Are they playing our song? Neural discrimination between songs of closely related songbirds

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Songs of the songbirds are beautiful and complex patterns of vocalization. Songs are different from species to species in their speed and frequency. Production and recognition of correct song is necessary for various social functions for males as well as for females like, males use songs to attract females and defend their territory whereas females use songs to identify own species partners. In the case of two songbird species, collared and pied flycatcher, the story is more interesting because of various facts like, both birds live together and build nest nearby each other. Sometimes the less aggressive pied males copy collared songs in their own songs to avoid attack from more aggressive collared males. The behaviour of copying others' song creates confusion in mate choice decision for females of both species. Moreover, young males look similar to each other, which add confusion in the females mate choice decision.

The question of my project was to detect female preference for specific songs over other songs of closely living bird species. To understand this better, I measured neural activity in the specific brain region namely, caudo-medial nidopallium (NCM) and caudo-medial mesopallium (CMM), already known for their role in song recognition. I performed song listening experiments on the birds. After the experiment, the birds were sacrificed and brain was cut into thin sections by a process called cryo-sectioning and chemical analysis was performed to detect egr-1gene expression (early gene response-1) using fluorescence staining which was observed in a microscope. The egr-1 response is related to neural activity in the brain of birds.

Collared bird response was natural and stronger for their own species song over others, but pied birds' response was opposite, and more for collared songs. In summary, collared females possess more accuracy to discriminate songs of closely related species over pied females. Pied female response is suggestive for song based discrimination at sub population level.

This study supports the usefulness of immunohistochemistry as a tool for neural analysis. In the future the study can be extended by using flycatcher birds from different areas and playing different songs to see the bigger picture.