

The role of bottom-up and top-down processes in the activation of orthographic, phonological and semantic representations during reading

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Introduction

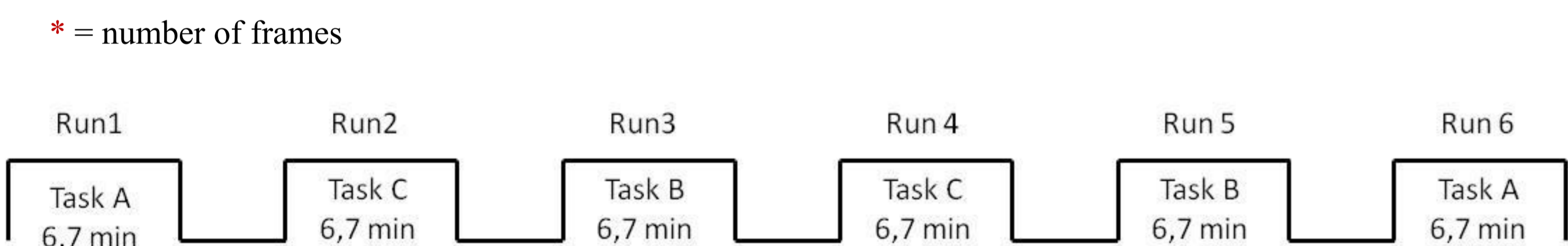
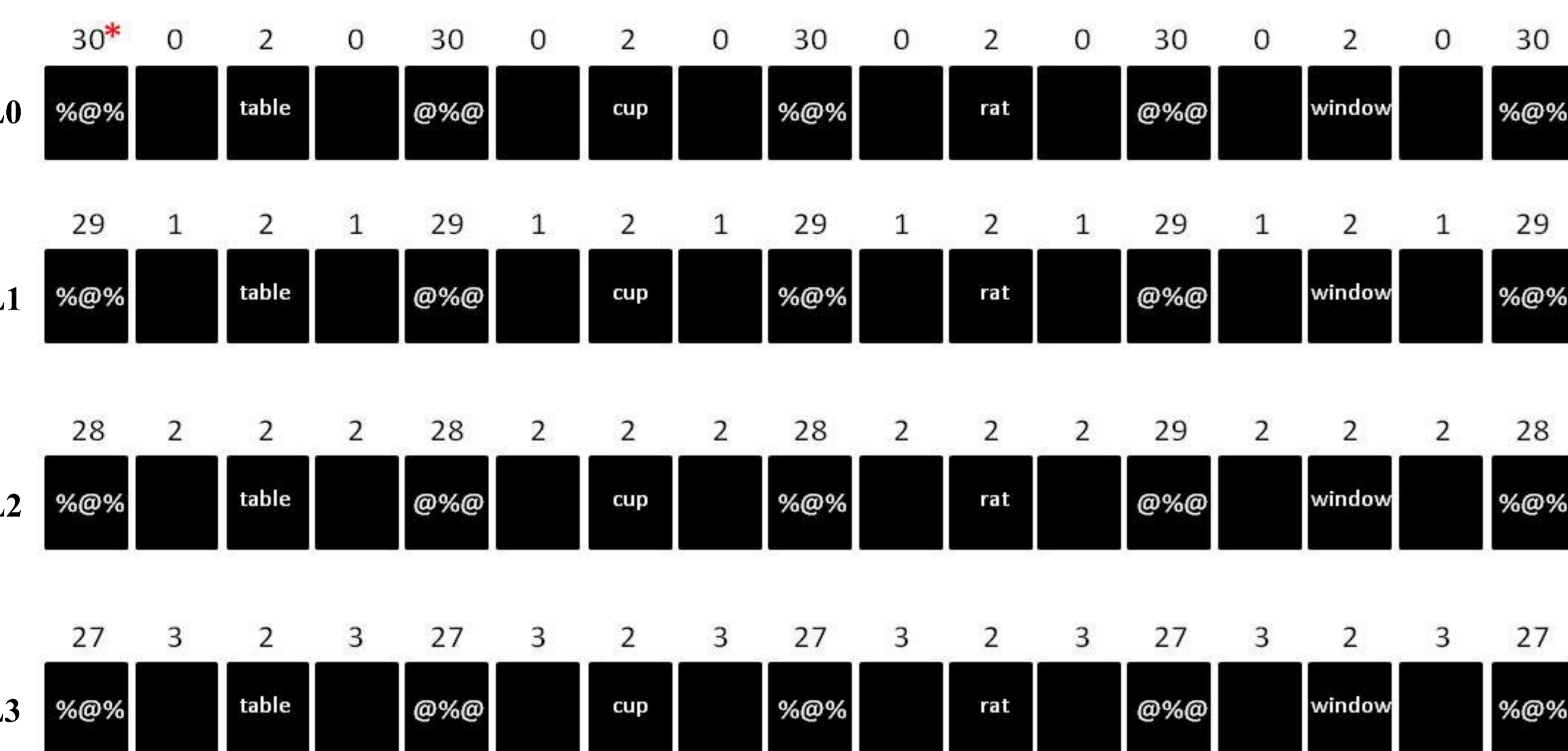
Reading is a multimodal activity. Several studies provided evidence showing that processing written words automatically activates not only the corresponding orthographic representations but also the phonological and semantic ones^{1,2,3}. These observations could be explained, for instance, by the connectionist models claiming that the presentation of an orthographic pattern as input initiates the spread of activation via weighted connections throughout the network in which orthography is linked to phonological and semantic information⁴. In the present fMRI study, we investigated the automaticity of the activation of these representations by looking at the role of *cognitive demand* (top-down factor) and *visibility of the visual input* (bottom-up factor) in reading processes.

