Exploring the quiet mind of former drug addicts using fMRI

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ABSTRACT

Introduction: Relapse refers to an act of taking drugs again which have previously been controlled or completely stopped. The issue related to drug relapse among former drug addicts (FDAs) is not new in Malaysia. Based on a previous study, this issue happens because of several factors including the activation of brain areas related to drug-craving behaviours when the FDAs are exposed to drug-related substances or images. However, it remains unclear whether these brain areas still show significant activation when the FDAs are not exposed to any drug-related substances or images. Thus, to address this issue, this study was performed using resting state functional magnetic resonance imaging (rs-fMRI) to identify whether the brain areas implicated with drug craving shows significant activation in FDAs at rest. **Materials and Methods:** A cross-sectional study involving 24 male FDAs recruited from community-based rehabilitation centres operated by National Anti-Drugs Agency (NADA) was conducted at the Universiti Kebangsaan Malaysia Children's Hospital. All participants were scanned using an MRI machine while they were at rest. The functional data then undergo pre-processing steps involving slice-timing correction, realignment, coregistration, segmentation, normalisation, and smoothing. Four out of 24 participants were excluded from this study as they did not meet the study's inclusion criteria. Fixed effect analysis (FFX) was used to analyse rs fMRI data for each participant. Random fixed effect analysis (RFX) was then used for within group brain activation maps. Data pre-processing and analyses were performed using Statistical Parametric Mapping 12 (SPM12) operating in MATLAB version 9.13 (R2022b). The significant level was set at PFWE < .05 and the number of voxels was thresholded at 10. **Results:** When FDAs are at rest, the right precentral gyrus (PrG), right superior parietal lobule (SPL), right middle cingulate gyrus (MCgG), left angular gyrus (AnG), left middle segment of the superior frontal gyrus (MSFG) and left supramarginal gyrus (SMG) showed significant activation. As supported by previous studies, only the right SPL and right MCgG are potentially related to drug craving. The right PrG which primarily associated with motor cortex, showed no direct link to drug craving. Meanwhile, the left AnG, left MSFG and left SMG are parts of the Default Mode Network (DMN) which usually show activation during resting state, also not associated to drug craving. However, these findings showed that the brain of FDAs at rest still exhibits significant activation in the areas involved in drug-craving. **Conclusion:** The rs-fMRI study showed that in the absence of drug related cues, the brain of FDAs still exhibits significant activation in the areas associated with drug-craving. Although the brain areas are not primarily involved in drug craving, their significant activation in brain of FDAs at rest suggests that the current treatment and rehabilitation programs are not fully effective to completely inhibiting the activations of brain areas involved in drug craving. However, further study is suggested to identify the correlation between the brain areas and the subjective craving scores of the FDAs to accurately determine whether the activated areas related to drug craving.

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