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Cortical pitch representations of complex tones in musicians and non-musicians

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Musicians typically show enhanced pitch-discrimination ability compared to non-musicians, consistent with the fact that musicians are more sensitive to some acoustic features critical for both speech and music processing. In a previous behavioral study, musicians showed an increased pitch-discrimination performance for both resolved and unresolved complex tones suggesting an enhanced neural representation of pitch at central stages of the auditory system. The aim of this study was to clarify whether musicians show (i) differential neural activation in response to complex tones as compared to non-musicians and/or (ii) finer fundamental frequency (F0) representation in the auditory cortex.

Fundamental frequency (F0) discrimination thresholds were obtained for harmonic complex tones filtered in either a low or a high frequency region to vary the resolvability of audible harmonics. A functional magnetic resonance imaging (fMRI) paradigm was used to measure neural activation while performing the same pitch-discrimination task for conditions of varying resolvability.

Preliminary results from 6 listeners (3 musicians and 3 non-musicians) showed that the behavioral discrimination thresholds of musicians were, on average, lower than the thresholds of non-musicians, independent of harmonic resolvability. A group analysis on the 6 listeners revealed no differential neural activation for resolved vs unresolved conditions, suggesting that cortical responses did not increase with increasing stimulus resolvability, when adjusting for the task difficulty across conditions and participants. A significant effect of processing demand was observed in both auditory cortices, with a larger neural activation in the right auditory region. Overall, these preliminary findings suggest an involvement of a postero-lateral region in both auditory cortices during a pitch-discrimination task with conditions of varying processing demand.