

Early Amplification and Language Learning — or Sounds Should Be Heard and Not Seen

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Introduction

The hearing handicapped child born in 1971 and surviving one year, with modern medical care, can expect to live until approximately the year 2050. The question we must ask ourselves is: "Are we equipping the child with limited hearing to participate in and be an effective member of an increasingly complex urban world? Are we preparing him to be a part of a knowledge-centered society, with a growing emphasis on communication as a necessary component in adapting to technological and social change?" In my opinion, the answer is, at best, only a qualified "yes." In most instances it is an unqualified "no." The basis of my evaluation lies only partially in our lack of knowledge of how to attack the problem. The difficulty appears to be more related to our failure to systematically apply the knowledge and technology we have already developed, and, further, to establish our priorities in a way which will permit this application. Based upon my observations and experience, gained from 18 years of professional activity at the Bill Wilkerson Hearing and Speech Center, it is my belief and firm conviction that the history of the future of the child with limited hearing and the degree to which it is expanded and participatory or locked in and isolated, is determined prior to the time he reaches six years of age.

By age six the child with normal hearing has passed the critical periods for auditory learning and language learning. His acquisition of language and speech occurs so naturally, in most instances, that we take this marvelous process for granted, failing to recognize that critical nature of the first three years of life. It is this time frame, of 0-3, that the auditory organization and intersensory patterning which undergird oral language are developed. It is within this period that the whole process of learning to listen occurs. Friedlander (1970, p. 19) suggests a crucial relationship between this early period of receptive organization and ultimate expressive capacity in the following statement: "If language competence is indeed an integrated totality, listening and speech may be functionally inseparable in terms of central processes, and distinctive only in the peripheral components of acoustical signal reception and speech mechanics . . ." In this statement is housed a critical challenge for those of us concerned with habilitative audiology, and in fact for all audiologists.

The thesis of my presentation this morning is double edged—the edges are first that maximizing of language learning for the child with limited hearing is contingent upon very early identification and relevant treatment, and second, that the optimizing language learning is dependent upon auditory processing. I shall attempt to support this thesis by sharing with you some of the findings

which have emerged from our efforts at the Wilkerson Center to provide services following this philosophy for children with limited hearing in the 0-3 age span.

PROGRAM PREMISES

The over-riding premise of the program is that the most important goal toward which all other activities must be focused is the child's acquisition of language. In striving toward this goal, the following premises are held:

1. Identification, assessment and treatment must be implemented as early as possible, preferably under 12 months of age, and assessment and treatment must continue concurrently and intensively.
2. The majority of severely hearing-impaired children here-to-fore considered as "deaf" have significant degrees of residual hearing — hearing that if captured and utilized early and fully will serve to facilitate significantly their aural and oral language learning.
3. In addition to those children with severe hearing handicaps, those with moderate and even mild losses are to be considered "at risk" and thus should be treated early and intensively.
4. Amplification through binaural hearing aids should be provided as soon as possible.
5. The audiologist should play a continuing, intensive and interactive role — not to be separated from the educative aspects of the program.
6. Programs for children in the 0-6 age span should give primary emphasis to aural-oral language learning and should be based on normal developmental processes and sequences.
7. The principal teaching targets for children in the 0-3 range should be the parents. This is critical. The teaching provided for the parents should maximize and optimize their linguistic input and all of the auditory input to the child during this time frame.
8. Infant and early childhood programs should be interfaced with broad and comprehensive programs offering multiple educational options and utilizing the systematic coordination of audiological, educational, health, and other services drawn from both the public and private sectors.

"DEAF" CHILDREN HAVE SIGNIFICANT AUDITORY RESIDUAL

Our program for children in the 0-3 age range was initiated in 1967 through a demonstration grant from the Bureau of the Education of the Handicapped. In the Spring of 1970 when federal funding was terminated, we had seen 94 children and their families. Of these 94, there were only three children in whom we could not measure an auditory residual which we felt to be functional.

It is this kind of a finding which convinces us that *every* child with reduced hearing should be given a chance to benefit from acoustic input—that no child should be denied the opportunity of at least trial hearing aid use. One must be even further committed to this position when the results of first hearing tests are compared with later tests. An analysis of the first and last thresholds, aided and unaided, in dB for pure tones and complex stimuli on all of the active participants in the early infant project revealed that there were statistically

significant changes in the direction of better responsibility for all of the aided comparisons (250 Hz through 4000 Hz) and for live voice, recorded environmental sounds, and complex noise. A comparison of the first and last unaided thresholds revealed only one statistically significant shift—that one being at 1000 Hz.

These findings highlight the importance of acoustic input at an early age. Differences exceeded the .001 level. This finding confirmed our hypotheses that the first trials with hearing aids cannot be expected to yield a maximal result with the very young hearing impaired child. Rather, as he learns to use his aids, as he becomes accustomed to them—he tunes in, learning to separate foreground from background, to selectively attend, and to generally adopt a listening attitude.

A recent study (Callihan, 1971) comparing the binaural and monaural discrimination ability in quiet and in noise of a group of preschool hearing impaired also is supportive of the premise that binaural aids are to be desired. She found all binaural vs. monaural comparisons to be statically significant in favor of the binaural listening. In addition, subjective appraisals by both parents and children revealed a strong preference for binaural amplification.

