



Neural Activation for Lexical Sign and Pantomimic Gestures in Deaf Signers.



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Introduction

- There is debate about the degree to which motor systems are involved in language comprehension.
- Some accounts suggest that speech comprehension relies on motor systems similarly to comprehension of observed actions.
- American Sign Language (ASL) makes use of a variety of manual and body actions to convey meaning. These include conventional lexical signs as well as pantomimic enactments (aka constructed actions).
- We examined neural requirements for the production and processing of lexical signs and pantomimic actions in deaf signers.
- Of particular interest is difference in activation in IFG.

Methods

Subjects

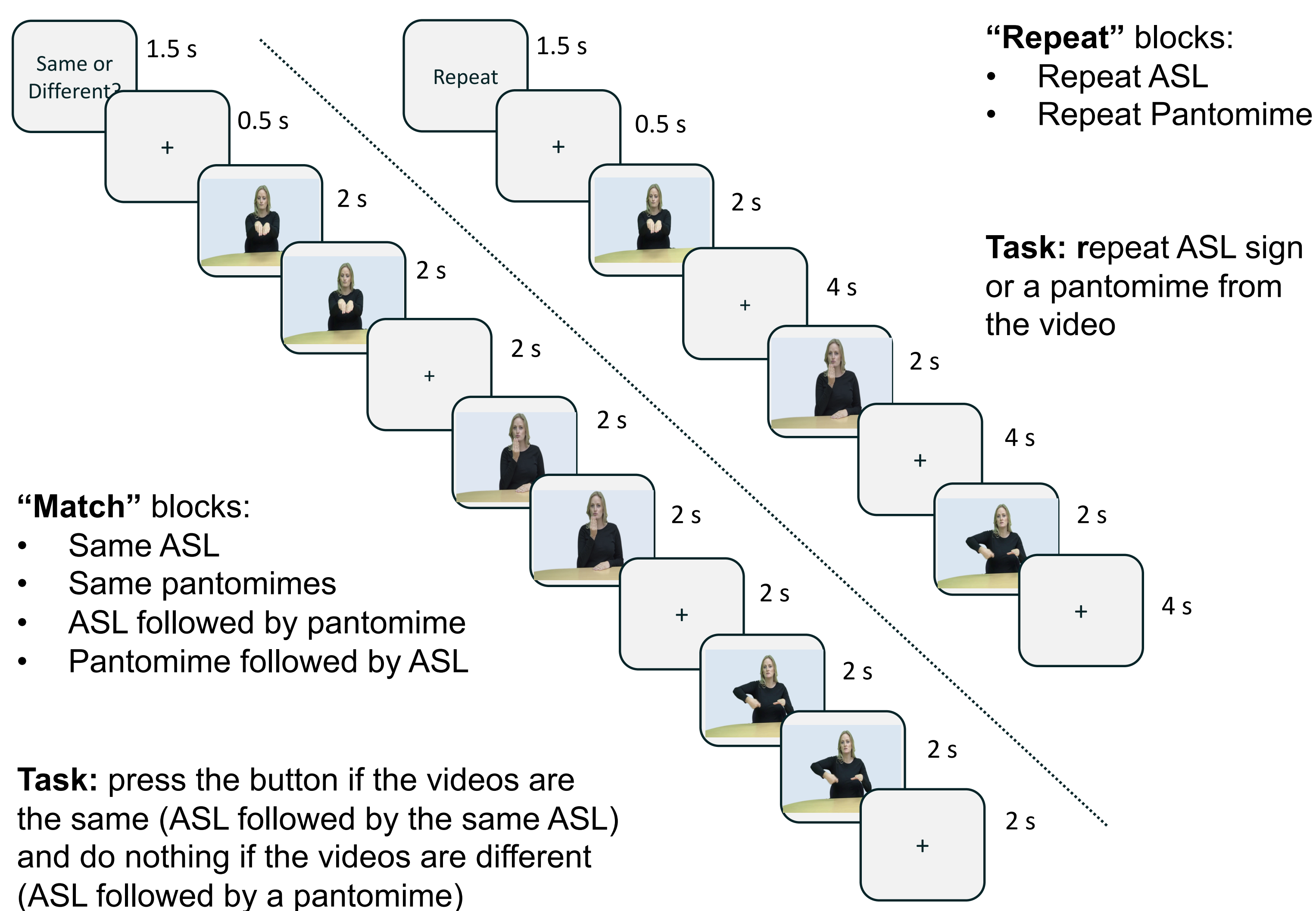
- 16 deaf participants (11 females), age range 18-45.
- All the participants were born to deaf parents and exposed to ASL from birth. All the participants were right-handed

