HEARING LOSSES AND HEARING AIDS

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The Prosthetic and Sensory Aids Service is concerned with research on hearing aids as well as with improvement of artificial limbs, braces, aids to the blind, and numerous other aids for the disabled. As in other areas, the Prosthetic and Sensory Aids Service cooperates in such research with a variety of VA Services, other government agencies, and private industry.

In previous issues of the Bulletin of Prosthetics Research there have been brief mentions of three prosthetics research projects related to hearing aids: one at the Veterans Administration Hospital in Washington, D.C., another at Northwestern University, and a third at Houston Speech and Hearing Center. In this issue, for the first time, we have major articles from these projects as well as from the National Bureau of Standards on activities related to furnishing of hearing aids for VA beneficiaries.

Because of the specialized nature of this field, some introduction seems appropriate.

Specialists in the field of rehabilitation of the hard of hearing and the deafened are well aware of the problems facing the person with hearing deprivation in his daily activities. Families and friends have varying degrees of insight into the problems confronting such people. Our thoughts here and in the introductory article which follows are directed to those many practitioners of other aspects of rehabilitation who are not directly concerned with problems of hearing loss. They, too, should have some understanding of communications problems which may affect the clinical situation with which they are concerned.

Indeed such clinical relationships may be greatly affected by the inability of the individual with a hearing loss to understand instructions, thus impairing his relationships with a clinic team as a whole or with individual members. The typical clinic team environment, with many participants in a large, echoing, perhaps noisy room, may present problems. There is considerable, though often unrecognized,

strain on a person who has even a mild loss in paying attention to animated discussion with a group, particularly in such a noisy environment. If a hard-of-hearing person misunderstands a single word, he may provide a response which to him is logical yet to others seems ludicrous. Worse yet, if the response seems relevant to the questioner but actually is erroneous, in extreme cases the course of treatment may be distorted.

The very nature of his hearing loss may affect the performance of an individual with multiple disabilities. For example, an amputee who also has a hearing loss may fail to notice high-pitched squeaks or clicks or may lose the sensory feedback possible from faint low-pitched thuds. Clinicians concerned with amputee rehabilitation need to be aware of these complications.

Many factors affect auditory communication. It may not always be clear to the nonspecialist that the nature of an individual's hearing loss, the nature of his hearing aid, and the environmental situation affect his degree of understanding and perhaps involve psychological stresses. "Uncle John can hear if he wants to" is a common remark because an individual with a hearing loss generally can understand *certain* words and speech frequencies or can comprehend complete messages under the right conditions. The layman, however, very likely may not understand the difficulties and confusion which often occur under superficially similar—but actually much more stressful—conditions of message, of choices of synonyms with different frequency-time patterns, and particularly of competing conversations or other noises. Not all normal individuals realize the difficulties which they encounter in comprehending conversations over the telephone with its limited frequency band and considerable distortion, particularly with noise in the background at the other end of the connection.

Individuals with normal hearing and even many hard-of-hearing patients may also overlook some of the psychological stresses to which a previously normal person is subjected if his hearing is failing. These stresses occur particularly with the gradual decrease of sensitivity to high frequency and thus decrease of comprehension and increasing risk of embarrassing misunderstanding typically occurring with advancing age. Because hearing loss, unlike some of the disabilities assisted by our Service, *seems* to be invisible, many such patients tend to believe that the loss can be concealed from other persons, so they postpone acknowledging it and taking active steps toward rehabilitation. (Another discussion might be devoted to contrasting "major" and "minor" losses—amputation, quadriplegia, total blindness, or profound deafness versus partial toe or finger amputation, partial or scattered paralysis, partial vision, or mild hearing loss. The psychological impact of minor

loss often is disproportionately greater than any reasonably "objective" measure of loss.)

Largely because of the concentration of effort on disguising a hearing loss, the hearing-aid industry in its advertising and sales efforts has generally tended to stress miniaturization of hearing aids and has encouraged attempts to hide them. Rapid developments in electronics indeed have permitted successive miniaturization: from the desk-top box of the early 1920's to wearable hearing aids with small "peanut" vacuum tubes and separate battery packs of the World War II era, then to use of printed circuits in the single-unit shirt-pocket aids of the early 50's, later to the rapid introduction of transistors after 1953, leading to eyeglass and over-the-ear aids, and currently to great interest in integrated circuits and further miniaturization. Numerous aids now emphasize "all in the ear," though risk of acoustic feedback from the receiver past a tolerable ear insert to the microphone currently limits such aids to low amplification for mild losses. Many experts believe that excessive emphasis upon miniaturization has led to sacrifice of quality and in some cases has discouraged rational "adjustment" (perhaps inevitably involving some degree of resignation to fate at a given state of the art) by patients.

To supplement and guide the physical testing program which has been conducted with the aid of the National Bureau of Standards, research is being conducted on the correlations between the many physical properties of aids and the relative performance of these aids under clinical conditions. The three research laboratories involved traditionally have had relatively complementary roles. The VA Hospital in Washington, D.C., alone or in conjunction with the National Bureau of Standards, primarily has tested the significance of physical properties, one by one. Houston Speech and Hearing Center has tended to work with actual hearing aids which differed radically in some major property, even though they probably also differed to a lesser extent in a variety of other physical properties because of the complex interaction of the many factors entering into hearing aid design. The Northwestern University Audiology Program has concentrated particularly on the role of binaural hearing aids in relation to monaural, hoping to specify more clearly those circumstances under which binaural aids might be valuable to specific individuals.

With gradually changing emphases, these three projects plus the group at National Bureau of Standards over some years have built up a considerable body of information about hearing aids and hearing-aid selections to meet needs of individual patients. Numerous individual papers have been published in professional journals, such as those of the American Speech and Hearing Association: *Journal of*

Speech and Hearing Disorders, Journal of Speech and Hearing Research, ASHA, and *ASHA Monographs* (formerly *Journal of Speech and Hearing Disorders. Monograph Supplements*). This issue of the Bulletin attempts to summarize some of the information from each project which is likely to be of most interest to our widespread readership, primarily from other fields than audiology. To assist these other readers some introductory remarks by a layman in hearing-aid studies may be in order.