

## A Developmental Origin of the Mirror Neuron System

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Where does the mirror neuron system come from? How does human acquire the correspondence between self and others? Though various aspects of the mirror neuron system have been discovered in the last two decades, its developmental origin has rarely been studied.

We investigate the role of perceptual development in the emergence of the mirror neuron system. Our hypothesis is that immature perception in early infancy enables infants to acquire the correspondence between self and others. Through motor babbling, infants learn the association between motor repertoires and movement observed, for example, in vision. Immature vision, which has a lower acuity in terms of time and space, makes it difficult to detect differences between self-produced motion and motion produced by others (e.g., different body location and temporal delay in others' motion). Such non-differentiated movement is associated with the corresponding motor repertoire, which results in the mirror neuron system in the later stage of development.

We examined our hypothesis from a computation point of view. We designed a robotic model to learn the sensorimotor association through visual development. Our experiment verified that visual development plays a crucial role in the acquisition of the mirror neuron system. Only the robot equipped with the mechanism of visual development obtained the self-other correspondence while the robot without visual development did not obtain it.