Improving the Quality of Auditory Training by Making Tasks Meaningful

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Abstract

Traditional auditory training (AT) typically includes activities that focus on the formal properties of sounds without requiring attention to meaning. After reviewing the psycholinguistic bases for requiring attention to meaning, the authors present a series of examples of how to modify purely form-oriented AT activities so that they become meaning oriented. For example, a purely form-oriented same–different task with /ba/–/pa/ or /ba/–/ba/ can be modified using minimal pairs such as /bear/–/pear/ or /bear/–/bear/ and by requiring listeners to identify appropriate picture pairs in order (i.e., pictures of a bear and then a pear, or of a bear and then another bear). The modified version requires attention to meaning, whereas the original version does not. The authors promote a nonhierarchical and interactive approach to AT in which activities at 3 linguistic levels (word, sentence, and discourse) are included from the beginning and throughout AT, but with activities that are carefully designed to be meaning oriented and in which comprehension is the central focus. In the Summary By Example section, the authors describe an AT program (I Hear What You Mean; Tye-Murray, Barcroft, & Sommers, in press) that was designed to be meaning oriented at the word, sentence, and discourse levels. Specific benefits of providing meaning-based AT, such as higher levels of participant engagement, are highlighted.

Hearing loss poses a variety of challenges to effective communication in the real world. In addition to amplification (e.g., hearing aids) or surgical intervention (e.g., cochlear implants), the option of auditory training (AT) is available to individuals with hearing loss as a means of making the best use of their residual hearing or electrical stimulation. The quality of the AT provided is critical, in particular when it comes to ensuring that benefits observed in a clinical

setting transfer to the real world. In the real world, the purpose of conversations or any communicative interaction is *meaning oriented*, that is, to share ideas, relate experiences, express needs, instruct, influence, build understanding, and so forth (Tye-Murray, 2009). Previous work has already pointed out the importance of meaning orientation in the development and implementation of AT (Barcroft, Sommers, & Tye-Murray, 2007; Barcroft, Schroy, Sommers, Tye-Murray, & Mauzé, 2011). This article focuses on how to modify AT tasks that are purely form oriented so that they become meaningful. In so doing, our goal is to promote quality clinical practices that are likely to ensure benefit in the real world.

What Makes a Task Meaningful?

The term *meaningful task* refers to any task that requires an individual to engage in semantic (meaning-related) processing and to activate semantic space in the brain. This type of processing and mental activation can be distinguished from another type that is purely form oriented. For example, if someone who is studying a second language is asked to repeat a sentence (e.g., "The quick brown fox jumped over the lazy dog") aloud in that language, and the learner does not understand the sentence, he or she may be able to repeat the sentence (with varying degrees of success) without attending to the meaning of the sentence; however, if the learner is asked to answer a simple question at the sentence level (e.g., "What did the quick brown fox jump over?"), he or she must attend to meaning to answer appropriately. In the first case, the task can be performed in absence of semantic processing and with no necessary activation of semantic space related to the meaning of the sentence; in other words, the task can be completed by relying on processing and activation that are purely form oriented in nature. In the second case, the learner cannot respond without engaging in semantic processing and activating the semantic space related to the meaning of the sentence.

Examples of Purely Form-Oriented Versus Meaningful Tasks

In Table 1, we provide a series of examples of form-oriented versus meaning-oriented tasks at every level of linguistic grain. Note that none of the form-oriented examples require the learner to pay attention to meaning in order to complete the task, regardless of whether the task is at the word, sentence, or discourse level. All of the meaning-oriented tasks focus on similar forms, as do the form-oriented tasks, but require attention to the meaning of the forms in order to complete the task successfully, regardless of whether the task is at the word, sentence, or discourse level. Whereas with traditional AT one might not require attention to meaning until "arriving" at the discourse level, real world communication requires one to attend to meaning at all levels of linguistic grain and, by requiring attention to meaning at all levels, high-quality AT can do the same. AT designed in this manner is transfer appropriate with regard to the needs of the individuals with hearing loss in the real world (Barcroft, Schroy, et al., 2011).

