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Glutamate, and its relationship to task-induced functional connectivity in the human brain: A focus on schizophrenia

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Glutamate is the brain's major excitatory neurotransmitter mediating both neuroplasticity and network function (Zhou & Danbolt, 2014). Basal glutamate (Glu) measured using proton magnetic resonance spectroscopy (1H-MRS) provides insight into a region's density of neuropil related to the glutamatergic system. Moreover, given the role of glutamate in mediating brain network function, Glu levels may play a role in the brain's functional connectivity (FC), which is typically estimated from functional magnetic resonance imaging (fMRI) time series data. These questions converge when considering the clinical syndrome of schizophrenia (SCZ). Patients with SCZ show abnormalities in basal Glu in the hippocampus and prefrontal cortex (Tebartz et al., 2013). They also show functional dys-connectivity across brain networks induced by tasks of learning (Baajour et al., 2020). Yet, no investigations have systematically assessed relationships between basal Glu and task-induced FC in healthy controls (HC), and possibly altered relationships in SCZ. Here, we will explore relationships between Glu (hippocampus and prefrontal cortex) and whole-brain functional connectivity derived from fMRI data acquired using a specifically tailored learning task (Ravishankar et al., 2019). Data were acquired in a single session in 72 participants (36 SCZ and 36 HC). From Glu quantitated in the hippocampus and the prefrontal cortex (LC Model, Woodcock et al., 2018), we will explore statistical relationships to FC estimated across a 90-node brain network, using a combination of clustering and graph theoretic methods, and address whether these relationships differ between HC and SCZ.

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