

Music Keeps the Hearing Brain Young

By Nina Kraus, PhD, and Travis White-Schwoch

It's a story so familiar that it's become a clinical cliché: A retiree comes to the audiology clinic because she's having trouble hearing in daily settings. Her audiogram shows a sloping sensorineural hearing loss, and hearing aids are recommended. Two months later, she comes back for a check-up, and reports that the hearing aids have significantly helped her speech understanding in quiet settings, such as at home. Unfortunately, she still can't understand people in noisy environments like restaurants.

Successful speech understanding in noisy environments hinges on factors that extend beyond the ear, including cognitive abilities and the integrity of sound processing in the brain. Musical training is a robust approach to strengthen these factors—and converging evidence shows that individuals with musical training hear better in noisy environments than their non-musician peers (*Hear Res.* 2017; 352:49).

What evidence is there that music might be a viable therapeutic approach for our retiree who needs more than her hearing aids?

MUSIC AND THE AGING BRAIN

Multiple studies have shown that a life of playing music mitigates age-related decline in the auditory brain. Music specifically strengthens the aspects of sound processing that are hallmarks of auditory aging. For example, older adults have slower neural responses to speech than younger adults. However, the brains of older adult musicians pick up the details of speech sounds as quickly as those of young, non-musician adults (*Neurobiol Aging.* 2012;33[7]:1483.e1). Older adults with musical training also have larger, more consistent, and more accurate neural responses to speech than older non-musicians with normal hearing or hearing loss (*Front Aging Neurosci.* 2012;4[30]).



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Moreover, older adult musicians show stronger functional connections between multiple auditory areas in the brain (*J Neurosci.* 2015;35[3]:1240). This suggests that musical training actively strengthens the brain mechanisms that support auditory processing, including in noisy environments.

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Together, this shows that a life of musical training mitigates age-related decline in auditory perception and the auditory brain. But is it too late for our retiree who needs more than hearing aids to boost her hearing skills?

MUSIC AS AN INTERVENTION

To date, relatively few studies have used musical training as an intervention for older adults. An encouraging piece of evidence comes from studies of more basic auditory training in older adults and animal models. For example, computerized



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auditory training speeds up neural timing and improves speech-in-noise perception in older adults (*PNAS*. 2013; 12[11]:4357). This demonstrates that the aging brain still has the potential to benefit from training-induced neuroplasticity, providing support for a musical intervention.

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At the Neurosciences and Music VI – Music, Sound, and Health conference in Boston in June 2017, early results were presented from high-quality clinical trials of musical interventions for older adults. One major strength of these studies is that they employ medical models of research, including randomized assignment and placebo control groups. Although work is ongoing, early evidence suggests that musical training initiated later in life confers similar (albeit more modest) benefits as lifelong musical training.

When evaluating clinical interventions, it's important to consider their economics in addition to their efficacy. These include the actual financial costs (such as instructors and classroom space), which are relatively low for group music classes. But another crucial factor in clinical interventions is the opportunity cost—in this case, the question is if patients undergoing musical training could spend their time more effectively doing something else. One of the reasons we think music has a low opportunity cost is because it confers health benefits beyond the hearing brain. There is emotional satisfaction that comes from engaging in music, and using a group lesson model for older adults provides an opportunity for social engagement. The high cognitive load involved in making music engages key systems such as attention and working memory. Music also engages the sensorimotor system through rhythm, which could mitigate older adults' risk for falls.

As we've discussed in previous columns in *The Hearing Journal*, hearing is connected to feeling, thinking, and moving—so the emotional, cognitive, and sensorimotor benefits of musical training could cascade to provide further reinforcement for hearing skills beyond their broader health benefits (*Hearing Journal*. 2017;70[9]:52; *Trends Cogn Sci*. 2015;19[11]:642). Ongoing research suggests musical training as a strategy to supplement amplification and aural rehabilitation to improve hearing health in older adults. [\[1\]](#)