Statistical Association of Depression and ADHD Biomarkers

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1 Opportunity

The presence of psychiatric disorders is increasing according to recent population studies. Specifically, depression is present in 18

2 Challenge

The goal was to combine neurological structure, the presence of depression, the presence of ADHD along with information regarding gender to gain inference. Although previous research has indicated a possible relationship between the two disorders, there is an absence of quantitative research regarding the statistical relationship between the hindered brain regions.

3 Action

The first step towards determining the relationship between ADHD and depression was done by simulating a data set that incorporated the brain connectivity with psychiatric disorder diagnosis. Using the resting activity psychiatric data available, I was able to develop the data set to further incorporate ADHD and depression by defining the presence of disorders based on the blood flow to each region for each patient. Specifically, using the information presented regarding disease prevalence, I generated two binary vectors that indicated presence of ADHD and depression. Patients with the lowest blood flow activity (1-11

4 Resolution

Results of our depression logistic regression model indicated that the amygdala and the thalamus were the most statistically significant. Although previous research indicates that the hippocampus and striatum effect depression more (2), the model generated negated any statistical significance between the two

regions. The superior prefrontal cortex was determined to be the most statistically significant for ADHD. I altered the models by removing the gender vector to analyze the changes within our model. The presence of gender in the statistical model did not change which regions were significant for depression or ADHD, but improved the p-values. Using a Chi-Squared test to compare the statistical loss resulting from removing gender was further informative as gender played a more significant role in depression than in ADHD. Our model then implemented the removal of regions with extremely low variances to maximize data interpretation for both ADHD and depression. The results of this were the addition of statistically significant regions within the Thalamus region in regards to the presence of depression. For ADHD the most statistically significant region continued to be the superior prefrontal cortex. Furthermore, the correlation between the statistically modified areas of the brain affected by depression and ADHD is also the highest within our data when localized to the designated region.

5 Future Work

Using a variety of data mining tools and techniques, the relationships between ADHD and depression in terms of brain localization and connectivity could be further quantified. This project could be further investigated by implementing more research in regards to the structure of the thalamus and drug delivery therapies for depression. The results suggest more research regarding the interactions of the thalamus and the superior prefrontal cortex when diagnosing depression and ADHD.

6 Works Cited

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