Use It or Lose It, Use It and Improve It: Hearing Aid Use Prevents the Loss of and Improves Speech Understanding in Adults With Age Related Hearing Loss

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ABSTRACT

Significant hearing loss occurs in nearly two-thirds of adults aged 70 years and older in the United States and affects an estimated 16.1% of adults between the ages of 20 and 69 (2). The estimated number of individuals aged 71 or older with any type of dementia was 5.3 million in 2002 (3). Cognitive impairment in the absence of dementia is estimated to affect 21% of individuals aged 71 or older (3). In their study they questioned whether hearing loss was a marker for early-stage dementia or a modifiable risk factor (4). More recent study by Lin et al. found that hearing loss is associated with accelerated cognitive decline and called for a study to determine whether hearing rehabilitation could prevent such decline (5). In fact, hearing loss is a modifiable risk factor, then correcting hearing loss could potentially have great benefit not only to the individual affected but also to society at large. Understanding of speech requires both adequate hearing and satisfactory central auditory function; it is necessary for individuals to hear and recognize words in order to understand speech. Our study was designed to use speech discrimination as a marker for higher auditory cortical function and to determine if amplification could prevent decline in speech understanding and, in the presence of decline, improve understanding in subjects with clinically significant hearing loss. Our hypothesis is that without normal use the mature auditory system may lose normal function, and with restoration of appropriate auditory stimulation, the auditory system can recover normal function.

METHODS AND MATERIALS

83 subjects (mean age of 72, nearly equal numbers of male and female) were selected. In order to be included, subjects had to have undergone repeat audiometric evaluation at least six months following the initial audition and be willing or not to obtain amplification. They also had to agree to wear their hearing aids at least eight hours a day and expose themselves to conversational speech and other auditory stimuli. Air and bone conduction thresholds were determined for each ear. Speech reception thresholds were determined by using spondee words. Speech discrimination scores were obtained by utilizing live voice at 40 dB above the speech reception threshold using standard phonetically balanced word lists. All testing was performed without amplification. Subjects were followed whether or not they received amplification. Several different brands of amplification devices were used; all were digital and programmable. In all cases hearing aid use and daily exposure to auditory stimuli was confirmed by a family member, either a spouse or a child. Group 1 subjects had amplification shortly after their initial hearing test. Group 2 subjects did not opt for amplification after their initial hearing test, but did so on average 36 months later. Group 3 subjects never had amplification. Two other groups were derived from members of Groups 1 and 2. Group 4 subjects had initial speech discrimination of 92 or greater and Group 5 subjects less than 92. Hearing testing after amplification was performed over a year following the pre-amplification test.

RESULTS

In Groups 1 and 2, amplification, for an average of 25 months, significantly increased speech discrimination (Figure 1) in both the left ear (t(64) = 4.54, p < .0001) and the right ear (t(65) = 4.24, p < .0001). Subjects in Group 2, who did not opt for amplification initially, showed a decline in speech discrimination when tested a second time an average 36.0 months later: left ear (t(19) = -2.92, p < .009), right ear (t(22) = 2.30, p < .031). However, when they were then put on amplification and tested 19.5 months later, they showed a significant improvement in speech discrimination (Figure 2) in both the left ear (t(18) = 3.27, p < .001) and the right ear (t(19) = 3.58, p < .034). Similarly, subjects who never received amplification (Group 3) for a mean period of 39.1 months between their initial and final test had significant decreases in speech discrimination in both the left ear (t (9) = -4.42, p < .0001) and the right ear (t(10) = -3.79, p < .016). Finally, subjects with initial speech discrimination scores of < 92 (Group 5) who then received amplification for an average of 28.3 months demonstrated the greatest increase in speech discrimination on subsequent testing (Figure 3). In both the left ear (t(24) = 5.80, p < .001) and the right ear (t(27) = 3.79, p < .001), there were highly significant increases in speech discrimination on the order of 20.3% and 9.1%, respectively.

DISCUSSION

The results of the present study indicate the importance of good hearing for the maintenance of speech discrimination. In subjects with hearing impairment and excellent speech discrimination, amplification helped them maintain speech understanding. If hearing loss was allowed to progress, speech discrimination scores declined significantly. The most important finding of this study is that in subjects with poor hearing and poor speech discrimination, the use of amplification led to a significant improvement in speech discrimination scores. Assuming that good speech discrimination requires good brain function, these data suggest the importance of good hearing for the maintenance of auditory cortical function. It is important to note that subjects undergoing amplification were included in this study only if they used their hearing aids at least eight hours every day, based on personal accounts. This, we believe, has great importance for the aging population because it demonstrates that one aspect of cognitive function can be significantly improved by amplification and “auditory exercise”. The hypothesis that hearing loss directly or indirectly leads to cognitive decline has been proposed for many years by authors who have postulated that hearing aids or other aural rehabilitative devices could mitigate these outcomes. The finding that hearing loss is independently associated with a decrease in cognitive function led Lin (5) to question whether hearing loss was a modifiable risk factor or an early marker of cognitive decline. Our current study provides compelling evidence that hearing loss is a modifiable risk factor.

CONCLUSIONS

Hearing loss all too often leads to a decrease in speech understanding. This loss may be due to a decrease in brain function. Hearing aid use and “auditory exercise” may prevent this loss if begun before its occurrence and potentially can improve the condition once it occurs. Those professionals dealing with age related hearing loss need to counsel patients that the only way to stimulate auditory cortical function is to hear better and that hearing aids can act as exercise equipment for the brain. Like other types of exercise equipment, however, it does no good if it is not used.

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REFERENCES