# Neural Basis of Face Recognition in Older Adults

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## Introduction

- The neural mechanisms of facial recognition of those who are familiar to us, such as a loved ones, are important for understanding how we socialize with others[1].
- Neurocognitive disorders, like Alzheimer's Disease (AD), can dramatically reduce facial recognition in older adults[2].
- Using fMRI, we examined differences in brain activity across categories of faces.
- **We anticipate activity in cognitively healthy older adults will reliably differentiate between face categories, whereas people with MCI will show similar activity patterns across all categories.**

## fMRI Design

- Participant Demographics
  - N=24
  - Age average = 71.57 (61-84)
  - MoCA average – 26.87 (18-30)
    - 30% failed MoCA
- 7 runs – Average trial duration: 10s
  - Face duration – 4s
  - Average fixation – 6s
- Stimuli
  - 6 personally familiar, 6 experimentally familiar, 6 novel

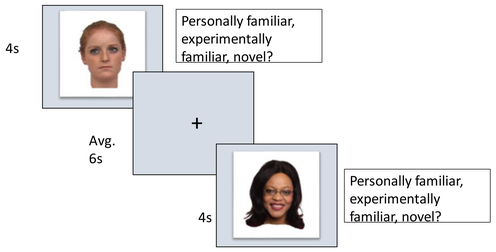


*Fig 1 : fMRI task: - participants were instructed to discriminate between PF, EF, and novel images by pressing the respective button in the scanner*

## Experimental Timeline and Tasks

**Prescreen**
- fMRI metal screening
- MoCA

**Day 1**
- fMRI metal screening
- MoCA
- Provide digital camera

**Day 2** Behavioral tasks
- iMDS – personally familiar (PF)
- Encoding task
- iMDS – experimentally familiar (EF)

**Day 4** fMRI scan
- 7 runs of fMRI
- iMDS - novel

*Fig 2 : Experimental timeline depicting task order*

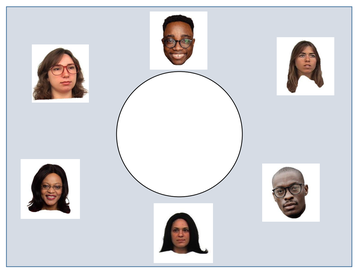

*Fig 3 : Participants were asked to organize faces based on similarity for each facial condition during the iMDS task.*

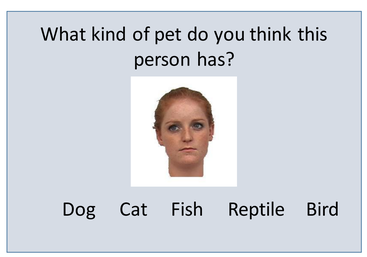


*Fig 4 : Participants took part in an encoding task to familiarize themselves with **experimentally familiar** faces*

## RSM for Face Categories and Regions of Interest (ROI)

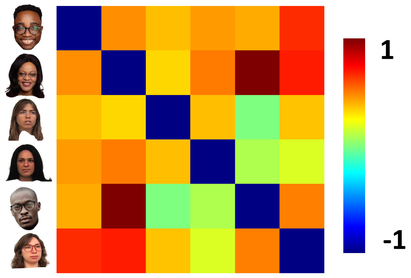


*Fig 5: Model of representational similarity analysis depicting scale used for the representational similarity matrices (RSM)*

