

# The Representational Structure of Social Relationship Knowledge

Haroon Popal<sup>1</sup>, Yin Wang<sup>2</sup>, Marisa Kruidenier<sup>1</sup>, Mark A. Thornton<sup>2</sup>, and Ingrid R. Olson<sup>1</sup>

<sup>1</sup> Department of Psychology, Temple University, Philadelphia, PA; <sup>2</sup> State Key Laboratory of Cognitive Neuroscience and Learning, and IDG/McGovern Institute for Brain Research, Beijing Normal University, Beijing; <sup>3</sup> Department of Psychology and Brain Sciences, Dartmouth University, Hanover, NH

## Introduction

The ability to track the relationships between individuals has allowed humans to live in and benefit from large social groups (Dunbar & Shultz, 2007). Previous work has shown that knowledge about social relationships is multi-dimensional in nature (Wish et al., 1976; Foa & Foa 2012; Fiske, 1992). *It is unclear which of the numerous dimensions from the literature are most important.*

**Aims:** To study whether knowledge about social relationships can be captured by principal components, and whether these components are represented in the brain

## Methods

- Behavior: 817 Mturkers rated 159 social relationships on 30 dimensions
- fMRI: 21 diverse young adults

### fMRI Task

Parent - Child

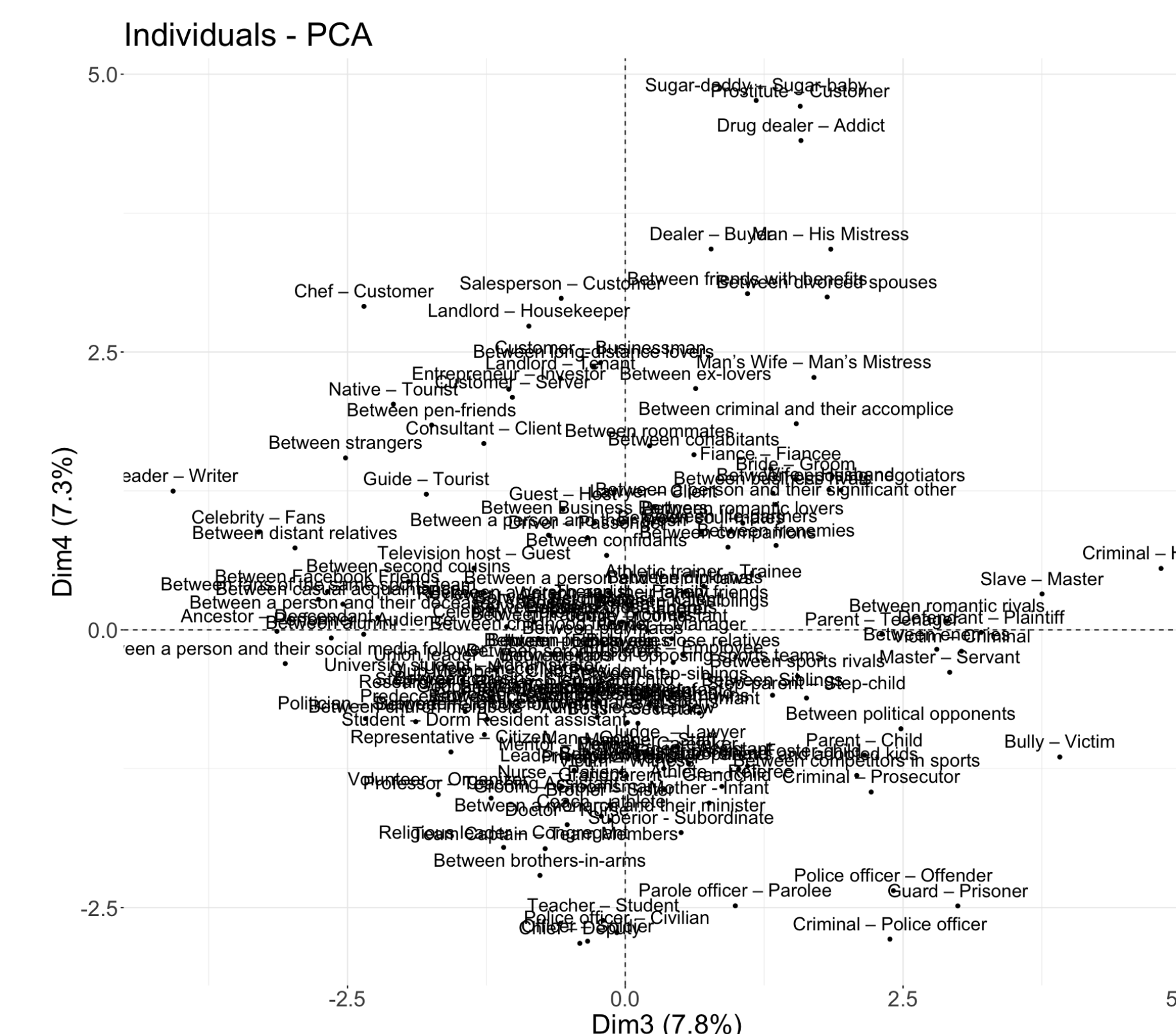
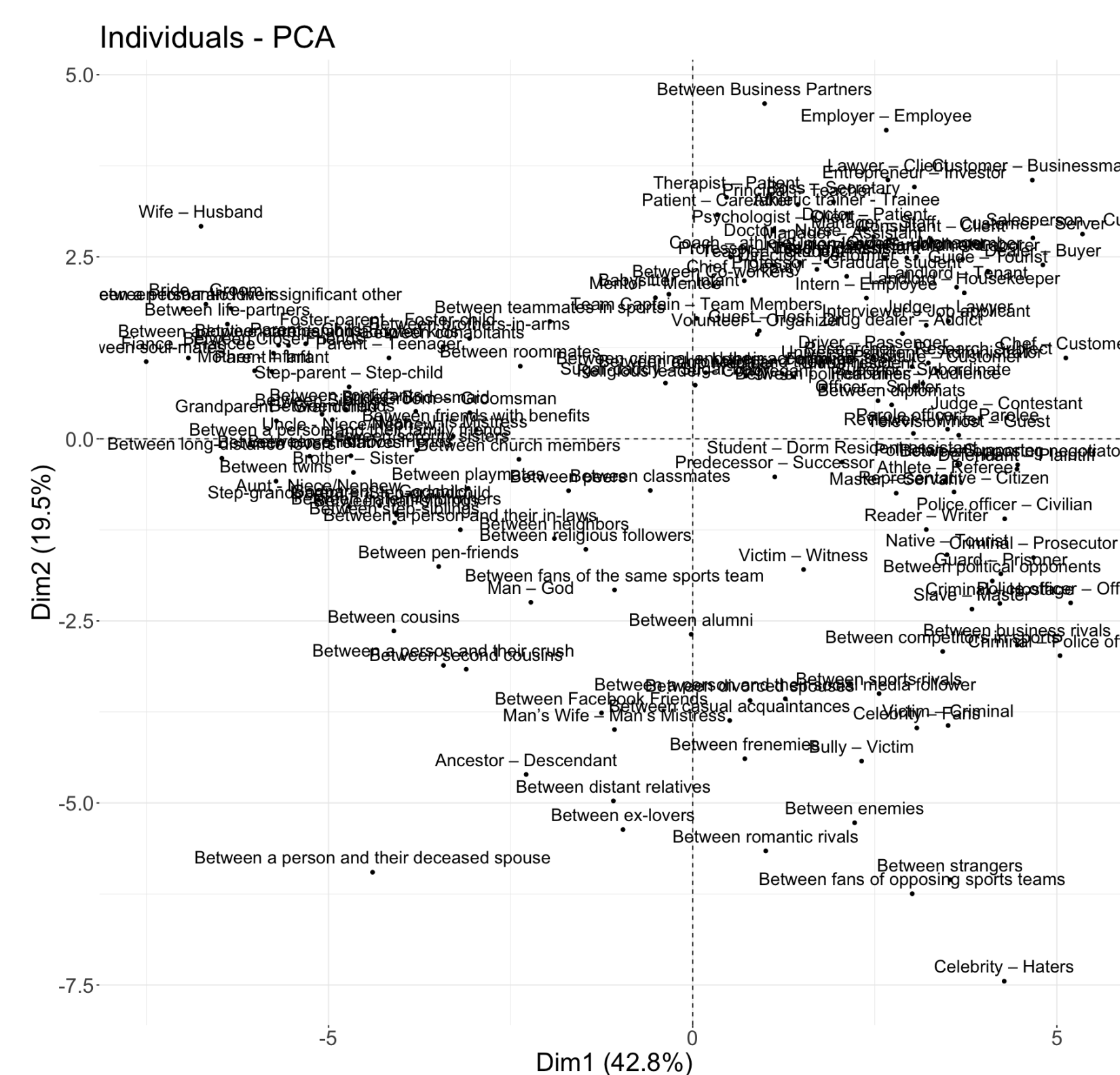
spoon feed

