
The biology of face-to-face communication: Action understanding and language

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An important source of information for language comprehension comes from the perception of action, including the movements of the mouth and hands. The neural interactions involved in processing this information involve the premotor cortex, the inferior parietal lobule, and the superior temporal gyrus. These regions and the neural connections among them comprise a human system for observation-execution matching that appears to have a phylogenetic basis in the “mirror neuron” system of the macaque. It appears that this system operates in part by covert simulation of perceived action. In this talk, we present data from several studies of audiovisual language comprehension that support this thesis. First we discuss the role of action understanding in speech perception, and show how it aids phonological disambiguation across environmental and contextual variation, and that the motor cortex plays a fundamental role in the process. We also show evidence for the existence of abstract neural codes for speech percepts that are independent of their auditory or visual components. In the second part of the talk, we discuss the role of action understanding in higher order language comprehension, which occurs through observation of manual gesture. Here we will show that some hand movements have semiotic meaning on their own, and are encoded in the brain very much like language; that other hand movements have meaning by virtue of their interaction with accompanying speech; and that these two types of linguistically relevant hand movements differ from similar hand movements that do not have the same relationship to language. We conclude that the process of understanding language involves multimodal sensory processing, motor simulation, and processing of derived abstract representations, which collectively form a distributed circuit encoding comprehension.