

Bilateral TMS demonstrates a functional interaction between the left and right pSTS during expression processing

Ryan Elson¹, David Pitcher², Magdalena Sliwinska³

¹ University of Nottingham, ² University of York, ³ Liverpool John Moores University

Background:

Both the left (lpSTS) and right (rpSTS) posterior superior temporal sulci have been shown to be causally involved in facial expression recognition using TMS (Sliwinska and Pitcher, 2018).

Aim:

We used bilateral TMS to assess whether the lpSTS and rpSTS functionally interact during expression recognition.

Participants:

Twenty (6 male, 14 female) 19-25 year-olds took part in the study.

fMRI localiser (see figure 1):

The face-responsive bilateral pSTS and object-responsive right lateral-occipital complex (rLO) were identified using videos of faces and objects.

TMS Study (see figures 1 and 2):

2 TMS sessions, each involving 3 runs of a 1-back expression matching task.

In both sessions rTMS (at 10Hz for 500ms) was applied to either the rpSTS (experimental site), rLO (control site) or no rTMS was applied (behavioural control).

In session 2 cTBSmod (30Hz for 33.3 sec) was also applied to the lpSTS immediately prior to the task. The order of sessions and runs was counterbalanced.

Figure 1

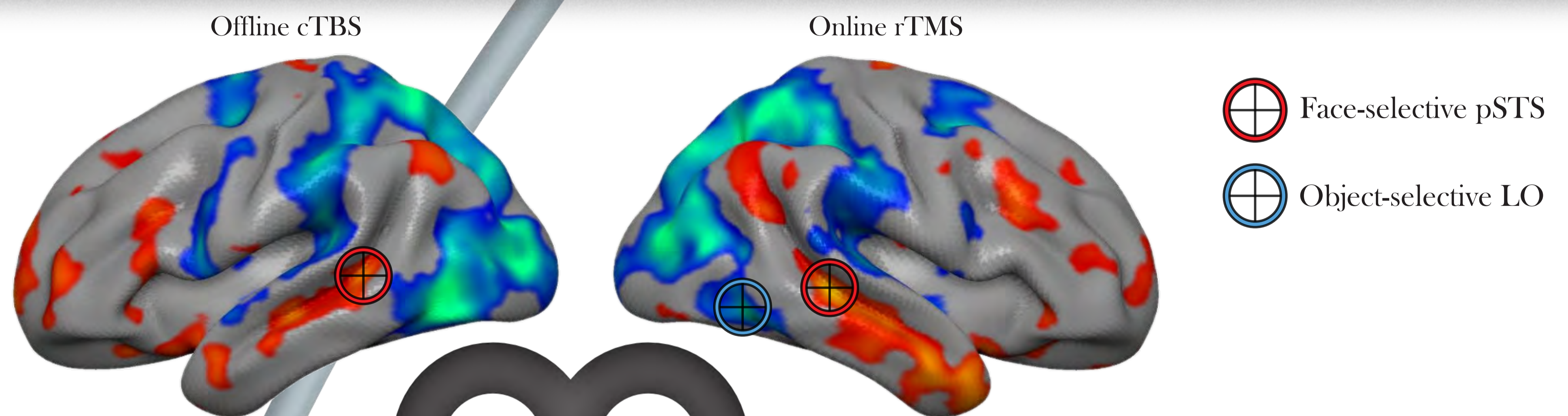


Figure 2

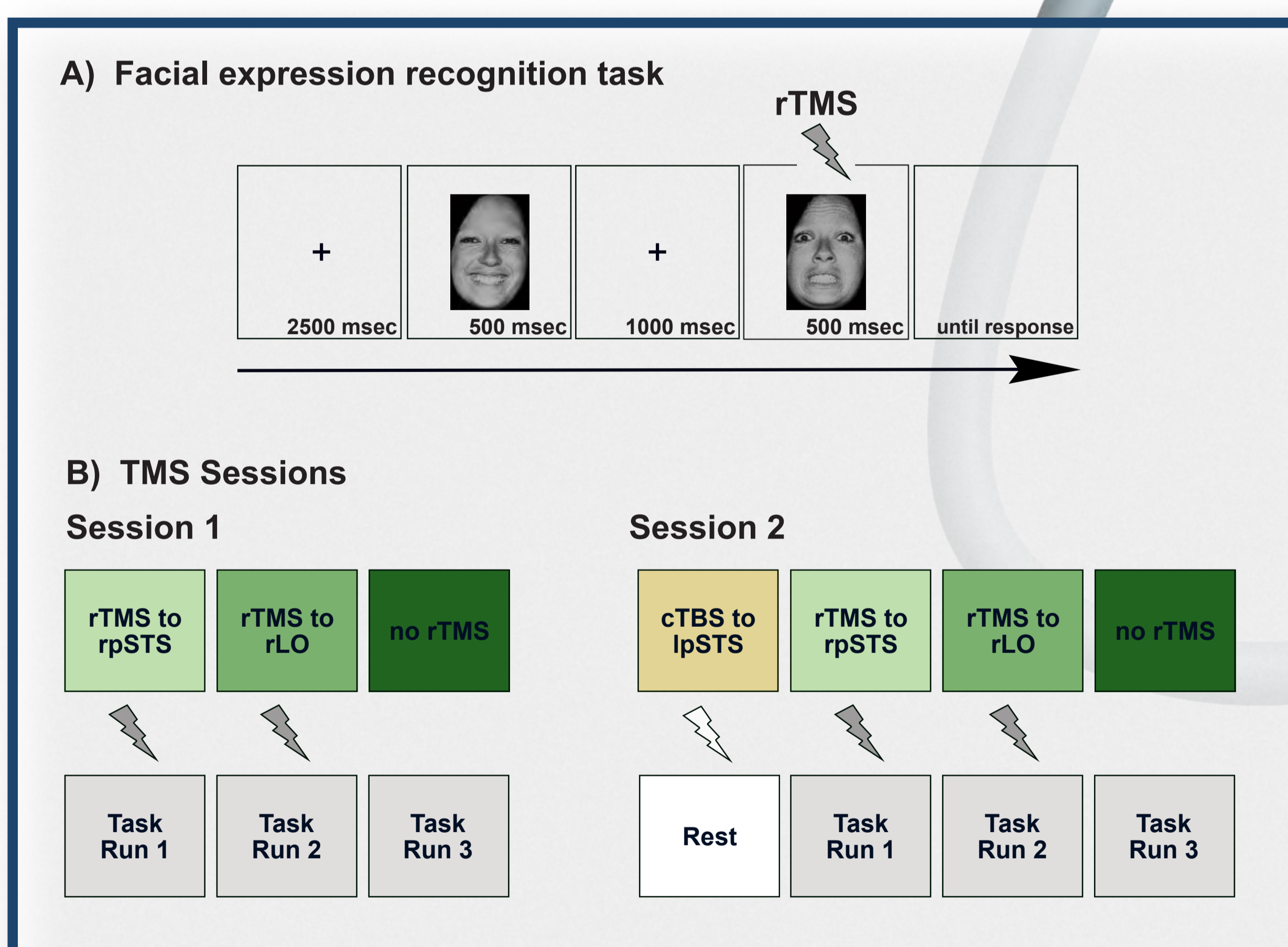
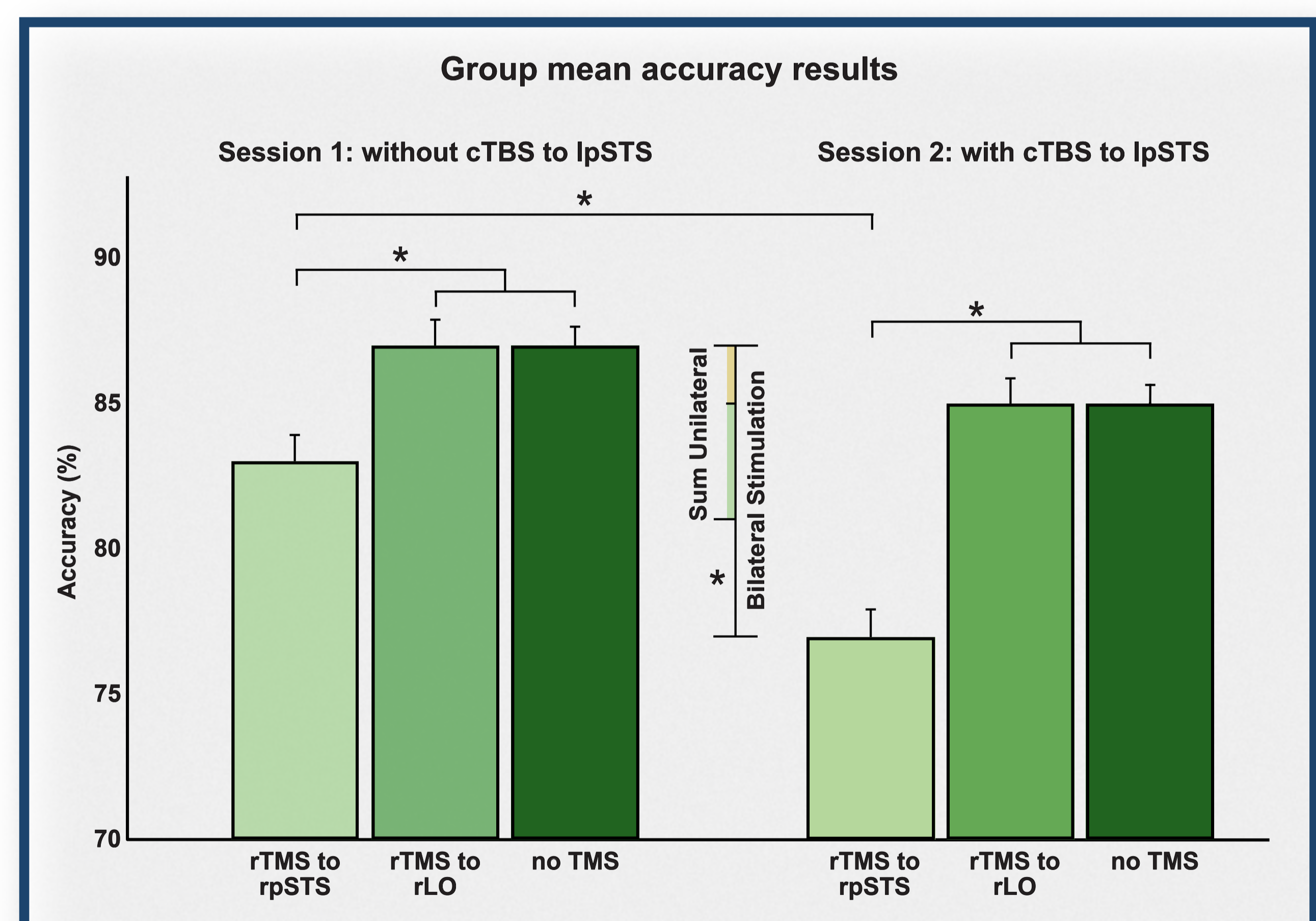


