2004). Spoken language can be divided into words, words can be divided into syllables, syllables can be divided into sounds, and sounds can be substituted to make new words (Catts, 1991; Roeser & Downs, 2004; Schuele & Boudreau, 2008; Sterling-Orth, 2004; Torgesen, 2002). This topic will be discussed in-depth in the next section.

Step 4 – Auditory Comprehension

Auditory Comprehension

Auditory comprehension is the ability to understand more complex verbal messages. It continues to develop as a child's language develops and requires other skills such as auditory closure and auditory memory for success (Bellis, 2003; Johnson et al., 1997; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). Auditory comprehension includes such tasks as following multi-level directions, understanding stories, and engaging in conversations (Bellis, 2003; Johnson et al., 1997; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). This is essential for a child to follow classroom instructions, benefit from the teacher's lessons, and socialize with peers.

Auditory Closure

Auditory closure is the ability to make sense of a message when information is missing (Bellis, 2003; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). In the presence of background noise, distraction, or a poor acoustic signal, we use auditory closure to try and complete a message (Bellis, 2003; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). If you were at work and thought you heard, *"You received a **pall** from Ms. Smith this morning"* you would use auditory closure skills to recognize that you received a ***call*** rather than a ***pall***. If you were on the phone and heard, "I can't ____ you, the phone is ____ out." You would use auditory closure skills to understand that the person on the line cannot hear you clearly because of a poor signal.

Auditory Memory

Auditory memory is the ability to retain and recall auditory information (Bellis, 2003; Cochlear Americas, 2009; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). The term auditory memory includes both short- and long-term memory. Short-term auditory memory describes the retention of auditory information that is used or rehearsed, but not stored over a long period of time. Long-term auditory memory is the ability to hear, store, and retrieve new information over longer periods of time (Bellis, 2003; Cochlear Americas, 2009; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). This may include addresses, or family birthdays, information learned in school, or stories your mother told you about your childhood. Different terms have been used describing auditory memory (e.g., perpetual, echoic, working, sequential, recall; Roeser & Downs, 2004; Bellis, 2003). Regardless of its label, auditory memory is essential for academic and social success (Bellis, 2003; Cochlear Americas, 2009; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). Short-term memory requires immediate auditory recall—retaining and using new information right away. If you repeat a statement, a telephone number, or other auditory information within seconds after hearing it, you are use immediate auditory recall. It also requires delayed auditory recall. If someone asks you for a book, and you finish washing the dishes before going to get the book from the office, you have demonstrated delayed auditory recall. Short-term memory may include passing on a telephone message after the call, telling a joke you just heard, or calling someone by name after just meeting him/her. Auditory sequential memory includes retaining information that must be used in a specific order, from locker combinations to cooking instructions (Bellis, 2003; Cochlear Americas, 2009; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004).

Linguistic Auditory Processing

The final stage of auditory processing includes the ability to interpret, retain, organize, judge, and manipulate language (Bellis, 2003; Cochlear Americas, 2009; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). This is the stage in which higher level learning and communication take place. Linguistic auditory processing takes auditory comprehension of language to a metalinguistic ability of judging and manipulating language (Bellis, 2003; Cochlear Americas, 2009; Roeser & Downs, 2004; Stredler-Brown & Johnson, 2004). It includes the ability to persuade, debate, and understand sarcasm, slang, and figurative language.

Auditory Processing Disorders

When an individual has auditory processing difficulties, a breakdown occurs beyond the physical ability to hear sound. That is, the individual hears sound normally, but is unable to make sense of that sound. Some children have normal hearing acuity—they hear and respond to pure tones within a normal range—however speech sound information "breaks down" at the level of perception and/or interpretation. These children have difficulty with auditory processing and a doctor may diagnose them with an auditory processing disorder (APD)—also called central auditory processing disorder (CAPD).

Identifying APDs can be challenging because of their subtlety. Often, such difficulties or disorders go unnoticed until school age, when children must learn via oral/aural lessons, distinguish background noise from the teacher's voice, follow intricate verbal directions, converse in noisy areas—such as the playground or lunchroom—and participate in other intense auditory situations both socially and academically (Bellis, 2003; Kelly, 2004; Johnson et al., 1997; Roeser & Downs, 2004). Common characteristics of auditory processing disorders include:

- difficulty listening with background noise;
- difficulty retaining verbal information (such as directions);
- problems understanding and retaining multistep or multilevel verbal information such as directions;
- language difficulties—especially receptive and vocabulary building;
- low academic performance;
- behavioral issues;
- difficulty attending to auditory information, especially in a noisy environment;
- needing extra time to process auditory information;
- difficulty with phonological awareness, reading, and spelling (Bellis, 2003; Kelly, 2004).

