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Shared mechanisms for speech and gesture recognition? (CRP 01-JA15)

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Abstract:

Does a mirror system exist for phonetic gestures recognition?

According to the motor theory of speech perception, speech is perceived by matching articulatory gestures, embedded in listened words, on the listener's motor repertoire. Speech perception and production therefore use a common repertoire of motor primitives represented in the brain as invariant motor commands. More recently the motor theory of speech perception has been indirectly supported by a series of neurophysiological data. In the ventral premotor cortex of the monkey (area F5) there are neurons that discharge both when the monkey performs a specific hand action and when it observes an individual making a similar action (mirror neurons). Brain imaging studies and electrophysiological investigations of motor cortex excitability showed that also in humans the observation of motor actions activates the motor circuits involved in the generation of the seen movements. Among active areas, the presence of Broca's region suggests a possible evolutionary pathway linking hand action related mirror system to the birth of spoken language. The homology between this newly discovered visuo-motor mechanism and the acoustic/motor matching postulated by the motor theory of speech perception is obvious. The present project is aiming to investigate if during speech listening there are involved listener's motor representation in a fashion similar to that showed by monkey mirror neurons during action observation. This project involves the use of transcranial magnetic stimulation (TMS) in normal human subjects and starts from some preliminary observations achieved in our laboratory: subjects listening to various verbal and non verbal stimuli show a specific facilitation of the cortical system controlling tongue movements (detected by TMS of tongue motor cortex) only when the listened stimuli are verbal stimuli and contain consonants which would mobilize the tongue when pronounced. The current study is aiming to elucidate the mechanisms at the basis of this "acoustic-motor" mirror system and will investigate its possible role in speech perception.