Stimuli

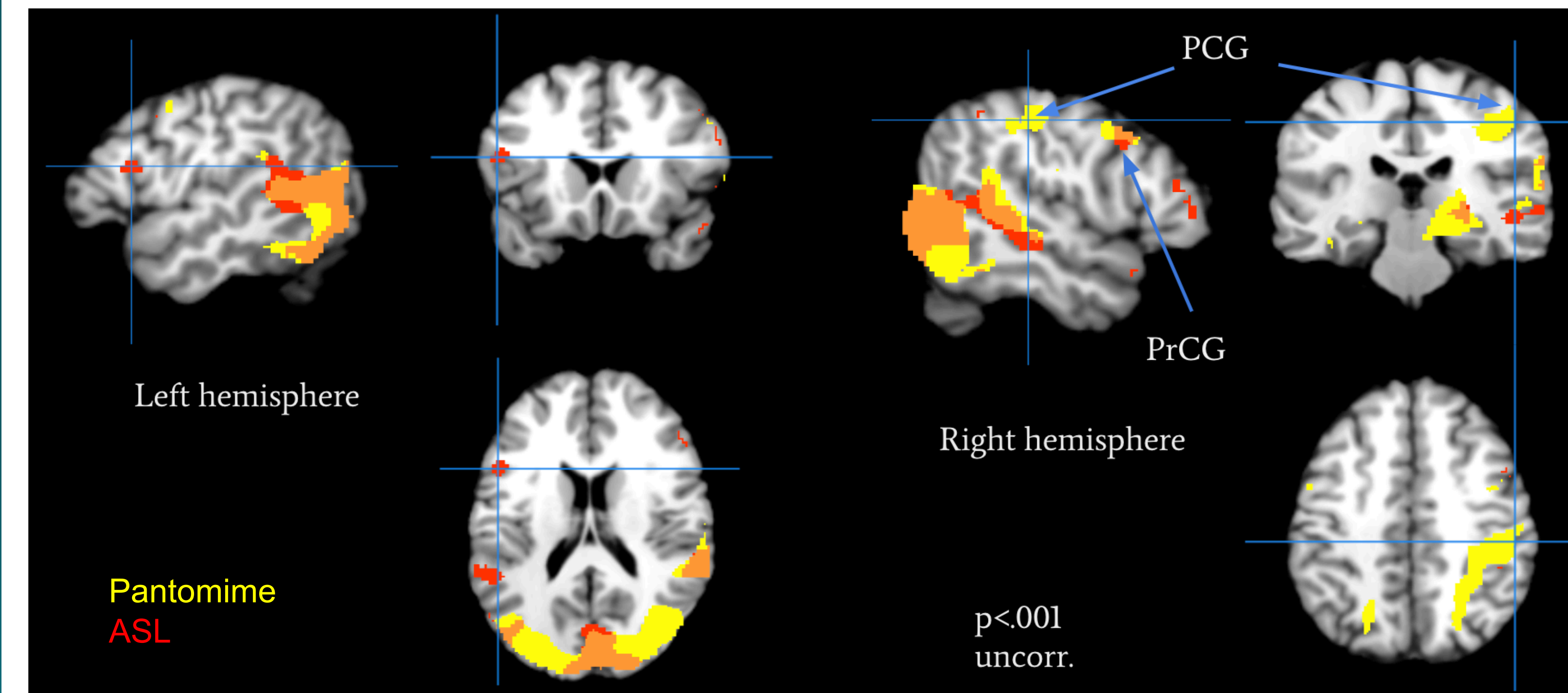
- 2 second long videos of ASL verb signs and pantomimic gestures

