

# Functional diversity of precuneal neurons revealed by single-unit fMRI mapping

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## Introduction

- Functional neuroimaging studies suggested a central role for the precuneus in a series of learning/memory tasks.
- Little research have looked into the diversity of neurons in terms of their responses to stimuli.
- In this study, we combined whole-brain fMRI with single-unit recordings in a local population (<0.5mm/day). to explore the functional diversity of precuneal neurons.

## Method

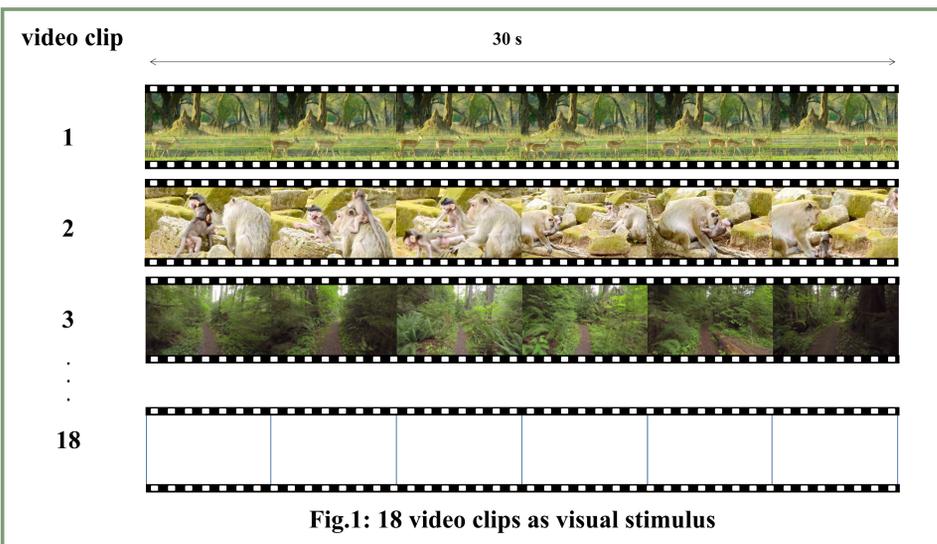


Fig.1: 18 video clips as visual stimulus

- Whole brain images were collected from two macaque monkeys while they watched 18 natural video clips (Fig.1) in a 3T scanner.
- Electro-physiological single unit data from another two macaque monkey's precuneal area (321 neurons in total) were also collected while they watched the same set of videos.
- For each neuron, we computed a whole-brain correlation map with all the voxels throughout the brain under same naturalistic movies viewing conditions (Fig.2).

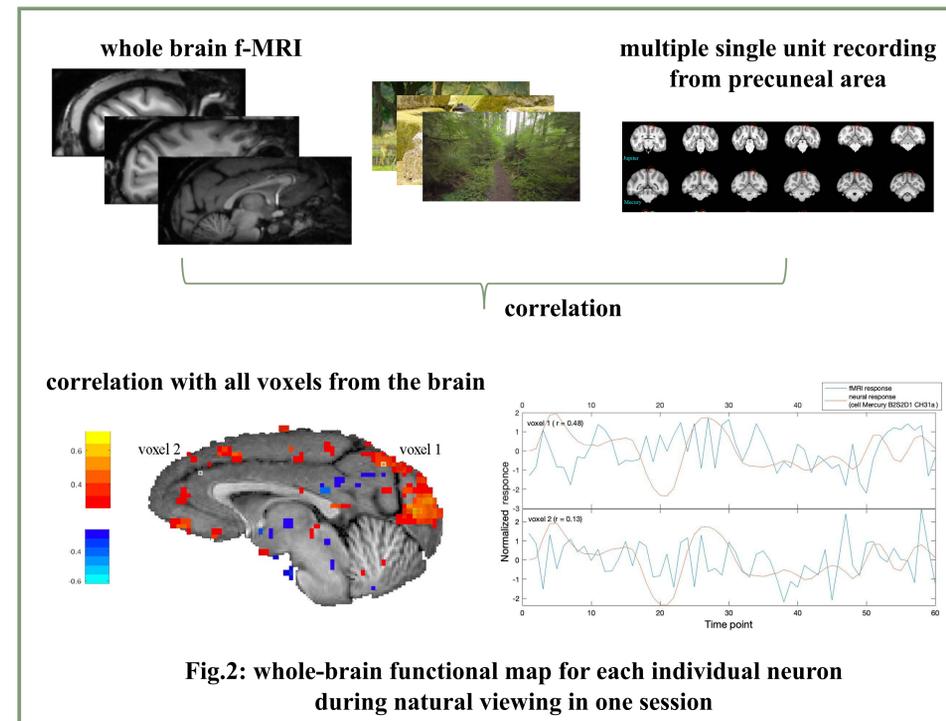


Fig.2: whole-brain functional map for each individual neuron during natural viewing in one session

