Reactivity changes in the occipital cortex of blind subjects revealed by the combination of transcranial magnetic stimulation and electroencephalography

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INTRODUCTION

In individuals who lack sight, especially since birth, the visual cortex can be activated by various external inputs, spanning from different modalities and across cognitive tasks. While this functional adaptation (i.e., crossmodal plasticity) has been thoughtfully investigated[1], the electrophysiological changes of blind subjects' occipital cortex remain unclear.

AIM

To investigate the reactivity profile of the occipital cortex after loss of sight by measuring the electroencephalographic (EEG) responses to transcranial magnetic stimulation (TMS) in blind and sighted subjects.

METHODS

SUBJECTS

- 9 Blind subjects (1 congenital)
- 10 Sighted subjects

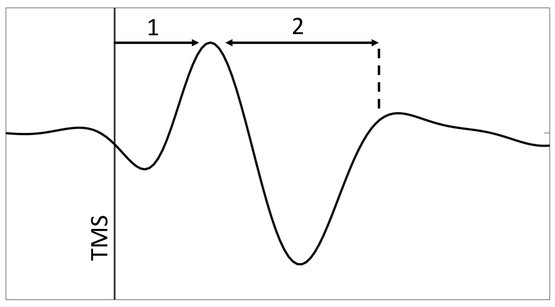
TMS TARGETS

- Left Occipital (BA19-target site)
- Left Premotor (BA6-control site)

EQUIPMENT

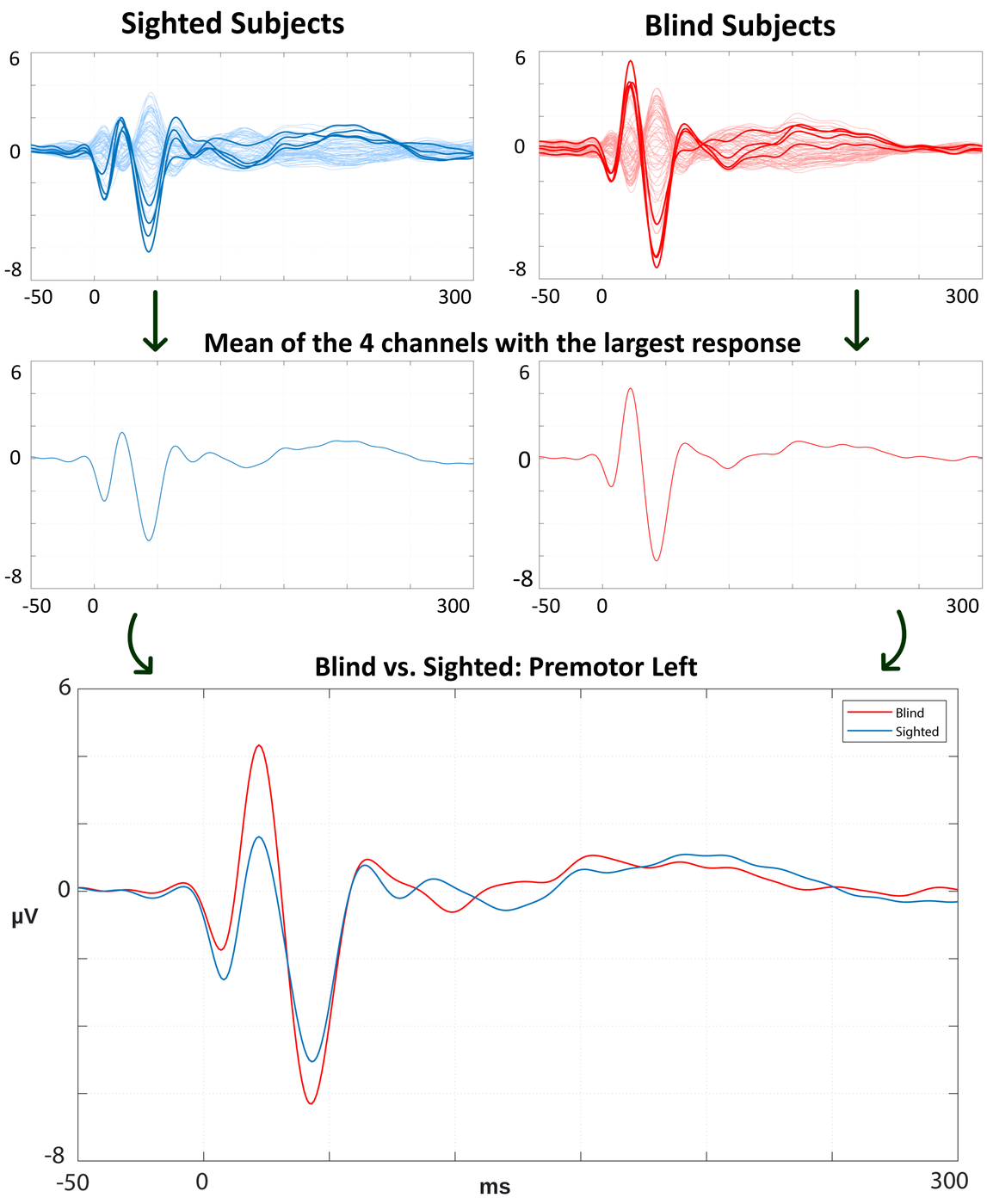
- 64ch EEG Amplifier (BrainAmp)
- Neuronavigated TMS system (Nexstim)