Although listening becomes more difficult in noisy situations for everyone, some students may have specific difficulty being able to distinguish sounds that are important to an auditory message from the sounds in background noise—this is called an auditory figure-ground difficulty.

Identifying APDs can also be challenging because they are not independent of, nor easy to differentiate from attention, memory, and cognition (Bellis, 2003; Kelly, 2004; Johnson et al., 1997; Roeser & Downs, 2004). In fact, Teri James Bellis (2003) asserts that every auditory experience involves such components.

Remediation of Auditory Processing Disorders

Although much research on diagnosis, etiology, and treatment of auditory processing disorders is still warranted, experts believe that *neuroplasticity*—the brain's ability to reorganize—depends on sensory stimulation to the affected area—the auditory centers of the brain. Therefore direct, theory-based auditory training may influence the organization of the auditory centers of the brain, increasing its function (Flexer, 1999). In her book *Assessment and Management of Central Auditory Processing Disorders in the Educational Setting,* Teri James Bellis (2003) discusses deficit-specific auditory training:

> Despite these unknowns, however, simple logic (as well as available research on neurophysiology, neuroplasticity, and information processing) dictates that the most effective direct therapy techniques will be those that are (1) frequent, intense, and challenging; (2) require active engagement and participation on the part of the listeners; and (3) target the specific auditory deficit(s) present. Furthermore, the teaching of deficit-specific compensatory skills that focus on the use of these fundamental auditory processes in spoken language comprehension will help to bridge the gap between bottom-up and top-down processing levels and enhance generalization of skills learned to real-world listening environments (p. 349).

HearBuilder™ Phonological Awareness targets nine essential auditory analysis/phonological awareness activities including:

1. Sentence Segmentation
2. Syllable Blending
3. Syllable Segmentation
4. Rhyming
5. Phoneme Blending
6. Phoneme Segmentation and Identification
7. Phoneme Addition
8. Phoneme Deletion
9. Phoneme Manipulation

Phonological Awareness (Auditory Analysis)

Phonological Awareness is the ability to think about oral language in terms of its structure (i.e., sentences, words, syllables, and sounds). Some researchers use the term auditory analysis when discussing phonological awareness (McGuinness, 2005; Roeser & Downs, 2004; Torgesen, 2002; Torgesen et al., 1994). Analyzing oral language structure includes rhyming, blending, segmenting, and manipulating syllables and sounds (Catts, 1991; Schuele & Boudreau, 2008; Sterling-Orth, 2004). The most sophisticated level of phonological awareness includes the ability to add, delete, and manipulate phonemes—or phonemic awareness—and is a strong indicator of later reading ability (Catts, 1991; Roeser & Downs, 2004; Schuele & Boudreau, 2008; Sterling-Orth, 2004; Torgesen, 2002). Phonological Awareness includes the following skills:

- **Sentence Segmentation** – the ability to identify words as separate units;
- **Syllable Blending** – the ability to listen to spoken syllables and blend them together to make a word;
- **Syllable Segmentation** – the ability to identify syllables as separate parts of a word;
- **Rhyming** – the ability to identify and categorize rhyme;
- **Phonemic Awareness** – the ability to identify, analyze, and manipulate the smallest unit of spoken language structure (Anthony et al., 2003; Catts, 1991; Gerber et al., 2008; Hatcher & Hulme, 1999; McGuinness, 2005; Schuele & Boudreau, 2008; Schreiber, 2008; Sterling-Orth, 2004; Torgesen, 2002; Torgesen et al., 1994). This is the most sophisticated level of phonological awareness and includes the following skills:
  - **Phoneme Blending** – the ability to listen to separate phonemes, and blend them together to make a word
  - **Phoneme Segmentation and Identification** – the ability to identify phonemes as separate units within a word
  - **Phoneme Deletion** – the ability to delete a phoneme from a word to make a new word
  - **Phoneme Addition** – the ability to add a phoneme to a word to make a new word
  - **Phoneme Manipulation** – the ability to substitute one phoneme in a word for another phoneme to make a new word (Anthony et al., 2003; Catts, 1991; Gerber et al., 2008; Hatcher & Hulme, 1999; McGuinness, 2005; Schuele & Boudreau, 2008; Schreiber, 2008; Sterling-Orth, 2004; Torgesen, 2002; Torgesen et al., 1994).

