Auditory Deprivation: Use It or Lose It

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With regards to hearing loss, have you ever wondered if there’s any truth to the “use it or lose it” theory? Have you ever questioned if hearing impairment means your ability to understand speech or decipher sounds will decrease over time? Researchers have been asking those same questions for more than 40 years. In searching for answers, they examined the phenomenon of “adult onset auditory deprivation,” or the systematic decrease in auditory performance over time as associated with the reduced availability of acoustic information (Arlinger et al., 1996, p. 87S). Or to put it in layman’s terms, the process in which humans struggle to recognize speech due to lack of auditory stimulation (hearing loss).

Despite the large body of literature surrounding adult onset auditory deprivation, there is still a lack of understanding regarding the causes and effects of this phenomenon. This article will discuss the concept of auditory deprivation with a focus on adults with bilateral hearing impairment.

One method of assessing this effect has been through the testing of individuals with bilateral hearing loss who use only one hearing aid. The expectation is that the unaided ear would be deprived of some auditory input as compared to the ear with the hearing aid. Previous studies used already established data to examine the effects of auditory deprivation. However, Palmer and colleagues believe that using retrospective data to measure auditory deprivation is problematic due to a historic lack of documentation on the severity of hearing loss, hearing aid use, and overuse of “outcome measures that are dependent on mid-to-low frequency sounds that the individuals have probably been hearing all along as opposed to outcome measures that tap the newly restored high-frequency hearing” (1998, p. 1709).

In a hallmark study, Silman and colleagues (1984) experimented with amplifying only one ear in adults with bilateral sensorineural hearing impairment. The researchers did not find any significant changes to the audiometric thresholds over time; however, their results did show a significant decline in suprathreshold speech recognition performance in the unaided ears of the patients even when age and hearing threshold effects were removed. The researchers did not see the same decline in the binaurally aided patients. They concluded that there was an auditory deprivation effect and it manifested as a decline in supra-threshold word recognition performance, not as poorer audiometric thresholds.

Gelfand and colleagues, in 1987, showed similar declines in speech recognition performance from 86 monaurally aided patients with bilateral sensorineural hearing loss. The results agreed with the findings of Silman and colleagues in that there were no significant threshold shifts between the initial test and the follow-up test; the patients wearing one aid had significantly poorer word discrimination in the unaided ear when compared to their binaurally aided counterparts.

In 1999, Raymond Hurley conducted a prospective study to investigate the prevalence of the unaided ear effect to determine if the amount of hearing loss is a factor in auditory deprivation. This study consisted of 142 participants with bilateral sensorineural hearing loss, 77 were fit with one hearing aid and 65 were fit binaurally. The study
followed these individuals one, three and five years post-fitting. The author observed significant declines in word recognition scores for 25 percent of the monaural subjects compared to only six percent of the binaural subjects experiencing a decline in word recognition performance. The author also concluded those with more severe hearing loss tend to have more auditory deprivation.

Additional studies have failed to show evidence of auditory deprivation. Dalzell and colleagues attempted to replicate the 1984 Silman and colleagues study with 95 monaurally or binaurally fit individuals with moderate sensorineural hearing losses (1992). The researchers examined word recognition performance over time and found no greater decline in word recognition performance for the unaided versus aided ears of the monaurally fit participants. In a study performed by the University of Finland Department of Audiology, 500 participants with symmetrical, sensorineural hearing impairment were recruited and examined before and after monaural hearing aid use, and the results did not reveal significant changes in suprathreshold speech discrimination [Jauhiainen, 2001].

The research on auditory deprivation to date lacks a clear consensus and does not reflect investigations on effects other than measures of word recognition and audiometric thresholds. Clearly, additional research is needed to better understand the effects of auditory deprivation. However, we cannot lose sight of the fact that there are several studies that show an auditory deprivation effect when comparing suprathreshold word recognition performance of aided and unaided ears in monaurally fitted individuals. This evidence suggests that as clinicians we should consider each patient’s case individually and monitor for significant changes in suprathreshold measures of performance of monaurally aided patients. Word recognition measures in quiet may not be sensitive to auditory deprivation, and more challenging baseline and periodic measures may be appropriate. If there are significant declines in suprathreshold measures unilaterally, an appropriate treatment plan should include amplification in both ears.

References


