Adult Aural Rehabilitation: What Is It and Does It Work?

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Adult aural rehabilitation is here defined holistically as the reduction of hearing-loss-induced deficits of function, activity, participation, and quality of life through a combination of sensory management, instruction, perceptual training, and counseling. There is a tendency for audiologists to focus on sensory management, aural rehabilitation being seen as something done by someone else after the provision of hearing aids or cochlear implants. Effective sensory management may, by itself, lead to improved activity, participation, and quality of life, but there is no guarantee that these outcomes will be automatic or optimal. In fact, there is often a disconnect between clinical measures of assisted auditory function and self-assessed benefit. Costs associated with a holistic approach can be minimized by bundling as many as possible into the cost of hearing devices, by taking advantage of computer-based perceptual training, and by capitalizing on the benefits of group counseling.

**Keywords:** hearing loss; aural rehabilitation; audiological rehabilitation

Hearing loss acquired in adult life can have a serious impact on quality of life. This impact results primarily from deficits in the activities of speech perception and communication and the limitations imposed by these deficits on participation in social interactions, in employment, in leisure pursuits, and in the enjoyment of sound. The goal of rehabilitation is to restore quality of life by eliminating, reducing, or circumventing these deficits and limitations.

This goal can be addressed through a combination of:

- sensory management to optimize auditory function,
- instruction in the use of technology and control of the listening environment,
- perceptual training to improve speech perception and communication, and
- counseling to enhance participation, and deal both emotionally and practically with residual limitations.

This concept of adult aural rehabilitation is summed up in the following definition: the reduction of hearing-loss-induced deficits of function, activity, participation, and quality of life through sensory management, instruction, perceptual training, and counseling.

This definition uses the terminology developed by the World Health Organization (WHO) in its generic attempts to conceptualize, classify, and describe the impact of disease. An earlier classification system used the terms impairment (what is missing or not working properly), disability (the things that could not be done because of the impairment), and handicap (the negative impact of the disability on quality of life). The emphasis was on the individual's losses. The current language is more positive. We speak of function, activity, and participation: the emphasis is on the individual's assets.

**Life With Hearing**

In applying the WHO taxonomy to hearing and hearing loss, it helps to add 1 more level at the beginning and to separate the objective concept of participation from the subjective concept of self-perceived quality of life, giving 5 categories in all.

1. **Anatomy and physiology:** Physical and functional integrity, including the integrity of the outer ear, the middle ear, the cochlea, neural pathways to
the brain, and the brain itself. Our major concern is with the status of the cochlea. With older subjects, however, the integrity of neural structures becomes increasingly significant.

2. Function: Basic perceptual capacity as measured in the clinic or research lab. This includes threshold, dynamic range, frequency range, spectral and temporal resolution, acoustic pattern discrimination, direction and distance perception, attention, auditory working memory, processing speed, and noise resistance.

3. Activity: The use of this capacity—the things one wants or needs to do with hearing in the real world. Examples include being alerted by sound, monitoring the environment, recognizing and localizing events and deducing their significance, monitoring and controlling one’s own speech, and enjoying auditory experiences. The activities of most concern, however, are perceiving the speech of others and engaging in spoken language communication.

4. Participation: The contribution of these activities to daily life, including social interactions and relationships, employment, leisure, learning, control, and creativity.

5. Quality of life: Reflects self-assessment of the current life experience and includes such things as enjoyment, meaning, purpose, usefulness, value, freedom of choice, and independence. Quality of life is a moving target. It is influenced by function, activity, and participation, but is by no means completely determined by them.

Targeting Hearing Loss

When considering hearing loss, our main anatomic and physiologic concern is cochlear damage, including disruption of structures, malfunction or loss of hair cells, or both. Such deficits may, however, be compounded by postsynaptic atrophy and other effects of auditory deprivation. They may also be compounded by the cognitive and processing difficulties that can accompany aging.

