

Encoding of Reaching and Grasping

Across Premotor and Primary Motor Cortex

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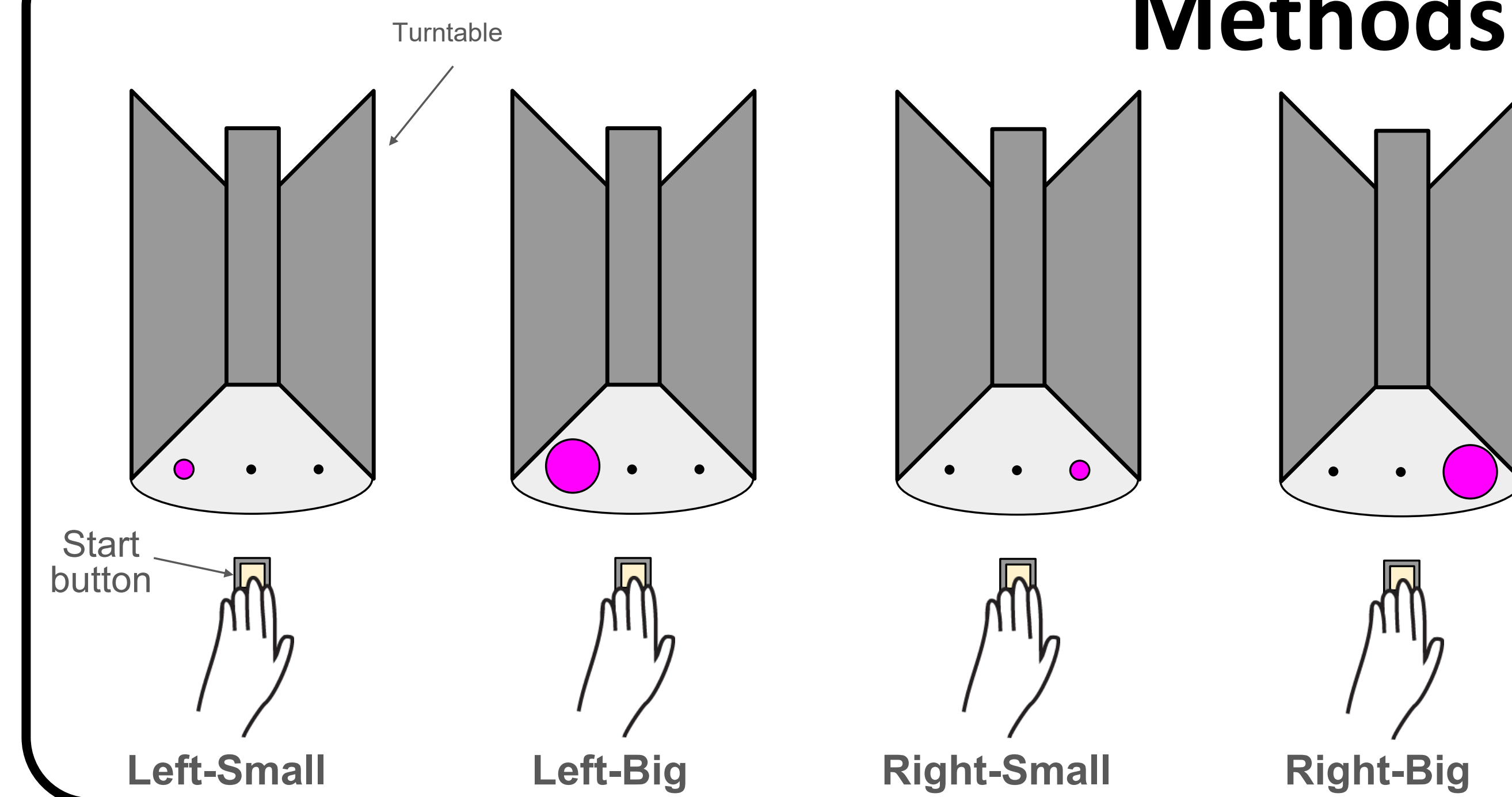
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Introduction

- Reaching and grasping are fundamental motor behaviors
- Prior work indicates dorsal premotor cortex (PMd), ventral premotor cortex (PMv) and primary motor cortex (M1) all encode parameters relevant to these movements
- When are reach- and grasp-related information available to each brain area?**