Table 1. Examples of form-oriented and meaning-oriented auditory tasks at every level of linguistic grain

Level	Form Oriented	Meaning Oriented
Phonetic/Phonemic	Same or different?: *ba/da*	
Word	Which word is longer?: *ball/butterfly*	Word–picture matching: With *ball*, find picture of ball among various pictures that may be confusing acoustically (e.g., *tall, fall, mall*) or not (e.g., *dog, cricket, butterfly*).
Sentence	Repeat the sentence when given a clue (word that will appear in the sentence: *car*): "What color is your car?"	Answer the question: "What color is your car?"
Discourse	Follow the text in the chapter book with your finger as you hear me read it.	Listen to the text from the chapter book for meaning and answer comprehension questions afterward.

A Paradigm Shift

The traditional hierarchy in AT consisted of four levels: (a) awareness, (b) discrimination, (c) identification, and (d) comprehension (see Figure 1, Carhart, 1960; Erber, 1982). *Awareness* is the first auditory skill level that is developed; it means knowing when sound is present and when it is not. *Discrimination* is the second auditory skill level that is developed and involves distinguishing whether two sounds are the same or different. The third auditory skill level, *identification*, involves listening to a word or sentence from a closed set and indicating what was presented. *Comprehension* is the highest auditory skill level and requires understanding what has been presented auditorily and answering pertinent questions or carrying out instructions. Traditional AT requires that an individual master one level before moving onto the next level.

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Figure 1. Four Levels Of Auditory Skill Development.
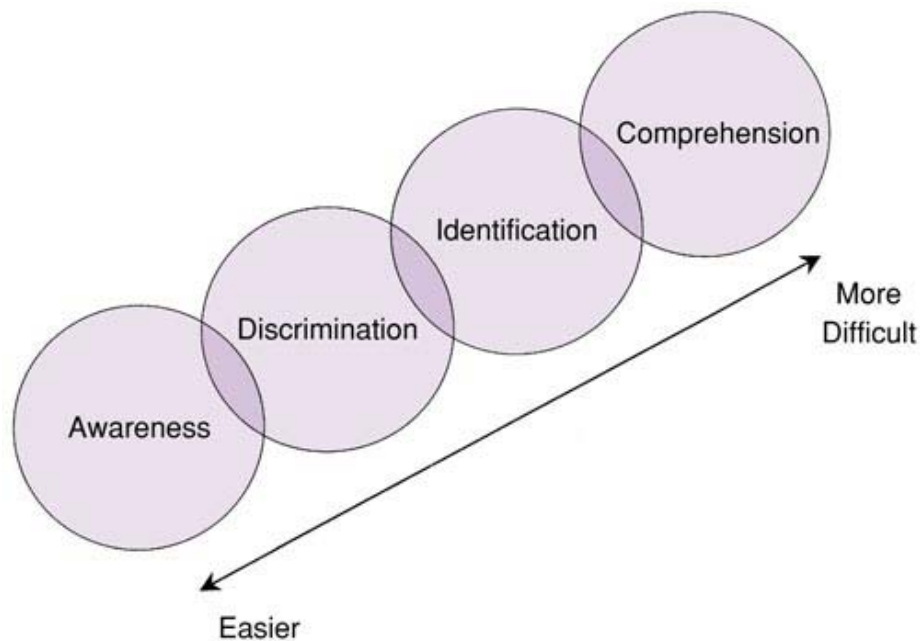
From Foundations of Aural Rehabilitation: Children, Adults, and Their Family Members (p. 144), by N. Tye-Murray, 2009, Clifton Park, NY: Delmar Cengage Learning. Copyright 2009 by Delmar Cengage Learning. Reprinted With Permission.