Cochlear damage has direct and immediate effects on most aspects of auditory function, including sensitivity, resolution, discrimination ability, and noise resistance. The deficits of function produce deficits of activity, especially speech perception and communication by spoken language. These last deficits are seriously exacerbated by noise. Reduced activity impacts participation, and deficits of participation are reflected in quality of life.

The goal of aural rehabilitation, as defined here, is to reduce or eliminate these various deficits and, as far as possible, restore the individual to his or her preloss state. One of the long-term goals of auditory research is to restore cochlear function in humans through the regeneration of functional hair cells along with their neural connections. At the time of writing, regeneration of hair cells in mammals, once thought to be impossible, has been achieved, but functionality and neural connectivity are still in question; it will be many years before we see this work extended to humans. In other words, we are currently unable to restore cochlear integrity; however, the other 4 areas of deficit can be targets for intervention.

Targeting Function

We address deficits of function through sensory management. The basic tools are hearing aids and cochlear implants, with the possible addition of accessories such as FM microphones or assistive devices such as amplified telephones. The immediate goals are to provide audibility of the sounds of speech while preserving comfort and perceived sound quality and to do so over as wide a range as possible of talker spectrum, talker distance, talker effort, and interfering noise and reverberation.

Improvement of auditory function should have a positive impact on the activity of speech perception. We cannot assume, however, that carryover to participation and quality of life will be either automatic or optimal, nor can we assume that there will be a return to the preloss state. The immediate outcomes of sensory management vary dramatically from individual to individual. Differences between expectation and reality can result in a combination of selective nonuse (wearing the device only in particular situations), complete nonuse, or continued avoidance of situations in which the device might offer benefit and learning opportunities. This last point is critical. Many adults with acquired hearing loss are looking not for a significant improvement of function but for full restoration—a “cure.” It is our inability to meet this expectation that creates the need for a holistic approach to adult aural rehabilitation that goes beyond sensory management.

Instruction is a key component of such an approach. The immediate goal is for the adult with the hearing impairment to become a knowledgeable and effective user of the hearing device and a knowledgeable and effective controller of the
communication context. All users of these devices need to understand the nature of their hearing loss, the potential benefits of hearing aids, cochlear implants, and other hearing-assistance devices, as well as the limitations of this technology. They need to learn how to maintain and operate their devices effectively and to deal with the associated inconveniences. And they need to acquire insights into the factors that enhance or limit communication together with techniques either to avoid communication failure or to repair it. It is generally accepted, therefore, that sensory management must be supplemented by instruction.

There is, of course, a difference between “instruction” and “telling.” Instruction has not occurred until the client has learned. To facilitate learning, the audiologist may need to provide not only verbal and written materials but also demonstration and coaching, and often, more than once. Note, also, that to refer to this aspect of management simply as “counseling” is potentially misleading, although “informational counseling” might be an appropriate term.

Targeting Activity

Deficits of auditory perception may be addressed through perceptual training. The immediate goals are to enhance auditory or auditory-visual perceptual skills, or both, especially the skills involved in spoken language perception. The term “auditory training” is often used in reference to this component. All hearing aid or implant users need to learn to deal with auditory sensations that are both impoverished and different from those experienced before the hearing loss. Such learning can occur spontaneously in the context of everyday communication. There are, however, individual differences in such things as the amount of learning needed, the opportunities for learning and the confidence to engage in them, adaptability, perceptual speed, use of context, and tolerance for error and embarrassment.

Formal perceptual training in an unthreatening environment with high levels of success and feedback on performance increases “time-on-task.” If this increases confidence and helps the client modify perceptual strategies, the expected outcomes are faster learning and higher ultimate performance. Any improvements in perceptual and communicative skill are expected to translate into increased participation and improved quality of life. Once again, however, it is a mistake to assume that the generalization will be either automatic or optimal.