MEASUREMENTS

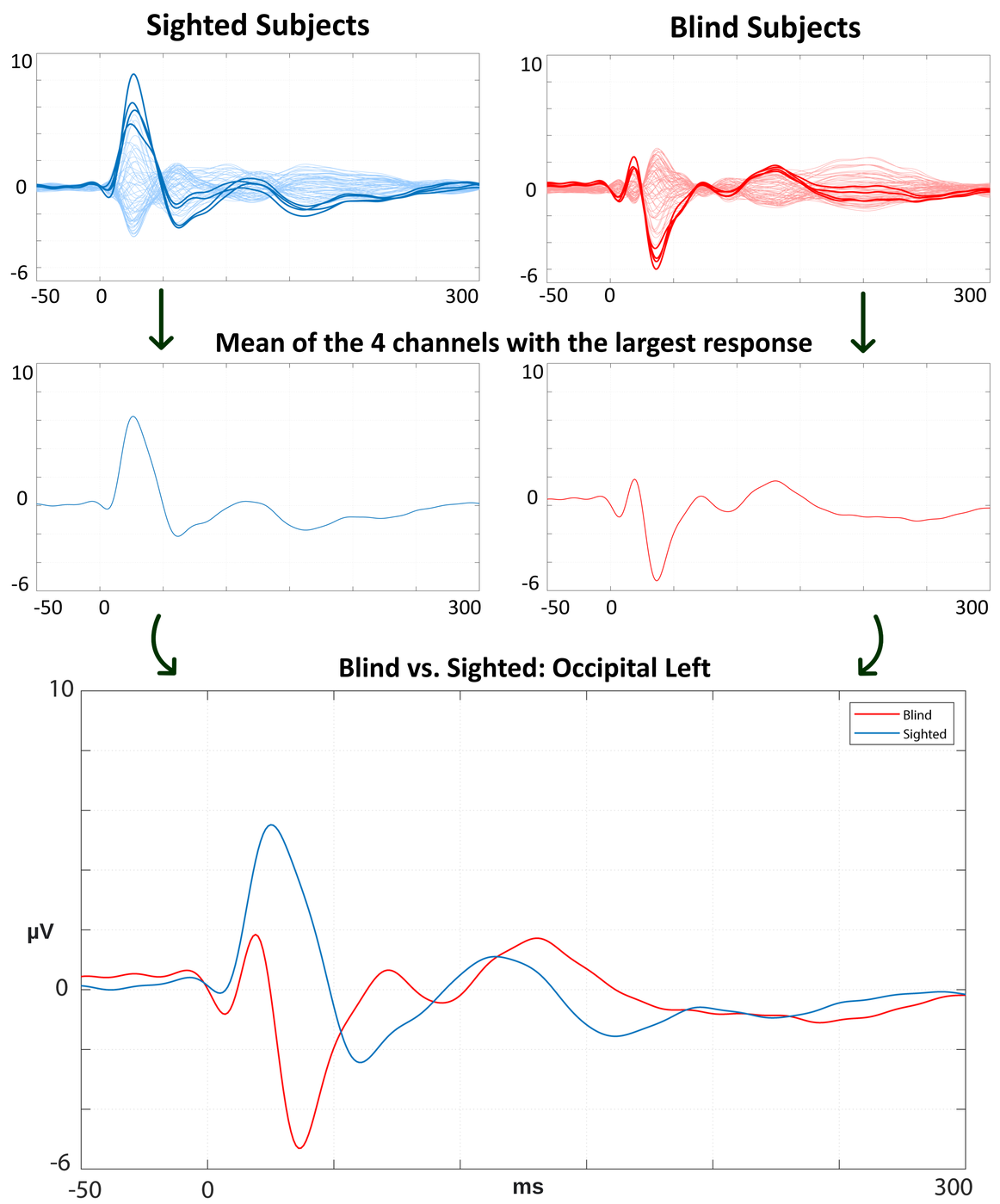


[1]**Start time =** latency of the first positive peak after the stimulation.
[2]**InterPeak time =** time lag between the first two positive peaks evoked by TMS.