Instead of following this hierarchy, our proposal is to design AT activities that are meaningful at all levels and involve a variety of the auditory skill levels simultaneously. For example, in accordance with the hierarchical model one would have to identify referents ("Show me the *cat*") before listening to a read-aloud story about a cat. If one were following the meaning-oriented and interactive model, the story could be read aloud and an identification task could be completed periodically during the larger listening activity.

Figure 2 depicts the meaning-oriented interactive model of AT activities. The central focus is the comprehension of language, which is consistent with our larger tenet of meaning orientation in AT. The focus on comprehension is represented by the center of the circle. The outer ring of the circle includes the three distinct levels of linguistic analysis: (a) word, (b) sentence, and (c) discourse. The two-way arrows reflect our view that these levels need not be approached in a hierarchical manner; in other words, improvement at the sentence level is likely to increase improvement at the word and discourse levels. Similarly, improvement at the word level is likely to increase improvement at the sentence and discourse levels and, finally, improvement at the discourse level is likely to increase improvement at the word and sentence levels.

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Figure 2. Nonhierarchical and Interactive Model of Auditory Training
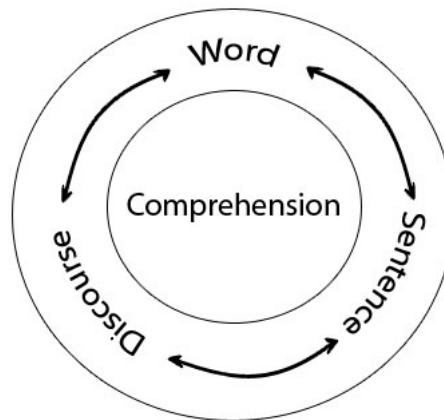
Converting Purely Form-Oriented Tasks Into Meaningful Tasks

Although many traditional AT activities are already meaningful, many are not, but these can be altered so that they do involve meaning. In the sections that follow, we present a series of examples of traditional AT tasks that do not require attention to meaning. For each example, an explanation is provided regarding how the task can be modified so that it becomes meaning oriented. The tasks are based on three levels of linguistic analysis: (a) word (Examples 1–3), (b) sentence (Examples 4–6), and (c) discourse (Examples 7–9). This order is for organizational purposes only and should not be interpreted as implying any sort of hierarchy. As discussed earlier, our proposal is to include meaning-oriented tasks in an interactive manner at all levels of linguistic grain.
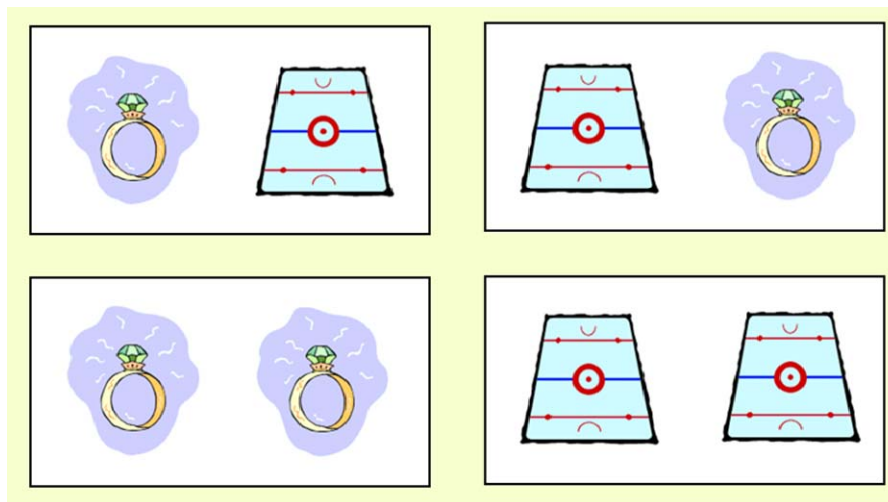
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Word Level Examples

Table 2 shows three popular word-level tasks.

