Investigating the temporality of gesture/speech integration with transcranial magnetic stimulation: Building of a study

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Introduction

Gesture/speech integration (GSI) has been increasingly studied over the past few years. On the one hand, co-speech iconic gestures entertain a semantic relationship with the utterance they accompany. Several studies have shown improvement in reaction times when presenting matching iconic gestures and verbal utterance. On the other hand, these gestures entertain a particular temporal relationship with the accompanying utterance, temporal synchrony being essential for a successful integration of the presented information.

Previous behavioural and electrophysiological studies have shown the importance of temporal synchrony, but they do not allow a precise determination of the temporality of the cerebral neural processes.

Aim of the study

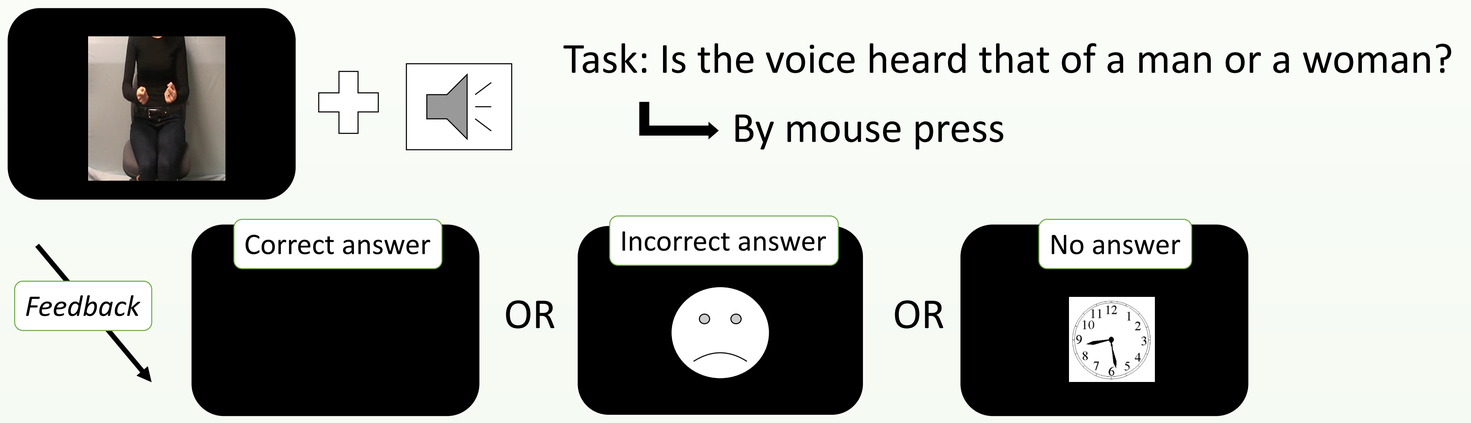
Determine gesture/speech integration temporality in brain regions that have been shown to be implicated in this integration.

Methodology

Participants

- Healthy participants
- Aged between 18-38 y/o
- Must complete a medical screening questionnaire (no personal of familial history of epilepsy)
- Absence of visual or hearing impairments
- Absence of neurological and/or psychiatric conditions

Behavioural task: Gender classification task



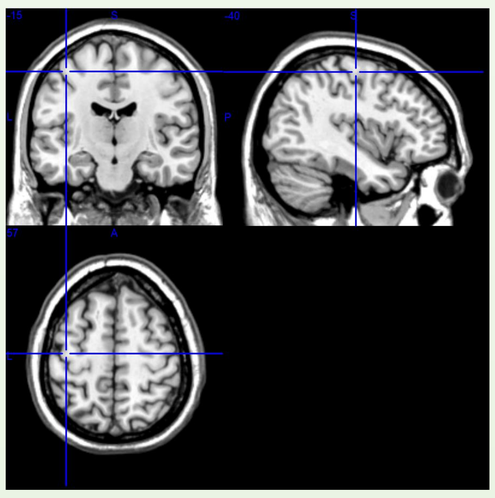
- Implicit behavioural measure of gesture/speech integration: faster to correctly classify the voices when the presented gesture matches the heard word

Transcranial magnetic stimulation (TMS)

- Online single pulse TMS during Gender classification task at -200, -120, 0, +120 and +200ms of stimulus presentation

Threshold determination

Single pulses on left primary cortex

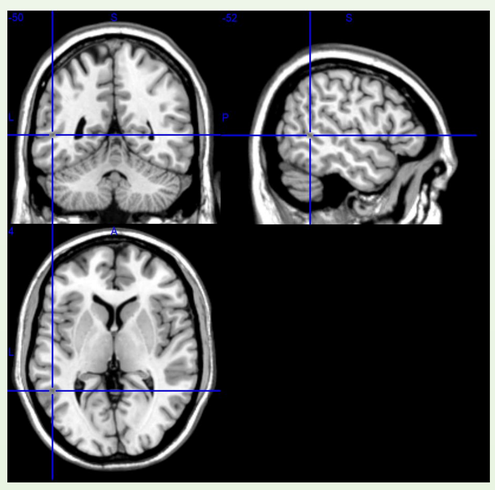


MNI coordinates : -40X, -15Y, 67Z
(Maegjerman et al., 2019)

Experimental phase

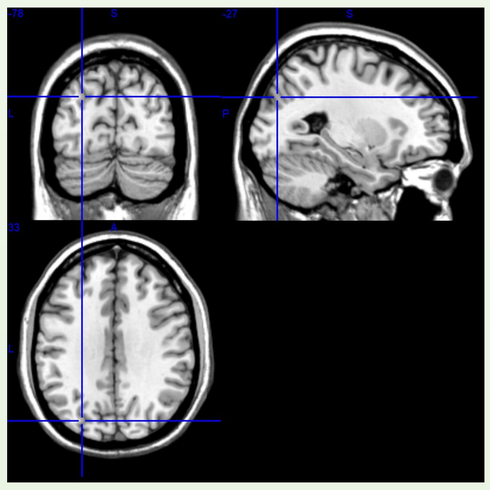
Key areas previously shown to be involved in gesture/speech integration

Left posterior superior temporal sulcus



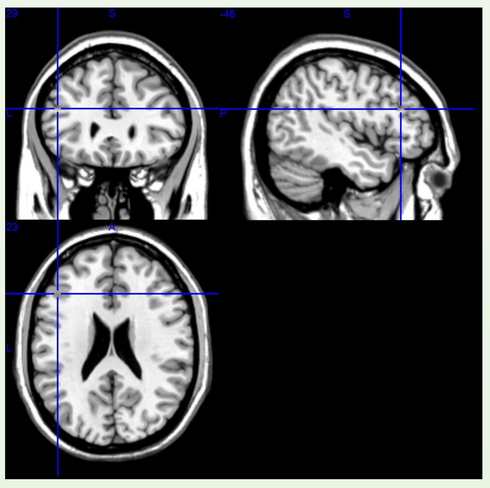
Activation in this zone probably reflects the interaction between context and retrieval of lexical-semantic information
MNI coordinates : -52X, -50Y, 4Z)
(Willems et al., 2007)

Left inferior parietal lobule



Region presumed to be linked with the increase in spatial attention
MNI coordinates : - 27X, -78Y, 33Z
(Holle et al., 2008)

Left anterior inferior frontal gyrus



Gesture/speech integration zone thought to be a general unification site for language comprehension
MNI coordinates : -46X, 29Y, 23Z
(Willems, et al., 2007)

Expectations

We expect to see a variation in performances related to the timing of TMS stimulation, allowing us to gain more knowledge on the timing of neural processes while they take place.

Bibliography

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