Method

Cognitive demand:

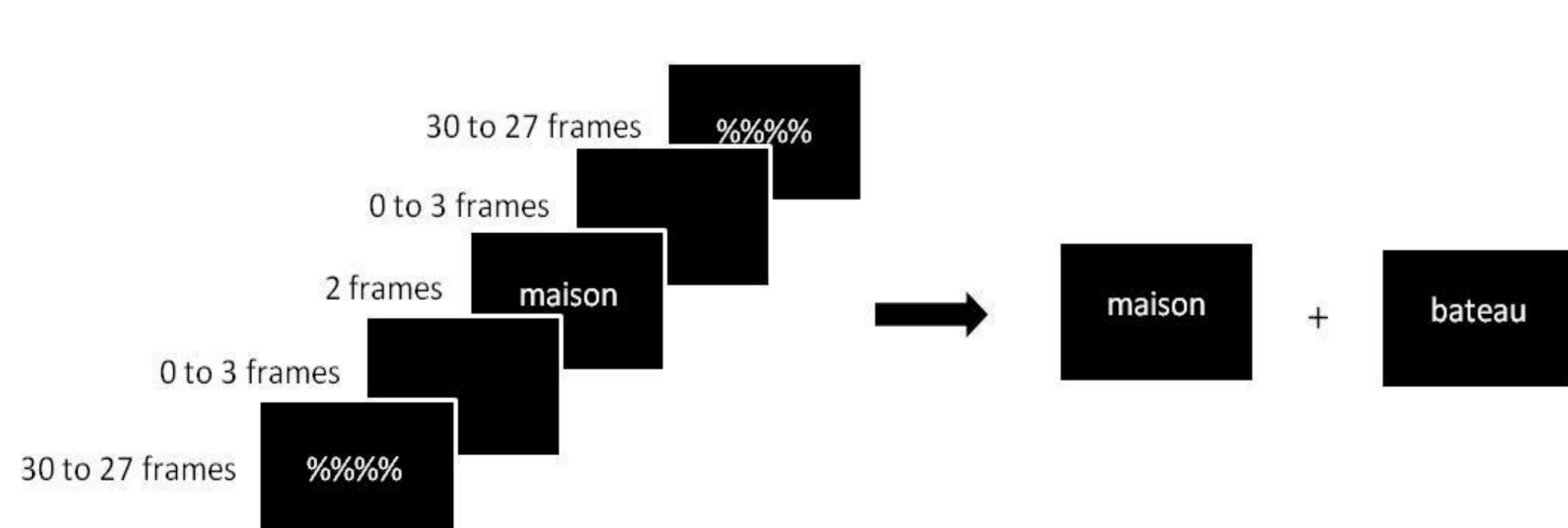
- Visual task: symbol detection
 - Phonological task: rime detection
 - Semantic task: animal name detection
- } Go-Nogo paradigm

Level of visibility: Four levels of visibility (Event-related design)



Behavioral Post-test: Participants performed a *Forced-Choice Task* to identify the individual level of visibility.