PREMOTOR CORTEX

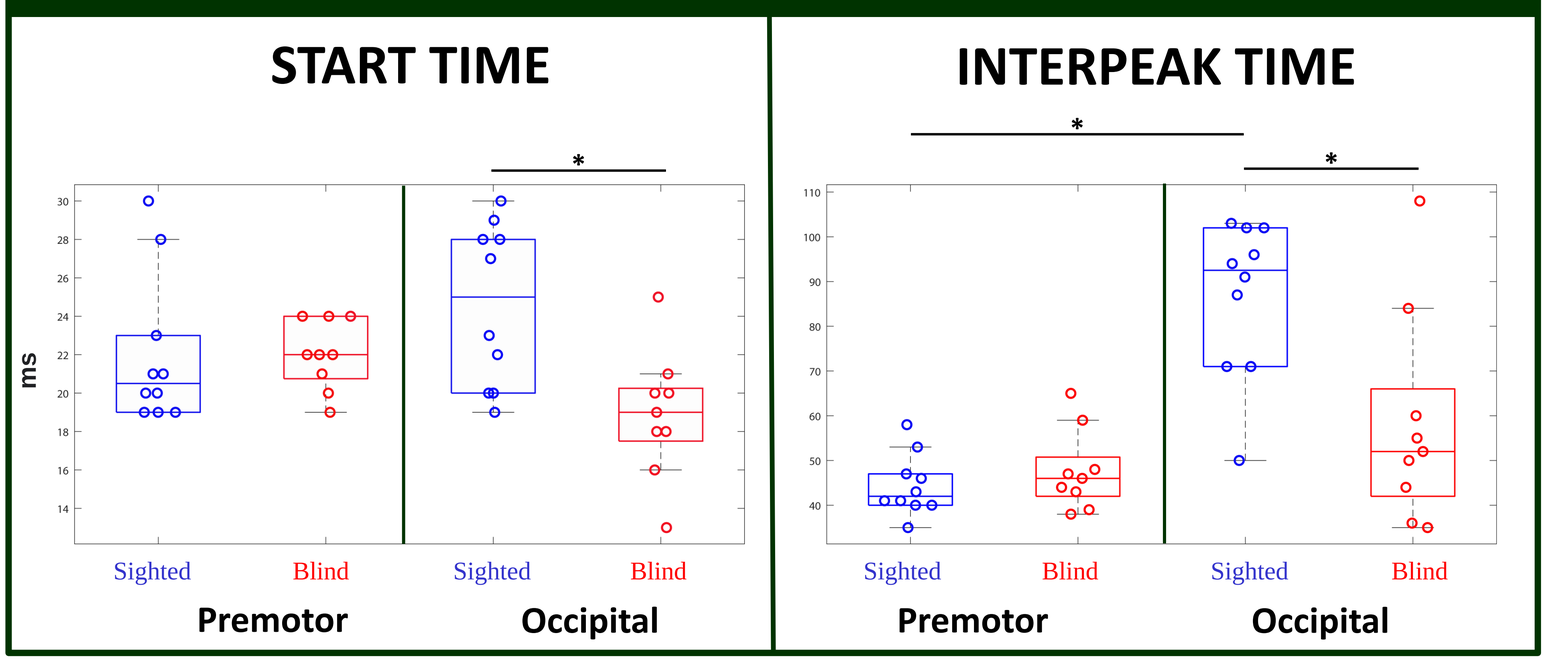


OCCIPITAL CORTEX



Grand average TMS-evoked potentials (TEPs) recorded in **Blind** and **Sighted** subjects by stimulating the left premotor cortex (Left Panel) and the left occipital cortex (Right Panel). Grand average TEPs were averaged across the four EEG channels showing the largest response in the first 50ms after the stimulation.

RESULTS: DIFFERENCES IN START AND INTERPEAK TIMES



CONCLUSIONS

- TMS-EEG uniquely allows for a direct investigation of the electrophysiological features of the occipital cortex in blind subjects.
- Both *Start* and *InterPeak* times are **shorter in blind** than sighted subjects when targeting the occipital cortex.
- Occipital TEPs displayed significantly **longer** *InterPeak* time than premotor TEPs in sighted but not in blind subjects.
- Occipital TEPs in blind subjects resembles the ones observed by stimulating more anterior cortices, suggesting a significant functional reorganization of this area.

REFERENCES

[1]Voss P. (2019). Brain (re)organization following visual loss. *Wiley interdisciplinary reviews. Cognitive science*, *10*(1), e1468. https://doi.org/10.1002/wcs.1468.

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