

From imitation to meaning: circuit plasticity and the acquisition of a conventionalized semantics

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Abstract

The capacity for language is arguably the most remarkable innovation of the human brain. A relatively recent interpretation prescribes that part of the language-related circuits were co-opted from circuitry involved in hand control—the mirror neuron system (MNS), involved both in the perception and in the execution of voluntary grasping actions. A less radical view is that in early humans, communication was opportunistic and multimodal, using signs, vocalizations or whatever means available to transmit social information. However, one point that is not yet clear under either perspective is how learned communication acquired a semantic property thereby allowing us to name objects and eventually describe our surrounding environment. Here we suggest a scenario involving both manual gestures and learned vocalizations that led to the development of a primitive form of conventionalized reference. This proposal is based on comparative

evidence gathered from other species and on neurolinguistic evidence in humans, which points to a crucial role for vocal learning in the early development of language. Firstly, the capacity to direct the attention of others to a common object may have been crucial for developing a consensual referential system. Pointing, which is a ritualized grasping gesture, may have been crucial to this end. Vocalizations also served to generate joint attention among conversants, especially when combined with gaze direction. Another contributing element was the development of pantomimic actions resembling events or animals. In conjunction with this mimicry, the development of plastic neural circuits that support complex, learned vocalizations was probably a significant factor in the evolution of conventionalized semantics in our species. Thus, vocal imitations of sounds, as in onomatopoeias (words whose sound resembles their meaning), are possibly supported by mirror system circuits, and may have been relevant in the acquisition of early meanings.

Keywords: imitation, language, circuit plasticity, onomatopoeia, pantomime, semantics