Neural networks supporting vocalization processing and production for information seeking in New World marmosets.

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Résumé

In natural foraging environments, social auditory cues are essential for information gathering and group coordination among primates. In this work, we examine neural responses in common marmosets (*Callithrix jacchus*) to conspecific vocalization processing and map the neural circuits engaged in vocal production through separate experiments. Using a 9.4T MRI scanner, we acquired whole-brain fMRI data from awake marmosets exposed to human and macaque vocalizations, marmoset conspecific vocalizations, and non-vocal sounds. Conspecific vocalizations included four distinct call types-phee, twitter, trill, and tsik-associated with maintaining social cohesion, signaling food presence, and alerting others to potential threats. During the vocal production experiment, a microphone was used to record vocalizations inside the scanner.

Our findings reveal strong conspecific vocalization-related activity in three patches within the temporal cortex and one patch in the anterior cingulate cortex (area 32), with distinct activation patterns according to call type. Notably, tsik calls, which function in alert and food-related contexts, elicited the highest activations within these voice patches, along with other brain regions. Previous studies highlight tsik calls as initial signals in sequences that prompt group gathering at food sources. In our separate experiment on vocal production, we observe widespread brain activation involving motor, somatosensory, dorsolateral prefrontal, anterior cingulate, and auditory regions, alongside subcortical structures such as the thalamus, cerebellum, and brainstem.

These results suggest that marmoset vocal-processing networks and active vocalizations networks play a crucial role in information-seeking and adaptive responses, potentially aiding marmosets in social foraging and exploration. Future research could further investigate how these vocal pathways influence behaviors related to exploration and group coordination.

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