Impact of Life Experiences on Hearing in Noise

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People are often motivated to visit an audiologist when they begin to notice a difficulty to hear in noisy environments. Hearing-in-noise issues can arise due to many reasons, and individuals with hearing loss have more difficulty understanding speech in noisy environments than those with normal hearing. Even without hearing loss, however, certain individuals struggle to hear in noise. A classic example is a middle-aged person who doesn't have age-related hearing loss just yet but notices a decrease in his or her hearing. There are many examples of healthy individuals with normal hearing who nevertheless experience hearing issues in noisy environments, including restaurants, classrooms, and sports arenas, to cite a few.

In previous Hearing Matters columns, we have reviewed many factors that play into a patient's hearing-in-noise abilities, including their cognitive abilities, brain function, and life experience. Here, we dive deeper into how different life experiences can shape an individual's ability to hear in noise. Specifically, we propose that hearing history is a crucial factor that needs to be considered when evaluating a patient's listening skills. These experiential factors affect hearing-in-noise abilities because they influence cognition, language, and neural functions—all of which, in turn, are important for hearing in noise. These experiences can help or hurt our ability to hear in noise, or it can be a mixed bag.

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MUSIC TRAINING

Music training boosts auditory and cognitive skills across the lifespan. Musicians' brains process sound quicker, more robustly, and more accurately (http://bit.ly/2IbAGCP). They also have a better ability to retain auditory information in their minds (imagine trying to remember a phone number somebody just told you), and are better at shutting out distractors to focus on one auditory object.

Musicians also have stronger hearing-in-noise abilities than non-musicians. They seem to excel, especially when trying to understand speech amid other speech sounds, such as when in a cocktail party or in a busy restaurant. These situations are in many ways analogous to playing in a musical ensemble. A musician must dynamically switch listening between instruments, and that practice seems to make them more adept at homing in on a single voice amidst a noisy background. However, this advantage may be mitigated by hearing loss following noise exposure.

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CONCUSSION

Brain injuries such as concussions can acutely disrupt our ability to hear in noise. Concussions can disrupt the ability of sensory systems, including the visual, vestibular, and auditory systems, to quickly and accurately process information. The concussed brain processes sound slower and less robustly than healthy brains, although this sound processing improves as patients recover (http://bit.ly/2I9P66w).

Patients with a concussion also struggle to process speech in noise. When compared with patients with sports injuries that do not affect the head or neck (such as sprains and fractures), concussion patients require speech to be louder amid noise to understand it with the same accuracy. Additionally, concussion patients struggle to maintain their performance on hearing-in-noise tasks, and experience fatigue more quickly than their peers with no concussion.


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BILINGUALISM

Speaking two or more languages confers multiple benefits on cognition and brain function. The hallmark cognitive benefit of bilingualism is increased executive control. Bilinguals have a superior ability to shut out distractors and focus on a single object, either visual or auditory. The bilingual brain also processes sound more robustly and consistently than the monolingual brain (http://bit.ly/2I9JNUy).

The story gets complex when considering bilinguals' hearing-in-noise abilities. Bilinguals outperform monolinguals when identifying non-speech sounds, such as tones, in noise. Bilinguals and monolinguals perform equivalently when trying to identify single words in noise. But bilinguals perform worse than monolinguals when trying to understand sentences in noise despite their cognitive and neural advantages. It has been suggested that these difficulties stem from having two competing mental inventories of languages from which to pull. For example, when a Spanish-English bilingual hears "el" at the zoo, the words "elephant" and "elefante" may get mentally activated. Against a backdrop of noise, these competing mental lexicons actually hurt a bilingual's speech perception.

HEARING HISTORIES

These three examples illustrate how different life experiences can shape an individual's everyday listening skills—all before hearing loss sets in. In a practical sense, this means that an individual's life experiences are important factors to consider when evaluating his or her hearing-in-noise abilities. A bilingual who performed slightly below normal on a test, such as the QuickSIN, might have performed normally in the context of the bilingual person's life experiences. However, a musician who performed within normal limits on the same test might, in the context of his or her life experiences, have actually struggled with speech perception.