

Contribution of Primary Somatosensory Cortex to Speech Perception

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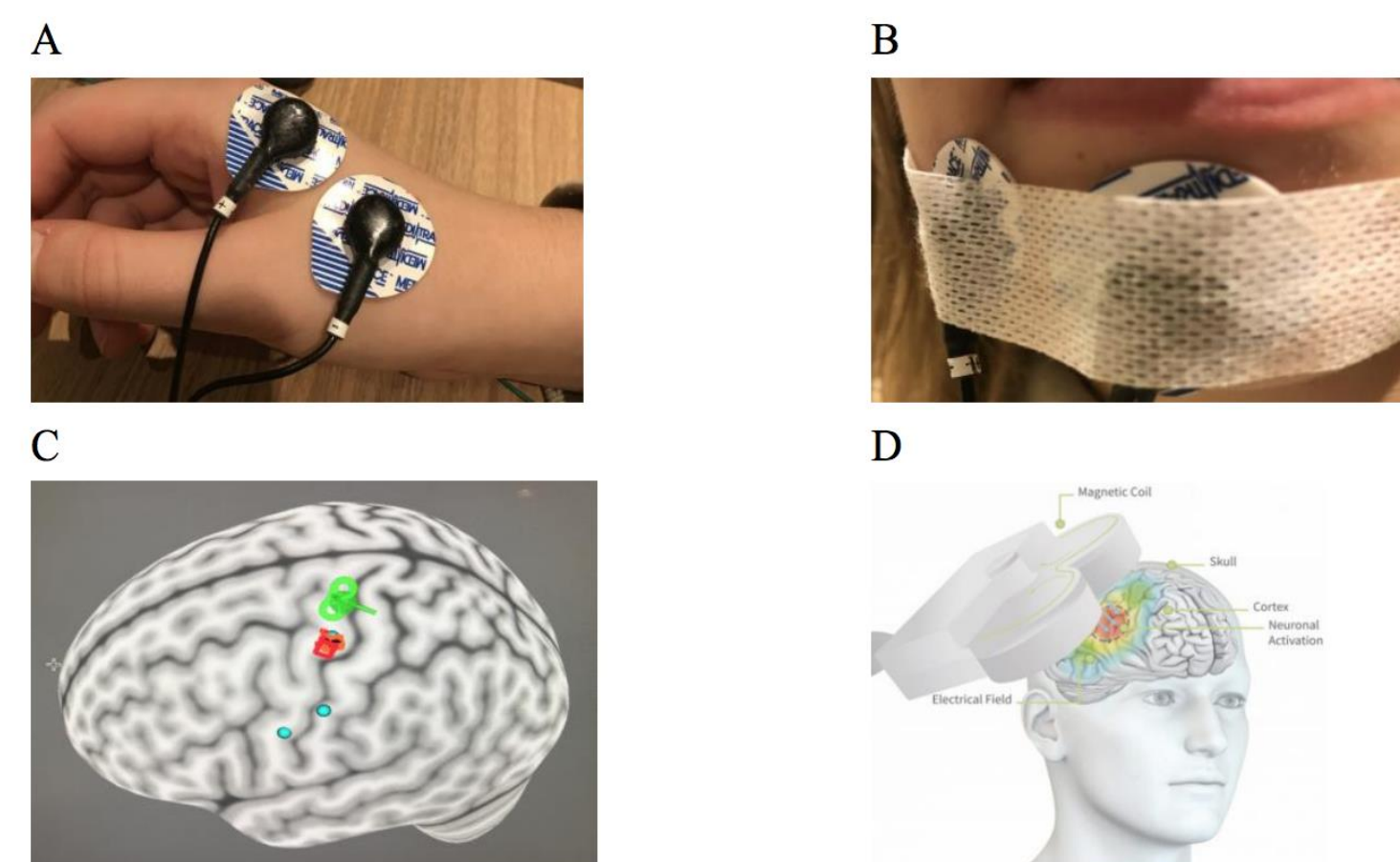
Background

- Speech perception relies on the auditory cortex.
- Many studies suggest that motor systems that control speech production play a role in speech perception.
- As the technology advances, several studies have used transcranial magnetic stimulation (TMS) to investigate the involvement of the motor cortex in speech perception.
- Meister's study successfully applied low-frequency repetitive TMS over the premotor cortex, induced a temporary disruption over the area, and impaired subjects' ability to identify sounds presented in noise.
- However, none of the previous studies investigated the involvement of the primary somatosensory cortex (S1) in speech perception through TMS.