Procedure

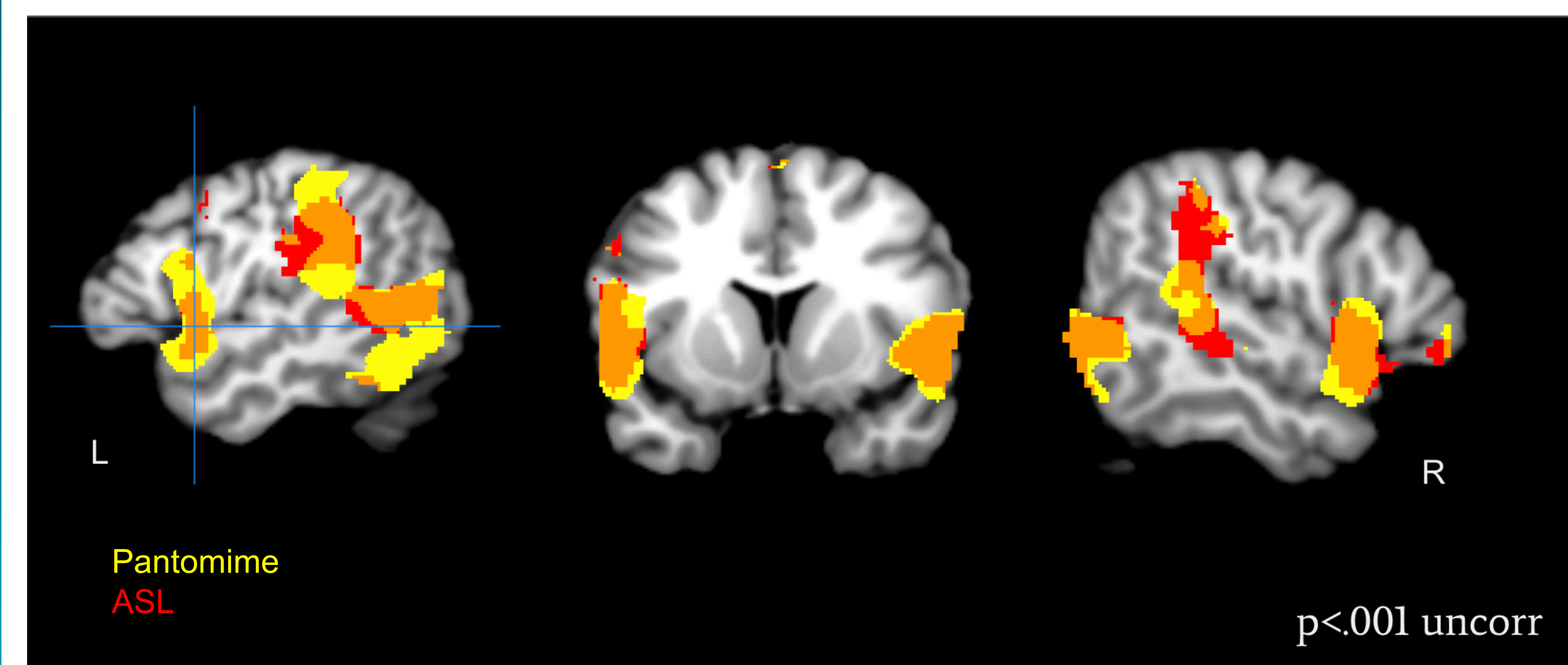
- 2x2 design: task x video type
- Every block was followed by a 10 s rest interval with a white fixation remained on screen.
- 12 blocks in a run (randomized order), 6 runs per subject.



