

The relationship between hearing loss and cognitive function has been a hot topic in the hearing health care community recently. Hearing loss is an insidious condition that many Americans suffer silently rather than seeking treatment. While the negative effects of hearing loss have been well-documented in professional communities, in some cultures, experiencing hearing loss as people age is viewed as a natural course of life that needs no correction.

Recent research studies on the effects of hearing loss on cognition suggest that this negligence is likely to cost individuals with untreated hearing loss a lot more than we previously thought. The burning question is “Can we do anything to enhance cognitive function or to slow down cognitive decline?”

Research on the Association Between Hearing Loss and Cognitive Functions

Recently, Frank Lin, M.D., Ph.D., an otologist and an epidemiologist at Johns Hopkins University School of Medicine, studied the associations between hearing loss and cognitive functions using the Baltimore Longitudinal Study on Aging (BLSA) database. BLSA tracks various health factors in thousands of men and women over decades. Lin and colleagues analyzed the relationship between hearing sensitivity and cognitive abilities in 639 people aged between 36-90 years who enrolled in BLSA between 1990 and 1994.

About 25 percent of the participants had some degree of hearing loss, but none of them had dementia in the beginning of the study. Participants’ hearing sensitivity and cognitive functions were tested every one to two years. Other factors such as age, sex, race, education, diabetes, smoking,

and hypertension were accounted for in the statistical analysis.

The results showed that 58 participants developed all-cause dementia or Alzheimer’s disease by 2008. Those who had hearing loss in the beginning of the study were significantly more likely to develop dementia. For other participants, their likelihood to develop dementia in the future is proportional to their degree of hearing loss at the end of the study: people with mild, moderate and severe degrees of hearing loss were projected to be two to five times more likely to develop dementia.

In a subsequent study, Dr. Lin and colleagues examined the link between hearing loss and brain mass change over time. They analyzed the MRI scans of 126 research participants taken over up to 10 years. Those with hearing loss in the beginning of the study had significantly greater brain atrophy (shrinkage of brain tissue) compared to those with normal hearing. The most shrinkage occurred in the superior, middle, and inferior temporal gyri which are responsible for processing sounds, speech, memory, and sensory integration. Although the causes of the atrophy are unknown, such shrinkage could potentially compromise the individuals’ cognitive functions. Some studies showed that the shrinkage of these areas were related to early stages of cognitive impairment and Alzheimer’s disease.

Other Studies

Although the above studies showed a strong correlation between hearing loss and cognitive functions, the causal effect (i.e., hearing loss causes cognitive decline) has not been established. In addition, studies examining the relationship between the use of amplification devices and cognitive function have generated mixed results. Several studies on hearing aid use have not provided evidence to support the notion that improving hearing sensitivity results in improved cognitive function or slowing down of cognitive

decline (Lin et al., 2011, Mulrow et al., 1992; Allen et al., 2003 and Dawes et al., 2015).

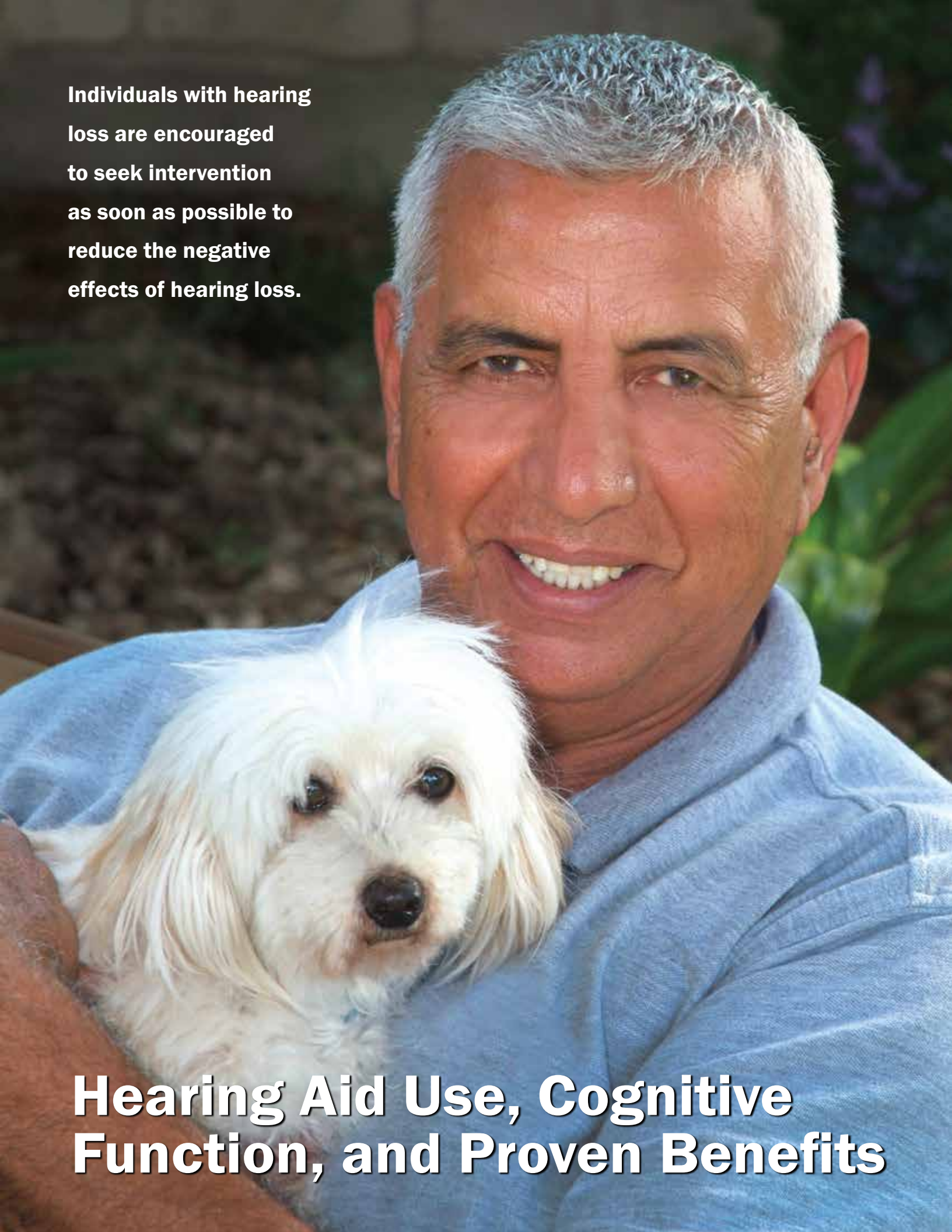
Piers Dawes, Ph.D., an audiology professor at the University of Manchester, U.K., and his colleagues examined the effect of hearing aid use on the mental health, social engagement, cognitive function, and physical health of 666 adults with hearing loss. Participants aged between 48-92 years old were drawn from a subsample of the epidemiology of hearing loss study cohort living in Beaver Dam, Wisconsin. At baseline, the 69 hearing aid users and 597 non-users did not differ in average cognitive, physical, or mental health. Examinations were conducted five and eleven years after the baseline measurement. The results showed no significant difference in any of the measures after adjusting for age, gender, and average hearing loss at five years. Similar results were obtained at eleven years, with the exception of one physical subtest in which hearing aid users obtained higher performance than non-users.