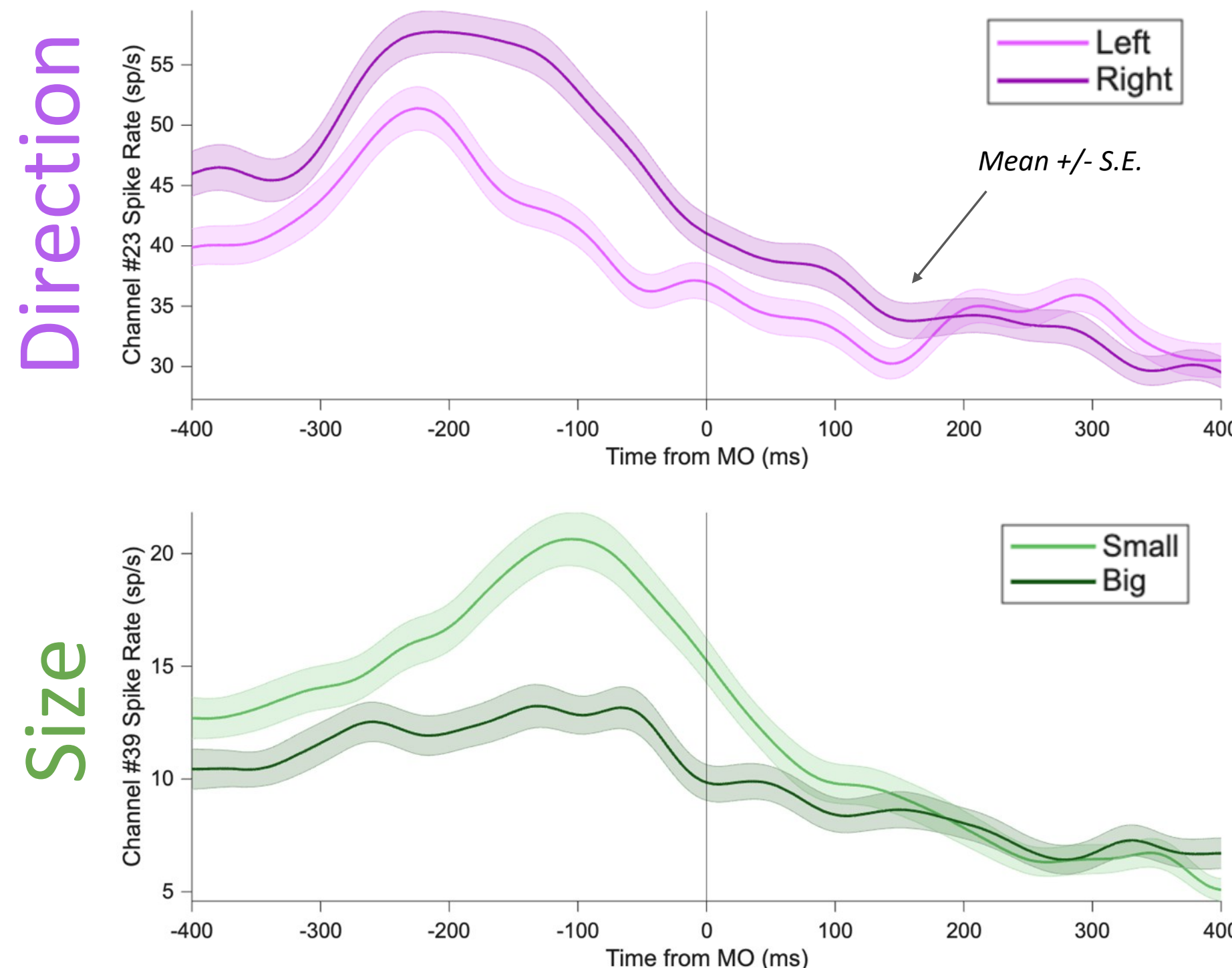
Methods



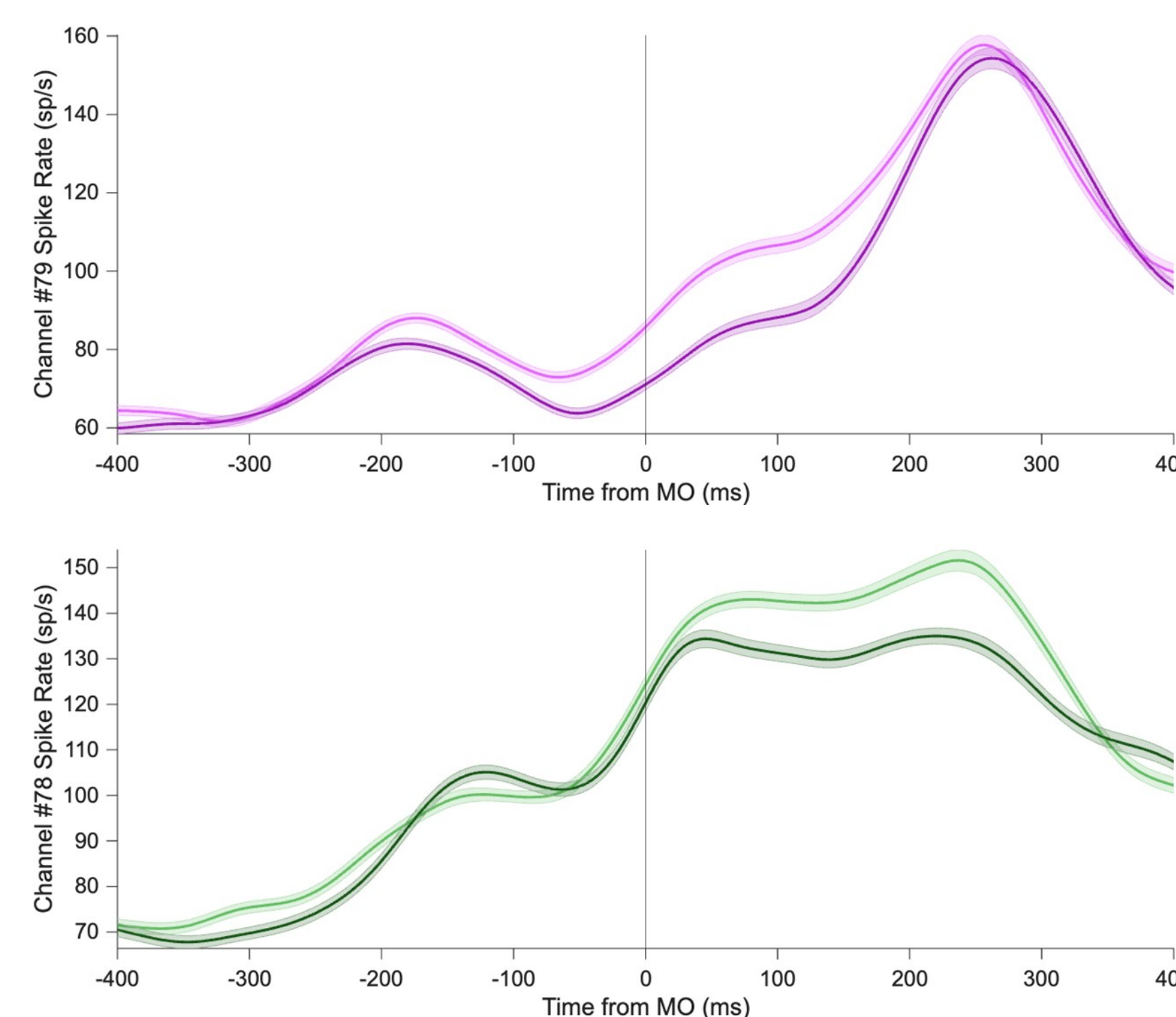
- A rhesus macaque performed 8 sessions of a reach-to-grasp task
- Recorded neural population activity (Utah arrays) from **PMd** (80 channels), **PMv** (80) and **M1** (96), 8 sessions

