Adult Audiologic Rehabilitation: A Review of Contemporary Practices

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ABSTRACT: The contemporary practice of adult audiologic rehabilitation is client centered, individualized, and efficient. Audiologists recognize that audiologic rehabilitation is vital but also acknowledge the economic realities of cost-oriented hearing health care. Time is money, so rehabilitation protocols must accommodate the fast pace of today’s clinical practices. In this article, current rehabilitative strategies surrounding the adult hearing aid fitting are reviewed, including clear speech, hearing aid follow-up groups, auditory training, lipreading, self-assessment tools, and treatment outcome measurement. These strategies, although not new, are discussed in a 21st-century context to allow practical approaches to providing rehabilitative treatment to adults with hearing loss and their family members and/or significant others.

KEY WORDS: audiologic rehabilitation, auditory training, LACE, lipreading, clear speech, hearing aid follow-up groups, family and significant others

CURRENT REHABILITATIVE STRATEGIES

Clear Speech

Given the time constraints that all audiologists in the early 21st century face, including family members/SOs in the
rehabilitative process may appear to be a daunting challenge. However, audiologists have at their disposal a scientifically sound, clinically applicable, quick and easy-to-teach strategy: clear speech. What is clear speech? Put simply, it is speech that is somewhat slower than conversational speech and is precisely enunciated. Clear speech can improve speech intelligibility an average of 17% (Picheny et al., 1986). Note the differences in the production of the same sentence (Clark & English, 2004): The kids’ swim’n in the pool (conversational) versus The kids (pause) are swimming (pause) in the pool (clear speech).

Clear speech is characterized by several different acoustic parameters. The first and most apparent characteristic of clear speech is a slower speaking rate that includes a greater number of pauses and an increase in pause length. Second, the stop bursts of almost all word-final consonants are released, and alveolar flapping is reduced (Bradlow, Kraus, & Hayes, 2003). Third, consonants as well as vowels are lengthened (Ferguson & Kewley-Port, 2003), and the consonant-to-vowel intensity ratio is increased (Bradlow et al., 2003). When using clear speech, the acoustic space between vowels is increased (Bradlow et al., 2003), and the first formant of vowels is higher than in conversational speech (Ferguson & Kewley-Port, 2002a). Also in clear speech, the mean and range of the fundamental frequency are greater than in conversational speech (Bradlow et al., 2003). Finally, the long-term volume of clear speech is 5 dB–8 dB greater than conversational speech (Picheny, Durlach, & Braida, 1986).

Several studies have documented the use of clear speech by people communicating with clients who have hearing loss. Many of these studies have simply asked the speakers to talk like they would to someone with hearing loss (i.e., slowly; Bradlow et al., 2003; Ferguson & Kewley-Port, 2002a). However, Caisse et al. (2005) studied the effects of formally training spouses to use clear speech versus conversational speech. Spouses of people with hearing loss served as the speakers. Some of the speakers received clear speech intervention (one 45-min session); others were simply instructed to speak clearly. The speakers were recorded reading sentences at three different points in time—conversational speech before intervention, clear speech 1 week after intervention, and clear speech 1 month after intervention. These sentences were played for participants with normal hearing and participants with hearing loss at a level of 65 dB HL in the presence of multitalker babble noise at a signal-to-noise ratio (SNR) of +10 dB. Participants with hearing loss wore their hearing aids during testing. This study found that asking the speaker to speak clearly did, in fact, elicit clear speech. However, the speaker who had clear speech brought about changes in a greater number of speech parameters, more stable changes in speech, and better speech recognition by the participants with hearing loss. Furthermore, when participants with hearing loss listened to the speaker who had clear speech training, they performed as well as the participants with normal hearing did. When participants with hearing loss listened to the other speaker, they performed worse than normal-hearing participants. The results of this study indicate that training family members in clear speech can result in improved speech recognition for persons with hearing loss. As such, individuals with hearing loss would benefit if their partners were provided with clear speech training (Caisse et al., 2005).

There are many reasons to incorporate clear speech training in an audiologist’s routine practice. It involves the family/SO, it is easy to explain and teach, information can be disseminated in handouts, and it produces almost immediate results if done correctly. Finally, clear speech is so logical and practical that clients and their families can easily be convinced to incorporate it into daily communication.

**Hearing Aid Follow-Up Groups**

Hearing aid follow-up groups are not a new idea. In fact, Raymond Carhart initiated the first hearing aid follow-up groups for military personnel at Deshon General Hospital following World War II (Olsen, Rose, & Hedgcock, 2003). Although audiologists lost interest in this concept over the years, hearing aid follow-up groups have been resurrected as effective, cost-efficient ways of providing rehabilitation. Indeed, in the early 21st century, these groups are consistent with one of the hottest trends in health care: patient education.