Figure 3



Results (see figure 3):

The bilateral pSTS and rLO were found in all participants.

Accuracy data showed significant main effect of stimulation, with expression matching deficits caused by applying rTMS to the rpSTS but not rLO compared to the no rTMS conditions.

There was also a significant effect of session and interaction between stimulation site and session, with the application of cTBS to the lpSTS causing an enhanced effect of stimulating the rpSTS with rTMS.

The effect of bilateral stimulation on expression matching performance was significantly greater than the sum of the effects of unilateral stimulation.

References:

Sliwinska, M., and Pitcher, D. (2018) TMS demonstrates that both right and left superior temporal sulci are important for facial expression recognition. *NeuroImage* 183 394-400.

This research was funded by the BBSRC and conducted at York Neuroimaging Centre.

Discussion:

The effect of bilateral stimulation supports the role of both the left and right pSTS in expression processing.

More notably, the supra-additive effect of bilateral stimulation suggests a functional interaction between the left and right pSTS during expression processing.

This supra-additive effect raises the possibility that the right pSTS might be able to compensate for a disruption in function in the left, but further investigation using fMRI or fNIRS would be needed to support this.

The results suggest that cognitive functions that are seemingly lateralised in neuroimaging studies may still rely on interactions between hemispheres for optimal performance.