Forced-choice task (with four levels of visibility)

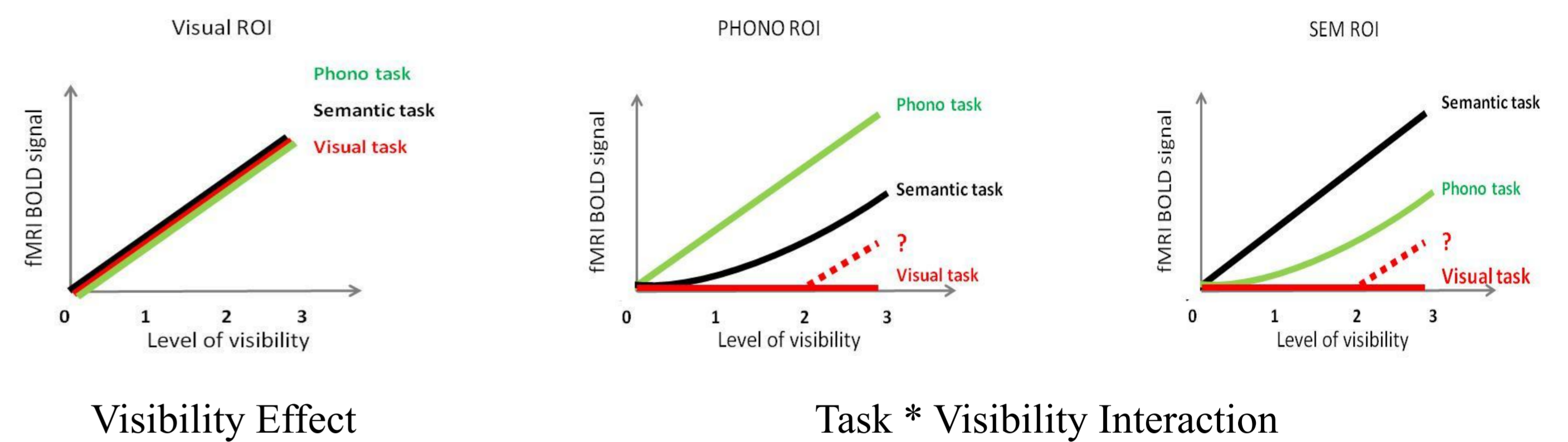


Participants: 23 right-handed, native French speakers

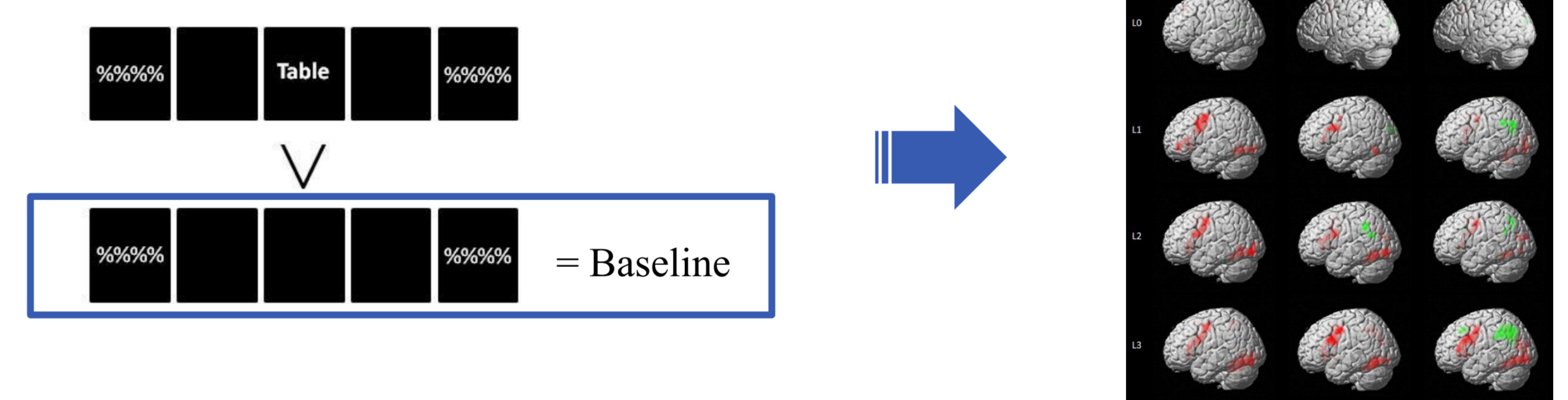
References

- 1 Perfetti, C. A., Bell, L. C., & Delaney, S. M. (1988). Automatic (prelexical) phonetic activation in silent word reading: Evidence from backward masking. *Journal of Memory and Language*, 27(1), 59-70.
- 2 Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of experimental psychology*, 18(6), 643-662.
- 3 Ziegler, J. C., & Jacobs, A. M. (1995). Phonological information provides early sources of constraint in the processing of letter strings. *Journal of Memory and Language*, 34(5), 567-593.
- 4 Harm, M. W., & Seidenberg, M. S. (1999). Phonology, reading acquisition, and dyslexia: Insights from connectionist models. *Psychological Review*, 106, 491-528.