By the end of the 20th century, studies were being published that fueled interest in offering group audiologic rehabilitation. Preminger (2003) reported a significant reduction in hearing handicap scores as measured by the Hearing Handicap Inventory for the Elderly (HHIE; Ventry & Weinstein, 1982) after 6 weeks of participation in an adult audiologic rehabilitation group. Beynon, Thornton, and Poole (1997) similarly found a greater reduction of hearing handicap in those participants who attended 4 weeks of a group rehabilitation course. And Abrams, Hnath-Chisolm, Guerreiro, and Ritterman (1992) found a reduction in hearing handicap after only 3 hr of group rehabilitation. Abrahamson and Wayner (1998) cited potential benefits of offering group audiologic programs beyond a reduction of hearing handicap. These include peer interaction, realistic expectations, spouse involvement, frequent contact with the audiologist during the trial period, opportunity to practice skills, quality service, and cost effectiveness.

The cost-effectiveness issue is particularly important to audiologists in the current health care arena. Providing client education and audiologic rehabilitation in a group setting clearly saves time, which translates into cost savings for the audiologist. But, other cost benefits have been demonstrated with this model as well. Northern and Beyer (1999) compared new hearing aid users who participated in posthearing aid fitting rehabilitation called the Hearing Education & Listening Program (HELP) with new hearing aid users who opted not to participate. They then examined the “return for credit” rate for each group. This issue was of interest because of the 18% hearing aid return for credit rate that was reported by the Hearing Industries Association the year before this study was conducted (Northern & Beyer, 1999). The return rate for those who did not attend the HELP classes was 9%; the return rate for those who did attend the HELP classes was 3%. These results suggest
that the education, counseling, and rehabilitative strategies that were provided during the group rehabilitation sessions contributed to more successful hearing aid adjustment as measured by return for credit. When a client returns his or her hearing aids, it typically suggests a failure of the rehabilitative process to some degree. As such, the low rate of return reported by this study, as compared to the rate of return for those who did not participate, provides strong support for adult hearing aid follow-up groups.

Hawkins (2005) conducted an evidence-based practice systematic review of the literature to examine the evidence regarding the efficacy of adult audiologic rehabilitation groups. Specifically, he reviewed the literature from 1998 to 2004 to answer the question: Do adult audiologic rehabilitation interventions that focus on counseling and communication strategies provide measurable benefits, over the short- or long-term, in benefit/satisfaction with hearing aids, adjustment to hearing loss, or perceived hearing handicap? Hawkins found that there was good evidence that participation in adult audiologic rehabilitation programs provides a short-term reduction in hearing handicap and better use of communication strategies and hearing aids. However, the literature did not address whether these outcomes would remain stable over time, which remains a key research question.

The American Academy of Audiology’s “Guidelines for the Audiological Management of Adult Hearing Impairment” (Valente et al., 2006, p. 37) state that post-hearing aid fitting follow-up requires instruction to “the patient and his/her communication partners to develop appropriate strategies to maximize and augment the assistance he/she receives from those hearing aids.” In the busy, cost-conscious health care climate of the early 21st century, post-hearing aid fitting groups provide the ideal solution for providing this follow-up and are a win-win situation for clients, families, and audiologists.

**Including SOs: Always Significant**

It has been well documented that hearing loss not only affects the individual, but it also can have significant effects on family members and SOs. Brooks, Hallam, and Mellor (2001) found that family members and SOs experienced difficulty in communication and personal and social relationships as the result of hearing loss. However, Stark and Hickson (2004) found that hearing aids can reduce negative quality-of-life effects for both the individual with hearing impairment and the SO.

One reason for including family members and SOs in the rehabilitation process is that family members and SOs can provide the support system necessary for success. As such, it is critical that family members and SOs have realistic expectations of hearing aid and rehabilitation outcomes before engaging in the process. Jachim and McCarthy (2004) investigated the expectations of hearing aid candidates and their spouses before the fitting to determine if differences existed. The Expected Consequences of Hearing Aid Outcome (ECHO; Cox & Alexander, 2000) was administered to 15 participants, and a modified version was administered to 15 spouses. Although results showed no significant differences between groups, individual dyads showed markedly different prehearing aid fitting expectations between hearing aid candidates and their spouses. These results suggest that spouses, family members, and/or SOs should be included in prefitting hearing aid counseling in order to address possible differences in expectations.

