

A Meta-analysis Of TSPO Neuroinflammation PET Imaging In Neurodegenerative Diseases

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Background: Neuroinflammation is a feature of neurodegenerative diseases. Positron emission tomography imaging of the translocator protein (TSPO-PET) is the best-established technique for imaging neuroinflammation, though individual studies can be underpowered to detect precise effects.

Methods: EMBASE and MEDLINE were systematically searched for studies in neurodegenerative diseases using TSPO-PET as per a preregistered protocol (PROSPERO:CRD42025646753). Random-effects meta-analyses were conducted using the standardised mean difference (SMD) in TSPO binding between disease and healthy control (HC) groups for each reported brain region. Mixed-effect meta-regressions were used to find associations between neuroinflammation and clinical variables.

1) Study selection

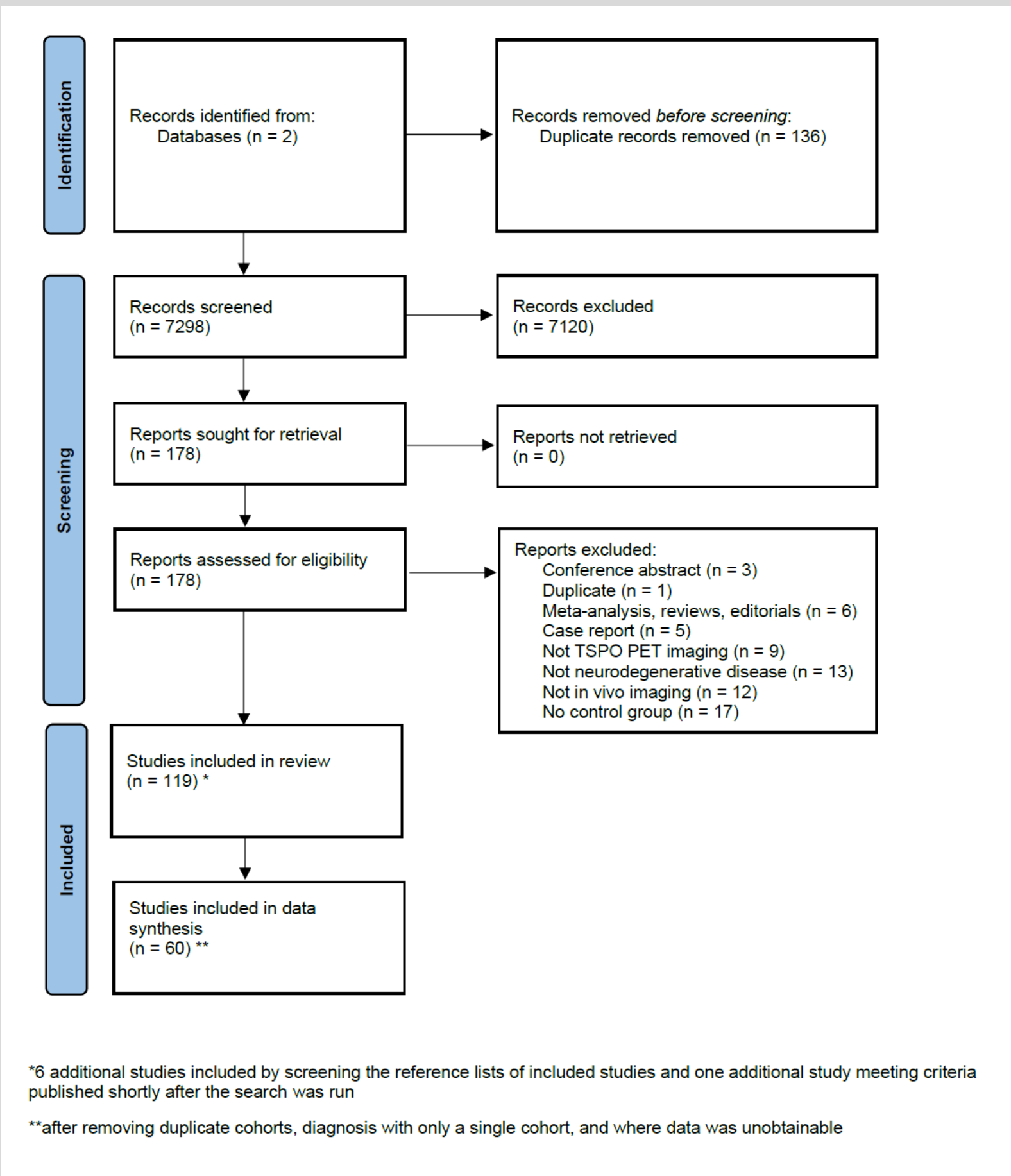


Figure 1: PRISMA flow diagram

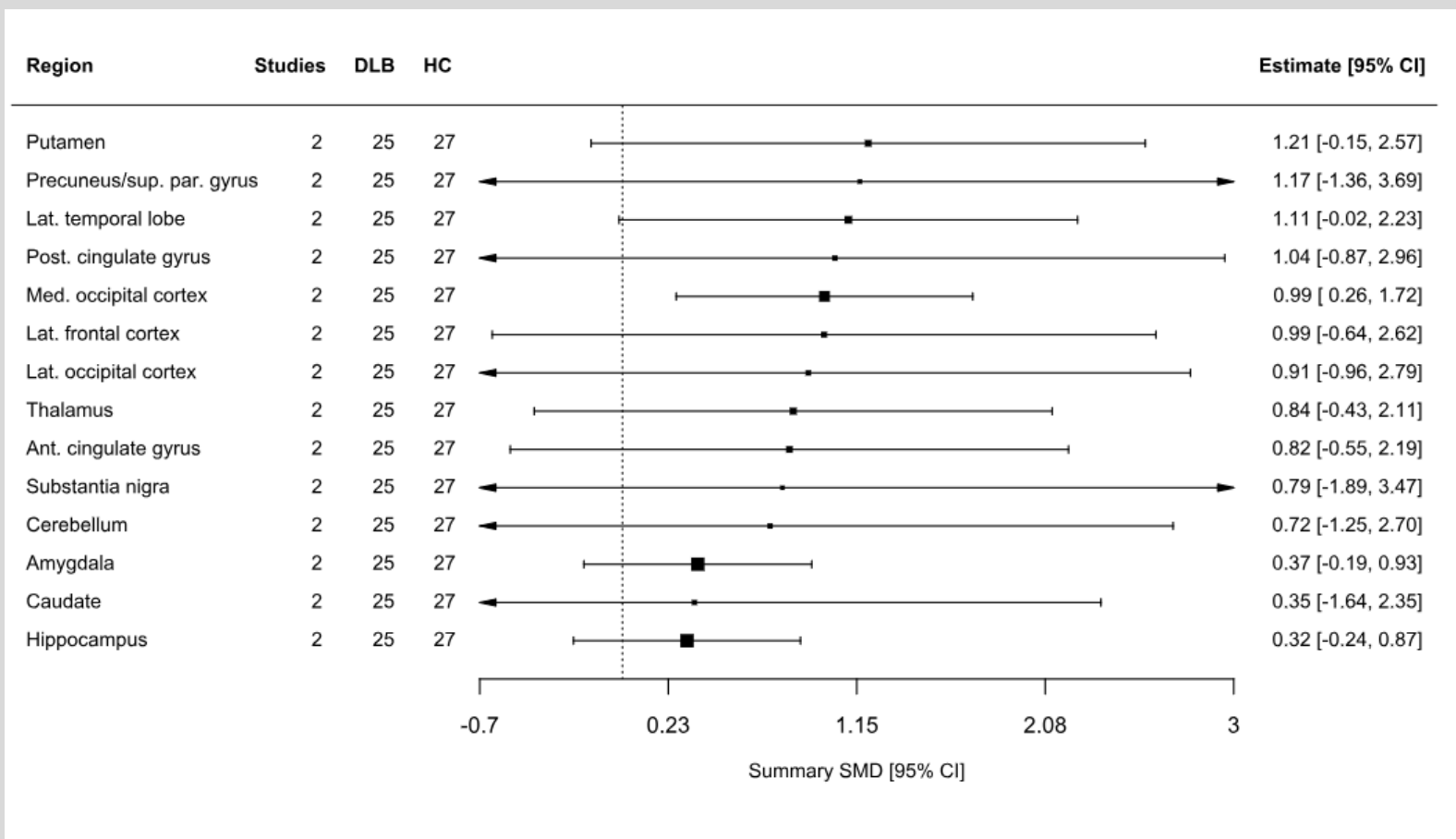


Figure 2: Forest plot for DLB showing significant neuroinflammation in the medial occipital cortex (SMD=0.99[0.26-1.72])