cry to be held

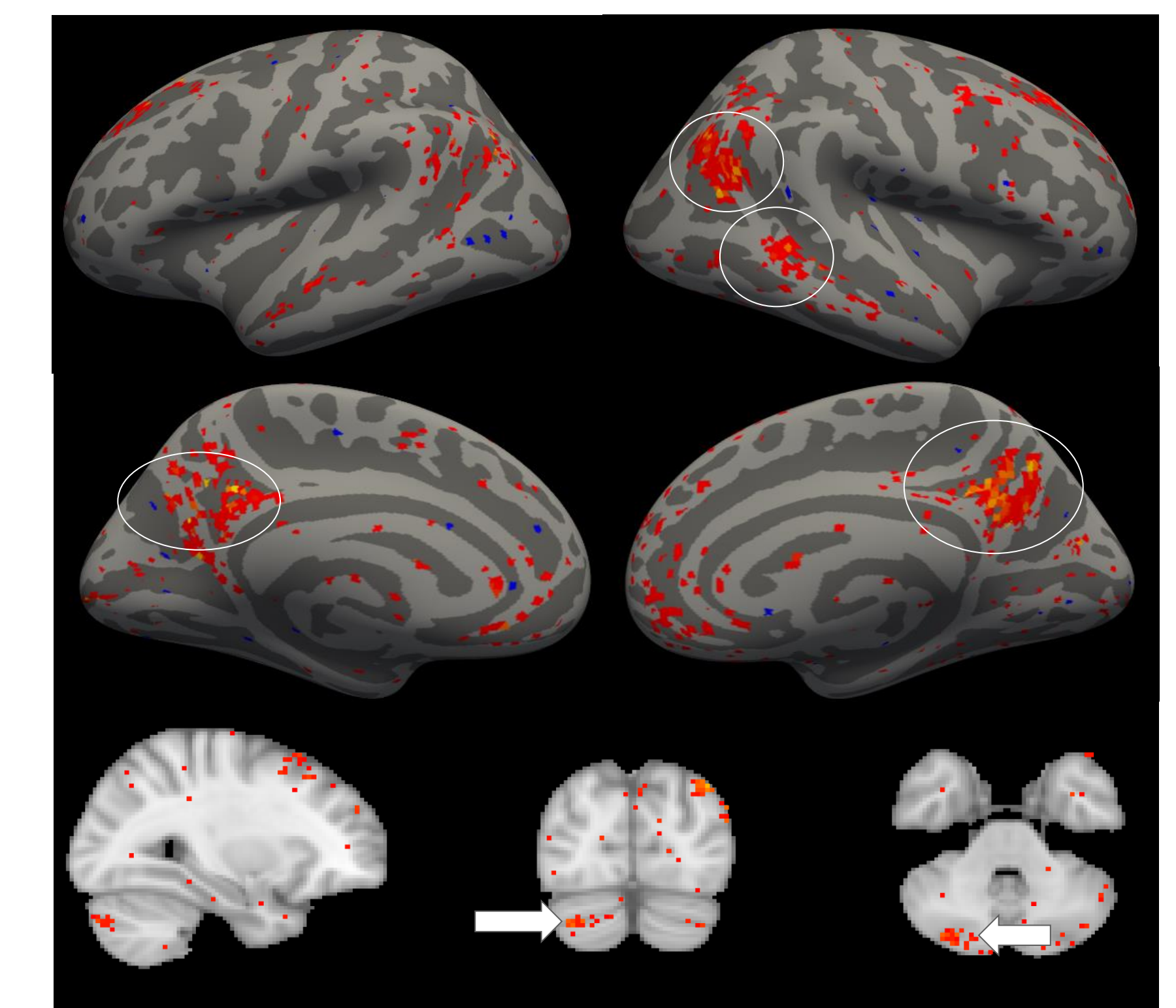
## Analyses

- Principal Component Analysis (PCA)
- Reliability analysis (Tarhan & Konkle, 2020)
- Representational similarity analysis (RSA) (Kriegeskorte et al., 2008)