Preminger (2003) demonstrated the benefit of including family members or SOs in the rehabilitative process in a study of adult post-hearing aid fitting group outcomes. She found that participants with hearing impairment increased their use of communication strategies and showed significant reductions in hearing handicap. However, the greatest handicap reduction was found among those participants who attended the group sessions with a family member or SO.

A study by The National Council on Aging (NCOA, 1999) also investigated the relationship between an individual’s hearing loss and family members/SOs. It surveyed 2,300 adults with hearing loss and 2,090 close family members or SOs. Among the issues surveyed was the benefit of hearing aids reported by individuals compared to family members. Interestingly, 56% of hearing aid users reported an improvement in relationships at home as a result of hearing aid use; yet 66% of family member/SOs reported such an improvement. Similarly, 48% of hearing aid wearers reported an improvement in quality of life overall, whereas 62% of family members/SOs felt that hearing aids had improved quality of life overall. These results suggest that the family members/SOs may perceive equal if not greater benefits of the rehabilitation process than the hearing aid wearers themselves.

The results of these studies underscore several important points to consider in the rehabilitative process. First, hearing loss affects not only the individual, but also those in his or her support system. Second, the expectations of the individual as well as the family member and SO should be incorporated into prefitting counseling sessions. Third, the multiple benefits of post-hearing aid fitting rehabilitation accrue not only to the individual with hearing loss, but also to involved family members and SOs.

**Auditory Training With Adults: An Innovative Approach**

In the last half of the 20th century, most people who wore hearing instruments received minimal, if any, auditory training. Audiologists argued that time constraints and lack of reimbursement precluded offering these services. Yet, by the end of the last century, it was becoming clear to audiologists that although hearing aids provide audibility of the speech signal, they do not compensate for all of the peripheral, central, and behavioral issues related to hearing impairment. To address these issues, further rehabilitative management is needed. Yet for decades, there has been little research and development directed toward auditory training with adults beyond the hearing aid fitting and loudness/comfort programming. In recent years, however, there has been a resurgent interest in and application of auditory training activities for improving the perception of
speech in special clinic populations such as cochlear implants users, adults with psychoacoustic auditory processing disorders, and older individuals with compromised cognitive skills (Kricos & McCarthy, 2007).

Development of the Listening and Communication Enhancement (LACE) program was based on the tenet that audibility of sound alone is not enough for the listener with hearing impairment, especially when he or she is placed in challenging listening situations (i.e., noise or rapid speech; Sweetow & Sabes, 2006). LACE is a computer-based auditory rehabilitation program that was created to improve the listening and communication skills of adults with hearing loss and to provide them with practical information on compensatory strategies. It was created out of the need for a more comprehensive, less time-consuming, cost-effective way to deliver audiologic rehabilitation services to a greater number of adult clients. LACE provides a variety of tasks that are both adaptive and interactive. There are three main categories of tasks included in the program: degraded speech, cognitive skills, and communication strategies. The degraded speech exercises include tasks in which speech is presented in either multitalker background babble or with a single competing speaker. Another of the degraded speech tasks presents time-compressed speech to simulate a person who speaks quickly. The cognitive skills exercises are designed to help the client with auditory memory and speed of processing. Two exercises are included under this heading: identification of a missing word in a sentence or phrase and identification of words either preceding or following a target word in a sentence. Throughout the training, the client is given various communication strategies, including strategies to optimize telephone use and tips on how to be a better, more active listener (Sweetow & Sabes, 2006).

In Phase 2 of the initial study testing, LACE trainees were asked to perform the tasks mentioned above for 30 min per day, 5 days per week, for 4 weeks. Sixty-five clients were divided into two groups: The “trained group” started training immediately following baseline testing that included both on-task and off-task measurements. On-task measurements included a speech-in-babble task, a time-compressed speech task, a competing speaker task, an auditory working memory task, and a missing word task. Off-task measurements included the QuickSIN (Killion & Niquette, 2001), Hearing in Noise Test (Nillson, Soli, & Sullivan, 1994), Listening Span Test (Pichora-Fuller, Schneider, & Daneman, 1995), and Color-Word Stroop test (Uttl & Graf, 1997). The second group, a crossover group, received baseline testing, testing 4 weeks later, and then 2 weeks and 4 weeks into training. In other words, the crossover group started training 1 month following the “trained” group and served as a control group to the trained group during this time. Results demonstrated that all trained participants showed a significant improvement on all of the LACE tasks, including degraded speech and cognitive skills.

