

Research Abstract

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TITLE

The song system of the human brain

ABSTRACT

Although sophisticated insights have been gained into the neurobiology of singing in songbirds, little comparable knowledge exists for humans, the most complex singers in nature. Human song complexity is evidenced by the capacity to generate both richly structured melodies and coordinated multi-part harmonizations. The present study aimed to elucidate this multi-faceted vocal system by using ¹⁵O-water positron emission tomography to scan “listen and respond” performances of amateur musicians either singing repetitions of novel melodies, singing harmonizations with novel melodies, or vocalizing monotonically. Overall, major blood flow increases were seen in the primary and secondary auditory cortices, primary motor cortex, frontal operculum, supplementary motor area, insula, posterior cerebellum, and basa ganglia. Melody repetition and harmonization produced highly similar patterns of activation. However, whereas all three tasks activated secondary auditory cortex (posterior Brodmann Area 22), only melody repetition and harmonization activated the planum polare (BA 38). This result implies that BA 38 is responsible for an even higher level of musical processing than BA 22. Finally, all three of these “listen and respond” tasks activated the frontal operculum (Broca’s area), a region involved in cognitive/motor sequence production and imitation, thereby implicating it in musical imitation and vocal learning.