Conclusions: Neuroinflammation showed disease-specific patterns in neurodegenerative diseases and was associated with worse greater cognitive impairment, longer disease duration and motor features. Longitudinal, multimodal studies using novel PET tracers are needed to further clarify the role of neuroinflammation in neurodegeneration.

2) Regional TSPO binding is increased in disease-specific patterns

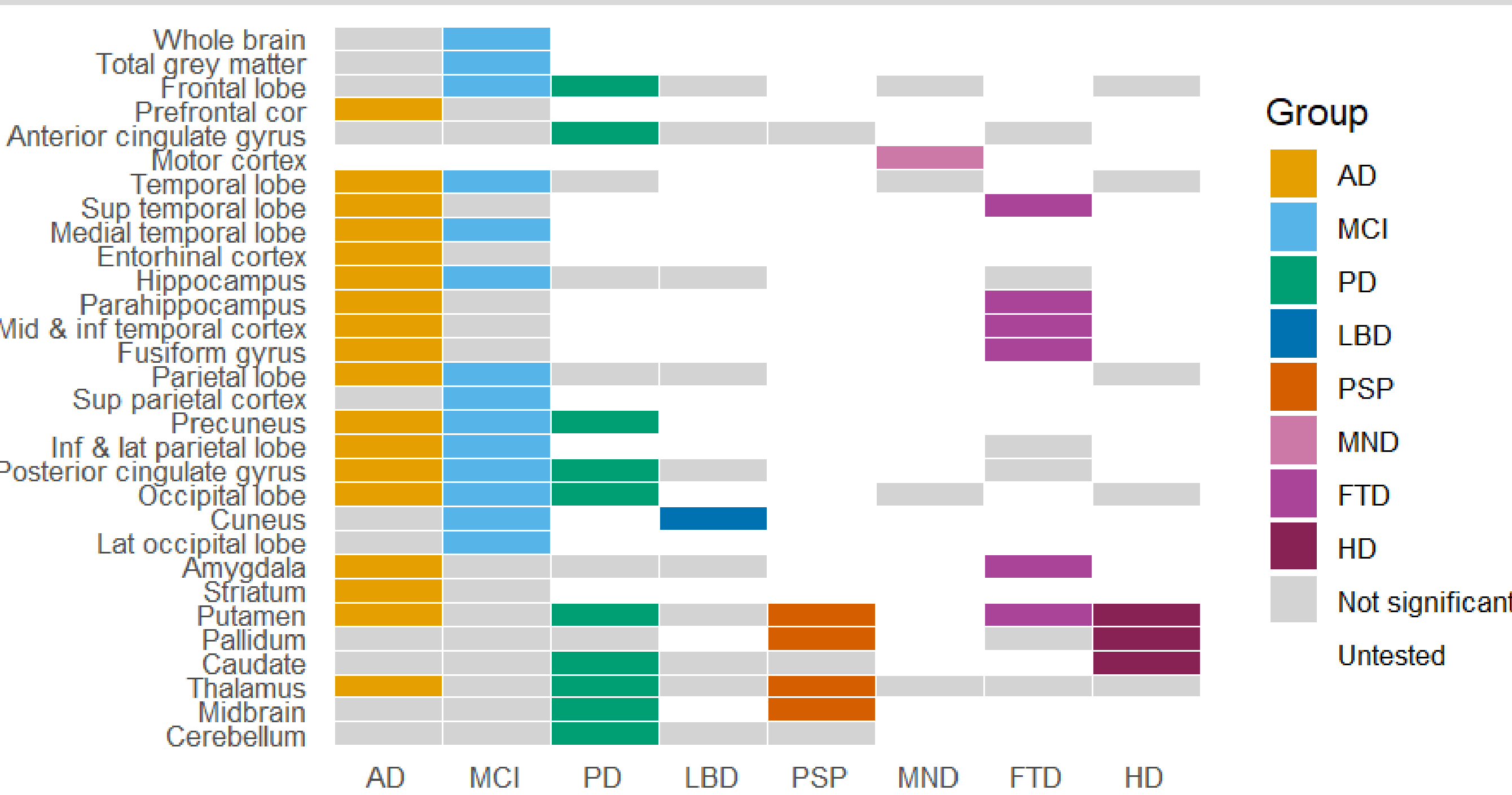


Figure 3: Heatmap showing brain regions with significantly increased TSPO binding compared