Also measured in this study were baseline and posttreatment performance on the Quick SIN, Hearing in Noise Test, Listening Span Test, Stroop Color Word test, HHIE/Hearing Handicap Inventory for Adults (Newman, Weinstein, Jacobson, & Hug, 1990), and Communication Scale for Older Adults. On all of these measures, with the exception of the Hearing in Noise Test, participants who were trained showed significant improvements over those who were not trained (Sabes & Sweetow, 2007). The importance of improvement on tasks such as the Quick SIN and decrease in hearing handicap as indicated by scores on subjective measurements should not be overlooked. These improvements provide further evidence of the value of training and generalization to everyday communication.

The advantages of the LACE program are that it is interactive, home based, and adaptive. An adaptive task is one that becomes more or less difficult based on how the client performs throughout the test. If the client performs well, the task will become more difficult, but if the client performs poorly, the task will become easier. Because it is adaptive, it is individualized to the client’s skill level. This procedure keeps the client interested in the task. The client is also allowed to move at his or her own pace and perform the training when it is convenient for him or her to do so. Newer versions of the program provide instant feedback on performance improvement from baseline in graphic form. Also, the audiologist is able to monitor the client’s progress remotely. For clients who do not have a home computer, there is also a stand-alone version of LACE that can be used in the audiologist’s office.

One of the major limitations of LACE is that it requires the client to have a certain degree of computer literacy, although this can be attained with brief training. It also requires the client to focus and participate for an extended period of time. Some clients may not be open to training or be willing to put in the time for training. Furthermore, some clients believe that the devices alone should provide the benefits they are seeking without any work on their part (Sabes & Sweetow, 2007; Sweetow & Sabes, 2006). These clients may be unwilling to participate in programs like LACE without extensive counseling by the audiologist.

**Lipreading: Can You See Me Now?**

Although formal teaching of lipreading per se has become a thing of the past, the role of visual cues in communication cannot be underemphasized in adult audiologic rehabilitation in the 21st century. Contemporary hearing aid fitting protocols stress the synergistic benefits of binaural stimulation that result from use of amplification as well as visual cues in communication. It has been well established that communication performance improves when auditory and visual cues are combined. In fact, adding visual cues to auditory cues can improve the SNR by up to 15 dB (Sumby & Pollack, 1954). Each dB improvement in SNR is equal to a 5–10 percentage point increase in intelligibility (Grant & Braida, 1991). This improvement results in better performance by persons with hearing loss, especially in the most difficult listening environments.

Summerfield (1987) hypothesized three possible reasons for this improved understanding of speech in noise. First, speechreading provides both segmental (consonant and vowel) and suprasegmental (stress, intonation) information...
to the listener. This information is redundant to the cues that are provided from the acoustic signal. In other words, it reinforces the information from the acoustic signal. Speechreading also provides information, both segmental and suprasegmental, that complements the cues that the individual obtains acoustically. Third, when the listener watches someone speak, the acoustic signal and the movements of the speaker’s lips have spatial and temporal properties in common, thus providing redundant cues to the listener.

The last of Summerfield’s hypotheses was tested by Grant and Seitz (2000) to answer the question of whether the visible movements of the speaker’s articulators could be used to improve detection of speech in noise. What they found was that visual cues from the movements of the speech articulators during speech production do interact with their temporal and spatial correlated auditory cues to enhance auditory detection.

Lipreading is an important communication strategy that is often overlooked in clinical settings as it is assumed that individuals with hearing loss naturally use this skill to compensate for hearing loss. However, effective communication is dependent on three independent skills including the overall ability to lipread, the ability to hear auditory information, and the ability to integrate information from the auditory and visual modalities (Tye-Murray, Sommers, & Spehar, 2007a).

Most studies that look at the ability to lipread look at all three modalities (auditory only, visual only, and auditory + visual combined). Many studies have compared one group to another in terms of their ability to lipread. Interestingly, until recently, the lipreading abilities of the older adult population with a sloping hearing loss caused by presbycusis had not been studied. Tye-Murray and her colleagues (2007a) compared the performance of older adults with normal hearing to older adults with hearing loss on a variety of lipreading tasks. Participants were tested in their ability to integrate auditory and visual information and identify consonant, word, and sentence stimuli. Results suggested that overall, older individuals with hearing loss have similar integration skills to older individuals with normal hearing. In other words, there is no evidence to support the assumption that individuals with hearing loss automatically begin reading lips as a compensatory strategy.

The authors of these studies stress the need to develop rehabilitation strategies that improve the auditory and visual aspects of speech perception for older adults. They also encourage the development of protocols that can improve lipreading as well as integration of auditory and visual information to improve the performance of individuals with hearing loss (Tye-Murray et al., 2007a). Contemporary audiologic practice, however, typically does not include formal lipreading training. As more evidence regarding visual speech perception is obtained, valid lipreading and bisensory training procedures should be developed and incorporated into routine practice. Until then, the value of visual cues in communication, in conjunction with amplified speech, cannot be overemphasized.