Targeting Participation and Quality of Life

The principal mechanism for addressing deficits of participation and quality of life is counseling. For the present purposes, I am not including under this heading the explicit knowledge that was covered under instruction. Instead, I am referring to situations in which persons with hearing loss can discuss and come to terms with its impact on their everyday lives, discuss their feelings about this impact, and explore ways to address the practical, social, and emotional consequences. The goal, in a sense, is to enhance participation and quality of life despite residual deficits of function and activity. Issues for discussion might include relationships, employment, anger, shame, risk tolerance, and perceived locus of control. Some aspects of counseling can be informal and can occur during sensory management, instruction, and perceptual training. Other aspects may require intervention by personnel with appropriate expertise.

Training programs must provide budding audiologists with knowledge and skills in this area, including:

- an understanding of, and sensitivity to, the psychosocial issues surrounding acquired hearing loss;
- appropriate interactive styles;
- the ability to recognize when there is a need for services beyond their expertise and/or scope of practice;
- the realization that they do not treat hearing loss in people—they serve people with hearing loss (Figure 1).

Components of Aural Rehabilitation

The foregoing analysis classifies the process of aural rehabilitation into 4 components:

1. Sensory management—to target and enhance auditory function;
2. Instruction—to increase the probability of positive outcome from sensory management;
3. Perceptual training—to target activity, by supplementing the learning opportunities provided by everyday communication;
4. Counseling—to target issues of participation and quality of life that result from residual deficits of function and activity.

Note that the definition offered at the beginning of this article includes both the goals of adult aural
rehabilitation and the processes just discussed. It is not enough to define it in terms of only one of these.

**Does It Work?**

We now turn to the second question in the title of this article: Does it work? In other words, how well do the processes of sensory management, instruction, perceptual training, and counseling meet the goals of restoring function, activity, participation, and quality of life in adults with acquired hearing loss?

Now we are in difficult terrain. Each major component of intervention can involve many subcomponents practiced with varying degrees of emphasis and expertise. In a similar fashion, each goal can have several subgoals. And outcome at each level is influenced by numerous factors that may be beyond the control of the rehabilitative personnel. These factors include such things as the hearing-impaired person’s

- motivation,
- readiness,
- expectations,
- sense of entitlement,
- personality,
- adaptability,
- perceived locus of control,
- lifestyle,
- function in other areas such as cognition, tactile perception, and visual perception

- auditory ecology,
- resources, and
- support from significant others.

Clearly, the importance of these factors increases as we move from function, through activity, to participation and quality of life. A hearing aid may improve auditory function, but it will not convert an introvert into an extrovert or a grouch into an angel.

So the only sensible answer to the question “Does it work?” is “It depends.” It depends on what aspect of aural rehabilitation is being discussed, how well it is being implemented, the goals being pursued, the characteristics of the person being served, and the suitability of the outcome measure in relation to the goals.

**Outcome Measures**

This last point cannot be overstressed. When assessing the effectiveness of a particular aspect of intervention, the choice of outcome measures must reflect the goals of that intervention. When evaluating the benefits of instruction for new hearing aid recipients, for example, nonreturn may be a suitable outcome measure if the goal is to increase sales. It is only a necessary but insufficient condition if the goal is hearing aid use. And if the goal is to enhance quality of life, then nonreturn may tell us nothing.
When providing perceptual training, performance on formal speech perception tests may be a suitable outcome measure if the goal is to improve speech perception in the clinic or laboratory. But if the goal is to enhance communication in everyday life, then improved speech perception scores in the clinic or research lab may only be an encouraging indicator.

**Got Evidence?**

For the moment, let us use the general goals suggested in this presentation and the 4 components of intervention. What is the evidence for the conclusion that these components meet their goals?

