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THIS IS YOUR BRAIN ON MUSIC: RESEARCHERS DISCOVER TWO-PART PROCESS



Georgetown neuroscientists have found that separate processes are involved in learning a new piece of music and recalling a tune once it's learned.

OCTOBER 17, 2012 — GEORGETOWN SCIENTISTS HAVE DISCOVERED that one part of the brain is involved in learning a new musical piece while another part recalls the tune after it's learned.

The scientists presented the new discovery this week during the annual meeting of the Society for Neuroscience Oct. 13-17.

Byrannon Green, a graduate student working in the laboratory of senior author and Georgetown neuroscientist *Josef Rauschecker*, notes that although parts of the brain were surprisingly found to participate in both processes.

HIJACKING MOTOR SYSTEM

"The motor system contains brain structures that nature invented to decode sequences, so to learn a melody, the auditory system hijacks the motor system," Rauschecker explains.

"This is also the part of the brain you use to learn how to ski or dance," adds Green. "This study shows that motor sequencing areas in the brain are really generalized sequencing areas that process both motor and auditory sequences."

Green and Rauschecker worked with three colleagues at Aalto University in Helsinki, Finland on the study, funded by a PIRE grant from the U.S. National Science Foundation and a FiDiPro award from the Academy of Finland.

FIRING NEURONS

The study used an MRI scanner to map functional neural activity in the brains of volunteers who listened to musical sequences.

Participants heard early parts of a 30-second musical sequence 20 to 30 times in an attempt to make that part of the melody familiar to them. They heard the rest of the music only one to 10 times.

The researchers found that learning a novel sequence required use of the brain's motor areas, including the basal ganglia and cerebellum, which researchers previously thought were only used to move muscles involved in singing.

But these areas were active in learning the sequence of parts of the tune — one sound fired one small group of neurons, the next sound fired a second group, and so on.

BRAIN SWITCH

The study showed that after the participants learned the tune, brain activity switched from the motor regions to areas in auditory and prefrontal cortex, which had previously beshown to be associated with long-term memory of sounds.

Rauschecker likens storage of a tune to dominoes stacked next to each other.

"The tones are chunked together, chained to one another in a sequence," he says. "It's like pushing the first domino, and then they all fall, one after the other."

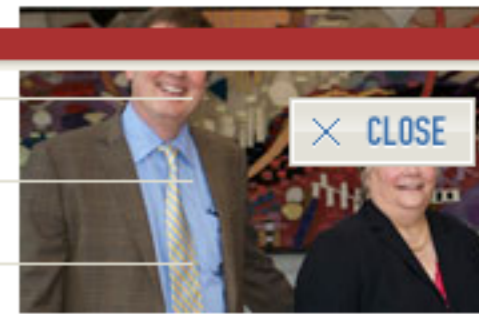
"That can explain why if you get stuck in the middle of a melody you are playing on a piano, it is easier to recall it if you start from the beginning of the tune," Green says.

Tipping the dominos at will also illustrates "how a symphony conductor is always ahead of the orchestra," Rauschecker adds. "One cue triggers the next and then the next."

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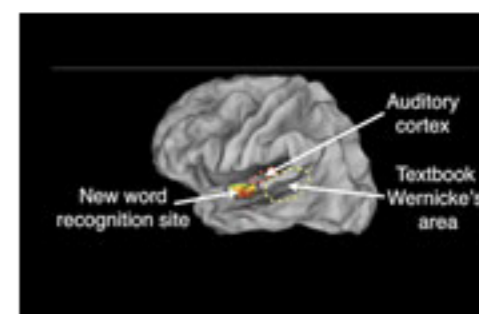
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GEORGETOWN UNIVERSITY
37th and O Streets, N.W., Washington D.C. 20057
(202) 687.0100

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