Self-Assessment Tools: The Client’s View

Although the audiogram is the “gold standard” for assessing hearing loss, it tells the practitioner very little about the client’s functional status in regard to the hearing loss. Consequently, self-assessment of hearing handicap has been measured in clinical practice for many years as a way for clinicians to determine the impact of a client’s hearing loss on his or her daily life.

Hearing handicap can be defined as the nonauditory problems that are the result of the client’s hearing loss. The perception of degree of hearing handicap for an individual with hearing loss is affected by such factors as personality, age, general health, and psychosocial adjustment to hearing loss (Ventry & Weinstein, 1982). Often, it is this hearing handicap that will lead the person with hearing loss to seek audiologic services and, ultimately, audiologic rehabilitation for this handicap.

Hearing handicap can be measured in various ways in both clinical and research settings. Often in clinical settings, hearing handicap assessments are administered before and following treatment to assess outcomes by measuring the reduction in hearing handicap. (The use of outcome measures will be described in further detail in the section below.) Research in the area of self-assessment has attempted to correlate hearing handicap with degree of hearing loss. However, attempts to predict the degree of hearing handicap based on the degree of hearing loss have not been successful. This gives further credence to the need for individualized treatment planning because each person will experience different effects of hearing loss even with the same degree of loss.

Several self-assessment tools to assess hearing handicap have been developed over the years. One of the most widely used tools is the HHIE. The HHIE has a 13-item subscale that looks at the emotional consequences of hearing loss as well as a 12-item subscale that looks at the social and situational effects of hearing loss. The person taking the assessment is asked to answer yes, sometimes, or no, with each item scored with 4, 2, or 0 points, respectively. A total score is then calculated, with a higher score indicating increased social and emotional problems due to hearing loss (Weinstein & Ventry, 1983). The HHIE and the HHIA are both excellent tools of self-assessment that are hearing specific. Although the HHIE and HHIA measure the degree of hearing handicap that the individual is experiencing, they differ on three items. The HHIE is used with elderly clients who are retired, whereas the HHIA can be used with adults of all ages, including elderly individuals who are still working.

More generic measures of health status have been used in various studies to see how hearing loss affects overall health. One such measure is the “SF-36 Health Survey” (Ware, 1993), which is a 35-item questionnaire that is used to assess physical and mental health function across eight dimensions. These dimensions include physical function, role limitations due to physical problems, bodily pain, general health, energy and vitality, social functioning, role limitations due to emotional problems, and mental health (Ware, 1993). Pugh and Crandell (2002) attempted to
The participant has completed responding, he or she is able to obtain information on various strategies and treatments for hearing loss, including medical–surgical options, assistive listening devices, and hearing aids. Once the questionnaire is completed, the client is given a one-page hearing profile based on his or her responses (Holcomb & Punch, 2006).

Often, these inventories are validated in both ways as some clinicians prefer to do these inventories in a paper and pencil format whereas others prefer to use an interview format. The Multimedia Hearing Handicap Inventory (MHHI; Holcomb & Punch, 2006) offers an alternative to these formats. The MHHI is based on the HHIE and HHIA. The long version of the program provides the client with basic information on hearing loss, common problems noted by people with hearing loss, factors that affect the understanding of speech, and an explanation of the audiogram. When the questionnaire is completed, the client is able to obtain information on various strategies and treatments for hearing loss, including medical–surgical options, assistive listening devices, and hearing aids. Once the participant has completed responding, he or she is given a one-page hearing profile based on his or her responses (Holcomb & Punch, 2006).

The individual's hearing profile is based on his or her total handicap score, the test's assumption of an aided or unaided condition based on the individual's responses, and whether or not the MHHI has been administered previously. Eight different profiles can be generated by the program based on how the person responds. Based on this profile, the computer will give the client various recommendations. Profiles 1 and 3 apply to people who are not current users of amplification and who are in need of routine follow-up only. Profiles 2 and 4 are indicative of people who are current users of amplification who require routine follow-up only. Profiles 5 and 7 are indicative of persons who are not currently using amplification and are in need of an audiologic evaluation and possibly hearing aids. Profiles 6 and 8 are indicative of persons who are using hearing instruments but are not satisfied with them. With those participants who have a profile of 6 or 8, the computer will suggest the need to consider adjustment of their current aids, repair/replacement of current aids, or additional intervention strategies that augment the use of hearing aids (Holcomb & Punch, 2006).

