Abstract

Anxiety is a natural response to perceived threats, yet its excessive manifestation can lead to debilitating disorders with pervasive effects on emotional, behavioral, and physical health. Despite increased treatment rates, anxiety prevalence remains high with its reduction has proven elusive, creating a treatment-prevalence paradox. As early prevention and more targeted interventions are emerging as promising approaches to address such a paradox of anxiety, early identification of anxiety symptoms is imperative. While structural MRI has revealed insights into early neuroanatomical changes associated with anxiety, a gap persists in understanding how early physiological factors contribute to such developmental trajectories of anxiety and brain morphology. Leveraging normal-developing non-human primate models with two different behavioral assessments - Mother-Infant Scoring and Human Intruder Paradigm - conducted at different time points, this study aims to investigate the association of early anxiety-like behaviors with physiological precursors, focusing on gut microbiome imbalance and iron deficiency, and brain morphology in infant Rhesus macaques during their first year of life. The hypothesis posits that subjects exhibiting increased anxiety-like behaviors will demonstrate Proteobacteria imbalance, iron deficiency, and brain regional volume changes. Results reveal a consistency of anxiety-like behaviors and their association with higher Proteobacteria abundance, larger cingulate cortex, and smaller right hippocampus during the first year of life. Overall, the study underscores the potential presence of early indicators of anxiety and the intricate interplay between anxiety-like behaviors, physiological factors, and brain morphological development during infancy. Ultimately, these findings hold great implications for the development of more affordable and accessible methods for early identification, prevention, and intervention of anxiety.