Results

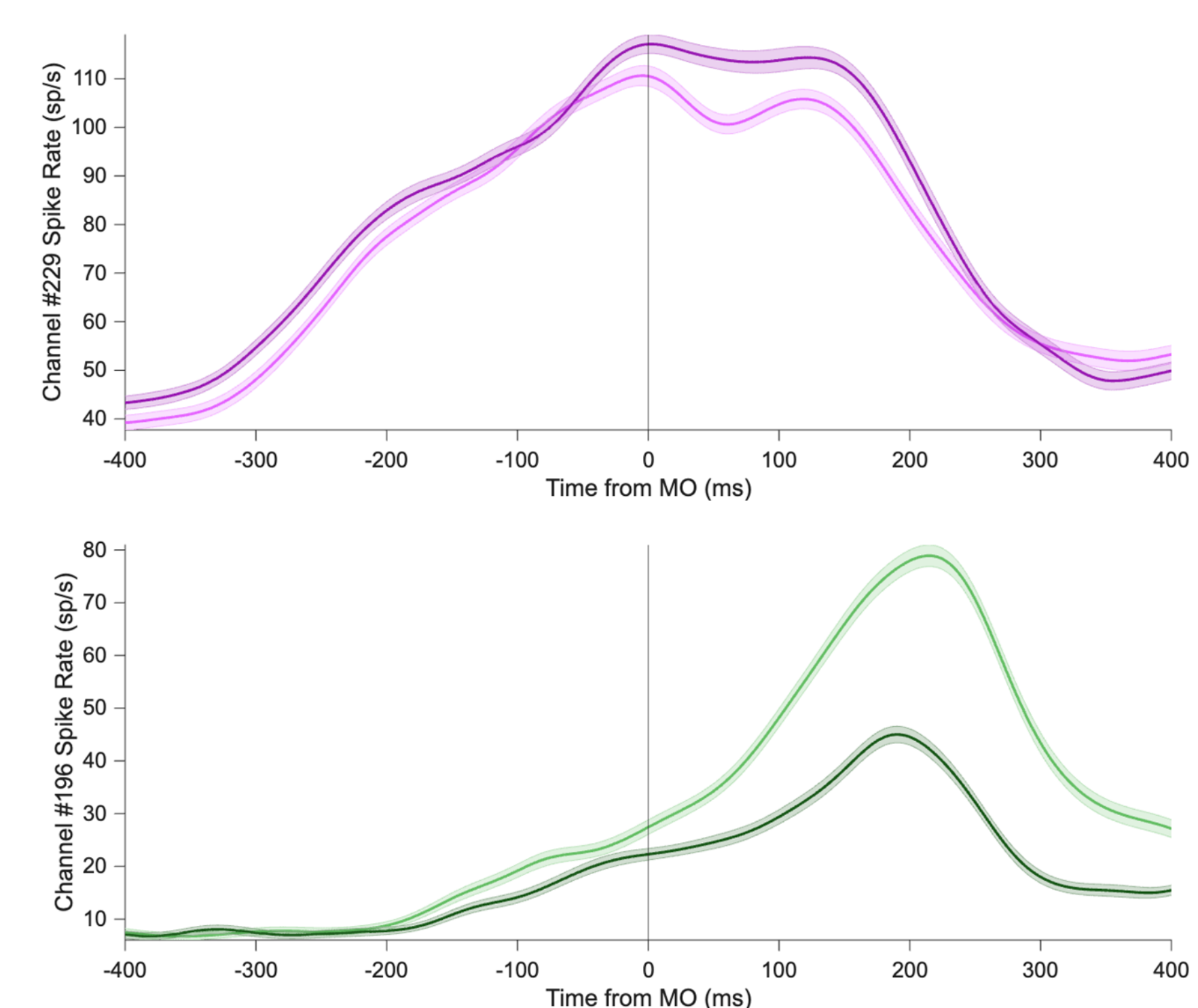
PMd



