

Evolving and developing communication through coupled oscillations

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Cooperation is central to human existence and much of it is mediated through conversations. Given its central importance in everyday social interactions, it is natural to ask, “How did conversational turn-taking evolve and how does it develop?” We use marmoset monkeys to test hypotheses on the origins of vocal turn-taking. We show that marmosets, like humans, take turns during natural dyadic vocal exchanges, *i.e.* they adopt a conversational rule. Moreover, the timing of call productions between marmosets is periodically coupled, consistent with the idea that an oscillatory mechanism (as opposed to more cognitive mechanisms) is responsible for the dynamics of vocal exchanges. To explore this idea, we first built a dynamic system model that was tuned to the vocal output of a single monkey producing vocalizations in isolation. The structure of the model was based on the known anatomical and physiological literature of vocal and self-monitoring behavior. Then, without any further tweaking, we simply paired two models together. Doing so accurately recapitulated turn-taking dynamics nearly identical to that seen in natural adult marmoset vocal exchanges. Finally, based on evidence that self-monitoring in speech production changes with development in humans, we used the model to generate predictions about the development of self-monitoring and its role in vocal exchanges. We then tested real marmosets and show that, as the model predicted, infant marmosets refine their turn-taking behavior in the first two months of life. Together, our data provide insights into the evolution and development of one type of cooperative behavior: turn-taking.