Predictions

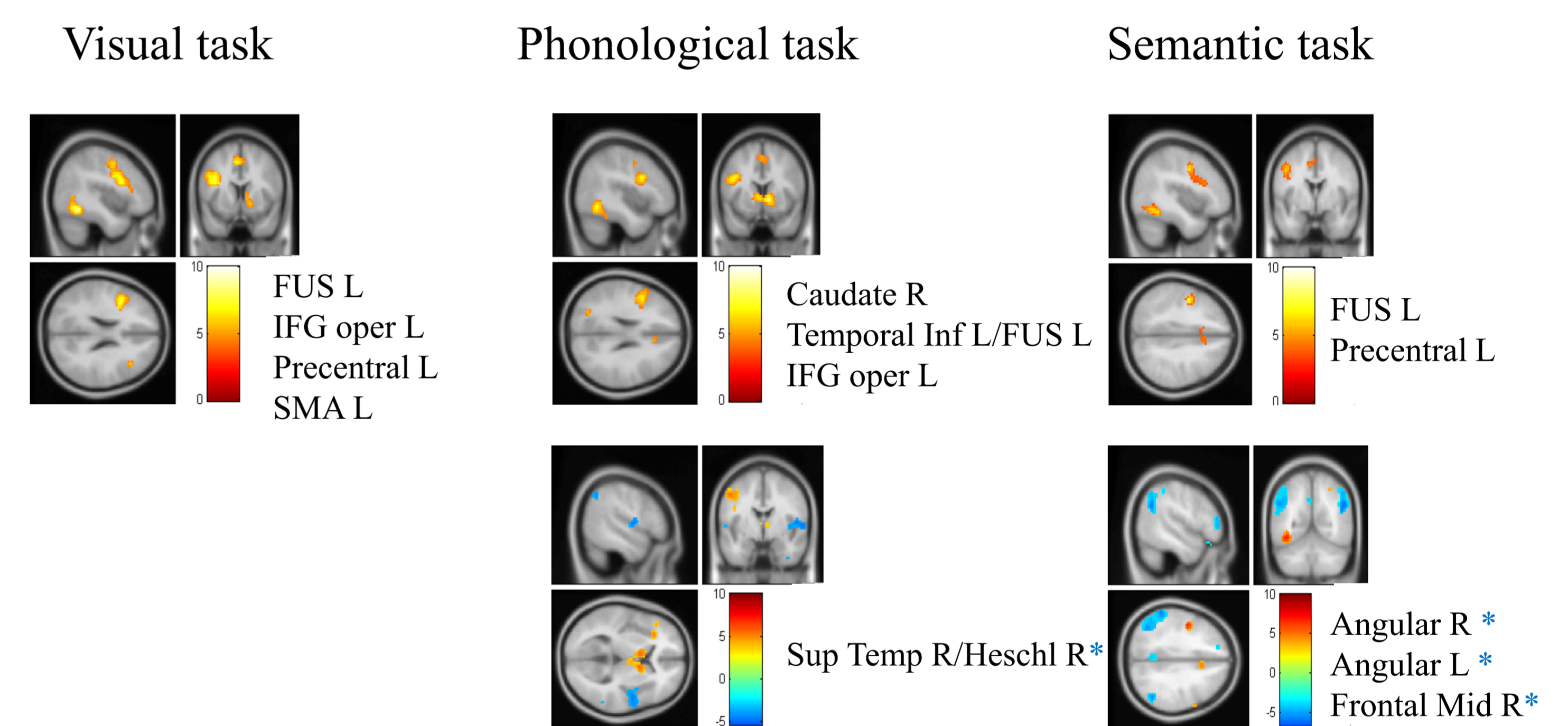


Preliminary results: whole brain analyses

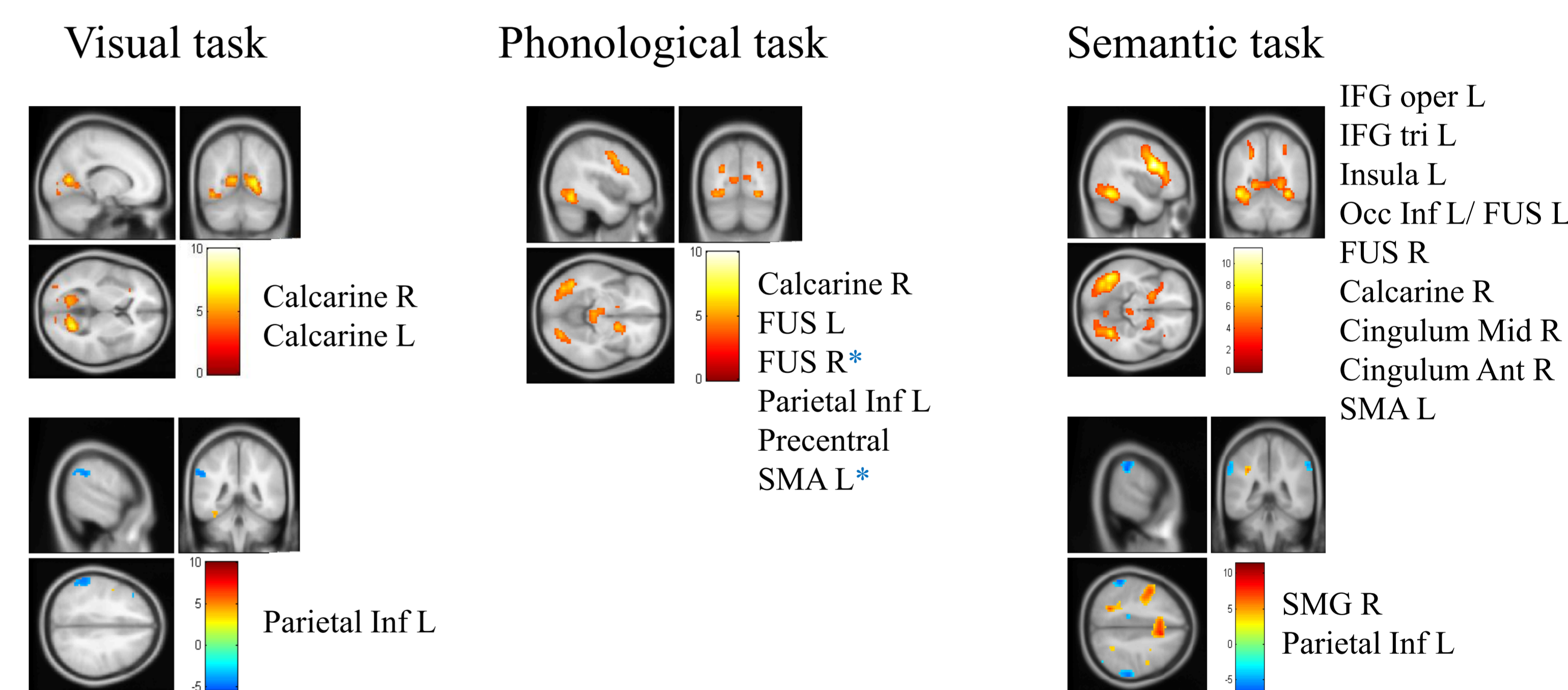


The threshold of $p < .05$ with family-wise error (FWE) correction for multiple comparisons was applied in the whole brain analyses. Except *: uncorrected voxel-based threshold at $p < .001$ combined with a cluster size p FWE-corrected at $p < .05$.

Global network



Linear effect of visibility



Interactions



fMRI BOLD Signal