The use of the long version of the MHHI can help guide audiologic counseling and help the clinician use his or her time with the client more efficiently. The long version takes approximately 15–20 min to administer. The short version takes approximately 2 min to administer and can be used during mass screenings at health fairs, and so on. As with LACE, clients need to be able to use a computer, although only a few key strokes are necessary and training can be accomplished in a short amount of time. Also, completion of the MHHI is typically done in an audiologist's office so there is no need for the client to have a home computer.

The MHHI incorporates counseling information in the framework of education and also provides written recommendations for follow-up (Holcomb & Punch, 2006). The MHHI is based on the health belief model (Rosenstock, 1990). This model states that clients are more likely to comply with the recommendations of the practitioner when they see themselves as being vulnerable to a condition. They also are more compliant when they see this condition as having serious social or medical consequences, they see benefits of obtaining assistance, and they see few barriers that exist to this compliance. In other words, this particular assessment goes beyond previous assessments in that it spurs the client on to some type of action based on his or her responses rather than simply looking to see if a hearing handicap is being experienced or not.

Outcome Measures: Did Audiologic Rehabilitation Make a Difference?

The use of outcome measures has become de rigueur in health care in the 21st century. In fact, the use of such measures represents a major shift in the arena of health care practice. As such, the use of outcome measurement in rehabilitative audiology has gained popularity in recent years. In fact, audiologists today are less concerned with whether or not to use such measures, but rather which measures to use in a particular practice.
There are three major reasons for the shift toward the use of outcome measures as documented by Cox (2003). First, the climate of health care has changed. Not long ago, the health care practitioner was viewed as the expert. During this time, it was the practitioner who determined what the treatment would be, when it was complete, and whether or not it was successful. However, in the health care arena of today, it is often the client who makes these decisions. Second, many aspects of the client’s audiologic profile cannot be attained with standard clinical tests alone. It is important to measure how the client’s daily activities are affected by his or her hearing impairment. Third, even when we simulate real-world conditions in the clinic or laboratory, the results of our tests do not resemble the client’s impression of his or her performance in that situation. Outcome measures allow us to tap into these aspects of performance and consequently have led to the routine use of outcome measures in a clinical setting. Outcome measures typically are given before and following rehabilitative intervention, for example, the hearing aid fitting. Pre- and posthearing aid fitting measurements then are compared to calculate the reduction in handicap or other change that resulted from the rehabilitative intervention.

Cox (2003) identified seven domains that can be assessed using self-report to measure outcomes. These domains include benefit, satisfaction, use, residual participation restrictions, residual activity limitations, impact on others, and quality of life. A discussion of these domains and the tools used to measure them follows.

**Benefit** measures typically focus on the difference in hearing performance with and without hearing aids. As an outcome measurement domain, benefit can be part of both hearing aid verification and validation. Both types of measurements are essential in an amplification protocol with verification based on objective measurements and validation based on subjective, client-centered measurements of outcome. Several self-assessment tools have been used to measure the benefit that is accrued from hearing aid use. The Abbreviated Profile of Hearing Aid Benefit (APHAB; Cox & Alexander, 1995) measures the amount of trouble the client is having with communication and sounds in everyday listening situations. Benefit is calculated by comparing the client’s self-reported difficulty in the unaided situation with his or her difficulty when using hearing aids. Another widely used subjective benefit tool includes the Client Oriented Scale of Improvement (COSI; Dillon, Birtles, & Lovegrove, 1999), which allows the client to nominate specific situations in which he or she is experiencing difficulty with communication. Benefit is measured by examining the client’s ratings of improvement in these situations following fitting of the hearing aid.

**Satisfaction** typically refers to fulfillment, contentment, or gratification. In an audiologic rehabilitation context, satisfaction often reflects a combination of physical, psychological, and financial changes that result from acquiring a hearing aid and engaging in the rehabilitation process surrounding the fitting. In clinical practice, audiologists are interested in determining how satisfied their clients are not only with the hearing instruments per se, but with the entire rehabilitative process. Over the years, many audiologists developed surveys to tap into the satisfaction outcome of their hearing aid clients. In 1999, Cox and Alexander developed the “Satisfaction with Amplification in Daily Life” (SADL) as a formalized measurement of many aspects of satisfaction, including the audiologist’s competence and the cost of the hearing aids(s). The SADL is the companion tool to the ECHO, which was also developed by Cox and Alexander (2000). Although the ECHO is given before the fitting to assess the individual’s expectations for the hearing aid fitting process, the SADL is given at some point after the fitting. A comparison of the pre/post responses allows the audiologist to determine if a successful outcome for the individual client has been achieved.