Table 2. Word Level Examples

	Example 1	**Example 2**	**Example 3**
Purely form-oriented task	Which word is longer? (e.g., Cochlear Corporation, 2003).	Same–different	Which word did I say? (e.g., Cochlear Corporation, 2003).
Instructions	I'm going to say two words, and I want you to tell me which word is longer, the first or the second.	Are these two words the same or different: /ring/–/rink/ (see Figure 3)?	You have a list of pairs of words in front of you that are numbered 1 to 10. I'm going to read you one sentence at a time. I want you to point to which of the two words I say (e.g., She went to the ball/mall).
How it can be modified	Say a word and have the person choose one picture from three or more. Some pictures and words should be the same length as the spoken word and some should be different lengths.	Instead of requiring the listener to indicate "same or different" only, make this a four-choice discrimination task in which the person hears two words (/ring/–/rink/) and has to choose from four cards with two pictures on each card (/ring–rink/, /rink–ring/, /ring–ring/, /rink–rink/; see Figure 3; Barcroft, Schroy, et al., 2011).	Instead of having the two words written orthographically on the paper, the sentence can be represented by a picture that the listener has to choose, or the two words can be represented by a picture.
Modified Instructions	Listen to the word I say and point to the picture that represents that word.	Point to the card that has the two pictures that you heard in the order that you heard them.	Point to the card that has the two pictures that you heard in the order that you heard them.

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| Comments | The purpose of the original task is pattern perception. In the modified task, this is still necessary because the distracters are of varying lengths, but because pictures are used the listener is required to attend to meaning to a greater degree. This is not to say that in the unmodified version the participant *might* activate some of the semantic space related to word meaning, but the modified task *requires* this type of semantic activation to a greater degree. | Note that you can complete the form-oriented task without accessing the referents of the two spoken words. The modified task, on the other hand, requires the listener to activate some amount of the semantic representation of these two words. They still need to determine whether the words are the same or different, but the modification allows meaning to be brought to the exercise. | When the words or sentences are represented by a picture, the listener has to attend to referential meaning in order to complete the activity. When the words are presented in written form, the listener may or may not activate the referential meaning of the words, but it is not a requirement to complete the activity successfully. When the listener is required to point to one of two pictures, he or she must utilize his or her visual system to perceive the two word referents, mentally activate what the two referents are, and attempt to map the referents activated in the conceptual/semantic system to the spoken forms being perceived. |

Figure 3. Example of Four-Choice Discrimination Task.

Note: From "A Tutorial on Incorporating Principles of Second Language Acquisition in Auditory Training, by J. Barcroft, M. Sommers, N. Tye-Murray, E. Mauzé, and C. Schroy, Manuscript Submitted for Publication. Reprinted With Permission.

Sentence Level

Example 4

- Purely form-oriented task: Repeat the sentence.

- Instruction:. I am going to say a sentence, and I want you to repeat it verbatim.

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- How it can be modified: Show a picture representing the sentence and one or more other pictures that do not depict the informational content of the sentence. In this way, pointing to the correct pictures confirms whether the spoken sentence has been correctly comprehended.

- Modified instructions: I am going to say a sentence, and I want you to point to the picture that represents what I said.

- Comments: If the person simply repeats the sentence, it is not known whether the sentence was truly understood. Pointing to a picture requires activation of meaning at a variety of levels. In order to point to the correct picture being described in the spoken sentence, one has to comprehend the sentence to a sufficient degree, activate the meaning/content of what is being depicted in the different pictures, and connect the spoken form to what is being portrayed in the picture. Note that the difficulty of the task can be increased or decreased by modifying the amount of detail described in the spoken sentence and in the degree to which the pictures are similar. For example, if the sentence is "The dog is by the chair," one picture could portray a dog by a chair, and another could portray a dog in a chair, which would be substantially more difficult than having one picture that portrays a dog by a chair and another that portrays a field of sunflowers.

Example 5

- Purely form-oriented task: Question or statement? (e.g., Cochlear Corporation, 2003).

- Instructions: I am going to say a sentence, and I want you to tell me whether I asked a question or made a statement.

