Brain Signatures of Communication (BraiSiCo) project

Neural correlates of speech act processing in gestural context

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The brain mechanisms underlying the main function of language, namely how words and sentences are used as a tool of communication, remains largely unknown. Researchers in child language development have pointed out that communicative functions, defined by pragmatic theories as speech acts (Austin, 1975; Searle, 1979), emerge already in the first year of life as pre-linguistic gestures, forming the basis of human language communication (Bates, 1976). Two types of gestures predominate children's early communicative repertoire - the pointing gesture for directing attention to an object and the give-me gesture for requesting a desired object (Bates et al., 1975; Tomasello, 2003). As caregivers react to these gestures with looking at, or handing over relevant objects, these gestures are gradually conventionalized as tools of communication, thus serving as 'proto-speech acts' (Kelly, 2006). Even after children start to produce single words, these gestures are often combined with holophrases forming a sentence-like meaning ["cup" + point at a cup] to communicate more complex ideas (Butcher, 2000; Kelly, 2006). Exploring the neural correlates behind communicative intentions expressed through linguistic structures and gestures are essential to better understand the unique human capacity of social-communicative interactions and his evolution.

The first planned experiment of the BraiSiCo project takes advantage of this interplay between language and gestures, by presenting the same words in context of, and simultaneously with, gestures providing the information about the illocutionary roles of the speech acts, whereas the utterances themselves provide referential information. Photographs of pointing and give-me gestures will index naming and requesting speech acts. Exactly simultaneous with the depicted gesture, single written words will be presented on a screen. Words will be from two different semantic types, referring either to animals or tools. Behavioural and neuroimaging techniques, including EEG, MEG, and fMRI will be used to address the neurocognitive correlates of speech acts manifested in the human brain. The observed time courses and loci of brain activation will be used, along with behavioural results, to validate theory-driven predictions and, eventually, to draw careful conclusions on the linguistic-pragmatic and neurocognitive mechanisms of speech act processing. Further experiments of the BraiSico project will be looking into different speech acts systematically in different modalities from comprehension to production and from single-person studies to multi-person recordings taking into account turn taking and common ground.

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