# A multivariate approach to analyze connectivity matrices with individual-specific parcellation

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## 1. Introduction

### Background

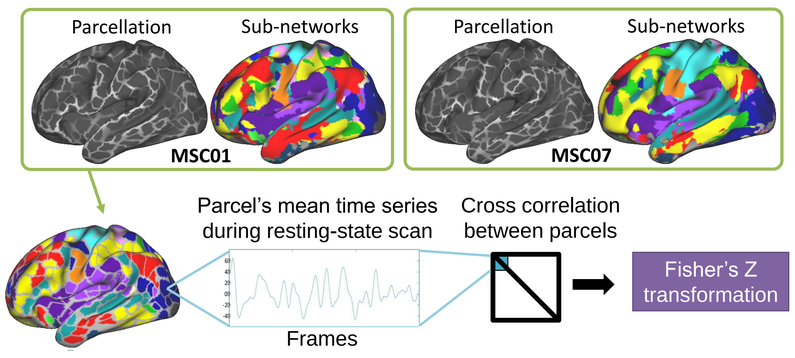
- Current resting-state *f*MRI (rs*f*MRI) analysis derives subject-specific parcellations and sub-networks.
- Standard approaches for rs*f*MRI:
  - **Graph/network analysis** accommodates different numbers of parcels/sub-networks.
    - Requires correction for multiple comparisons when examining sub-networks.
  - **Multivariate analysis** (e.g., MDS, DISTATIS) requires the same number of parcels/sub-networks.
    - Usually achieved by using a common template.
    - Biased against individuals who vary most from the target template.
- These problems are particularly severe for studies involving subjects that exhibit larger variance in brain structure and function.

### Aim

**To develop a new approach to accommodate different numbers of parcels and sub-networks.**

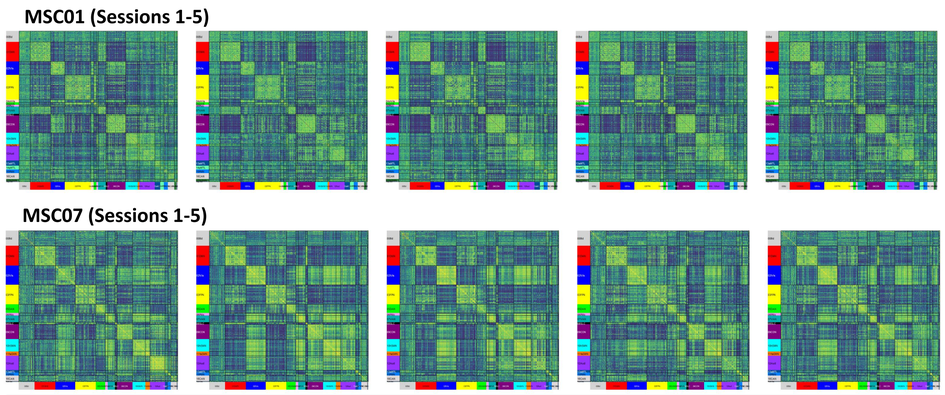
## 2. Resting-state data set

- **Midnight Scan Club (MSC; Gordon et al, 2017)**
  - Resting-state *f*MRI (30 minutes)
  - 10 participants × 10 sessions
  - Subject-specific parcellations and sub-networks

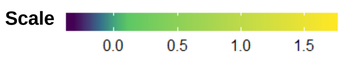



- Extract time series and create correlation matrix for each session of each subject

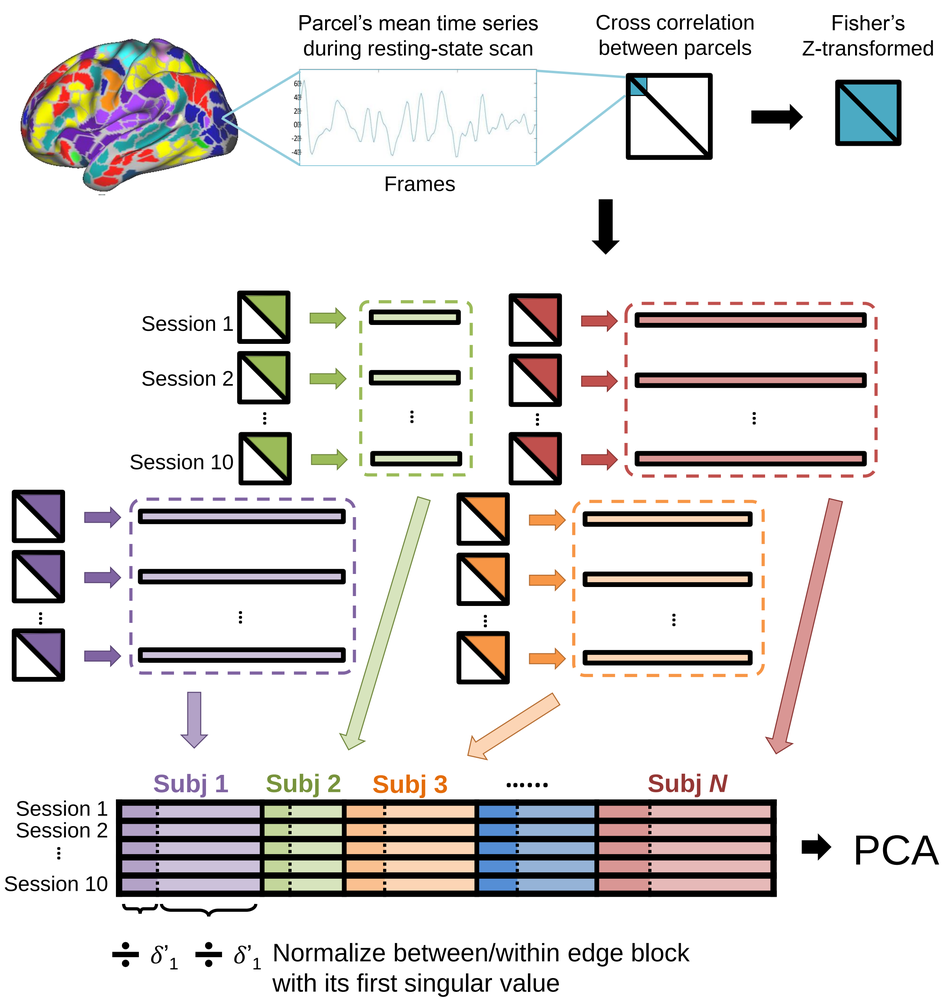
## 3. Examples of connectivity matrices




- Select common networks across participants
- Keep only positive correlation
- Z-transformed correlation




## 4. Multiple factor analysis




- The columns are grouped by their edge types (i.e., between- or within-network edges).
- First singular value of each block equals 1
- Equalizes block effects

## 5. Simulations

- **Sessions selection**
  - 4 sessions from MSC were kept
  - Only Sessions 2 and 4 were simulated
- **Simulating aging effect**
  - A decrease within DMN
  - An increase between DMN and FPN
  - An increase between DMN and DAN

## 6. Results