**Multivariate partial least square methods on the association between brain network stratification and social cognitive measures in schizophrenia spectrum disordres (SSD)**

Authors

Ju-Chi Yu, Lucy Bassman, Lindsay Oliver, Colin Hawco, Miklos Argyelan, James M Gold ,

Sunny Tang, George Foussias, Robert W. Buchanan, Anil K. Malhotra, Aristotle N Voineskos, Erin W Dickie

Kimel Family Translational Imaging-Genetics Research Lab, Campbell Family Mental Health Institute, Centre for Addiction and Mental Health, Toronto, Canada;

Zucker Hillside Hospital, Glen Oaks, NY, USA;

Maryland Psychiatric Research Center, Department of Psychiatry, University of Maryland School of Medicine, Baltimore, Md.

**Purpose**

Schizophrenia Spectrum Disorders (SSD) has been associated with dysconnectivity in “lower-order” (e.g. visual, auditory) and “higher-order” (e.g., default-mode and frontoparietal) cortical networks. We characterized patterns of dysconnectivity by decomposing whole-brain connectomes into connectivity gradients and examined their correlations to social cognitive measures in SSD with advanced multivariate analysis.

**Methods**

We analyzed behavioural measures (i.e., neuropsychological tests and social cognitive scores) and resting-state fMRI data from the multicenter ‘Social Processes Initiative in Neurobiology of the Schizophrenia(s) (SPINS)’ study (197 stable SSD and 157 healthy controls, ages 18-55). After pre-processing, we extracted the gradients from parcellated connectomes (Ji et al. 2019; Margulies et al. 2016). We then compute the correlation pattern between these gradients to the behavoural measures and use partial least square correlation (PLSC; Krishnan et al. 2011) to decompose this multivariate pattern into unrelated dimensions.

**Results**

From the first dimension of PLSC, we identify the general brain-behavioural association, where participants with SSD have worse behavioural scores which are associated with less stratified brain networks. The second dimension identifies stronger impairment in social cognitive than in neuropsychological outcomes in SSD. The results further showed that, when the Language and the Default Mode Networks are more stratified from the Frontoparietal Network, social cognition is better preserved.

**Conclusion/Implications**

These results suggest a potential role of decreased differentiation of brain networks in functional impairment in SSD and, specifically, the differentiation between Language and Frontoparietal Networks is associated with the social cognitive impairment in SSD.