

**Modeling gestural coordination  
in infant-caregiver dyads in the earliest stages of phonological acquisition**

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Coordination of articulatory gestures between individuals engaging in vocal exchange underlies a rich set of speech perception and production phenomena, including vocal imitation and vocal learning, both of which are exhibited across the life span, ranging from adults who are already proficient with spoken language to very young infants who are faced with acquiring this proficiency. In this talk, we focus attention on the highly specialized case of gestural coordination that takes place between these two groups, i.e., infants and their adult caregivers, during the earliest stages of an infant's acquisition of phonology, by putting forward a computational modeling architecture inspired by recent advances in the experimental literature investigating the nature of infant-caregiver vocal exchanges. We begin by reviewing several approaches to the characterization of gesture and gestural coordination between individuals that have taken shape since the 1940s, and how they have been applied to the case of infant-caregiver vocal exchange. Although these approaches have yielded substantial progress over the decades, we argue that they have serious shortcomings in light of results that are emerging from the experimental literature in two key areas: (i) the nature of the social relations between infants and their caregivers and how infants represent these relations cognitively, and (ii) the nature of the development of an infant's socio-cognitive representation of the self, which includes the development of sensorimotor representations that serves as the basis for more abstract representations of the self and crucially, of the infant's caregivers. We proffer a conceptualization of gestural coordination in infant-caregiver dyads during the earliest stages of phonological acquisition that takes this set of results as a point of departure. We then present a corresponding computational modeling architecture with two key modules, the first of which focuses on a specialized set of social and acoustic data that infants receive during vocal exchanges with their caregivers. The second module focuses on the internal computations carried out by infants in generating sensorimotor relations, and abstractions over them, in creating models of the self, along with models of their caregivers, using the internalized social and acoustic data derived from exchanges with their caregivers. The principle computation is the alignment of these constructed models, which brings about a kind of socio-cognitive convergence between infants and caregivers that has long been thought to play a role in phonological acquisition, but has been outside of the scope of most models. We conclude with a discussion of potential expansions of the modeling architecture and its implications for the study of early phonological acquisition.