### Effectiveness of Sensory Management

There is ample evidence to support the conclusion that, on average, sensory management enhances auditory function. In other words, hearing aids and cochlear implants give the typical adult user improved access to information carried by the sounds of speech. Moreover, the improved function enhances the ability to perceive the speech of others and to communicate by spoken language. Most of the research studies on which these conclusions are based were actually designed to compare hearing aid processing or prescription strategies.\(^\text{15-17}\) The overall benefit in terms of function and activity, regardless of strategy, is clear.\(^\text{18}\) There is also evidence to support carryover to participation and quality of life.\(^\text{19}\)

The conclusion that the provision of hearing aids or cochlear implants leads to enhanced participation and quality of life, however, is often assumed rather than confirmed. Indeed, a common finding in the case of hearing aids is of a relatively low correlation between improved function, as measured in the clinic or research lab, and self-perceived benefit and satisfaction.\(^\text{20-23}\) Some of the variance in outcome not explained by objective measures of function has been shown to be attributable to cognitive ability and the characteristics of the user’s auditory environment.\(^\text{14}\)

It is important to note that hearing aids and cochlear implants do not restore normal function. Users may be given relatively full audibility of the sounds of conversational speech, but deficits of spectral and temporal resolution remain and their severity varies from individual to individual. The consequences of these deficits are present in quiet but are particularly serious when listening to speech in noise. In the case of hearing aid users, deficits of aided function are partially correlated with unaided threshold.\(^\text{24}\)

Presumably, this relationship exists because both threshold and spectral-temporal resolution are determined by the underlying cochlear pathology. In the case of cochlear implants, the correlation between assisted function and preimplant threshold is weak or nonexistent. In this case, the critical factor can be assumed to be the effective number of discrete channels of stimulation. This number depends on the distribution of electrodes and their proximity to independently stimulable neural tissue, neither of which depend on the original cochlear pathology. Whatever the mechanisms, unresolved deficits of speech perception, especially in noise, will obviously limit carryover to perceived benefit, satisfaction, participation, and quality of life, especially if the user’s expectations greatly exceed reality.

Three techniques currently exist to address the negative effects of noise on speech perception: digital noise-reduction, directional microphones, and remote wireless microphones. These 3 options are listed in ascending order of functional effectiveness but descending order of convenience and acceptability.\(^\text{25-29}\) All have the potential to enhance function and activity when used as part of an effective program of sensory management.

### Effectiveness of Instruction

There is evidence to support the conclusion that formal instruction in hearing aid and accessory management leads to increased usage and, therefore, enhanced function and activity when summed over time.\(^\text{7,30-34}\)

### Effectiveness of Perceptual Training

Perceptual training does not target function. Rather, its goal is better use of that function through enhancement of perceptual skill. There is certainly evidence of improvement on formal speech perception tests.\(^\text{35,36}\) It is not always clear, however, how much of this improvement reflects skills that are generalizable to every day communication.\(^\text{37}\) And carryover to participation and quality of life are usually assumed rather than measured. As with language instruction, the full benefits of perceptual training will not be observed until the learner spends time using and refining newly acquired skills in a meaningful, real-world context.
Effectiveness of Counseling
Counseling, as defined here, specifically addresses participation and quality of life. There is evidence of its effectiveness, but obviously, the outcomes will be highly dependent on the characteristics of the person with the hearing loss, rapport with the counselor, rapport with other participants (if group or couple counseling), and the content of the program.

A Holistic Approach
The comments in the previous sections are summarized in Figure 2, where a check mark indicates evidence of effectiveness. This analysis supports the argument that optimal attainment of the goals of adult aural rehabilitation, as defined here, is best pursued by a holistic approach that includes the 4 components of sensory management, instruction, perceptual training, and counseling. Clearly, however, the relative importance of and the needed emphasis on the 4 components will vary from adult to adult.

The holistic approach is not a novel concept. Tye-Murray, for example defines the goals of adult aural rehabilitation as “…to alleviate the difficulties related to hearing loss and minimize its consequences.” She further describes the processes as including “…diagnosis and quantification of the hearing loss and the provision of appropriate listening devices [plus] communication-strategies training, counseling related to hearing loss, vocational counseling, noise protection, counseling and instruction for family members … [and] less commonly, speech perception training, such as speechreading training.” And the term was used if not coined by Lesner and Krikos in their 1995 text.