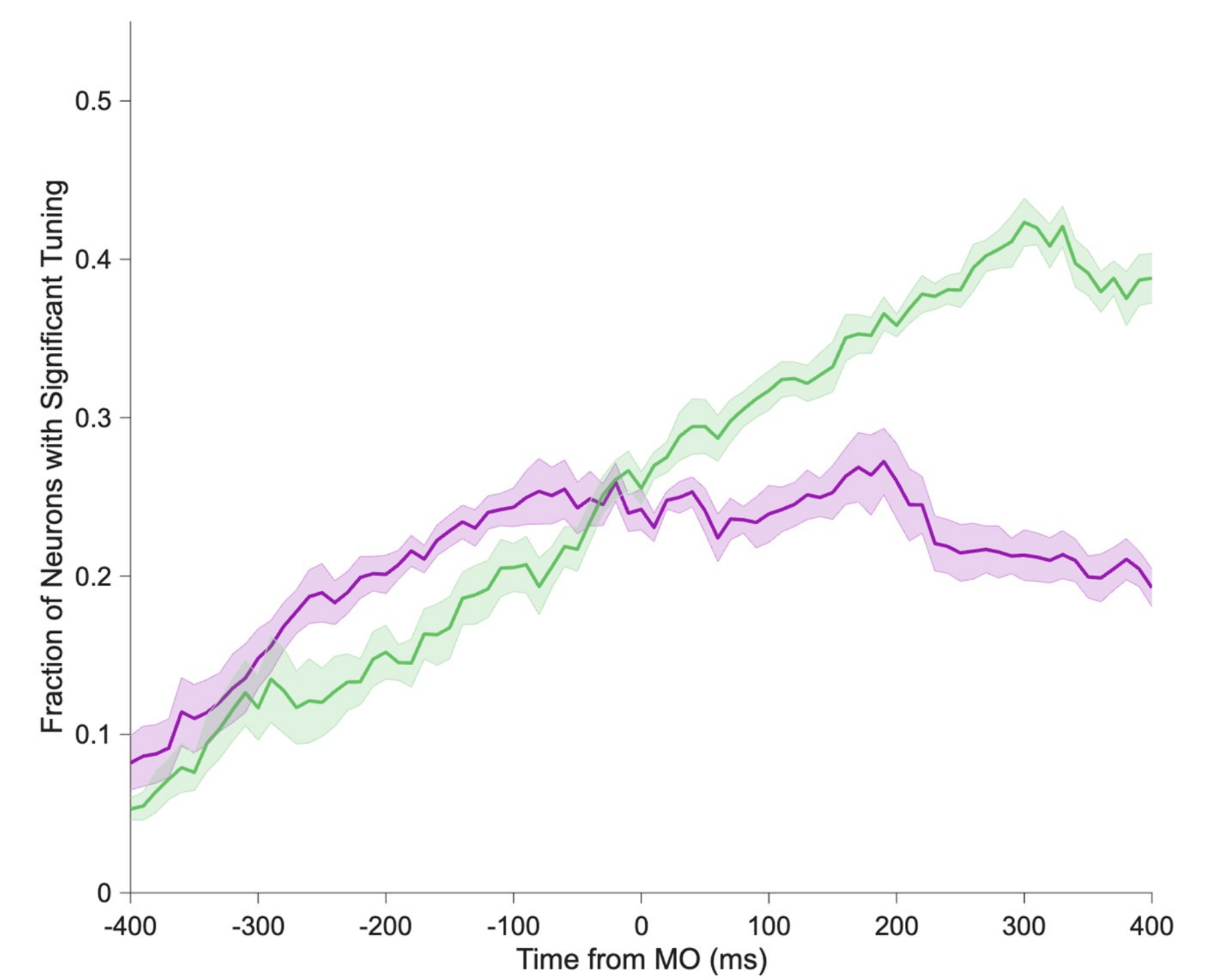
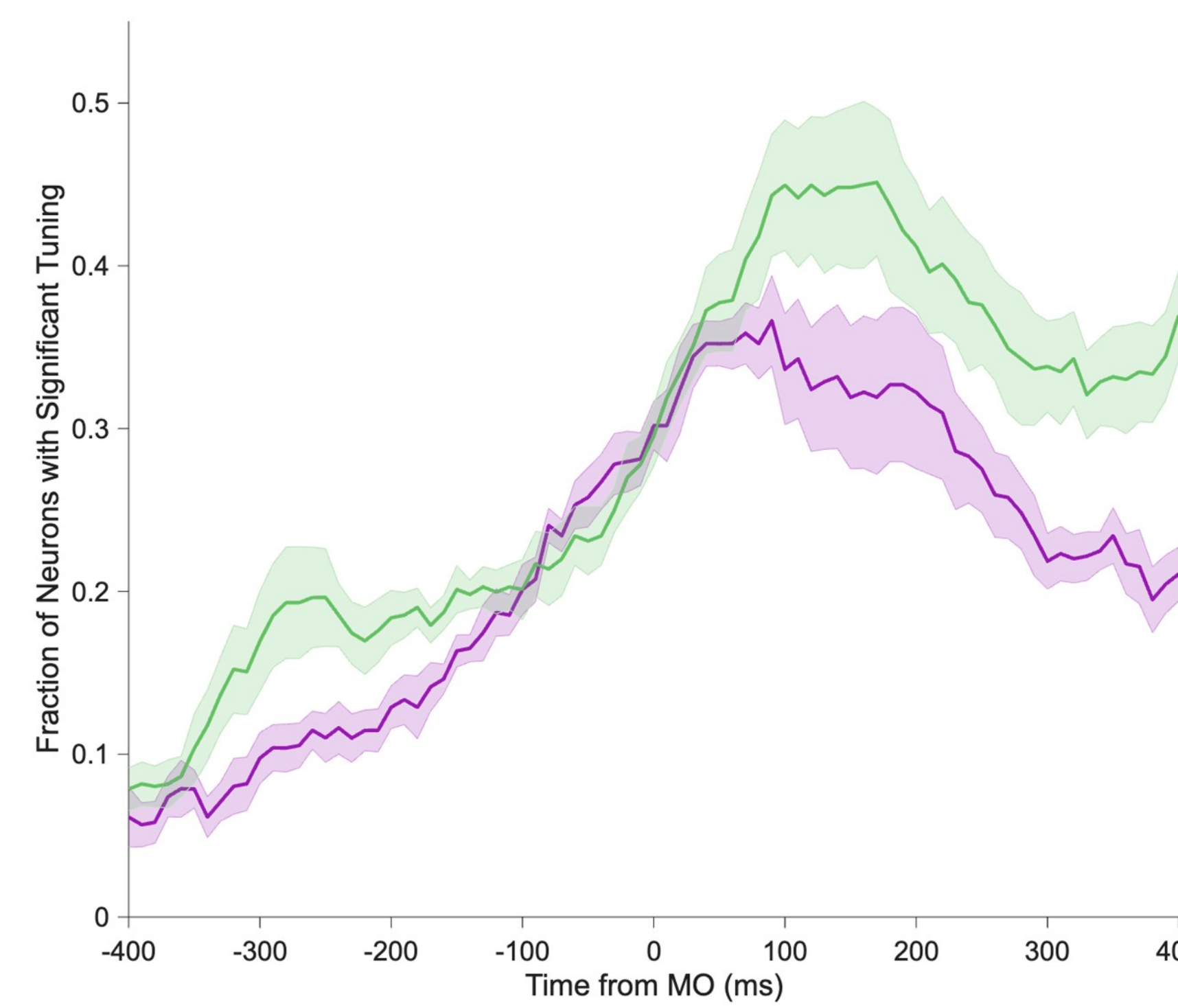
