Sensorimotor interactions in speech perception

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Over the past 50 years, researchers in speech perception have focused on the mapping between properties of the acoustic signal and the phonetic information it conveys. This mapping has turned out to be quite complex, because of the non-linear and non bi-univocal characteristics of the relations between acoustic events and phonetic features. Yet, a complete explanation of how humans perceive speech sounds remains at this time elusive. While pure perceptual auditory mechanisms have been proposed to explain speech perception, several theories assume that the objects of speech perception are the speaker's articulatory gestures rather than acoustic or auditory events. Because the speaker and the listener share a common repertoire of motor primitives, speech perception is thought as relying on the recovery of motor commands at the origin of the acoustic signal. This proposal has recently gained support from studies on mirror neurons in the macaque and on a putative mirror-neuron system in humans, showing that action observation and listening to action-related sounds partly involve the same neural circuits that are used in action performance. Compliant with the fact that brain areas involved in the planning and execution of speech gestures have been repeatedly found to be activated in speech perception, the human mirror-neuron system has been proposed to play a fundamental role in speech processing by providing a neurophysiological mechanism that creates a parity between the speaker and the listener. However, the question whether the motor system might mediate speech perception through the internal generation of candidate articulatory categorizations remains debated. Furthermore, recent studies also suggest that feedback projections from the motor system interacts with auditory representations and, therefore, that speech understanding is not simply determined through a unidirectional mapping between sensory inputs and motor representations. From these results, it will be argued that speech perception is neither purely sensory nor motor, but rather a sensorimotor process.