Evidence-Based Practice
The word “evidence” appeared several times in the foregoing analysis, which brings us to the concept of evidence-based practice. Evidence-based practice has been defined as the “conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research.”

During the past 2 decades, the medical community has developed techniques to promote and formalize evidence-based practice. At the time of writing, these techniques are being applied in audiology. Note that the definition just borrowed does not deny
the importance of clinical experience and expertise, but the idea is to go beyond personal beliefs and experience to validate or perhaps modify practice on the basis of data from high quality clinical research. “The proof of the pudding is in the eating.”

An important aspect of developing best practice is not just to consult the research but also to evaluate the quality of the evidence it provides. Several writers have proposed a hierarchy of levels of evidence.

At the top are meta-analyses and systematic reviews of the literature prepared according to strict guidelines for inclusion and weighting. Next come individual experiments designed with random assignment of patients to conditions and the inclusion of control treatments and conditions, together with “blinding” of participants and experimenters. In the field of audiology, randomization and blinding are not always possible, but we should expect control.

Although weaker, evidence from prospective single-subject studies can be useful, especially if they include control or no-treatment conditions and are replicated with a small sample. Less valuable are retrospective case studies because of the absence of both randomization and control.

The lowest level of evidence is expert opinion. This does not mean that expert opinion is necessarily of little value. Indeed, the opinion of the expert in question may be based on a systematic review of the literature. But “we have always done it this way” and “we have never done it this way” are not acceptable as evidence.

As audiologists seek high-quality evidence to validate or improve practice, it quickly becomes clear that such evidence is in short supply. There is a pressing need for increased research effort—and for the training of clinical researchers to carry it out.

Efficiency

I have said nothing so far about the cost of a holistic approach to adult aural rehabilitation. Individuals and third-party payers are often willing to pay for hearing aids and cochlear implants. After all, money is being exchanged for a tangible device. But enhanced activity, participation, and quality of life are intangibles; moreover, individualized instruction, training, and counseling can be expensive. For this reason there is interest, not just in demonstration of effectiveness but also in efficiency, or cost/benefit ratio.

In fact, there are ways to minimize the cost of the approach to management being advocated here. Basic instruction, for example, can be built into the cost of a device, as is already done by some providers. Self-administered computer-assisted, or significant-other-assisted techniques may enhance perceptual learning at low cost. Many of the goals of counseling can be accomplished in groups. And audiologists can develop the sensitivity and skills required to address participation and quality-of-life issues and, perhaps, reduce the need for therapeutic counseling. Although holistic adult aural rehabilitation may be more costly than simple hearing aid dispensing, the differences in cost do not have to be enormous and may be justified on the basis of improved outcomes.

Summary

Hearing loss acquired in adult life can have serious and far-reaching consequences for the individual concerned. There are deficits of auditory function (the things one can do in the clinic, or research lab, if asked), activity (the things one needs or wants to do in every day life—especially communicate via spoken language), participation (in social, vocational, and avocational activities), and quality of life (self-perceived). It is argued here that the ultimate goal of adult aural rehabilitation is to eliminate hearing-loss-induced deficits of activity, participation, and quality of life. Sensory management in the form of hearing aids, cochlear implants, and hearing assistance technology can go a long way toward meeting that goal by enhancing auditory function.

Such evidence as is available, however, suggests that the goal is best met by a combination of sensory management, instruction, perceptual training, and counseling. Improvements of outcome will be accompanied by increased costs. There are, however, opportunities for minimizing these costs by including some of them in the purchase price of hearing devices, by making use of computer-based self-instruction, and by taking advantage of group counseling. The need for high quality research to justify and optimize a holistic approach to adult aural rehabilitation is self-evident.

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References


