

**NEURAL PATTERN RECOGNITION IN CHILDREN WITH  
PSYCHIATRY DISORDER**

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## ABSTRACT

Pediatric bipolar disorder (BPD) stands out as one of the most prevalent and severe chronic psychiatric conditions, characterized by rapid and pronounced mood swings leading to substantial morbidity. Unlike adult BPD, pediatric BPD tends to manifest more severely. In its initial stages, children grappling with BPD experience swift fluctuations in mood, including episodes of mania and depression, which might occur multiple times within a single day. This phenomenon, referred to as a mixed state, is a hallmark of childhood BPD. Children afflicted with this disorder often grapple with feelings of anger, worthlessness, and self-harm tendencies. Additionally, they frequently display excessive energy levels and an inability to remain still. The presence of these mixed states signifies the occurrence of childhood BPD, often leading to recurring instances of illness and extended periods of impairment, thus rendering affected children severely disabled.

In the pursuit of comprehending the underlying neuroanatomical disparities, our study embarked on a comparison between children with BPD and typically developing (TD) children. To achieve this, we employed two distinct morphometric techniques: voxel-based and source-based morphometry. The central objective was to ascertain whether there existed discernible differences in gray matter (GM) and white matter (WM) between children with BPD and their TD counterparts. The outcomes yielded by these methods collectively disclosed that the anatomical imaging characteristics of children with BPD exhibited alterations.

In the intricate landscape of the cerebral cortex, the relationship between its morphology and the cognitive processes, as well as the potential influence of diseases, remains intricate and challenging to unravel. Thus, to glean a deeper understanding of brain abnormalities, our study delved into investigating

specific parameters: sulcus depth (SD), gyrification index (GI), and fractal dimension (FTD). These metrics collectively offer insights into the brain's size, complexity, and folding patterns, providing valuable information that complements traditional quantitative assessments.

The neuropathogenesis of pediatric BD remains an enigma, with limited research conducted in this area. Particularly during the euthymic phase, when clinical symptoms persist without substantially impairing mood or daily function, understanding the intricacies of brain structure and function becomes crucial. To probe the architecture of white matter, we harnessed the capabilities of diffusion tensor imaging (DTI), a non-invasive form of MRI. This modality allowed us to discern deviations in white matter organization associated with BD in children.

Further exploring resting-state brain activity in the context of BD, we focused on various metrics: amplitude of low-frequency fluctuations (ALFF), Local Correlation (LCOR), Multi Voxel Pattern Recognition (MVPA), and Seed-Based analysis. These techniques, applied to functional magnetic resonance imaging (fMRI) data, unveiled insights into the intricate patterns of brain activity in individuals with BD. Notably, this approach showcased its potential as both a research tool and a clinical instrument for monitoring persistent cerebral dysfunction in the context of bipolar depression.

Intriguingly, our findings also suggest that structural brain issues may persist even during periods of apparent remission or euthymia. This realization underscores the necessity of continued exploration into the nuanced interplay between brain structure and mood dysregulation, paving the way for a more holistic understanding of pediatric bipolar disorder.