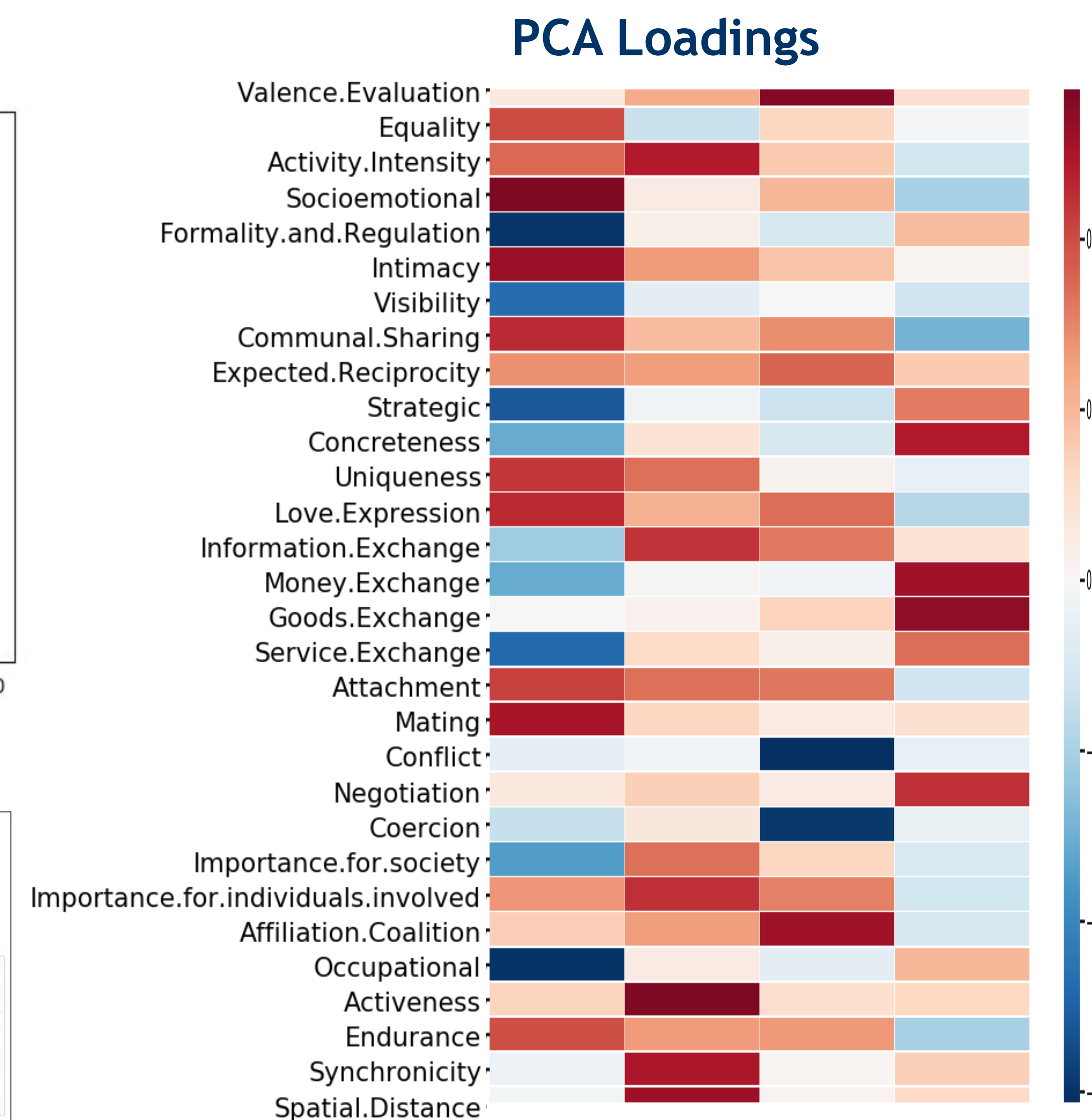