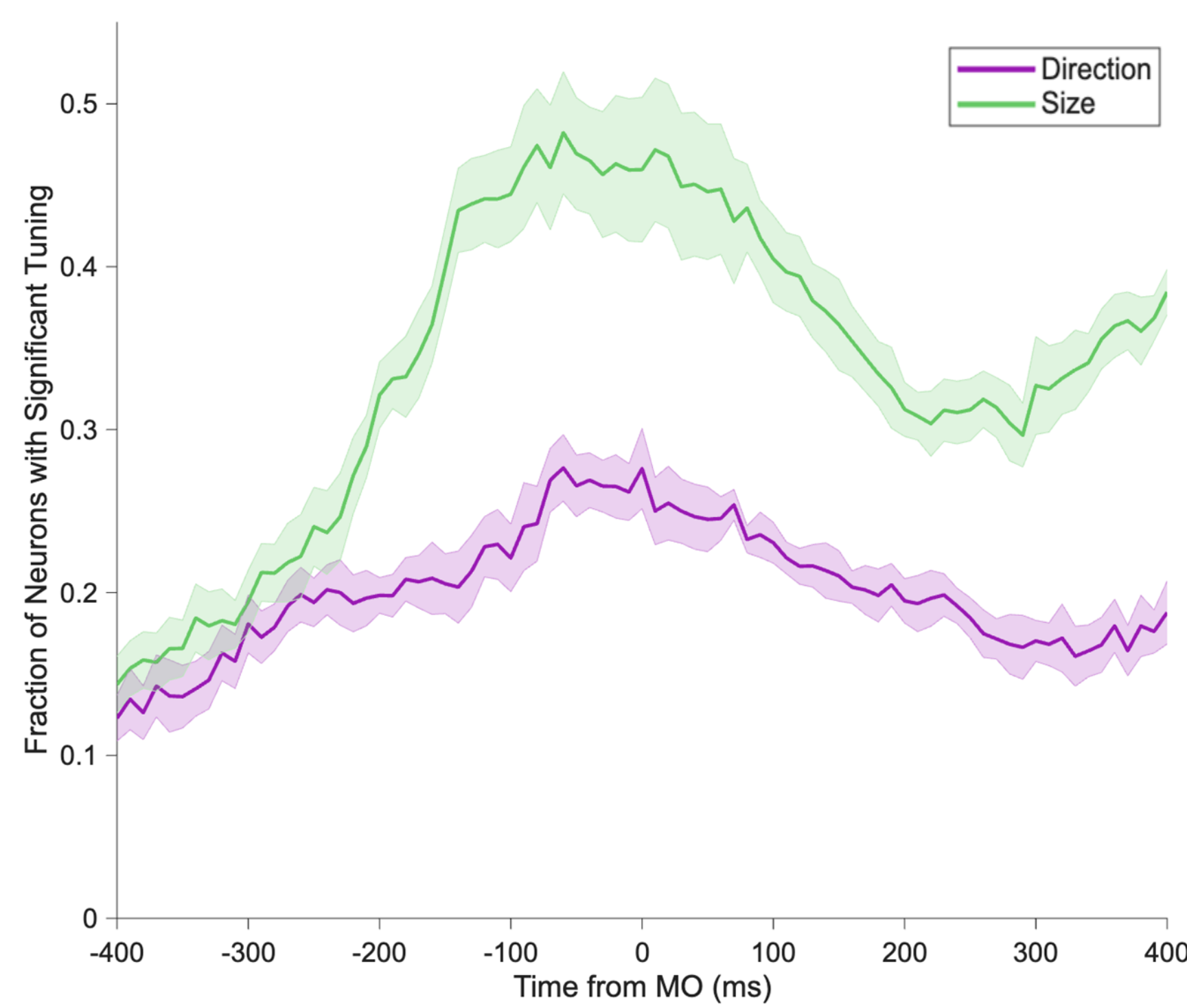
PMv