## Result and Conclusion

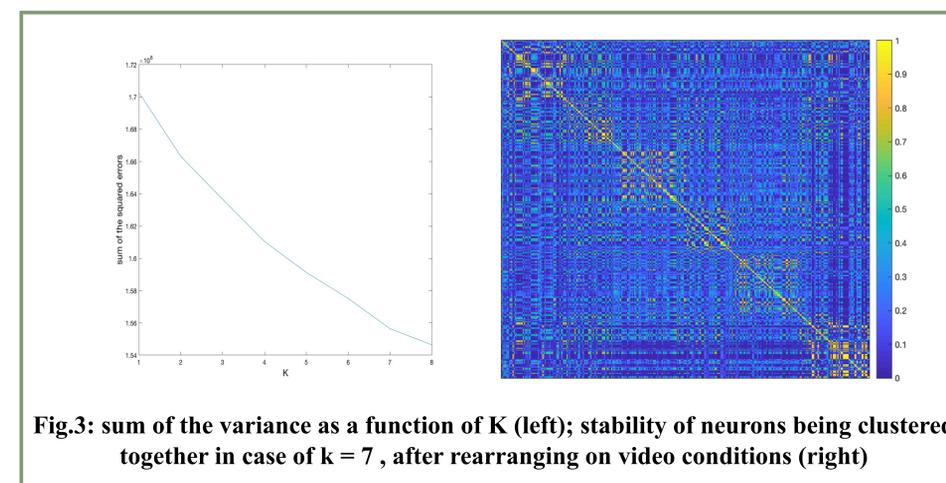


Fig.3: sum of the variance as a function of K (left); stability of neurons being clustered together in case of k = 7, after rearranging on video conditions (right)

- k-means clustering result demonstrated that compared with the mean obtained from all neurons, neurons collected under same video conditions showed a significantly stronger clustering pattern than without clustering. The number of clusters vary from 2-9 (k=2, p=0.0095; k=3,4,5,6,7,8,9, p=0) (Fig.3).

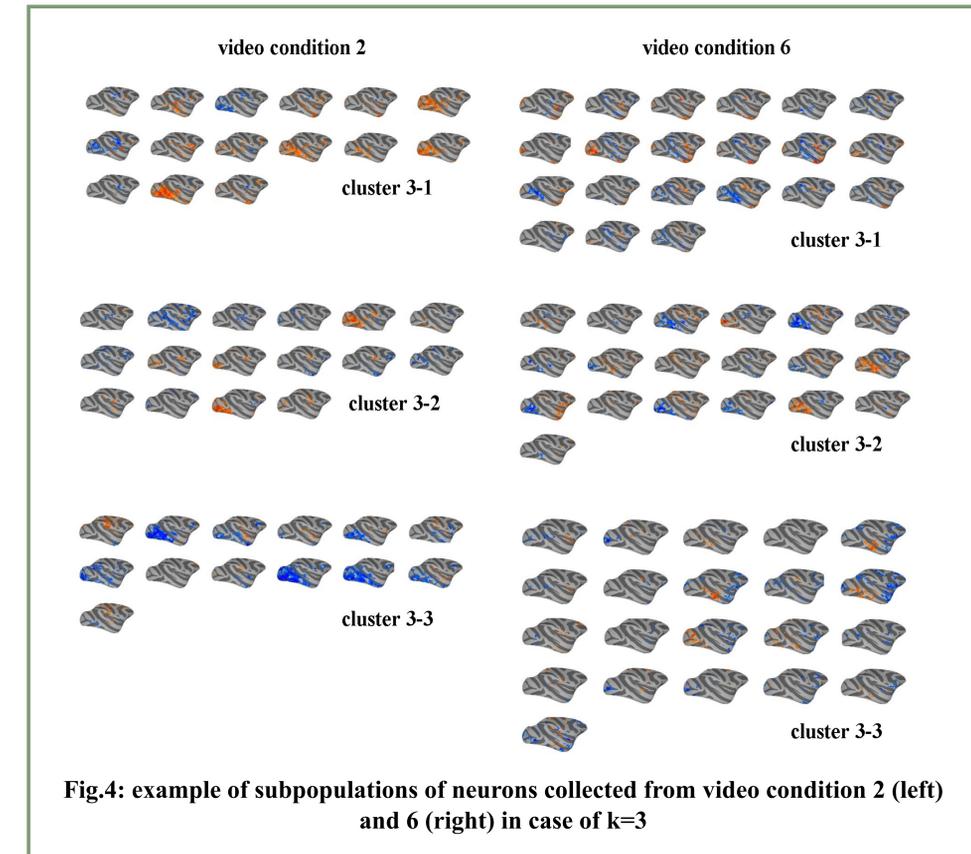


Fig.4: example of subpopulations of neurons collected from video condition 2 (left) and 6 (right) in case of k=3

- There are further functional subpopulations of neurons collected under each of video conditions (Fig.4).
- The results suggest a readout of large-scale fMRI networks under natural viewing and a new view of functional diversity in the primate postero-medial parietal cortex.

## Reference

- Cavanna, A. E., & Trimble, M. R. (2006). The precuneus: a review of its functional anatomy and behavioural correlates. *Brain*, 129(3), 564-583.
- Park, S. H., Russ, B. E. et al. (2017). Functional subpopulations of neurons in a macaque face patch revealed by single-unit fMRI mapping. *Neuron*, 95(4), 971-981.