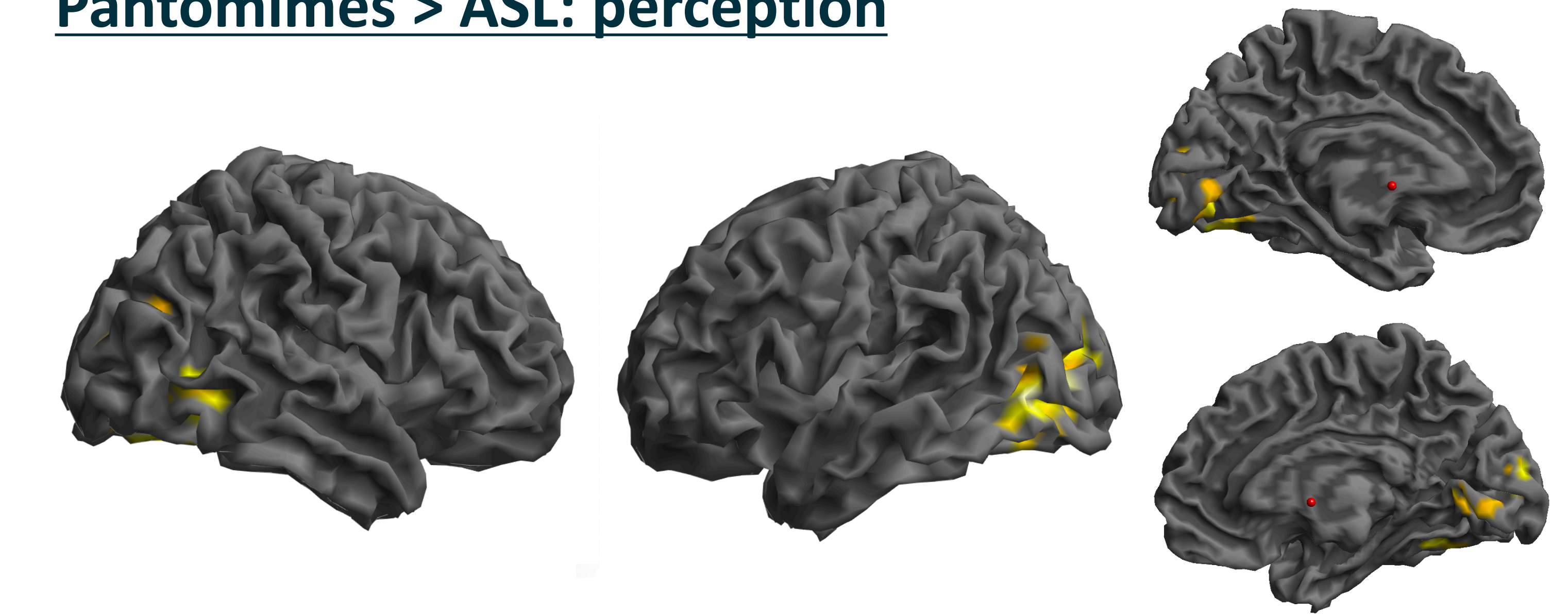
Activation overlap: perception



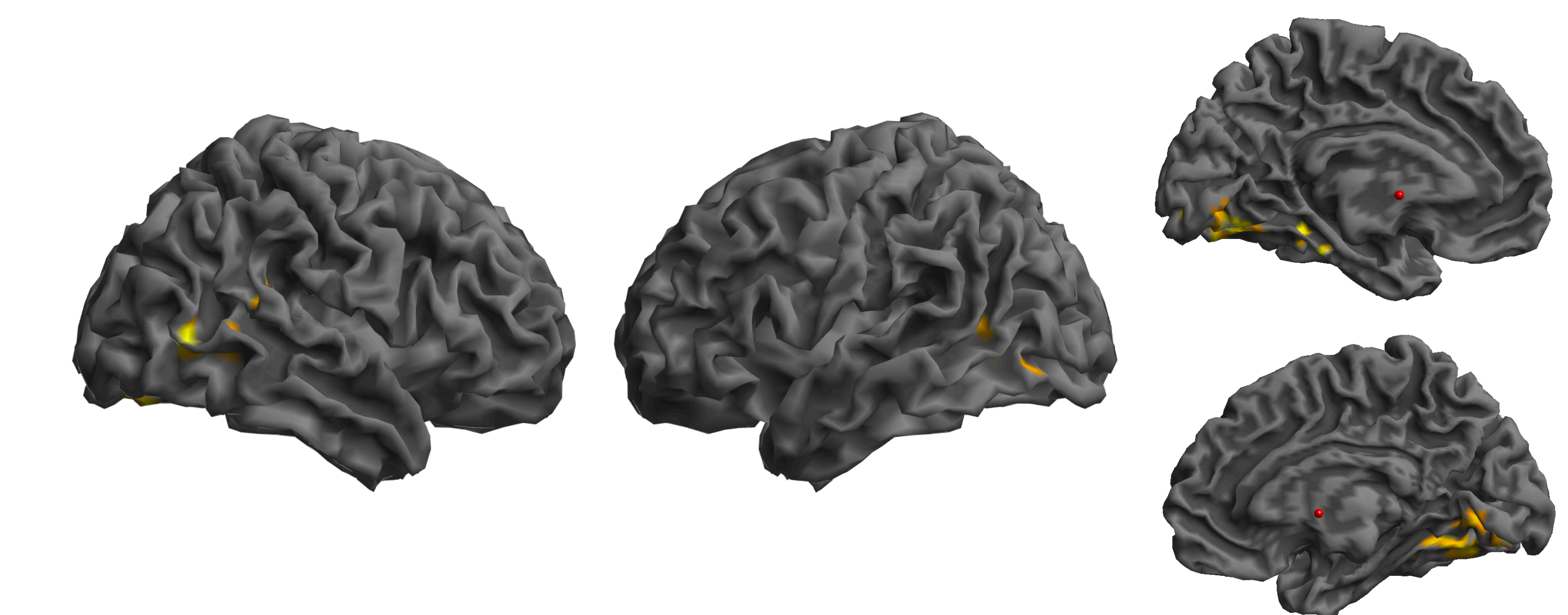
Activation overlap: production



Pantomimes > ASL: perception



Pantomimes > ASL: production



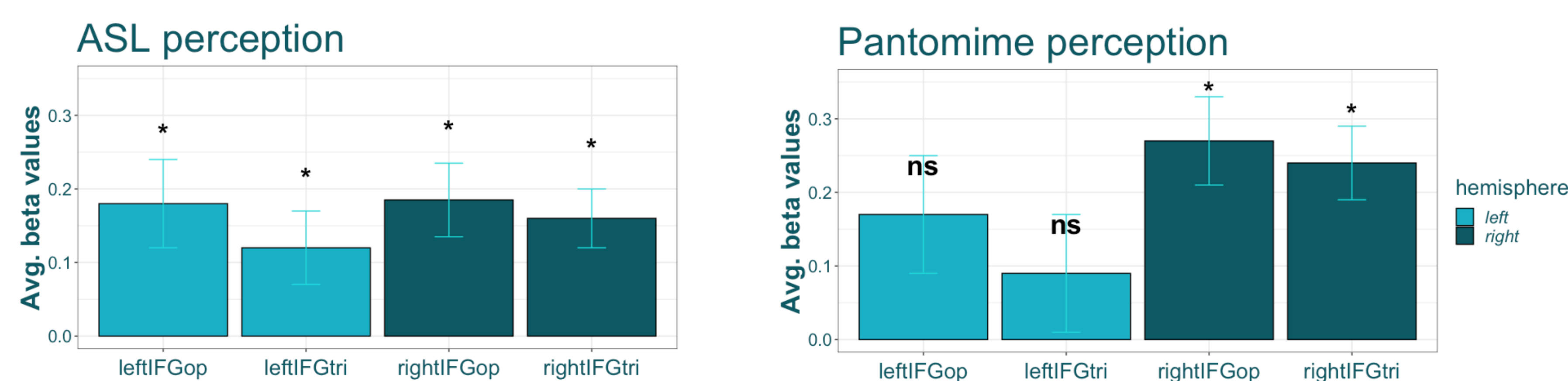
Conclusions

- **Perception:** a graded activation of anatomically similar bilateral visual cortical and posterior temporal areas which suggests commonality in the neural regions involved in perception.