to controls. Each row represents a brain region and each column a neurodegenerative diagnosis. Filled cells represent significant regions, grey cells represent regions not significantly increased compared to controls

4) TSPO binding was associated with cognition, disease duration and motor symptoms

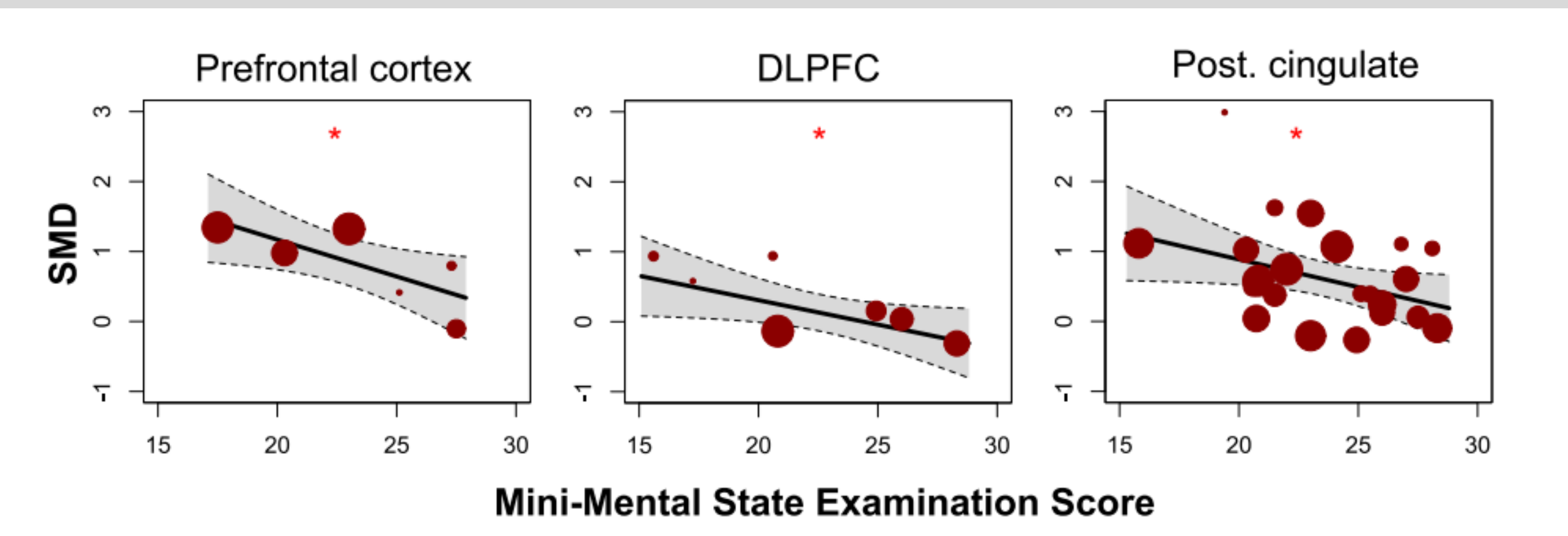


Figure 4: Lower MMSE was associated with higher standardised mean difference (SMD) in the prefrontal cortex, dorsolateral prefrontal cortex (DLPFC) and posterior cingulate gyrus in the AD/MCI

