

Somatomotor Network Connectivity as a Neural Correlate of Clinical Status, Symptom Severity, and Cognitive Performance

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Background/Objective:

Alzheimer's disease pathology begins years before clinical symptoms emerge. Most functional connectivity research has focused on "higher order" networks (default mode, frontoparietal, attention), consistently showing decreased connectivity in patients with dementia or cognitive impairment. However, primary sensory-motor networks remain relatively understudied. This study investigated somatomotor network connectivity across the AD spectrum and its relationships with cognitive and neuropsychiatric measures.

Methods:

146 participants (ages 60-92) from the Indiana Memory and Aging Study were stratified into preclinical (cognitively normal + subjective cognitive decline; n=81) and clinical (mild cognitive impairment + Alzheimer's disease; n=65) groups. Resting-state fMRI data were parcellated using the Desikan-Killiany atlas, with mean functional connectivity computed using Yeo's seven-network parcellation. Wilcoxon rank-sum tests and Welch's t-tests compared FC between groups across all networks. Spearman correlations assessed associations between all networks and NPI-Q composite domains and MoCA-derived cognitive domains, with FDR correction.

Results:

The somatomotor network was the only network among seven that significantly distinguished clinical from preclinical groups, showing a 37.6% effect size reduction. LASSO regression identified somatomotor connectivity as the sole predictive feature. Somatomotor FC showed specific positive relationships with executive function ($\rho = 0.251$) and language performance ($\rho = 0.268$), and negative correlation with vegetative/motor symptoms ($\rho = -0.226$). These associations remained significant after controlling for demographics.

Conclusions/Potential Impact:

These results suggest that somatomotor network integrity may be an early biomarker of disease progression, reflecting shared neural substrates between motor control and higher-order functions.