- In **production**, we observe an expected pattern of bilateral motor-sensory and inferior frontal gyrus activation, with increased middle and selected inferior frontal activation for pantomime relative to ASL production.
- These patterns of activation suggest differential metabolic demands reflecting a cognitive efficiency for linguistic processing and production and increasing demands for the on-line construction of pantomimic gestures.
- These data raise questions about the neural integration of constructed actions (i.e. pantomimic enactment) used in the context of ASL signing

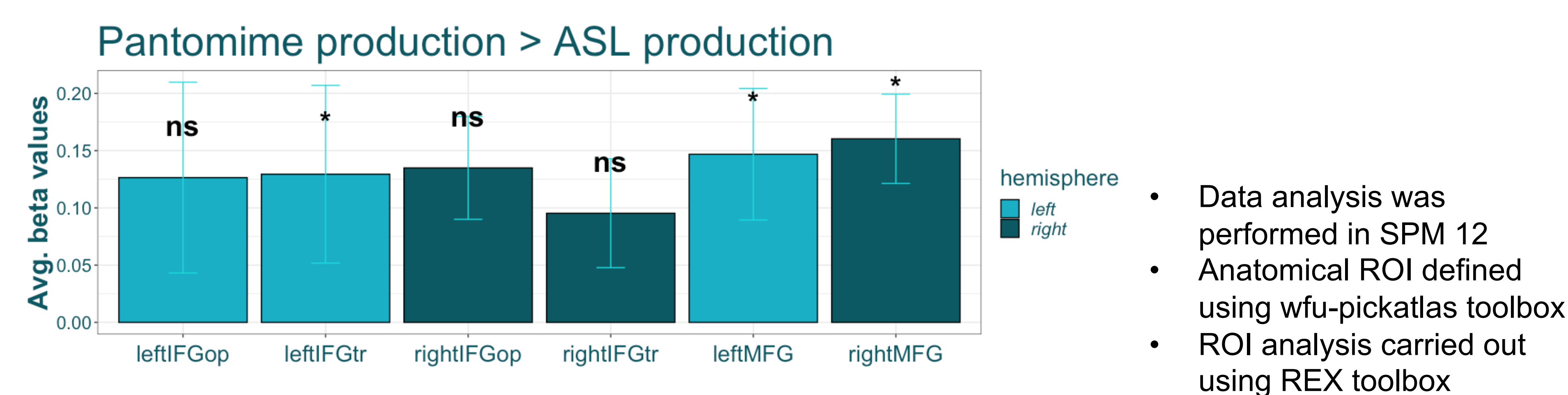
ROI analysis results

No significant effects in Pantomime perception > ASL perception

IFG activation in ASL and pantomime perception:



Activation in ASL and pantomime production:



References

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- Xu, J., Gannon, P. J., Emmorey, K., Smith, J. F., & Braun, A. R. (2009). Symbolic gestures and spoken language are processed by a common neural system. *Proceedings of the National Academy of Sciences*, 106(49), 20664-20669.