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The use of semantic and pragmatic knowledge in sentence comprehension: a Transcranial Direct Current Stimulation study

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Abstract

The current study attempts to shed light on whether the brain substrate of pragmatic knowledge is dissociated from semantic knowledge during sentence comprehension. Findings from previous studies are not consistent. The aim of the current study is to examine whether there is a dissociation between pragmatic and semantic comprehension, focusing on the role of Wernicke's area in the pragmatic and semantic processing of sentences.

To address this issue, responses to pragmatically and semantically violated sentences ("violation paradigm") were measured. The study included a behavioral experiment and a brain stimulation experiment using tDCS. In the behavioral experiment 30 participants aged 20-50 listened to sentences with no violations and to pragmatically or semantically violated sentences. The participants had to indicate per each sentence whether it describes a reasonable situation or not. The stimulation experiment included 26 participants aged 38-55, divided into two groups based on the stimulation polarity. The participants of the first group received a bilateral stimulation in which the anode was applied over the left STG (Wernicke's area) and the cathode over the right homologue region. The second groups received also a bilateral stimulation with the opposite polarity. The participants from both groups conducted the task of the behavioral experiment in three conditions – no stimulation at all, after active stimulation, after placebo stimulation (sham).

The results of the behavioral experiment showed faster response times and reduced accuracy for the pragmatic violations compared to the semantic violations. An improvement in response times as a result of stimulation was found only for bilateral stimulation when the anode was applied over Wernicke's area with faster response times for pragmatic violations than sham stimulation. These findings suggest a dissociation between pragmatic and semantic comprehension, which is expressed by Wernicke's area having a unique role in the processing of pragmatic violations, but not of semantic violations. These findings suggests that the way in which pragmatic knowledge is retrieved during sentence comprehension is different from the way that the semantic

knowledge is retrieved, indicating that probably each knowledge type is stored in a different brain's region with pragmatic knowledge stored in Wernicke's area.