

Aberrant structural connectivity between the medial thalamus nuclei and frontal cortices in individuals with early psychosis

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Introduction

- **psychosis** is a debilitating trans-diagnostic syndrome characterized by hallucinations and delusions [1]
- the **thalamus and its cortical connections** are crucial for the pathophysiology of psychosis [2, 3]
- the thalamus: separate nuclei with **distinct connectivity and functioning** [4]
- higher-order nuclei, e.g., mediodorsal, facilitate information transmission across cortical regions
→ integration of complex brain functions [5]
- recent study: lower volumes of the **medial thalamic subnuclei** in first-episode psychosis [6]

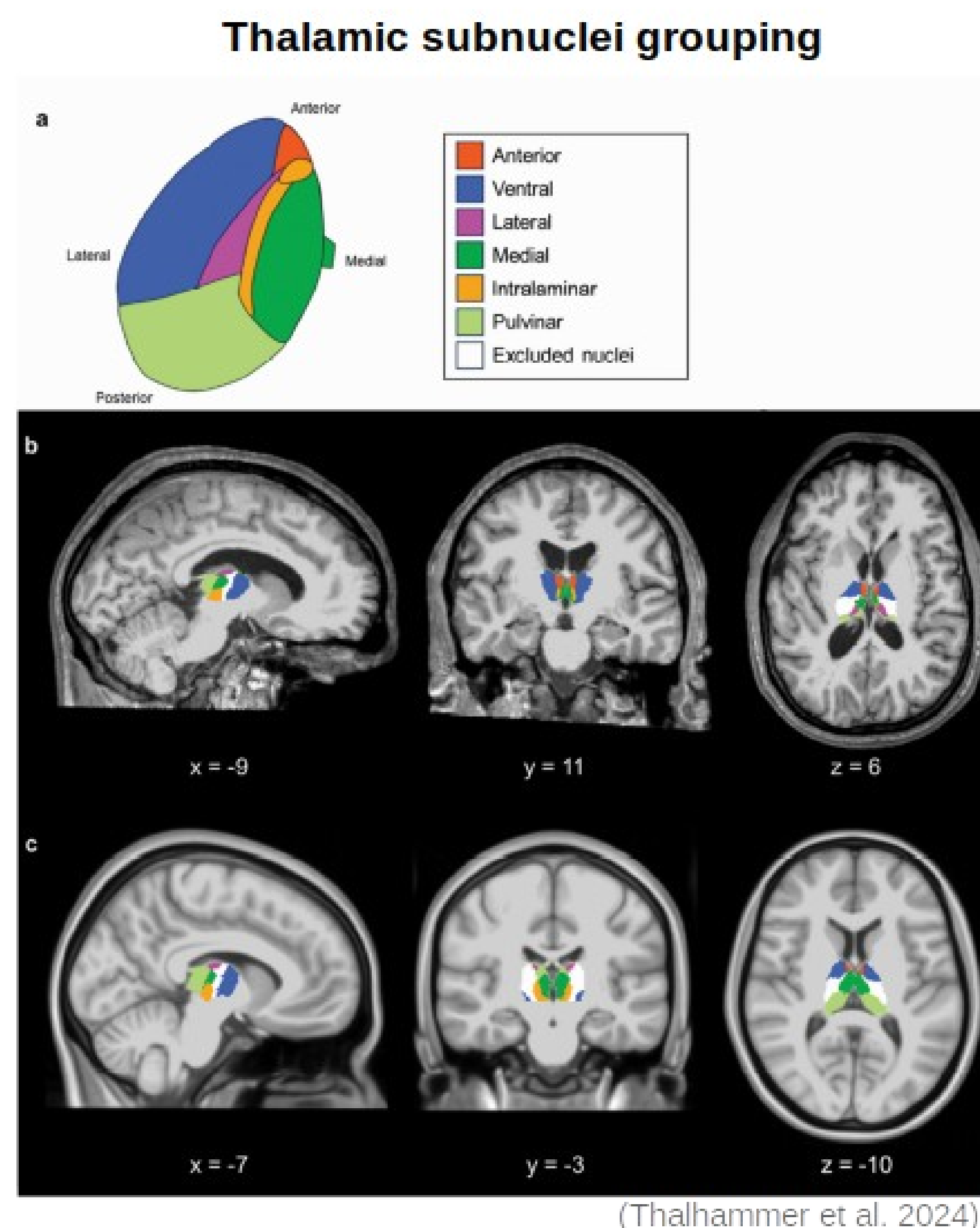
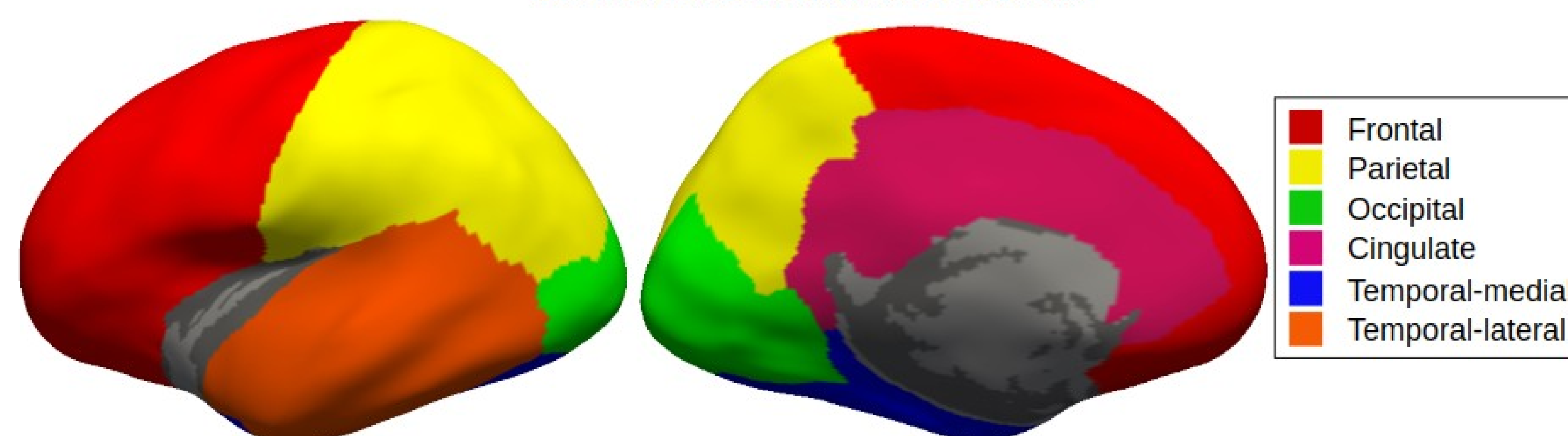
Hypothesis

