

Electrophysiological aspects of covert single verb reading in stuttering

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Introduction

The aim of the present study is to evaluate the sequence of brain activation during linguistic processing without overt speech motor responses in adults who stutter (AWS). During language perception activation spreads from the temporal cortex for semantic processing towards the inferior frontal and premotor areas. In AWS both structural and functional abnormalities have been shown in the left inferior frontal cortex (IFG).

The inferior frontal cortex also contains mirror neurons. These visuo-motor neurons are activated during both the execution and the perception of an act and also when a verb, which expresses an act, is presented. They are suggested to play an important role in the ameliorative effect of choral speech on stuttering.

Method

For this study, electroencephalography (EEG) and event-related potentials were used in order to examine the temporal aspects of linguistic processing. 20 right-handed male and 8 right-handed female stuttering persons participated in this study. An equal number of healthy, fluent speaking control persons matched for age, gender and education were included. A reading task, consisting of 50 arm-related action verbs and 50 non-action verbs in random order, was presented to all participants, and EEG was simultaneously registered. Participants were required to read the verbs silently. ERP analyses and source localization techniques were applied to the data.

Results

Our initial results showed an ERP around 150 ms after verb presentation over midline areas with a slight left-sided preference in adults who are normally fluent (AWNf). In the AWS group only a small number of participants showed an ERP. It occurred around the same time (150 ms) over midline areas with a slight right-sided preference.

Discussion

Atypical cerebral lateralization has been reported extensively in AWS during both speech production and perception, and in tasks ranging from simple phonological to complex sentence processing. Recently increasing evidence is found to support the hypothesis that right hemisphere overactivation is merely a compensation for a structural deficit in left IFG and not the cause of stuttering. Furthermore, the majority of AWS display no ERP. In conclusion, it seems that even in the absence of overt speech, abnormalities in linguistic processes occur in AWS.