

# Cognitive Pathways and Neural Dynamics in Subjective Cognitive Decline: Decoding Contributing Factors and Cerebral Hub Rewiring

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## Abstract

Memory concerns are prevalent among middle-aged and older adults, especially those experiencing subjective cognitive decline (SCD), highlighting its significance in early dementia detection. This study aims to deepen our understanding of SCD by examining cognitive and psychological factors influencing it and characterizing cerebral hubs in the brain network. Utilizing structural equation modeling, we explored relationships among metacognitive beliefs, personality, anxiety, depression, self-esteem, resilience, and memory complaints. Our findings underscore the significant impact of self-esteem and conscientiousness on memory complaints. Examining delta and theta electroencephalographic frequency bands during rest, we identified hub regions using betweenness centrality. Notably, our research unveils dynamic changes in hub roles in response to SCD pathology. The inferior temporal gyrus and left orbitofrontal area emerge as hubs, while the dorsolateral prefrontal cortex and middle temporal gyrus lose their hub function. This suggests a neural network rewiring as a compensatory response to SCD, wherein functional connectivity is maintained or restored by reallocating resources to other regions. In essence, this study contributes valuable insights into the multifaceted aspects of SCD, shedding light on both psychological contributors and intricate cerebral network dynamics. The identified hub regions and their shifting roles provide a nuanced perspective on how the brain responds to SCD pathology, potentially offering avenues for understanding and managing cognitive decline in its early stages.

**Keywords:** cognitive neuroscience, brain connectivity, aging, brain disorder, electroencephalography