Music on the Mind

New research finds melody ingrained in the brain

By Nancy K. Dess, Ph.D.

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Music and science may seem to inhabit different universes—one of beauty and emotion, the other of logic and reason. But now, neuroscientists are placing them in the same solar system. Norman M. Weinberger, Ph.D., professor of neurobiology and behavior at the University of California at Irvine, explains how new research is beginning to reveal the role of music in brain function—and our lives.

Nancy K. Dess: Is music in our genes?
Norman M. Weinberger: Music exists in every culture, and infants have excellent musical abilities that cannot be explained by learning. Mothers everywhere sing to their infants because babies understand it. Music seems to be part of our biological heritage.

NKD: So our brains evolved to process it?
NMW: Not in the sense that a particular chunk of brain is musical. It's complex, because music has many elements—rhythm, melody and so on. For example, certain cells in the right hemisphere respond more to melody than to language.

NKD: Music's complex representation in the brain must make it hard to study.
NMW: It does. One tack is to start with basics. For example, a fundamental aspect of music perception is recognition of a melody in different keys; each note's meaning depends heavily on its context. In one study, we exposed animals to three simple melodies with the same middle tone. Almost every neuron responded differently to that middle tone in the different contexts. This type of research helps us find out how musical processes with deep evolutionary roots differ from those appearing later in life—culture-specific preferences, for instance.

NKD: Are sound patterns recognized innately, or are they learned?
NMW: Neurons learn to prioritize some sounds. When a tone becomes important—because it signals food, for instance—the cells' response to that tone increases. This finding revolutionized thinking about brain organization by showing that learning is not a "higher" brain function but rather one that occurs in the sensory systems themselves.

NKD: Does musical experience shape the human brain?
NMW: It seems to. For example, the cortical representation of digits 2 to 5 on the left hand of string players is greater than for the right, suggesting that musical experience does influence the brain.

NKD: Does listening to music similarly shape the brain?
NMW: A few years ago, Shaw and colleagues reported on the "Mozart Effect"—the finding that college students who listen to Mozart for 10 minutes perform better on spatial-temporal tests, like pattern matching. Regrettably, this finding sprouted wings, such as the belief that kids get smarter after 10 minutes of Mozart. Intriguing as the finding is, it seems to have no practical implications because the effect lasts only a few minutes.

NKD: So, does listening to music have *any* long-term effect on the brain?
NMW: Yes, but only with time and practice. Evidence suggests that long-term musical involvement reaps cognitive rewards—in language skills, reasoning and creativity—and boosts social adjustment. Music exercises the brain. Playing an instrument, for instance, involves vision, hearing, touch, motor planning, emotion, symbol interpretation—all of which activate different brain systems. This may be why some Alzheimer's patients can perform music long after they have forgotten other things.

NKD: It seems a shame that music instruction has disappeared from many schools.
NMW: It's a disgrace. Some people claim that music programs are too expensive, but killing music programs deprives children of intellectual, personal and social benefits. I know it sounds corny, but by failing to foster musicality, our society is wasting its potential. Perhaps if more people knew music's true benefits, it would be restored to more schools. ■

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