Music Training: An Antidote for Aging?

By Nina Kraus, PhD, & Samira Anderson, AuD, PhD

One of the most pervasive effects of aging is the reduction in processing speed, affecting sensory, cognitive, and motor systems. In the January issue of *The Hearing Journal*, we discussed how aging influences central auditory processing (see http://bit.ly/AudAging, or p. 36 of that issue). The effects of aging on temporal processing likely play a role in the older adult's difficulty understanding speech in challenging listening environments (*Psychol Aging* 1999;14[3]:380; *Int J Audiol* 2003;42[S2]:26).

So what options can a clinician offer an older patient who continues to struggle with hearing after being fit with amplification? Research has demonstrated that both short-term auditory training and lifelong experience can not only lead to better hearing in noise, but also fundamentally alter the brain's representation of speech and other sounds.

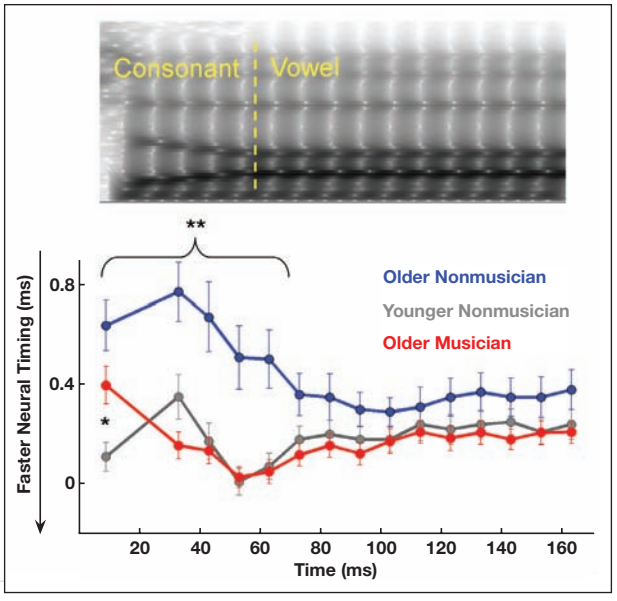
Musicianship is an example of long-term training that can result in the development of superior auditory skills extending beyond the music domain to speech-in-noise perception and auditory cognitive abilities, such as memory and attention (*Nat Rev Neurosci* 2010;11[8]:599). Aniruddh D. Patel, PhD, proposed the OPERA hypothesis to explain the heightened auditory skills of musicians (*Front Psychol* 2011;2:142).

- **O**verlap: There is an overlap in the anatomy and physiology of the auditory system for speech and music.
- **P**recision: More precision is required for music processing than for speech.
- **E**motions: The strong emotions often elicited by music may induce plasticity through activation of the brain's reward centers.
- **R**epetition: Extensive practice tunes the auditory system.
- **A**ttention: Focused attention to details of sound is required when playing an instrument.

These aspects of music training lead to better processing of speech in the auditory brainstem and cortex and to better understanding of speech in noise across age groups, including school-age children (*Brain Lang* 2012;123[3]:191), young adults (*J Neurosci* 2009;29[45]:14100; *Brain Res* 2010;1355:112), and older adults (*Front Aging Neurosci* 2012;4:30). In fact, older musicians do not have the same brainstem timing delays in their speech-evoked responses that older nonmusicians do (*Neurbiol Aging* 2012;33[7]:1483.e1).

Obviously, we can't all become professional musicians. However, young adults with even a limited period of music training in the form of lessons or participation in music activities at school have more robust brainstem responses to complex sounds than young adults who haven't had any musical experience (*J Neurosci* 2012;32[34]:11507).

Moreover, there is evidence that the effects of a modest amount of music training may be seen after as little as six months in infants. Babies who participated in active music classes for that length of time had better communication skills than babies who participated in passive music classes (*Dev Sci* 2012;15[3]:398). These studies provide the kind of evidence needed for continued support of music education in our schools.



Top: Spectrum of the syllable /da/ divided into consonant and vowel regions. Bottom: Older nonmusicians have delayed brainstem timing for the onset and consonant-vowel transition compared with younger nonmusicians, whereas older musicians show no delays except in the onset of the consonant. (Adapted from Neurbiol Aging *2012;33[7]:1483.e1.)*

When it comes to your older patient who hasn't had any music training, there may be benefits from starting such instruction later in life. Adults age 60 to 85 without previous musical experience exhibited improved processing speed and memory after just three months of weekly 30-minute piano lessons and three hours a week of practice, whereas the control group showed no changes in these abilities (*Aging Ment Health* 2007;11[4]:464). Given this evidence, music training may prove to be an effective rehabilitation strategy for older adults who would like to hear better in noise. More work is needed to document its benefits.

Dr. Kraus (left) is a professor of auditory neuroscience at Northwestern University, investigating the neurobiology underlying speech and music perception and learning-associated brain plasticity. **Dr. Anderson** is assistant professor in the hearing and speech sciences department of the University of Maryland, where she is studying the effects of hearing loss and aging on neural processing in older adults.