

Graduate School of Science and Technology Master's Thesis Abstract

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Thesis title	Associations between parents' anxiety and alcohol abuse, childhood conduct problems, aggression, brain structure and functional connectomes		
Abstract			
<p>Aggressive behavior could be either adaptive or maladaptive – caused by comorbid psychiatric condition and hence not improving chances for survival by providing greater access to resources or improving the status in the social hierarchy. Adaptive aggression, though could also pose a problem to the society, can not be treated, but requires educational, psychological or other non-medical interventions. Maladaptive aggression is usually addressed by treating underlying psychiatric condition. In both cases, it is important to distinguish the subjects with excessive aggressive traits, to ensure early interventions and prevent harmful effects for the individual and the society.</p> <p>Brain structural abnormalities like deficiencies or asymmetry in Gray Matter Volumes (GMV), Cortical Thickness (CTh) and Gray Matter Density in amygdala, orbitofrontal cortex (OFC), Insula, anterior cingulate cortex (ACC) and several other ROIs have been found to have links with aggressive behavior and psychopathic traits. Several follow-up studies aiming to address the weakness of using only one modality build up on the previous findings by examining functional connectivity, or by exploring both brain morphology and functional connectivity like resting state fMRI (rs-fMRI) or task fMRI. Some attempts to incorporate several levels in the analysis, trying to connect CTh, Aggression and Trauma Exposure were addressed by Sheehan et al, 2021. Still, multilevel relationships between Gray Matter Abnormalities (GMV, CTh), Aggression, Family History, Childhood Conduct Problems and Functional Connectivity remain unclear.</p> <p>In this study, we use human connectome project (HCP) data to confirm previous findings in terms of brain structure and brain morphology, perform binary classification based on fMRI features with support vector machine (SVM), random forest and gradient boosting algorithms in the first part of analysis. In the second part of analysis, we select a group of subjects matched by gender and ethnicity to investigate the relationships between childhood conduct disorder, parents' anxiety problems, brain morphology and brain function. Based on the findings of the second part of analysis, we construct a structural equation model (SEM) that quantifies these relationships, and build predictive models based on relevant features. Generalizability of predictive models is then tested on new dataset. The results show that parents' anxiety and childhood conduct problems play significant role in elevated levels of aggression of the same subjects in adulthood. Identification of aggression subtypes is out of the scope of this research.</p>			