- How it can be modified: Ask the listener a series of questions, and have him or her answer all of them.

- Modified instructions: I am going to ask you some questions. Please do your best to answer them.

- Comments: The purpose of the original activity is to discriminate the intonation of whether someone is asking a question or making a statement. The modified activity will still provide exposure to the intonation of a question, but the task will now be meaning oriented. If one wishes, statements could be interspersed with questions. In this way, the distinction between intonations for questions versus statements can be presented in the   input in a meaningful context, for example, "The weather report this morning said that it is going to be sunny this weekend. Do you have any plans for the weekend?"

Example 6

- Purely form-oriented task: Contextual sentence.

- Instructions: You have a list of sentences in front of you that are numbered 1 to 10 that are all related to the same theme (e.g., theater). Each sentence has two choices of words that are underlined. I'm going to read you the sentence using one of the underlined words. I want you to point to the underlined word that I said (e.g., the crew put the tape/cape on the stage.).

- How it can be modified: Instead of asking the listener to identify one of the two words, read a sentence containing one of the two competing words (a sentence in which either word would make sense) and present three written sentences as possible responses. Each of these sentences will relate contextually to one of the versions of the sentence. For example, if the presentation sentence was "The crew

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put the tape on the stage," then the three written sentences would be (a) "Dracula needed it in the first scene," (b) "It marked where the actors stood," and (c) "The scene involved a celebration." If the listener heard the word tape correctly, then "It marked where the actors stood" would be the correct answer. However, if the listener heard the word cape or cake, then one of the other sentences might be incorrectly selected (Barcroft, Schroy, et al., 2011).

- Modified instructions: You will hear a sentence. Look at the three written sentences on the paper in front of you. Tell me which of the sentences makes the most sense based on the sentence you heard me say.

- Comments: The original activity may or may not activate the referential meaning of the word tape or cape or necessarily the meaning of the rest of the sentence to any substantial degree. However, in the modified example the listener must understand the meaning of the original sentence and hear the competing words correctly in order to choose the correct response.

Discourse Level

Example 7

- Purely form-oriented task: Discourse tracking (De Fillipo & Scott, 1978).

- Instructions: I am going to read a passage to you one sentence at a time. I want you to repeat exactly what you hear me say. If you miss a word, I will repeat the sentence, and you can repeat the sentence again. We will continue this until you hear and repeat exactly what I say.

- How it can be modified: Provide the spoken version of a reading passage (with content that may be pertinent and interesting to the listener) and a set of comprehension questions about the information conveyed in the passage.

- Modified instructions: Listen to the passage as I read it. At the end of the paragraph, I will ask you questions about what you heard.

- Comments: Whereas the continuous discourse-tracking task does not require the listener to attend to the meaning of the passage, the modified version of the task does. Note also that the informational content in the meaning-oriented task is more likely to maintain the listener's interest over time. One can focus on making the best use of residual hearing during AT while learning information that can be pertinent and interesting. Focusing on meaning and learning in this manner is less likely to lead to boredom compared with the form-oriented discourse-tracking task.

Example 8

- Purely form-oriented task: Follow-along passage.

- Instructions: I am going to read this story aloud, and I want you to follow along with the written text in front of you. When I stop, I want you to tell me where I stopped and continue reading the next line.

- How it can be modified: This task could be modified in the same manner as in Example 7 to make it meaningful, interesting, and engaging. If the clinician is interested in focusing on particular parts of the spoken passage, instead of asking the listener to indicate where the clinician stops, the clinician can simply stop reading in particular parts of the passage and ask questions related to that particular part. The modified instructions presented next demonstrate how this can be done.

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- Modified instructions: Listen to the passage as I read it. I will ask you comprehension questions throughout the passage and also at the end.

- Comments: Focusing on any particular skill in a purely form-oriented task also can be attended to in a meaning-oriented context. In the form-oriented task, the skill of being able to keep up with continuous speech is focused on by requiring listeners to "read and follow along." This same type of skill is worked on in the meaning-oriented version by means of comprehension checks at different points in the spoken passage.

