

FUNCTIONAL ANATOMY OF PITCH MEMORY IN PERFORMANCE MATCHED GROUPS OF MUSICIANS AND NON-MUSICIANS

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Background

Most pronounced functional differences between musicians and non-musicians have been found in perisylvian brain regions using various functional brain mapping techniques while subjects perform musical tasks. It is unclear whether differences in performance, different cognitive strategies or structural brain differences account for these between-group functional differences.

Aim

We wanted to determine whether functional brain differences in a pitch memory task still exist when a group of musicians and non-musicians were matched with regard to their performance score.

Method

20 subjects (10 musicians and 10 non-musicians) underwent functional magnetic resonance imaging using a new variation of a sparse temporal sampling technique while performing a pitch memory task (comparing the first tone with the last or second last tone in a sequence of 6-7 tones). The pitch memory task was contrasted with a motor control condition. Non-musicians were selected from a larger group of subjects in order to match both groups with regard to percent correct responses.

Results

Both groups showed a similar activation pattern in perisylvian brain regions involving the superior temporal gyrus and the supramarginal gyrus. Non-musicians showed stronger activation of the prefrontal and superior parietal regions while musicians showed strong posterior temporal/inferior parietal activation. Contrasting both groups directly with each other revealed that musicians activated more the right supramarginal gyrus while non-musicians activated more the right superior temporal and superior parietal lobe.

Conclusions

These results indicate between-group processing differences since performance was similar between both groups. While musicians seemed to use more short-term auditory storage center (e.g., supramarginal gyrus), non-musicians relied more on primary and secondary auditory areas within the superior temporal lobe, multimodal sensory association regions in the superior parietal lobe and prefrontal memory areas in order to perform this pitch memory task.