Hutton (1980) was one of the first researchers to determine that a critical domain in assessing hearing aid outcome is hearing aid use, or wear time. The rationale is that the more hours a day the client is using amplification, the better his or her adjustment. Hearing aid “use time,” also referred to as “wear time,” can be measured subjectively or objectively. Clients can simply be asked to report the number of hours a day that they wear the hearing aid(s) in an interview or a self-report measure. Recent advances in data-logging technology in hearing aids have made the objective measurement of wear time easy and almost automatic for the clinician. This hearing aid feature allows the audiologist not only to determine how many hours the client has worn the hearing aid, but in the case of multiple memories, will display the number of hours the aid has been worn in different listening situations. The rehabilitative value of this feature is clear in that appropriate programming and counseling can be implemented based on the data-logging results.

**Residual activity limitations** relate to how well the client is able to perform an activity in a way that is considered normal. The APHAB, given before the fitting, provides a series of scores that show the percentage of time that problems arise with everyday activities. The COSI can also provide outcome data regarding activity limitations as the client describes the difficulties that he or she experiences in daily communication. Reduction in residual activity limitations as a result of the hearing aid fitting process is measured by comparing pre- and postfitting results.

**Residual participation restrictions** are related to disadvantages that limit or prevent the person from fulfilling his or her normal roles in life. The HHIE, APHAB, and COSI all tap into participation restrictions related to hearing loss. As such, using a pre/post fitting protocol allows the audiologist to gauge reduction of participation restrictions related to successful hearing aid use.

Another domain that has become increasingly important in outcome measurement is how the use of amplification impacts others. As discussed above, the role of family members and/or SOs in the rehabilitation process is critical to its success. This is not a new concept in that several self-assessment tools have been developed to tap into the family member’s/SO’s perspective, including the McCarthy-Alpiner Scale of Hearing Handicap (M-A Scale; McCarthy & Alpiner, 1983), which was designed to assess the psychological, social, and vocational effects of hearing loss from the perspective of the individual with hearing loss.
compared to a family member. The SAC was also designed with a companion scale, the Significant Other Assessment of Communication (SOAC; Schow & Nerbonde, 1982). Newman and Weinstein (1988) developed a companion scale to the HHIE, called the HHIE–SO, to assess the handicapping effects of hearing loss from the perspective of a family member. Any of these tools can be given to the family member/SO before and after the hearing aid fitting in order to gauge his or her perception of the reduction of hearing handicap resulting from the rehabilitation process.

Schipper, Clinic, and Powell (1990) defined health-related quality of life (HRQoL) as “the functional effect of an illness and its consequent therapy upon the patient.” Quality-of-life outcome measures in audiologic rehabilitation fall into two categories: disease specific and generic. Disease-specific measures focus on one condition (e.g., hearing impairment) and attempt to define its effects on daily functioning and well-being, whereas generic tools are broad in scope and applicability (Chisholm et al., 2007). The HHIE and the Communication Profile for the Hearing Impaired (CPHI; Demorest & Erdman, 1987) are two examples of HRQoL disease-specific measures. The Sickness Impact Profile (SIP; Bergner, Bobbitt, Carter, & Gibson, 1981), the SF-36 (Ware & Sherbourne, 1992), and the Health Utilities Index (HUI; Feeny, Torrance, & Gibson, 1981), the SF-36 (Ware & Sherbourne, 1992), and the Health Utilities Index (HUI; Feeny, Torrance, & Furlong, 1996) are examples of generic HRQoL measurements that have been used in audiology.

A recent large-scale evidence-based practice systematic review of the audiology literature was conducted to examine hearing aid outcomes in the HRQoL domain. Specifically, Chisholm et al. (2007) reviewed the pertinent literature to answer the question, Does use of hearing aids compared to not using hearing aids result in improvements in HRQoL for adults with sensorineural hearing loss? They found that hearing aid use has a robust, medium to large effect on HRQoL when outcomes are measured using disease-specific instruments. However, generic HRQoL measures did not demonstrate HRQoL benefits from hearing aids. The authors concluded that hearing aids improve adults’ HRQoL by reducing the psychological, social, and emotional effects of sensorineural hearing loss. Furthermore, audiology currently has a sufficient number of good disease-specific HRQoL measures but should strive to adapt or develop generic tools that would be appropriate and sensitive to hearing aid users’ HRQoL changes as a result of amplification (Chisholm et al., 2007).