Example 9

- Purely form-oriented task: Counting instances of a word.

- Instructions: I am going to read you a paragraph about televisions. I want you to count the number of times I say the word television.

- How it can be modified: This task could be modified in the same manner as in Example 7 to make it more meaning oriented. If one of the goals of completing the task is to develop the ability to pay attention to key words in a spoken passage, the modified version can still include focusing on the word television, but in a more meaning-oriented manner; specifically, the clinician can ask the listener to pay attention to the different contexts in which the word television is used in the passage, such as whether it is used to refer to television as an object in one's house or in the more general sense such as in the phrase "the role of television in modern life."

- Modified instructions: Listen to the paragraph as I read it. At the end of the paragraph, I will ask you questions about what you heard. Also, each time you hear the word television, consider whether the word is referring to television as an object in one's house or in the more general sense as would be the case of "the role of television in modern life."

- Comments: As with Example 8, subtasks can be included in the modified version of the task that parallel the type of skill intended to be focused on in the original form-oriented task. In the present case, the word television is focused on in both versions but is focused on in a more meaning-oriented manner in the modified version. If desired, successful performance of the subtasks can be verified. For example, in the modified version of the present task (Example 9), a checklist could be provided with two columns with column headings "Object" and "Nonobject." Then, each time that the word television is spoken, the listener is provided time to check a box to indicate which sense of the word television conveys.

Summary by Example

On the basis of the principles related to meaning orientation just described, a computerized AT program (I Hear What You Mean) was developed for individuals with hearing loss (Barcroft, Schroy, et al., 2011; Tye-Murray et al., 2011). This program consists of 12 lessons. Each training lesson includes five types of activities. Each lesson takes approximately 1 hr to complete and focuses on a particular theme (e.g., restaurant, travel). In addition, each exercise provides extensive practice on a set of phonemes, with easily discriminated phonemes featured in early exercises and less easily discriminated phonemes featured in later exercises. All stimuli in the program are presented auditorily only in adaptive four-talker babble, to maintain performance at approximately an 80% correct response rate.

Within each of the 12 lessons, Activity 1 focuses on sound identification in a manner that introduces the theme of the lesson. Participants hear a word and then indicate whether a

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lesson's target sound occurs in the initial, medial, or final position. This is the only activity that is not meaning based. Activity 2 is a meaning-oriented, picture-based, four-choice discrimination task. Participants hear two words that are either the same (e.g., *mat–mat*), or that differ by a single phoneme (e.g., *mat–bat*), and then select which of four pictures shown on the touch screen illustrates the two words. In this example, the pictures would display two mats, two bats, a mat next to a bat, and a bat next to a mat. Activity 3 involves completing sentences. Participants hear the first part of the sentence in quiet and then select the final word that completes the sentence's meaning, from a choice of four options varying by one phoneme and heard in the four-talker babble. Activity 4 is a meaning-oriented sentence-identification task and requires participants to listen to a sentence and then select from three written sentences the one that is most likely to occur next, given the context of the preceding spoken sentence. Activity 5 focuses on comprehension of extended passages. Participants hear a passage and then answer two multiple-choice comprehension questions. Next, they hear and simultaneously read the same passage and answer two additional multiple-choice comprehension questions. This second presentation and the accompanying text allow them to verify what they heard. All activities have a testlike format in which participants make a decision in response to a prompt.

Expected and Observed Outcomes for Meaning-Oriented AT

Although the primary purpose of this article is to emphasize the importance of a meaning orientation in AT and to provide examples of how to modify purely form-oriented activities so that they become meaning oriented, it is worthwhile to point out, albeit briefly, some of our observed outcomes using the meaning-oriented approach to AT we have described in this article. To this end, we consider three questions. First, how beneficial and engaging is meaning-oriented AT? Second, what compliance rates does meaning-oriented AT yield in an experimental setting? Third and last, to what extent does meaning-oriented AT result in benefits for speech perception abilities?