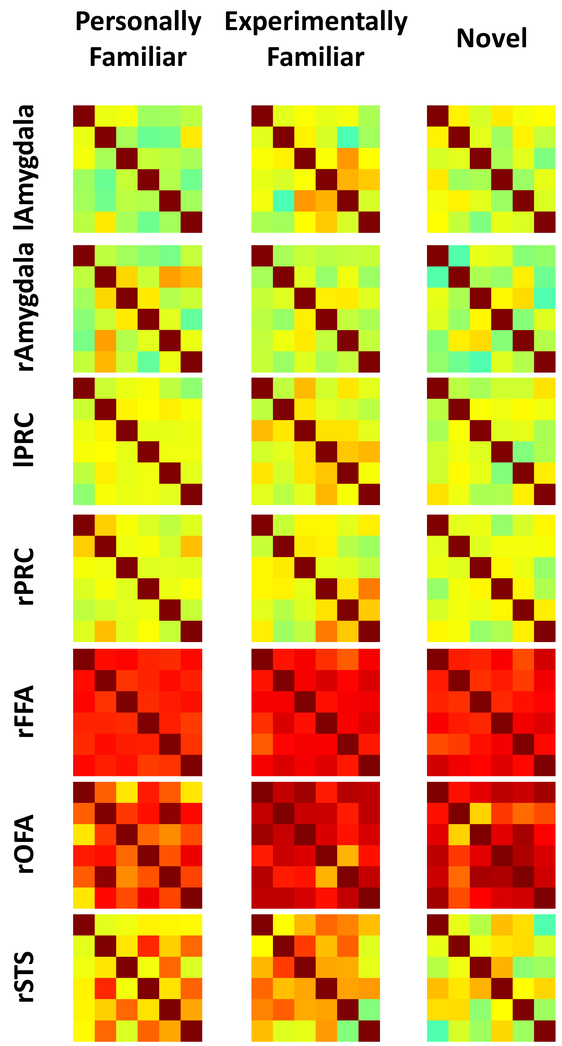


*Fig 6: Representational similarity matrices for face categories by region of interest of one cognitively healthy adult participant*

## Average Representational Similarity in ROIs Across Condition

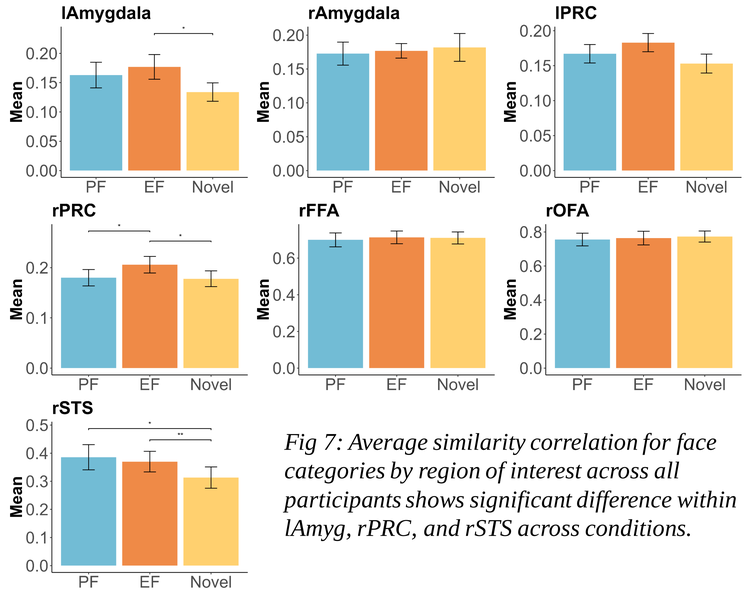


*Fig 7: Average similarity correlation for face categories by region of interest across all participants shows significant difference within lAmyg, rPRC, and rSTS across conditions.*

## Conclusions

- Neural representations of face categories show more similarity in the core face network regions (FFA, OFA, STS), while regions in the extended face network (PRC and amygdala) show more dissimilarity.
- Results suggest that the face network remains intact in healthy aging adults, such that the extended network, associated with biographical information related to faces and feelings of familiarity, shows distinction among face identities, and the core network, associated with face recognition, shows more similarity between faces.
- Further analysis will investigate between group differences for cognitively healthy aging participants and participants with indications of MCI.

## References

1. Donix, M., Jurjanz, L., Meyer, S., Amanatidis, E. C., Baeumler, D., Huebner, T., ... & Holthoff, V. A. (2013). Functional imaging during recognition of personally familiar faces and places in Alzheimer's disease. *Archives of Clinical Neuropsychology, 28*(1), 72-80.
2. Gobbini, M. I., & Haxby, J. V. (2007). Neural systems for recognition of familiar faces. *Neuropsychologia, 45*(1), 32-41.