3) TSPO binding is higher in AD compared to MCI

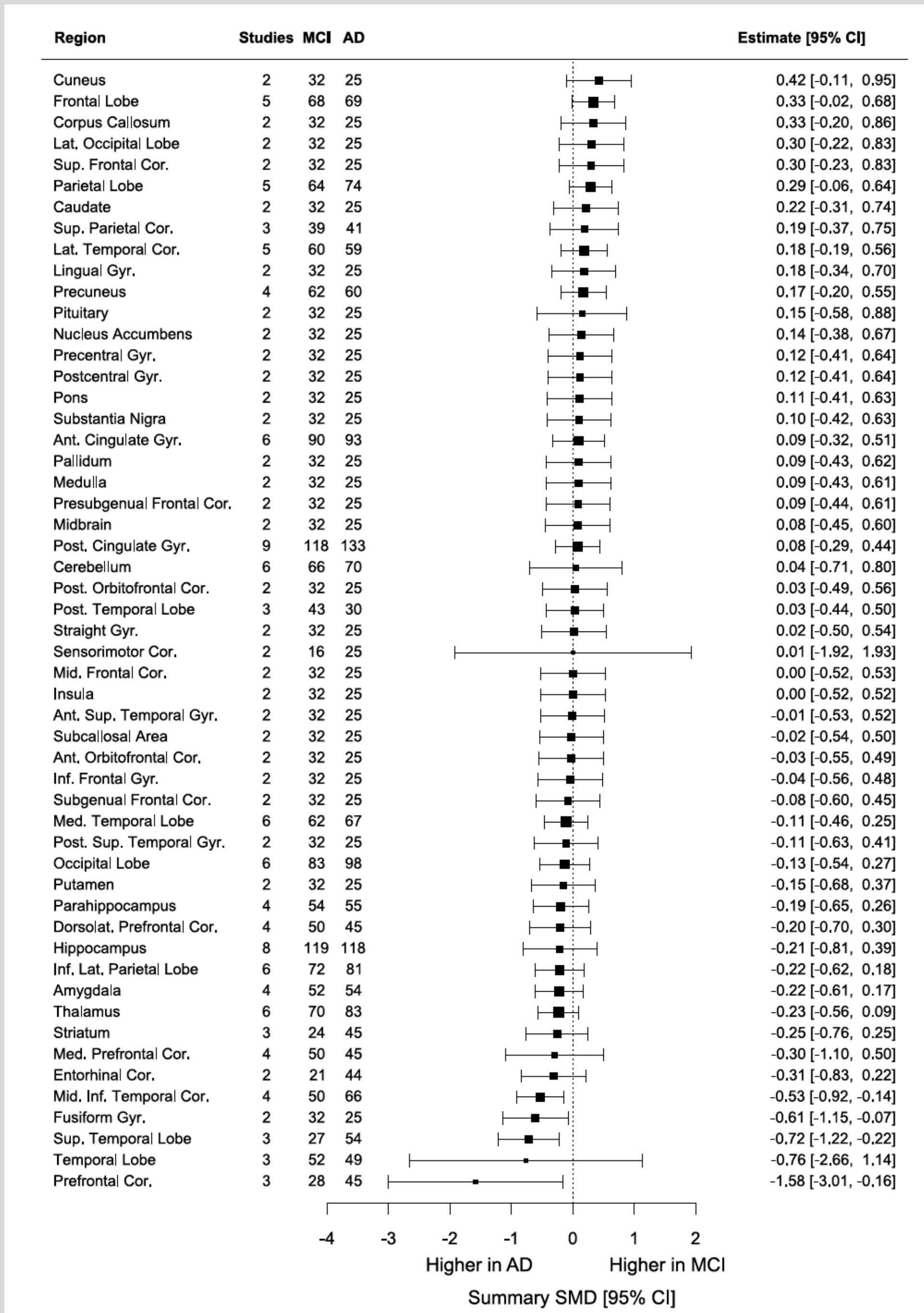


Figure 5: TSPO binding was higher in several regions in AD compared to MCI, including the superior temporal lobe (SMD=0.72,[0.22-1.22]), whilst no regions were higher in MCI compared to AD.