

Structural and functional pathology in cocaine use disorder with polysubstance use: A multimodal fusion approach structural-functional pathology in cocaine use disorder

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Introduction:

Cocaine use disorder (CUD) is described as a compulsive urge to seek and consume cocaine despite the inimical consequences. MRI studies from different modalities have shown that CUD patients exhibit structural and/or functional connectivity pathology among several brain regions. Nevertheless, both connectivities are commonly studied and analyzed separately, which may potentially obscure its relationship between them, and with the clinical pathology.

Objective:

Here, we compare structural and functional brain networks in CUD patients and healthy controls (HC) using multimodal fusion.

Methods:

The sample consisted of 63 (8 females) CUD patients and 42 (9 females) healthy controls (HC), recruited as part of the SUDMEX CONN database. For this, we computed a battery of graph-based measures from multi-shell diffusion-weighted imaging and resting state fc-fMRI to quantify local and global connectivity. Then we used multimodal canonical component analysis plus joint independent component analysis (mCCA+jICA) to compare between techniques and evaluate group differences and its association with clinical alteration.

Results:

Unimodal results showed a striatal decrease in the participation coefficient but applied supervised data fusion revealed other regions with cocaine-related alterations in joint functional communication. When performing multimodal fusion analysis, we observed a higher centrality of the interrelationship and a lower participation coefficient in patients with CUD. In contrast to the unimodal approach, the multimodal fusion method was able to reveal latent information about brain regions involved in impairment due to cocaine abuse.

Conclusion

The present results could help in understanding the pathology of CUD to develop better pre-treatment/post-treatment intervention designs.