

Problem Statement: Working Memory

Many with psychiatric disorders also have some degree of cognitive impairment. However, people with lower levels of education also will perform worse on cognitive tests, and those with fewer years of education are also more likely to have psychiatric disorders. To what extent does a diagnosis predict a person's cognitive ability?

The CNP dataset is a community sample from Los Angeles of individuals in four categories: Controls, ADHD, Schizophrenia (SZ), and Bipolar Disorder. The following data elements are present:

fMRI measures:

Visual_Global_Efficiency Somatomotor_Global_Efficiency
Dorsal_Attention_Global_Efficiency Ventral_Attention_Global_Efficiency
Limbic_Global_Efficiency Frontoparietal_Global_Efficiency
Default_Mode_Global_Efficiency

Cognitive Measures:

Verbal Working Memory, Spatial Working Memory, Reaction Time.

Structural (MRI) Measures:

Left.Amygdala Right.Amygdala Left.Caudate Right.Caudate Left.Accumbens.area
Right.Accumbens.area TotalGrayVol CortexVol CorticalWhiteMatterVol
Left.Putamen Right.Putamen Left.Pallidum Right.Pallidum
Left.Hippocampus Right.Hippocampus WM.hypointensities
non.WM.hypointensities

Analyses

- 1: predict how cognitive ability changes with demographics, fMRI, MRI data. What is the individual predictive power of each modality? What is the cumulative predictive power?
2. Build a model using only controls to predict cognitive ability, and test this on the patients. What is the difference between the actual vs. predicted? Does this vary by diagnosis?
3. What other trends do you find in the data?