Assessing each of the seven outcome domains discussed above, although important, can be time consuming in a busy audiologic practice. Two measurement tools have been developed that encompass several of these domains into one tool: the Glasgow Hearing Aid Benefit Profile (GHABP; Gatehouse, 1999) and the International Outcome Inventory for Hearing Aids (IOI-HA; Cox, Stephens, & Kramer, 2002). The GHABP encompasses six outcome domains: hearing handicap, hearing disability, hearing aid use time, benefit, residual disability, and satisfaction. The GHABP allows the client to nominate four additional problem situations (like the COSI), provides normative data, can be downloaded for computer administration/scoring, and identifies problems in each domain (Gatehouse, 1999).

The IOI-HA consists of seven questions—one per domain (hearing aid use, benefit, residual activity restriction, satisfaction, residual participation restriction, impact on others, and quality of life). Many audiologists find that using the IOI-HA as a screening tool is a quick and efficient way to determine outcomes in several domains during the postfitting rehabilitation process. If a less than adequate outcome is garnered in any domain on the IOI-HA, a more comprehensive outcome measurement instrument can be used.

Of interest to audiologists and researchers is how outcomes change over time. Vestergaard (2006) looked at the stability of outcomes over time using a variety of outcome measures that were given to new clients immediately after the fitting, 1 week following the fitting, and 13 weeks following the fitting. The goal was to look for any changes that would occur in any domain over time. Results showed that first-time users who wore their hearing aids more than 4 hr a day showed an increase in self-reported outcome over 13 weeks on some scales. Furthermore, data collected immediately after the fitting were much less valid than data that were collected later (Vestergaard, 2006). This is an important point because outcome measures in many practices are performed shortly after the initial fitting. Clearly, more study is needed to determine the stability of these measures as well as the optimal time frame for administering outcome measures.

Outcome measures are an important part of the rehabilitation process, especially in today’s climate of consumer-driven health care. It is more important now than at any other time to measure whether or not rehabilitation has made a difference. Choice of which outcome measure to use should be made with face validity in mind. Some tools are more appropriate for a particular client population than others. Furthermore, inclusion of a family member or SO is becoming an increasingly valuable practice. Finally, outcome data should drive the rehabilitation process for the individual. Less than a positive outcome, in any domain, should provide direction for the audiologist to adapt the individual’s treatment plan and thereby increase his or her chances for improved communication.

**FUTURE DIRECTIONS**

The contemporary practice of adult audiologic rehabilitation is evolving into a client-centered, rather than a device-centered, process with a focus on improved communication. This focus must continue if audiologists are going to meet the hearing health care needs and expectations of our clients in the 21st century. Adults with hearing loss are more knowledgeable, savvy, and demanding than in the past and have high expectations for hearing health care services. As such, hearing aid follow-up can no longer depend on the “call me if you have problems” approach. Audiologic rehabilitation, with hearing aids as the nucleus, must be evidence based, efficient, and an integral part of the hearing aid fitting process.

At least three major challenges face audiology as a rehabilitative profession in the early 21st century. First, our
rehabilitative strategies and protocols, both those existing and those developed in the future, must provide evidence of efficacy and effectiveness. Both third-party payers and the public will demand that our treatment makes a difference, both short term and long term. Second, the public must buy into the value of the rehabilitative process surrounding the hearing aid fitting. Myths surrounding the “magic” of digital hearing aids, accompanied by clients’ unrealistic expectations, must be replaced by an understanding of the necessity of rehabilitation in combination with amplification. There are no quick fixes with adult hearing loss; clients must understand that the goal is improved communication, not just improved audibility provided by amplification.

The third challenge may be the most daunting of all: Audiologists must face the dilemma posed by reimbursement for audiologic rehabilitation. The present model relies on bundling of costs for devices and the rehabilitative services surrounding the hearing aid fitting. As such, treatment becomes part of a “package deal.” Often, the cost of these services in the price of the hearing aid is not transparent to the hearing aid user. Consumers often see hearing aids as high priced, and they have little understanding of the cost of treatment services included in that price. So, would clients or third-party payers actually pay for these services if they were unbundled? At present, it is doubtful. Yet, if audiologic rehabilitation is not considered a reimbursable service that clients value and demand, there will be little incentive to expand our rehabilitative repertoire. If hearing loss rehabilitation is not considered a priority, it will continue to be considered an “add-on.”

Ross (2007) cautioned that until the significance and impact of adult hearing loss on individuals and society is understood and accepted, audiologic rehabilitation will remain a stepchild of the audiology profession. The long-range outlook for our profession is not bright if clients do not equate hearing aids with audiologic rehabilitation and recognize our role in providing this treatment. Our next goal as a profession, therefore, must be to educate the public and policymakers not only about the many consequences of adult hearing loss, but also the value of audiologic rehabilitation.

REFERENCES