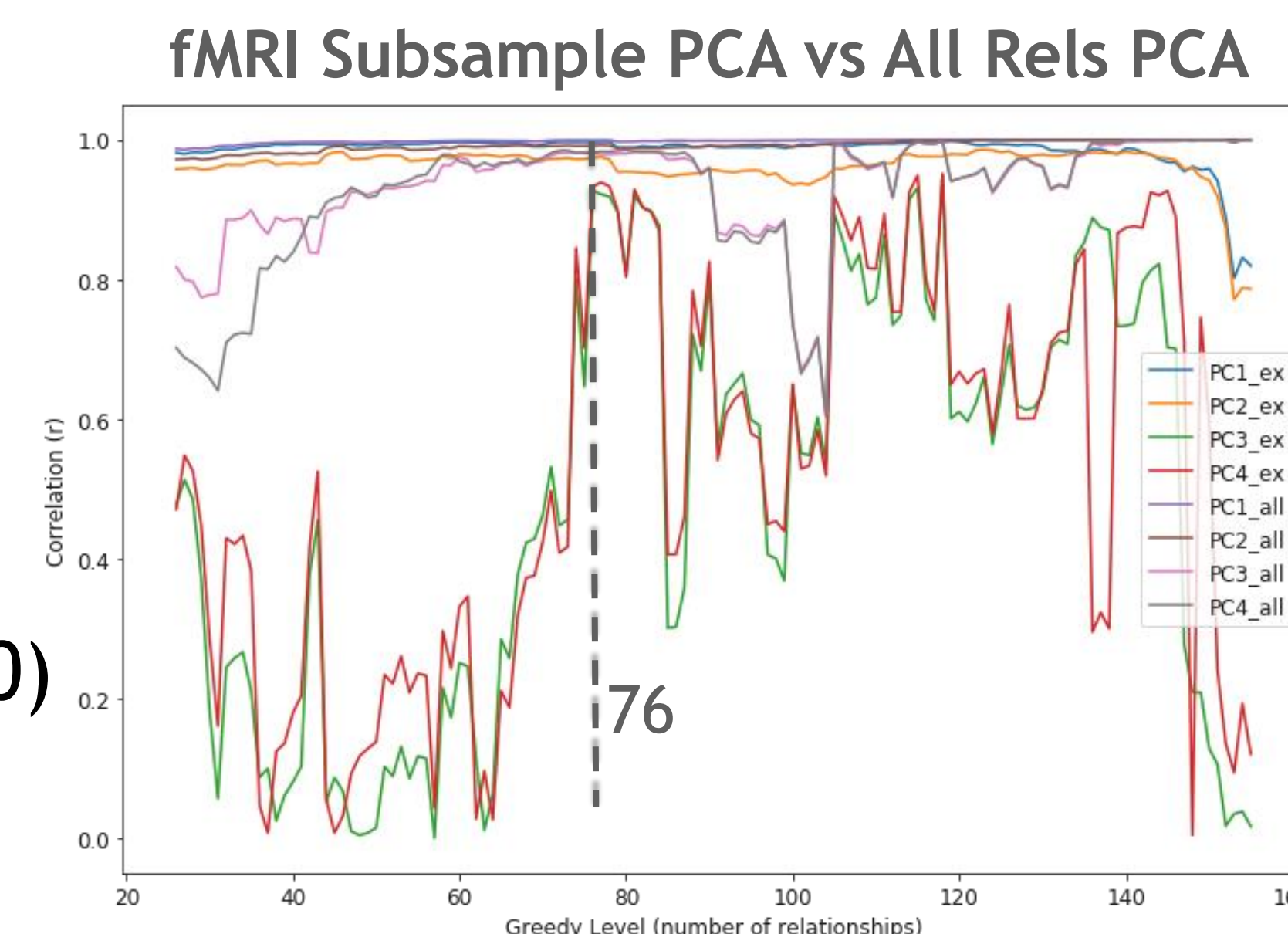
