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Primates evolved spectrally complex calls in compensation for reduction in olfactory cognition

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Abstract

Tetrapod vertebrates evolved acoustic calling to circumvent impediments in communication media. Motor and auditory neural underpinnings of such calling are hundreds of millions of years old. More complex vocalizations, known as display, however, have since convergently evolved in many lineages. I hypothesized that music-like calling might correspond to larger sizes of neural structures corresponding to visual-spatial and motor control capacities, perhaps due to processing overlap. I tested this theory on primates by comparing relative brain component sizes to several spectrographic indexes—song complexity, reappearance diversity [ARDI], and syllable count. Visual and spatial components had moderately positive associations with vocal complexity measures. Areas associated with emotion, arousal, and motivation as well as motor control (especially of head, neck, and eyes) had even stronger associations. Olfaction, however, had negative correlations with all indexes, suggesting an evolutionary trade-off between smell and other brain components during evolution towards signals of greater acoustic complexity.