Selectively aberrant medial thalamus-cortex connections in adults with early psychosis

Methods

- 69 patients with **non-affective early psychosis (EP)**, 46 healthy controls from HCP - Early Psychosis (mean age: 23.11 ± 3.8 years, f/m = 36/79) [7]
- **thalamic subnuclei** were segmented into 6 groups using freesurfer [8]
- cortical regions were segmented into 6 ROIs based on DK atlas [9]
- diffusion-weighted images were preprocessed using FSL [10]
- fractional anisotropy (FA) in thalamic subnuclei
- **probabilistic tractography** between medial thalamus and cortical regions
→ connection probability and connection density
- harmonization across scanners using NeuroComat [11]

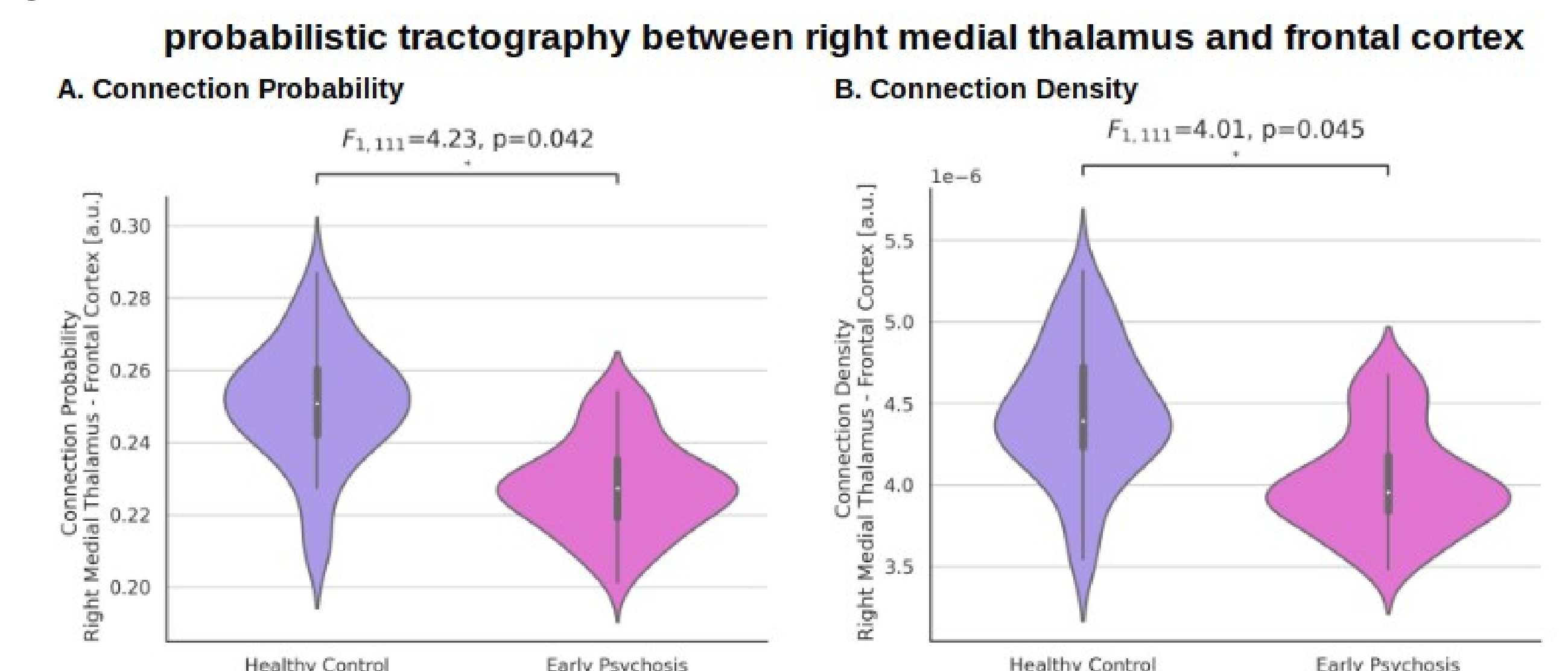
Cortical ROIs based on DK atlas



(Thalhammer et al. 2024)

Results

- volumes of all thalamic nuclei were not altered in EP
- microstructure (FA) of all thalamic subnuclei was not altered in EP
- lower **connection probability** ($F_{1,111}=4.23$, $p=0.04$) and lower **connection density** ($F_{1,111}=4.10$, $p=0.05$) in tracts between the **right medial thalamus and the frontal cortex** in EP
- follow-up analysis: lower connectivity between **medial and lateral mediodorsal nuclei** and frontal cortices in EP
- aberrant connections were not linked with psychotic symptoms and cognition



Discussion

- aberrant thalamocortical connectivity for medial thalamus nuclei and frontal cortices in EP
- in contrast to volume and microstructure, aberrant thalamocortical connectivity shows that these alterations are present in early stages of psychosis spectrum disorders
- abnormal connectivity between mediodorsal nuclei and frontal cortex suggests impaired cortical information synchronization in psychosis
- BUT: no correlations were found with cognitive or psychotic symptoms

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