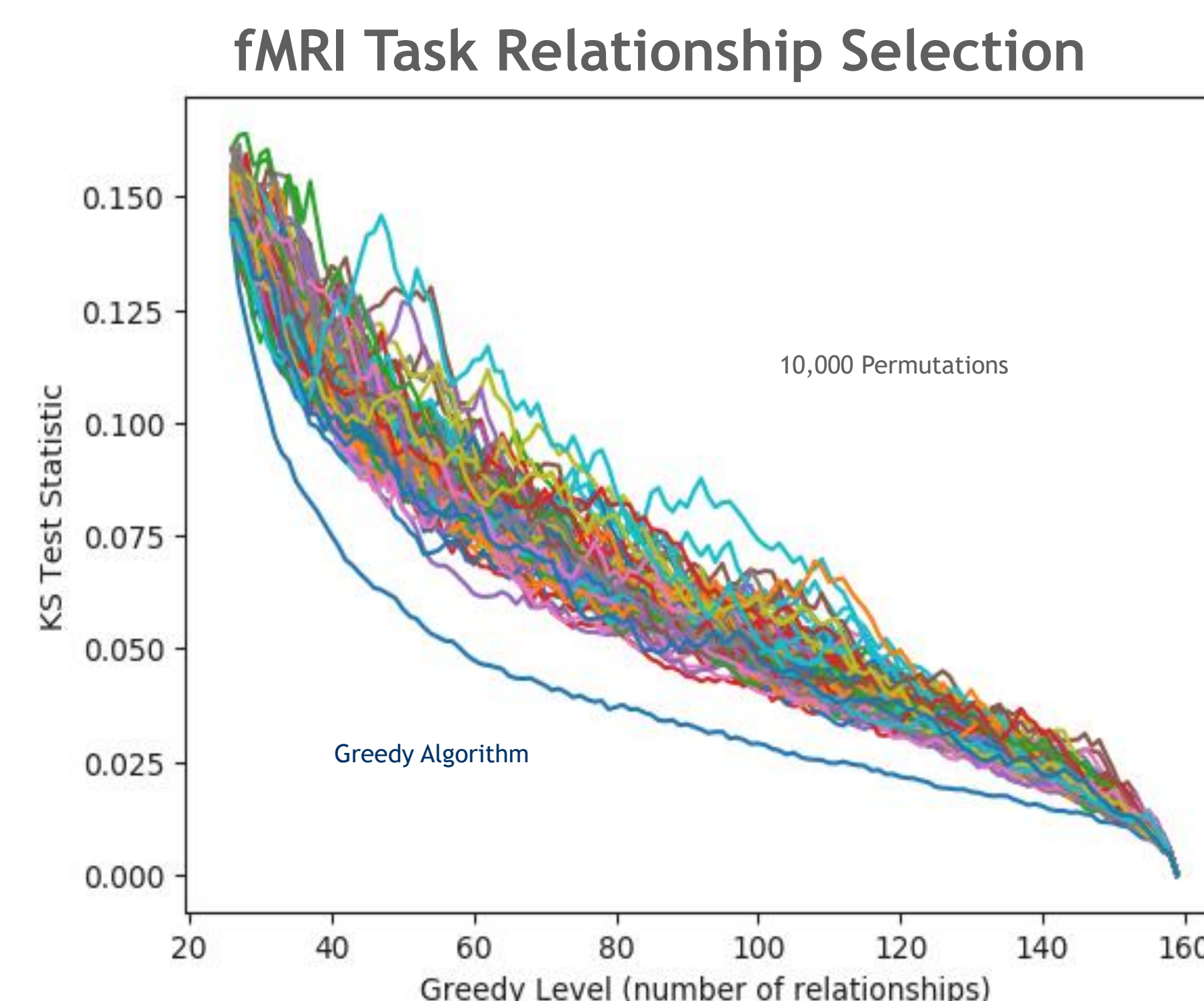
## PCA: Relationship-Space