AUDIOLOGIC MANAGEMENT

The continuing and intensive role of the audiologist is considered to be critical in the management of the infant and very young child with limited hearing. This premise is basic if the priority goal with each child is the fullest development of the use of his residual audition. Only through a selective and systematic process of associating sound and meaning can a child learn to make optimum use of his hearing residuum however minimal. It is therefore considered important that audiologic management play a vital role in close coordination with the teaching, to make possible an orderly and on-going audiologic schedule which will insure that the children receive optimum benefit from wearable amplification. An analysis of the number of audiologic visits per child for 78 children under three years in our project underlines the contention and points up the need for flexibility in the management of hearing aids to an extent not usually feasible for adults and older children with established language patterns. The audiologist, therefore, must orient himself to a different kind of role if he intends to meet the needs of the infant. The children in this project wore various loaner hearing aids for an average period of 4.8 months before their own permanent aids were obtained. While wearing the loaner aids, the children were undergoing audiologic tests routinely and frequently. The parents were guided in making observations of the child's responses to sound while wearing the aids at home.

BINAURAL HEARING AID USE

The literature has not provided us with definitive information on the objective measurement of improvement with binaural hearing aids as compared to monaural aids. In spite of this void, our philosophy is that binaural fittings wherever possible will be used.

The analysis of results derived from 11 preschool children having worn binaural aids for an average of 22 months are interesting in this regard. These 11 children have undergone at least ten audiologic testing sessions using speech

as one of the test stimuli employed. The results of the first five and the last five test sessions were compared. Mean unaided thresholds progressed from 65.6 dB to 67.5 dB (a non-significant difference using the Sign Test).

However mean *aided* thresholds differed significantly between the first five and the last five tests—from a mean speech awareness level of 35 dB on the first five tests to 24.5 dB on the last five tests. The 78 children required a total of 652 test sessions directed at obtaining unaided responses which yielded an average of 8.3 sessions per child. The total for aided test sessions was 1152 with an average per child of 14.9. We are convinced that thoroughness in the audiologic management is mandatory in a program for very young hearing impaired children.

The typical separation of the audiologist from the educative aspect of programs has led naturally to a dichotomy of chasm-like proportions in the perception of his role by both the educator and the audiologist. This spatial separatism has resulted in psycho-professional separation. The all-too-frequent result is that the educator feels that she knows, or needs to know, little or nothing about the child's individual amplification system. The audiologist divorces himself from being available to service intensively the needs of the very young hearing impaired child, his parents, and his educators—thus divorcing himself from the responsibility of their advocacy.

LANGUAGE GAINS

The goal toward which all efforts—audiological, educative, parent training, and health—must be directed is the establishment in the child of language—that function which lies at the heart of intellectual development.

Several means were employed to plot the rate of language and speech acquisition of the children participating in the early intervention project, but one which allowed us a rather convenient and continuous vehicle was the Communicative Evaluation Chart (Anderson, Miles and Matheny, 1963). This assessment allows the comparison of language performance with other areas of performance. This measure was used with a group of children who had participated in the project for an average of 27.8 months. In Language Quotient this group advanced from 33.6 to 52.1 while the Performance Quotient remained stable. They showed a marked acceleration in Language Age gain (21 months gain in 28 months time) from the pre-instruction period to the post-instruction period as contrasted to the Performance Age growth which remained virtually linear.

SOUNDS SHOULD BE HEARD-NOT SEEN

The title of this paper suggests that the priority channel for input of language in the early years should be the auditory channel, not the visual channel. I shall attempt to support this contention in a summary fashion both pragmatically and theoretically, in anticipation of Mrs. Amon's paper to follow:

1. The human infant is a moving, exploring organism whose developmental characteristics are contradictory to reliance on the visual channel as the major source of linguistic input. If vision is attributed the input priority then we shall automatically reduce in significant degree the amount of aural language input to which the child has access. By contrast auditory input is *not* subject to spatial limitations. The child has the capacity to

continually process his auditory environment irrespective of his spatial orientation to source of sound-linguistic or otherwise.

2. There is an output-input correlation between listening and generation of sounds—the capacity for listening is accompanied by the capacity to create sounds. “From the very beginning, babies are able to make noise with their vocal apparatus, and the ability to make many different classes of sounds with their mouths increases rapidly . . . This capability to generate stimuli in the same modality as reception has no counterpart in visual experience.” (Friedlander, p. 29) The capacity to self-stimulate by voice is a distinctive class of input-output correlation. The self-stimulating capacity of the child to generate prelinguistic and linguistic sounds bears significance to the baby’s increasing awareness of the regularities of linguistic organization. This capacity for self-stimulation is significant in the child’s capacity to monitor his own output of speech sounds, particularly as it relates to the auditory-proprioceptive correlates of speech of sound production.
3. The factor of recurrence or redundancy is held as a critical variable in perceptual organization (Gibson, 1960). If this premise is valid in considering perceptual learning—that is redundancy and recurrence are thought to be important variables in language learning, and it is hard to believe that they are not—then the degree to which sounds and sights are differentially available for repetition must be a crucial variable in the child’s language learning.
4. The meaning of language is transmitted by both linguistic and para-linguistic features. In the early stages of language organization it is those features that are para-linguistic or prosodic—intonation and stress—that bear the burden of transmitting meaning. The capacity of a system of signs or manual symbols to transmit these features is non-existent. To subtract these features from the information transmitted to the infant, preschooler, or older child is the subtraction of a significant component of meaning.

I do not mean to imply that I think all children have the capacity to learn primarily through an auditory modality, because, obviously, there are children who simply do not have sufficient sensory capacity. My contention is, rather, that we have insufficient evidence to warrant making a critical decision that will deny acoustic-linguistic information to the child under five years of age. A decision to follow another educational route must be made, in my opinion, after the critical auditory and aural language learning period has passed.

Yesterday we talked at great length about the importance of hearing aid selection in our functions as audiologists. I suggest that an equally important function, central to the role of the audiologist, involves the development of auditory training programs. We are responsible for seeing not only that auditory linguistic information is maximally and optimally available to individuals with hearing impairment, including young deaf children, but also that the skills necessary to process this information are fully developed. I contend that we as a profession have neglected this aspect of our responsibility.

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