On the other hand, a study conducted by Isabelle Mosnier, M.D., of the Assistance Publique-Hôpitaux de Paris, and her colleagues reported that cochlear implants plus speech and cognitive rehabilitation training have improved the cognitive functions of cochlear implant users. Patients aged between 65-85 years old received unilateral cochlear implants, with the exception of one individual who received simultaneous bilateral implants. The patients then received six months of speech and cognitive training twice per week. In the beginning of the study, 50 of the cohort had normal scores in all six cognitive function tests and 41 had abnormal test scores in one to three tests.

After 12 months of cochlear implant use and speech and cognitive training, 76 percent of the normal group maintained their normal

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Hearing Aid Use, Cognitive Function, and Proven Benefits

Hearing Aid Use

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functions in all tests and 24 percent obtained one or two abnormal scores. For the group with original abnormal cognitive test scores, 81 percent showed a reduction in the number of abnormal test scores, the other 19 percent had no change.

Although the results support cochlear implantation as an intervention to improve cognitive functions and speech understanding in quiet and noise, it is uncertain whether the improvement was due to cognitive training or due to the enriched auditory input offered by cochlear implants.

In Dr. Lin's first study on hearing loss and dementia, approximately 13 participants sought hearing aids for their hearing loss. Hearing aid use was found to be associated with higher cognition scores after adjusting for hearing loss severity, age, sex, race, education, and income. These results, however, should be interpreted with caution because of the small sample size. In a subsequent study, Dr. Lin and colleagues examined the relationship between hearing aid use and cognitive function with a larger sample size (182 hearing aid users and 218 non-users). They reported no difference in the rate of cognitive decline or the number of occurrences in cognitive impairment between the two groups of participants.

The lack of a definite causal effect between hearing aid use and cognitive improvement suggests that the amount of auditory input might not be a factor affecting cognitive function, and some unidentified factors might be affecting both hearing sensitivity and cognition function. Clinically, Pichora-Fuller, Ph.D., professor of psychology at the University of Toronto, cautions that there is a "bidirectional link between auditory and cognitive impairment."

Health professionals, therefore, need to know that patients with hearing loss might obtain a lower cognitive

score if the hearing loss is not compensated during testing than if the hearing loss is compensated. On the other hand, patients having cognitive impairment may also be diagnosed with a higher degree of hearing loss than they actually have. In addition, patients with cognitive impairment might warrant different auditory compensation/amplification strategies.

In light of the sound research, even though there has not yet been a causal effect between hearing loss and cognitive decline, we should ask the question:

When Should You Get Help for a Hearing Loss?

When is a good time for a person with hearing loss to seek amplification options? The answer is immediately!

Through the years, many studies have reported the benefits of using amplification devices. Here are only a few of those benefits:

- improving communication
- improving the quality of life
- lowering depression scores
- increasing social engagement
- improving working memory accessed using auditory stimuli

- freeing cognitive capacity for other tasks in challenging communication environments

Individuals with hearing loss are, therefore, encouraged to seek intervention as soon as possible to reduce the negative effects of hearing loss. Let's replace stigma with pride. **HLM**

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expertise is in amplification and conducts research studies to assess the effectiveness of hearing aid and cochlear implant technologies to derive strategies to reduce wind noise, and to examine the hearing status of underserved or unserved populations. Dr. King's work can be found at researchgate.net/profile/King-Chung. She can be reached at kchung@niu.edu.



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