## Neural Reliability Map: Regions of the brain that were reliably activated during the fMRI task

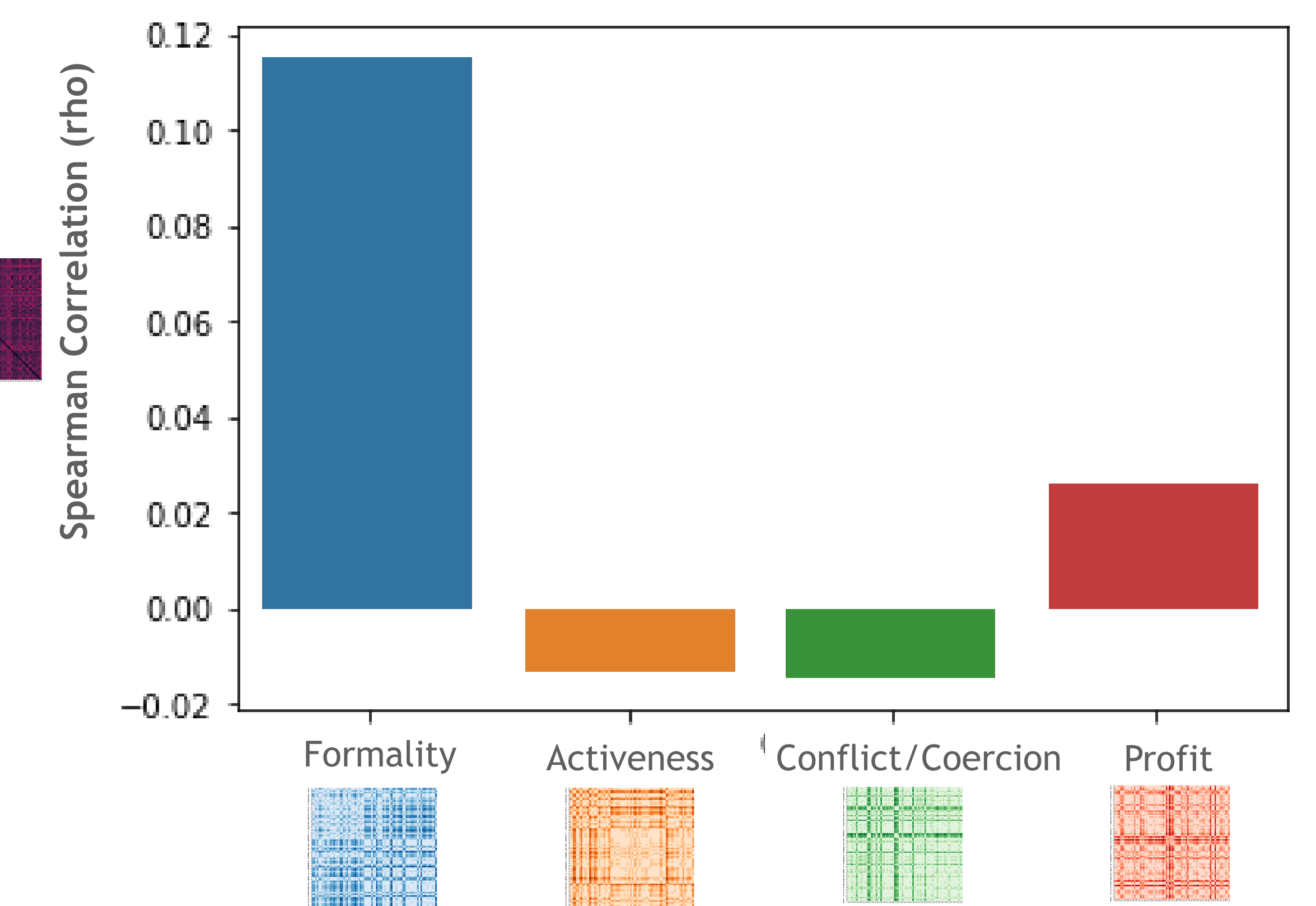


**Findings:** The “social brain” network were reliably activated, including the TPJ, PCC, vmPFC, MTG (circled) cerebellum (arrows)



**Findings:** First 4 components (Formality, Activeness, Conflict/Coercion, and Profit) account for 75% of variance

## RSA: Compare neural RDM to theoretical RDMs



**Findings:** Neural representations of social relationships were only related to the first component, Formality in our social network ROI

**Conclusion:** Behaviorally, social relationships can be represented as four components. RSA shows that only the first component, Formality, is represented in regions of the social network including the TPJ, PCC, vmPFC, MTG, and portions of the cerebellum.