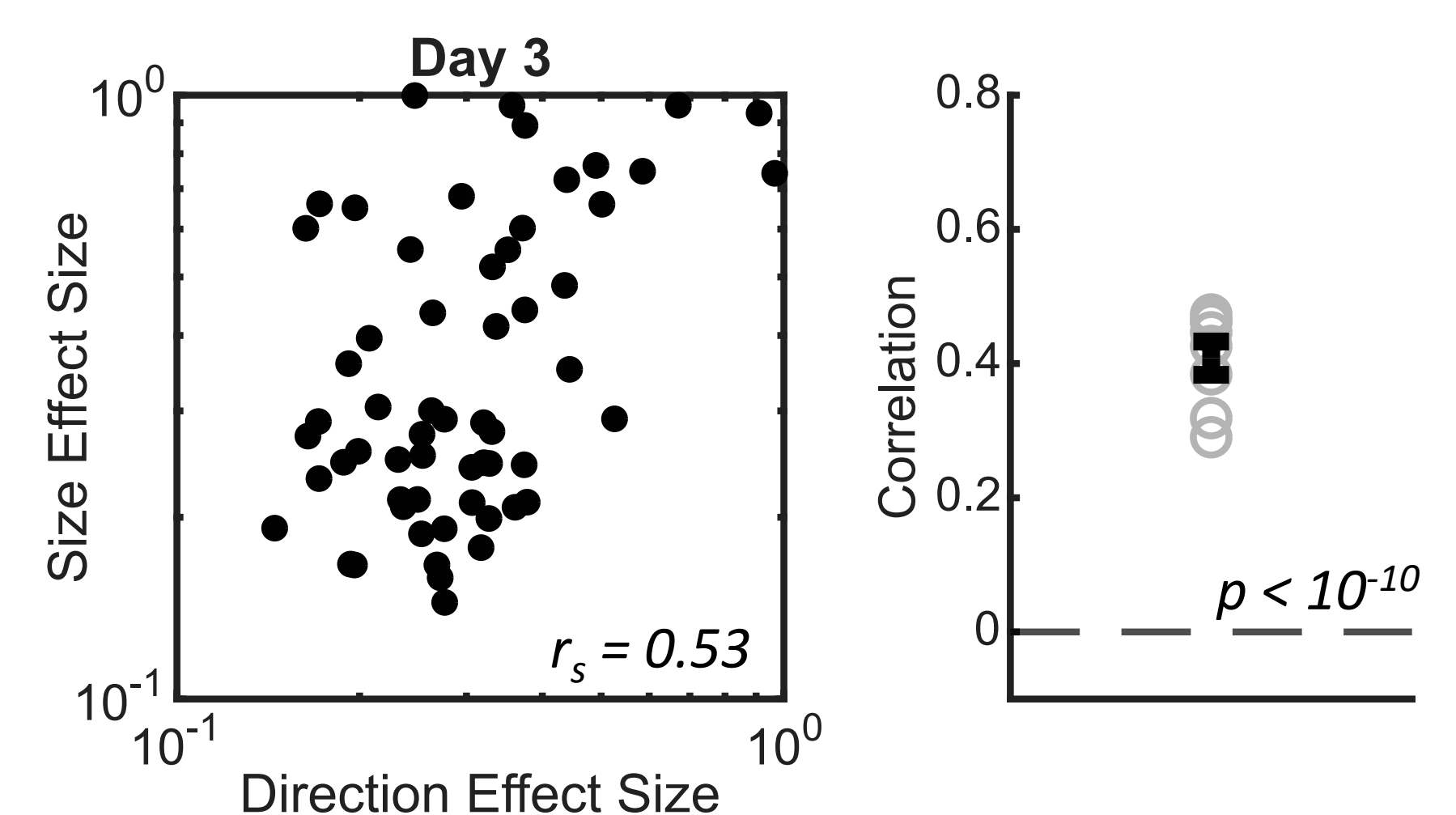
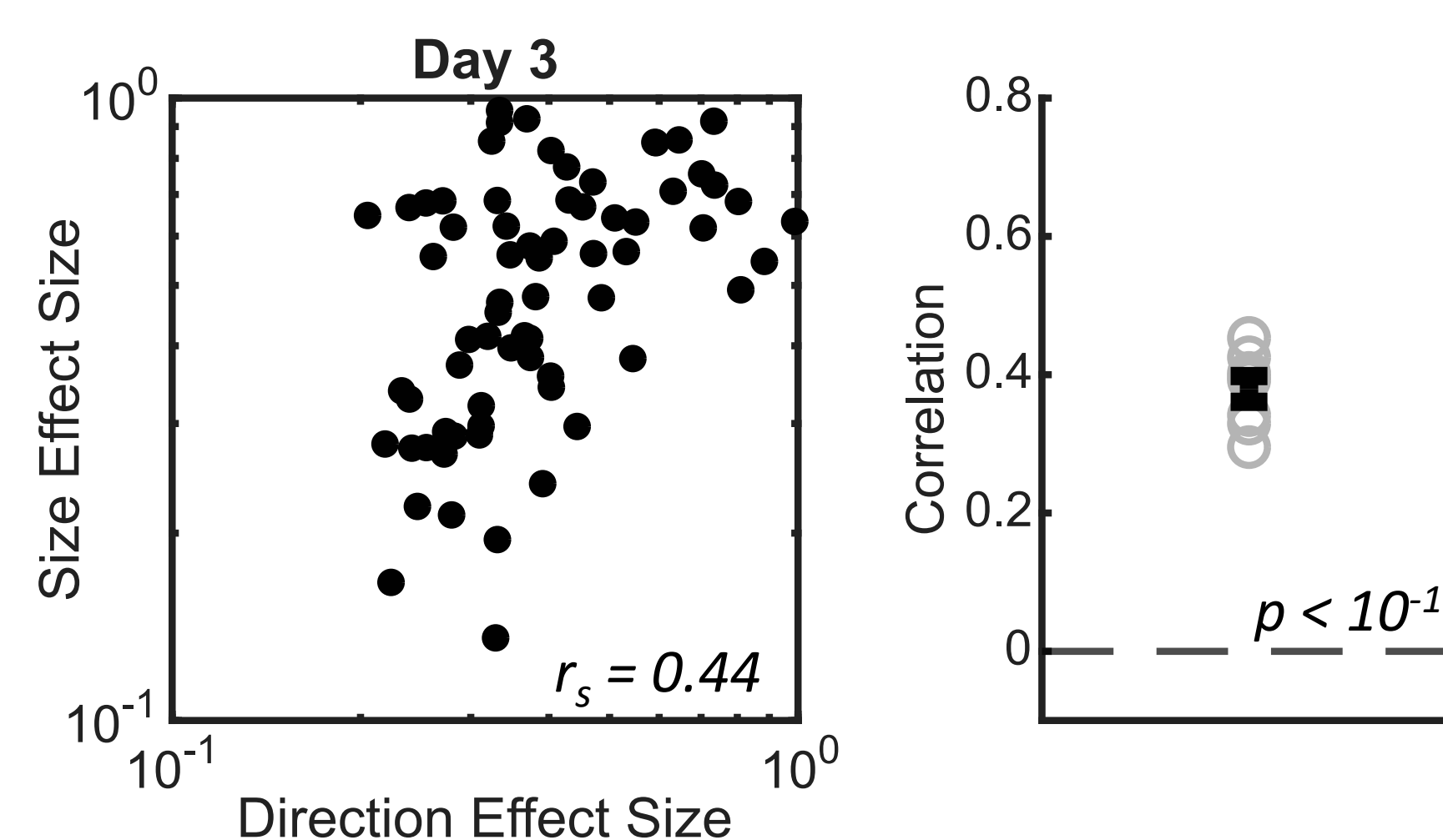
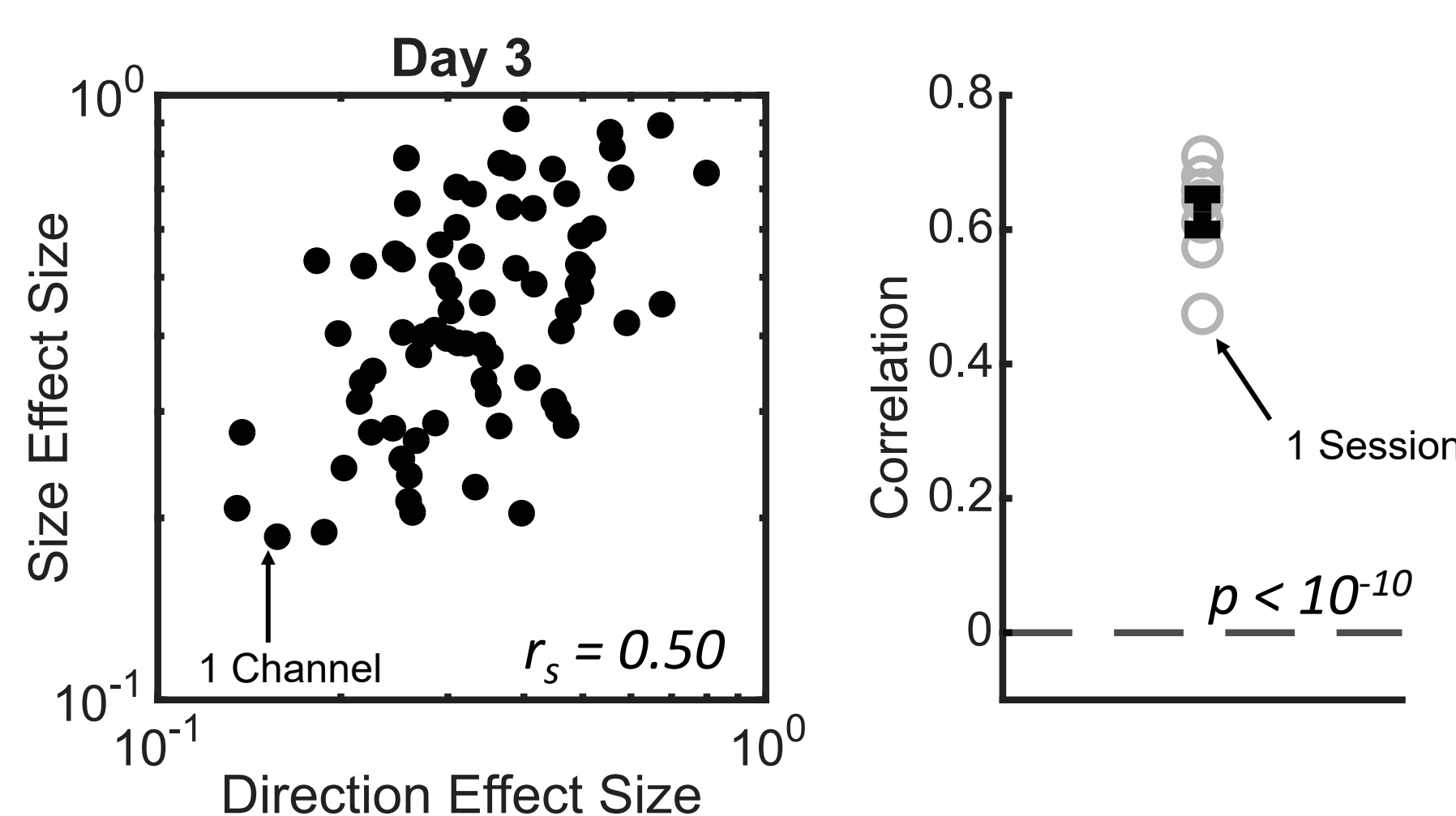
M1



Individual channels from each area were tuned to reach direction and object size



The timing of peak encoding varied by area and by type of information



Single channel direction and size tuning were correlated in all brain areas

Discussion/Conclusions

- PMv exhibits strongest directional tuning, whereas all areas exhibit commensurate size tuning
- PMd and M1's direction encoding reached maximum before movement onset, whereas PMv's peaked as the reach commenced
- PMd's size encoding peaked before movement onset, followed by PMv which peaked after movement onset, and finally M1
- Channels with greater separability for one parameter (direction or size) also showed greater separability for the other.

Future Directions

- Study encoding of other types of movement-relevant information:
 - Object weight
 - Grip type
- Align data to object contact / lift time
- Studying communication between brain areas of different types of movement information

Acknowledgements

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