There is an agreement among researchers that phonological awareness, letter identification, and oral language ability are strong indicators of future reading ability (Catts, Fey, Tomblin, & Zhang, 2002; Scarborough, 1998; Torgensen, Wagner, & Rashotte, 1994).

Phonological awareness generally considered along a continuum of shallow-level knowledge to a more complex, deeper-level knowledge (Stanovich, 1992; Schuele & Boudreau, 2008). Shallow levels of phonological awareness include skills such as sentence segmentation, syllable segmentation and blending, and rhyming (Stanovich, 1992; Schuele & Boudreau, 2008). Deep levels of phonological awareness include phonemic awareness (Stanovich, 1992; Schuele & Boudreau, 2008).

Researchers agree that phonological awareness skills do not develop linearly (Anthony et al., 2003; Sterling-Orth, 2004; Schreiber, 2008). There is a general trend of development from shallow to deep levels of knowledge, but they are not prerequisite to each other. Development may happen among several skills simultaneously (Anthony et al., 2003; Sterling-Orth, 2004; Schreiber, 2008). For example, a child learns to generate a new rhyme and identify the first sound in a word simultaneously. More on the development of phonological awareness and the role of the SLP in targeting it will follow in the *Targeting Phonological Awareness* section.

Although, some children may develop shallow levels of phonological awareness without direct instruction, research shows that children with auditory processing difficulties, language difficulties, learning difficulties, and/or low literacy achievement demonstrate lower performance in phonological awareness tasks (Catts et al., 2002; Sharma et al., 2009; Schuele & Boudreau, 2008; Torgesen et al., 1994). Research also indicates that lower phonological awareness performance directly relates to early reading abilities (Magnusson & Naucler, 1990). Torgesen (2002) states, "the most common cause of children's early difficulties in acquiring accurate and fluent word recognition skills involves individual differences in their phonological knowledge and skill" (p. 12).

Phonemic Awareness

Vast amounts of research has indicated that phonemic awareness is a very strong predictor of later reading skills (Hatcher and Hulme, 1999; Schuele & Boudreau, 2008; Schreiber, 2008; Torgesen, 2002). The *U.S. National Reading Panel Report Summary* (2002) determined that teaching phonemic awareness is "effective in improving reading with all types of children under a variety of teaching conditions" (p. 3).

Children generally learn spoken language naturally, by hearing words and attaching meaning to them. In the early years, children do not perceive the phonological aspects of words as separate from their semantic meaning. For example, Hugh W. Catts (1991) discusses how a young child might state that "train" is a long word due to its semantic meaning rather than its phonological features. Although hearing and understanding spoken words is a process that develops naturally, phonemic awareness and reading are much more complicated and usually require instruction (Lyon, 1998). This is because we perceive words as single units of auditory information. When we listen to speech, we hear

and associate meaning to words as a whole—we do not attend to the different phonemes (speech sounds) that make up the word. At least in part, this is because phonemes are coarticulated—influenced by neighboring sounds—in fluent speech (Catts, 1991; Gerber et al., 2008; Lyon, 1998). The result is that phonemes have inconsistent acoustic signals with various ways of articulating each one. For example, the sound /p/ has different features when falling at the beginning of a syllable or word "pig" (air is released) versus the end of a word "up" (air is unreleased)—yet we do not use two different letters to represent these sounds.

Phonemic Awareness and Phonics

Phonemic awareness is often confused with phonics (Lyon, 1998; Torgesen, 2002). Phonemic awareness is the ability to identify, analyze, and manipulate phonemes (speech sounds). Phonics is the ability to attach speech sounds to graphemes (letters). Although phonics has a clear role in early reading decoding, it has little meaning without phonemic awareness (Beck & Juel, 2002; Lyon, 1998; Torgesen, 2002). Phonics and early reading skills are reliant on the ability to blend, segment, and identify phonemes (Beck & Juel, 2002; Lyon, 1998; Torgesen, 2002). Children must become aware that words can be broken into smaller units to give meaning to learning letters. Torgesen (2002) states that, "phonemic awareness is what makes phonics meaningful" (p. 12). Isabel Beck and Connie Juel (2002) explain that the task of decoding requires, "knowing that print is important because it carries a message, that printed words are composed of letters, and that letters correspond to the somewhat distinctive sounds heard in a spoken word" (p. 3).

