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Facial Biomarkers Detect Gender-Specific Traits for Bipolar Disorder

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Abstract

Bipolar disorder (BD) is a psychiatric disorder associated with brain and neurodevelopmental alterations. As in other disorders, patients with BD present minor Physical Anomalies (MPAs) in higher frequency than healthy subjects. MPAs are subtle signs of developmental deviation that appear in body regions that share the ectodermal origin of the brain and are likely triggered by the same insults altering early brain development in mental disorders. MPAs are thus considered potential biomarkers for neurodevelopmental disorders. In this study, we compared facial shape variation between patients with BD and healthy controls using 3D facial reconstructions from magnetic resonance images (MRI) to test the potential of MPAs as a biomarker of BD diagnosis. Moreover, we assessed sex-specific facial shape variation to test whether the disorder affects differently male and female patients. We collected the 3D coordinates of 20 anatomical facial landmarks in a sample of 174 subjects (87 patients with BD and 87 healthy controls) and analyzed global and local patterns of facial shape using Geometric Morphometrics and multivariate statistical techniques. Although Procrustes-ANOVA analysis revealed that diagnosis accounted for a low but significant effect (1.1% of total facial shape variance, P-value=0.016), global facial shape did not significantly discriminate between patients with BD and healthy controls (P-value=0.19). However, Euclidean Distance Matrix Analysis (EDMA) based on local distances of the face revealed that 16.8% of facial traits were significantly different between patients with BD and healthy controls. Remarkably, the patterns of facial differences were sex-specific, suggesting that BD has a different effect on male and female patients. These findings show that local facial

differences could be used as biomarkers for an improved diagnosis of BD and raise awareness on the importance of studying sex differences on neurodevelopmental disorders to develop more specific and efficient treatments.

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