Research Goal

- We aim to use repetitive transcranial magnetic stimulation (rTMS) to temporarily disrupt the lip area of the left primary somatosensory cortex and present experimental subjects with speech perception tasks in order to see whether the alteration of speech perception could be observed.

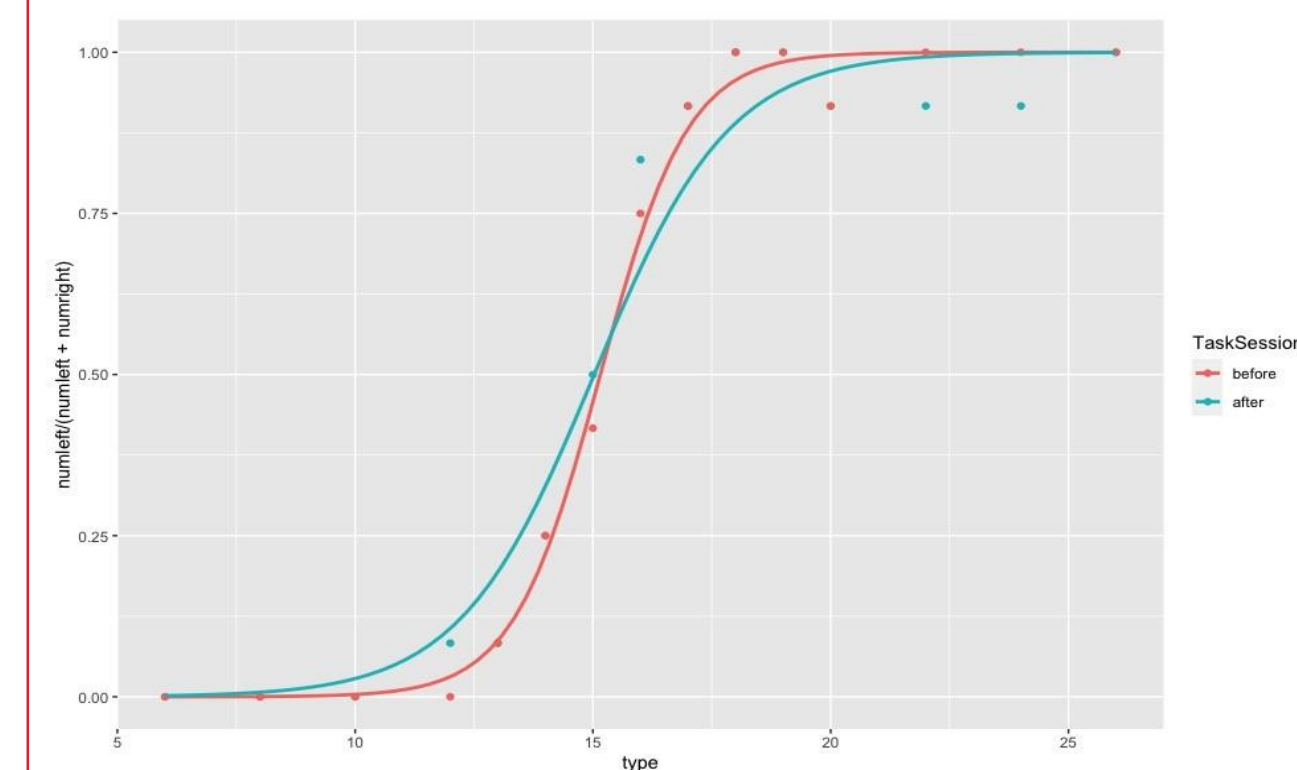
Methods



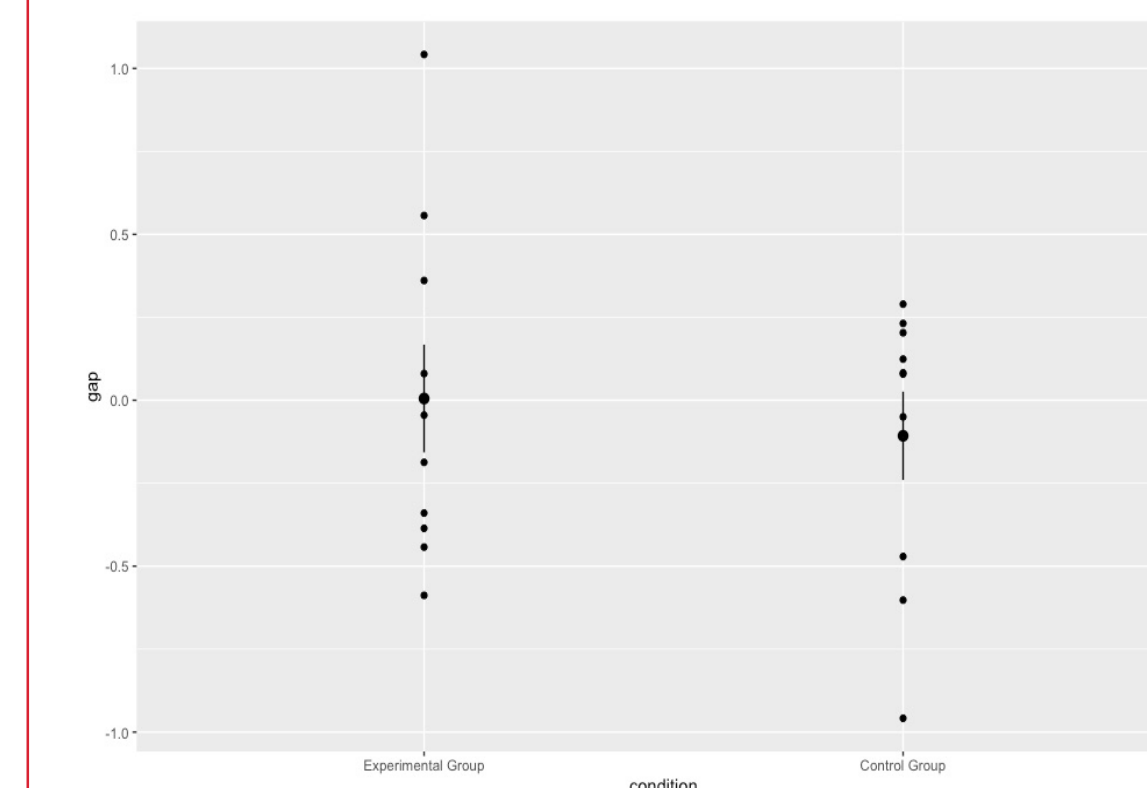
- Photo D is by Brainclinics

- Experimental and Control groups (N = 20)
- Auditory Stimuli: The stimulus continuum from "Sell" to "Shell" was generated by the computer.
- The first speech perception test: the subject was presented with one of the twelve words, selected in random order. The task was to identify whether the word was "Sell" or "Shell".
- TMS stimulation and recording: Single-pulse TMS was used to evoke MEPs from the bottom lip muscle (Experimental group) or the right-hand muscle (Control group).
- rTMS suppression: Bursts consisted of 3 stimuli applied at intervals of 33.3 ms (30 Hz), with bursts repeated at 167 ms intervals (6 Hz).
- The second same speech perception test.

Results



- This figure shows the logistic curve of the speech tests of pre-rTMS and post-rTMS for a single subject TMS007.



- This is the overall data so far. The figure shows that the change of speech perception sensitivity after the rTMS suppression in the experimental group is not significantly different from the control group. Error bars give the standard error across subjects.

Discussion

- We are still collecting the data and aim to investigate the involvement of primary somatosensory cortex in speech perception.
- That would suggest the somatosensory cortex integrated with auditory and motor regions provides humans with richer and more precise speech perception.

References

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