

Editorial

How do Affective Temperaments Develop into Bipolar Disorders?

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Abstract

Affective temperaments are considered to be antecedents or sub-syndromal manifestations of bipolar disorders. It is, however, unknown how these temperaments develop into bipolar disorders. We hypothesize that: [1] just before the onset of bipolar disorder, the left medial frontal gyrus (MFG) of cyclothymic and/or hyperthymic healthy subjects may degenerate and shrink in volume concomitantly with its dysfunction, [2] just after the onset of bipolar disorder, this change may involve the right MFG and bilateral anterior cingulate cortex, leading to dysfunction of prefrontal cortex, [3] during the first episode of bipolar disorders, prefrontal dysfunction may involve limbic system, leading to dysfunction of prefrontal-limbic system, and [4] along with recurrences of bipolar disorders, the prefrontal-limbic system dysfunction may progress. On the basis of our neuroimaging findings of affective temperaments, we believe that these hypotheses warrant further investigation.

Keywords: Affective Temperament; Cyclothymic Temperament; Hyperthymic Temperament; Bipolar Disorder; Voxel-Based Morphometry; Medial Frontal Gyrus; Prefrontal-Limbic Network

In the early 20th century, Kraepelin [1] described 4 basic affective dispositions (Grundzustaende: depressive, manic, cyclothymic and irritable basic affective dispositions), suggesting that these are antecedents or sub-syndromal manifestations of bipolar disorders. This unique idea has been succeeded by Akiskal [2-4] for which he replaced the term of affective dispositions with that of affective temperaments, adding anxious temperament to the existing classification. In total, 5 affective temperaments are considered to be antecedents or sub-syndromal manifestations of bipolar disorders. It is, however, unknown how these temperaments develop bipolar disorders.

Recently, a consensus model of the neural mechanism of bipolar disorder was proposed [5], which assumes that bipolar I disorder arises from abnormalities in the structure and function of emotional control networks in the human brain and that the developmental failure to establish healthy ventral prefrontal-limbic modulation underlies the onset of mania and progression of bipolar disorders. Although this model has been derived from expert opinions and is yet to be fully substantiated, there is a possibility that the onset and progression of bipolar disorders may reflect the degen-

eration of the neural correlates of affective temperaments, resulting in an incursion upon the ventral prefrontal-limbic network.

Hatano et al. [6] performed a cross-sectional neuroimaging study of 60 healthy subjects with affective temperaments, and analyzed the association between voxel-based morphometry of the brain in relation to affective temperaments. As a result, high cyclothymic subjects had significantly larger gray matter volumes of the left medial frontal gyrus (MFG) than low cyclothymic subjects. High hyperthymic males but not females also had significantly larger gray matter volume of the left MFG than low hyperthymic males. Moreover, subjects with both high cyclothymic and high hyperthymic temperaments demonstrated significantly larger gray matter volume of the left MFG than their counterparts. These findings suggest that cyclothymic and hyperthymic temperaments even in healthy subjects may have their morphological basis in the left MFG.

In contrast to MFG change in affective temperaments, meta-analyses of volumetric structural studies in bipolar disorders have shown that the anterior cingulate cortex and

insula are reduced in volume [7,8]. In view of the close location between MFG and anterior cingulate, it can be hypothesized that: [1] just before the onset of bipolar disorders, the left MFG of cyclothymic and/or hyperthymic healthy subjects may degenerate and shrink in volume concomitantly with its dysfunction, [2] just after the onset of bipolar disorders, this change may involve the right MFG and bilateral anterior cingulate cortex, leading to dysfunction of prefrontal cortex, [3] during the first episode of bipolar disorders, prefrontal dysfunction may involve limbic system, leading to dysfunction of prefrontal-limbic system, and [4] along with recurrences of bipolar disorders, the prefrontal-limbic system dysfunction may progress. On the basis of our neuroimaging findings of affective temperaments [6], we believe that these hypotheses warrant further investigation.

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