

The neurobiology of smartphone addiction in emerging adults evaluated using brain morphometry and resting-state functional MRI

ABSTRACT

The characteristics of smartphone addiction (SPA) can be evaluated by neuroimaging studies. Information on the brain structural alterations, and effects on psychosocial wellbeing, however, have not been concurrently evaluated. The aim of this study was to identify abnormalities in gray matter volume using voxel-based morphometry (VBM) and neuronal functional alterations using resting-state functional MRI (rs-fMRI) in emerging adults with SPA. We correlated the neuroimaging parameters with indices for psychosocial wellbeing such as depression, anxiety, stress, and impulsivity. Forty participants (20 SPA and 20 age-matched healthy controls) were assessed using VBM and rs-fMRI. The smartphone addiction scale –Malay version (SAS-M) questionnaire scores were used to categorize the SPA and healthy control groups. DASS-21 and BIS-11 questionnaires were used to assess for psychosocial wellbeing and impulsivity, respectively. VBM identified the SPA group to have reduced gray matter volume in the insula and precentral gyrus; and increased grey matter volume in the precuneus relative to controls. A moderate correlation was observed between the precuneus volume and the SAS-M scores. Individuals with SPA showed significant rs-fMRI activations in the precuneus, and posterior cingulate cortex (FWE uncorrected, $p < 0.001$). The severity of SPA was correlated with depression. Anxiety score was moderately correlated with reduced GMV at the precentral gyrus. Collectively, these results can be used to postulate that the structural and neuronal functional changes in the insula are linked to the neurobiology of SPA that shares similarities with other behavioural addictions.

Keyword: Behavioural addiction; Internet addiction; Problematic smartphone use; Resting-state functional magnetic resonance imaging; Voxel-based morphometry