Targeting Phonological Awareness

Poor phonological awareness is indicative of early reading difficulties, specifically decoding skills (Catts,1991; Schuele & Boudreau, 2008; Torgesen, 2009; Torgesen et al.,1994). In general, phonological awareness begins to emerge in preschool and is further refined into phonemic awareness through late kindergarten and early first grade (Schuele & Boudreau, 2008). However, Torgesen (2009) discusses that 20% of children still fail to acquire sufficient phonological awareness skills, even within a stable classroom learning environment. Torgesen and his colleagues (1994) recommend "that training in phonological awareness be included in any preventive or remedial program for children either at-risk for or identified with reading disabilities" (p. 285).

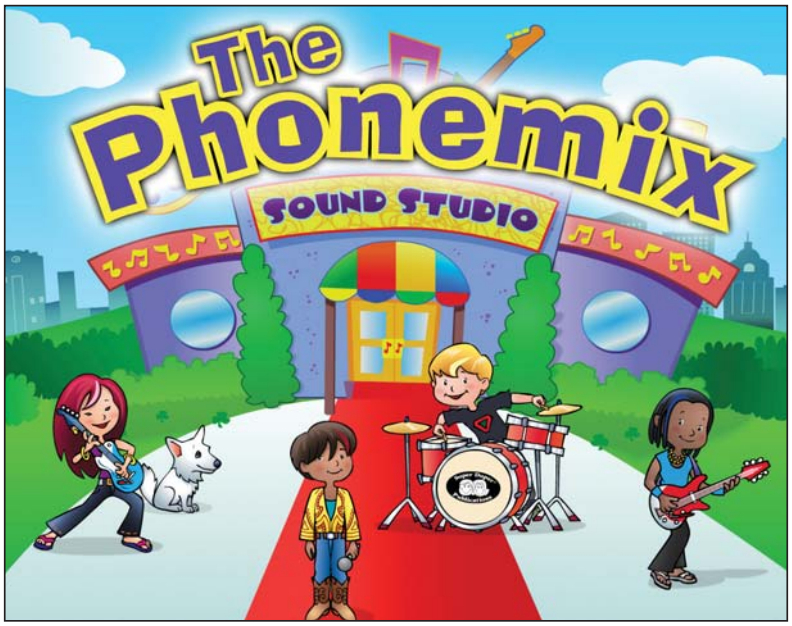
Considering the relationship between oral language and literacy development, the fact that children with language and auditory processing difficulties are at much higher risk for reading difficulties, and that decoding is directly affected by phonological awareness—the SLP undoubtedly has a role in targeting phonological awareness and other early literacy skills (Catts,1991; Schuele & Boudreau, 2008; Sharma, Purdy, & Kelly, 2009). ASHA maintains

that the SLP has a clear role and responsibility in the prevention of reading disorders, including enhancing oral and written language and pre-literacy opportunities that are based around text (ASHA, 2009).

Schuele and Boudreau (2008) explain that the SLP should individualize phonological awareness training for a student or small group of students because, "The SLP brings detailed knowledge of not only typical development, but also the learning problems experienced by children with language impairments and/or poor phonological awareness" (p. 5). Considering that phonological awareness—auditory analysis—is one part of the continuum of auditory skill development an optimal program for SLPs to target both auditory processing in general and phonological awareness specifically, should be theory-based, systematic, and intensive (Beck & Juel, 2002; Catts, 1991; Flexer, 1999; Schuele & Boudreau, 2008, Torgesen, 2002). Recent research indicates that computer-assisted instruction (CAI) in phonological awareness is beneficial for at-risk and low-performing students, particularly those in kindergarten (Macaruso & Walker, 2008; Watson & Hempenstall, 2008).

Conclusion

HearBuilder™ Phonological Awareness is designed as a systematic, intense, challenging, and fun theory-based therapy tool. By providing sensory stimulation to the auditory centers of the brain, ***HearBuilder™ Phonological Awareness*** helps students improve auditory attention, auditory analysis, and auditory processing of spoken English, with the option of background noise to improve auditory figure-ground skills. This systematic approach to auditory training offers minimal increases of difficulty across the multiple levels in each activity. ***HearBuilder™ Phonological Awareness*** requires students to actively engage their brains to improve phonological awareness skills through listening, identifying, and analyzing speech sounds.



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