



Neurobiological signatures of substance misuse in schizophrenia and psychotic disorders

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Theme: Brain and mental health imaging

Project description: A history of cannabis use presents in half of patients with psychotic disorders. Cannabis is a 'component cause' of psychotic disorders and worsens prognosis. Neuroimaging markers such as resting state functional MRI, subcortical morphology and Magnetic Resonance Spectroscopy demonstrate differences in participants with and without a history of cannabis use (for an example see Figure 1). This may be important (1) for our understanding of the classification of the psychotic disorders and (2) to develop treatments to target dual diagnosis.

The PhD student will work on the British Medical Association Foundation for Medical Research funded TaRGeTS study - Targeting the Role of **G**lutamate/**G**lutathione in **T**reatment of **S**chizophrenia (PIs: Kumar & Katshu) to investigate brain structure and differences in neurochemical composition (particularly glutamate and glutathione) in patients with schizophrenia with varying levels of drug use, particularly cannabis. The student will also use existing data from Wellcome Trust funded Multimodal Imaging Study in Psychosis (MISP) and MRC funded Effect of Cannabis in early Psychosis (EfCiP) to investigate the impact of substance use, particularly cannabis use, on structural and functional brain imaging parameters.

This PhD studentship will include well-rounded training opportunities in: (1) psychosis and schizophrenia research; (2) addiction and substance misuse; (3) experience of recruitment of vulnerable patient populations, data acquisition, psychometric testing and considerations in running a neuroimaging study; (4) experience across a broad array of neuroimaging techniques (structural, functional, and spectroscopy) and their analyses; and (5) presenting and publishing research.

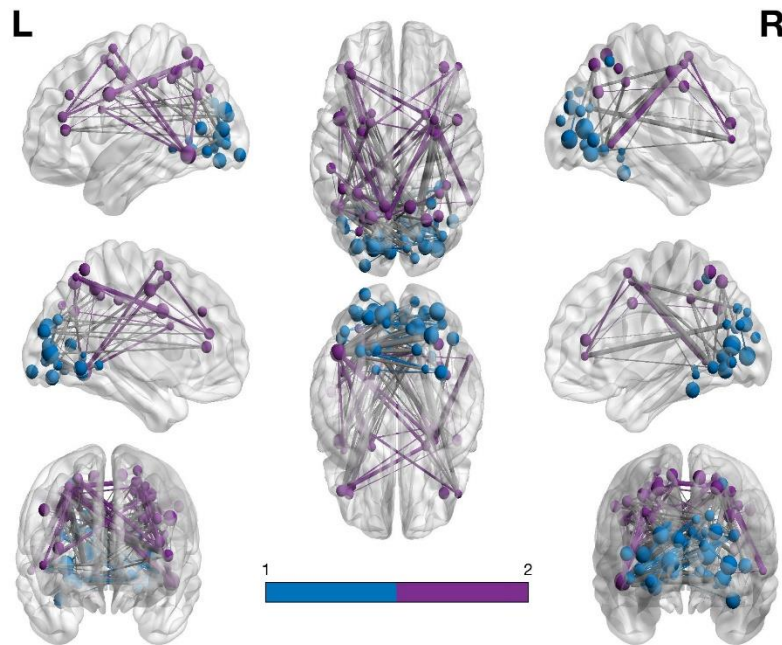
Proposed Timeline:

Year 1:	TaRGeTS Study –data acquisition & recruitment
	Introduction to neuroimaging and statistical techniques
	Introduction to schizophrenia and addiction research
	Neuroimaging based systematic review meta-analysis
Year 2:	(Aim for first 6 months) TaRGeTS Study –data acquisition & recruitment
	Aim for two further papers from analysis of EfCiP/MISP datasets.
Year 3:	Analyses from TaRGeTS study & write-up & submission

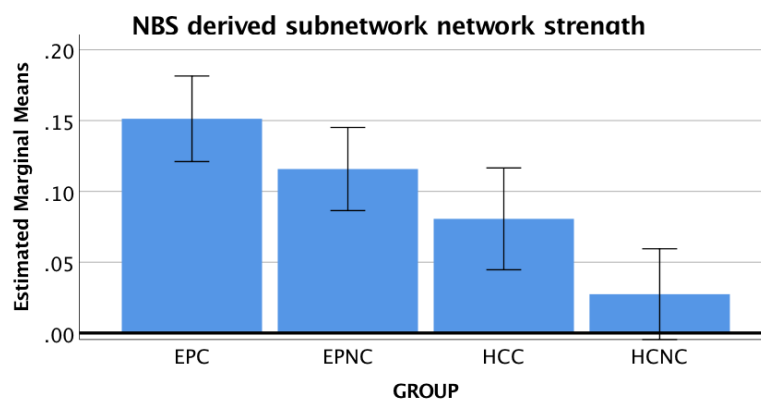
Lead school: School of Medicine

Figure 1: Resting state Functional connectivity: psychosis x cannabis interaction

(a)



(b)



Resting State functional connectivity psychosis x cannabis interaction from the EfCiP study. Data from the EfCiP study (Sami et al, In Submission). (a) demonstrates a Network Based Statistic (NBS) difference in Visual and Dorsal Attention Networks in patients and controls with and without a history of cannabis use ; (b) shows the averaged functional connectivity across the groups.

Legend: (a) Blue Nodes: Visual Network (VN); Purple Nodes: Dorsal Attention Network (DAN); Blue Edges: Visual Node to Visual Node connection; Purple Edges: Dorsal Attention Node to Dorsal Attention Node connection, Grey Edges: Internetwork connection. Radius of edge correlates to strength of F-Statistic. (b) EPC: Psychosis with history of cannabis use; EPNC: Psychosis without history of cannabis use; HCC: Controls with history of cannabis use; HCNC: Controls without history of cannabis use; All network strength means co-varied for mean motion.

Key Papers:

(1–4)

1. Kumar J, Liddle EB, Fernandes CC, Palaniyappan L, Hall EL, Robson SE, et al. Glutathione and glutamate in schizophrenia: a 7T MRS study. *Mol Psychiatry*. 2018;1–10.
2. Sami MB, Bhattacharyya S. Are cannabis-using and non-using patients different groups? Towards understanding the neurobiology of cannabis use in psychotic disorders. *Journal of Psychopharmacology*. 2018;
3. Sami M, Rabiner EA, Bhattacharyya S. Does cannabis affect dopaminergic signaling in the Human brain? A systematic review of evidence to date. *Eur Neuropsychopharmacol* [Internet]. 2015;(0). Available from: <http://www.sciencedirect.com/science/article/pii/S0924977X15000887>
4. Kumar J, Iwabuchi S, Oowise S, Balain V, Palaniyappan L, Liddle PF. Shared white-matter dysconnectivity in schizophrenia and bipolar disorder with psychosis. *Psychol Med*. 2014;72.

To apply for a place on the programme you will need to:

1. join the open day on **9 January** or contact a potential supervisor. If you wish to join the open day, please e-mail PI-Beacon@nottingham.ac.uk

2. [apply online here by 17 January](#)

3. on submission send an email to PI-Beacon@nottingham.ac.uk stating your preferred project, application ref number and enclose a CV

For any enquiries please email PI-Beacon@nottingham.ac.uk