

Introduction

- Major depressive disorder (MDD) is a mental illness predominantly characterised by low mood, among other symptoms, of varying severity^[1]
- Previous research has shown differences in functional connectivity in the brains of MDD patients compared to healthy controls (HC) in multiple brain regions^[2]
- Here we will discuss research to further prove the differences in functional connectivity previously found with larger sample sizes than previously possible

Aim

To identify differences in functional connectivity in the brains of HC compared to those of patients with varying scores of MDD

Method

- Data was taken in the form of IDPs from fMRI scans from UK Biobank^[3], with 380 participants separated into four groups; one HC group and three MDD groups of varying severity
- The data for each individual was plotted into a 55 x 55 matrix, and the Brain Connectivity Toolbox^[4] was used in MATLAB to calculate strength of connections, characteristic path length and clustering coefficient
- Due to restricted access to UK Biobank preventing identification of data from specific brain areas, mean values were used to produce results
- No differences with age or sex were detected, so all individuals were grouped together for the formation of results

Results

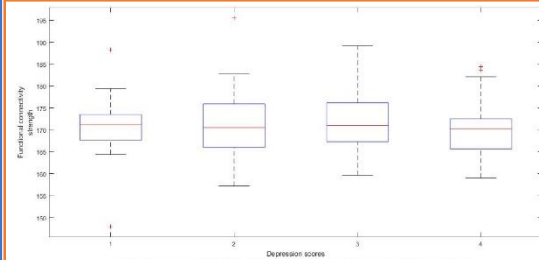


Figure 1 – Boxplot showing the functional connectivity strengths of each subject group

Strength here is the mean measure of the weights of functional connections to all nodes (small brain regions) from the whole-brain data of each individual^[4]
 There was no significant difference in mean strength between the HCs and any MDD score

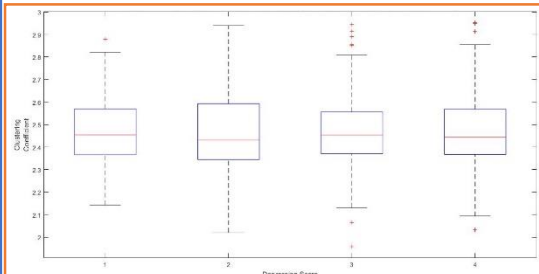


Figure 2 – Boxplot showing the clustering coefficients of each subject group

Clustering coefficient here is the equivalent of the mean fraction of every nodes' neighbours that are neighbours of each other^[4]
 There was no significant difference in mean clustering coefficient between the HCs and any MDD score

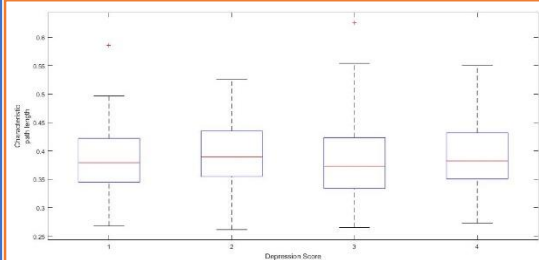


Figure 3 – Boxplot showing the characteristic path lengths of each subject group

Characteristic path length here is the average shortest path length of functional connections in the entire brain network measured^[4]
 There was no significant difference in characteristic path length between the HCs and any MDD score

Key for depression scores in **Figures 1-3**:

1 = HC, 2 = Single episode of MDD, 3 = Moderate MDD, 4 = Severe MDD

Discussion

- This research showed no significant differences in several functional connectivity parameters between HCs and varying severities of MDD
- However, other research groups have previously identified;
 - Increased functional connectivity in the subgenual cingulate and thalamus in patients with MDD compared to HCs^[2]
 - Reduced functional connectivity in many brain regions upon remission of MDD^[5]
- It is possible differences in specific brain regions could be present in the data used for this research, but the use of mean values for whole brain data may have masked any differences

Conclusion

- While this research project showed no functional differences between HC and MDD brains, other research by various groups has
- Future research using the large pool of data supplied by UK Biobank with full access could look into specific brain regions in an attempt to detect region specific differences in a larger cohort

References

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