**Methods**

**Participants and functional resting-state data**

The proposed technique of this study was tested with the rs*f*MRI data from The Midnight Scan Club (MSC) data set (Gordon et al. 2017), which was obtained from the OpenfMRI database with its accession number ds000224. The MSC data set includes 10 sessions of anatomical and functional MRI data from six different tasks, including an eyes-open resting-state task. These data were collected from 10 (5 females) healthy young adults (age ranged between 24-34) from the Washington University community.

**Identifying parcels and networks**

In Gordon et al. (2017), individual-specific parcellation was constructed for each MSC participants using their rsfMRI data. The putative brain area boundaries are identified using a gradient-based technique (Cohen et al., 2008; Nelson et al., 2010; Wig et al., 2014). Briefly, the time courses from all vertex of the brain were correlated with each other to generate a correlation brain map from every vertex. A map of spatial gradient was used to identify edges where the transition of spatial correlation patterns occurs. A watershed edge detection algorithm is used to identify unique parcels, resulting in an individualized parcellation scheme for each participant.

**Constructing rsfMRI correlation network matrices**

Across the 10 participants, the number of parcels (or regions) identified by the above method ranges from xx - xx. The functional connectivity between two regions was computed by a Fisher’s *z*-transformed correlation between their blood-oxygen-level-dependent (BOLD) signals across time points. Therefore, the whole-brain functional connectivity of an individual can be represented by a symmetric, region-by-region connectivity matrix.

**Regular multivariate techniques for rs*f*MRI: three-way multidimensional scaling (DiSTATIS)**

Because the coefficient of correlations (which represent similarity) can be transformed into distances (which represent dissimilarity), the functional connectivity is often analyzed by multidimensional scaling (MDS) and DiSTATIS (i.e., a three-way multidimensional scaling) (rf. xxx). MDS extracts principal components from a distance matrix to help visualize the regions according to their dissimilarity, and DiSTATIS optimally integrates multiple distance matrices and extracts principal components from this optimal space called the *compromise*. In DiSTATIS, we can visualize the dissimilarity of regions both from the perspective of the complete set of data tables as the factor scores and from the perspective of different connectivity matrices as the partial factor scores. In rs*f*MRI analysis, these multiple distance matrices could be the connectivity matrix from different individuals and/or different experimental conditions.

However, DiSTATIS requires matching regions across multiple distance matrices. As a result, to perform DiSTATIS, the individuals need to be mapped onto the same template with the same organization of brain networks.

**Hierarchical multiple factor analysis with individual parcellation**

To avoid