With respect to the first question, 93 adult participants with hearing loss who completed the I Hear What You Mean AT program were asked to complete posttraining questionnaire rating scales (Mauzé, Schroy, & Tye-Murray, 2011; Tye-Murray et al., 2011). To assess their impression of how their ability to recognize spoken language had improved, participants on average assigned a rating of 4.1 on a 7-point scale, on which a 1 represented *Not at all* and a 7 represented *Very much*. These results suggest that participants perceived moderate improvement in their spoken language recognition abilities. Their self-confidence in engaging in conversations with casual acquaintances or strangers and in conversations with family members or close friends also demonstrated improvement, with average ratings of 3.8 and 3.6, respectively, on two similar 7-point scales, one of which asked about how their confidence when talking to strangers and casual acquaintances had improved and the other of which asked about their confidence in conversing with family members and close friends. Finally, participants appeared to have enjoyed participating in training, assigning an average rating of 5.9 to a corresponding scale that asked them how much they had enjoyed training. A critical but generally neglected component of evaluating AT is to assess long-term benefits. To address this issue, we administered either a 6- or 12-month posttraining follow-up questionnaire to 48 of the participants. Questionnaire responses indicated overwhelmingly that participation in the AT program was "worth [a participant's] time" (87% of the respondents) and that they would take the training program again (81%). The majority also indicated that they would recommend the program to a friend (85%).

With respect to the second question, it is important to note that traditional AT programs often meet with poor compliance. For instance, Sweetow and Sabes (2010) reported that, of more than 3,000 individuals who enrolled in the Listening and Communication Enhancement program, less than 30% completed the program. Tye-Murray and colleagues (in press) reported

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that more than 100 people have finished the I Hear What You Mean AT program, and only one participant has not completed the program, because of a family situation. When asked what they liked best about participating in I Hear What You Mean, the most common responses pertained to the program activities and design. We believe that this set of responses and the excellent compliance rate underscore the value of having providing AT that is meaning oriented.

In addition to being engaging and yielding a very high level of compliance, our expectation is that meaning-oriented AT also should result in substantial gains in speech perception abilities. Barcroft, Schroy, et al. (2011) provided some initial data to address the third question posed earlier; specifically, they found that participants significantly improved their performance on a four-choice discrimination task as a result of having training with the I Hear What You Mean AT program.

Conclusion

Given that effective communication in the real world involves the transmittal and comprehension of meaning, our position is that AT activities should parallel real world communication and be meaning oriented. In this article we have defined and discussed what meaningful tasks are and provided a number of examples of purely form-oriented AT tasks and how they can be modified so that they require listeners to process both linguistic form and its meaning in order to respond correctly. We provided nine full-scale examples of how purely form-oriented AT tasks can be modified in this manner, three examples at each of three levels of linguistic grain: (a) three word-level tasks, (b) three sentence-level tasks, and (c) three discourse-level tasks. Furthermore, we provided one example of an AT program (I Hear What You Mean; Tye-Murray et al., in press) that was designed in consideration of the principles related to meaning orientation.

Although a three-tier division among word, sentence, and discourse levels may be useful for organizational purposes when discussing AT activities, we propose that any quality AT program include tasks at all levels of linguistic analysis from the onset and that these activities need not be conceived of in a strict hierarchical manner. Improvement at one level, be it lower (e.g., word level) or higher (e.g., discourse level on the continuum of different levels of linguistic analysis) can also result in improvement at another level. Our nonhierarchical interactive schema for AT tasks visually depicts this position, in contrast to an earlier schema that posited a hierarchy of AT tasks moving from easier to more difficult. A critical difference is that, in our schema, comprehension of the meaning expressed by linguistic forms, and not just the correct perception of the forms themselves, is consistently the central focus of quality AT. Comprehension of this nature is what the real world requires of individuals with hearing loss (and all individuals) for successful communication.

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