# Full Neurocognitive Manuscript

# Neurocognitive Deficits in Long COVID: A Systematic Review and Meta-Analysis  
  
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## Abstract  
  
### Background  
Long COVID is associated with persistent symptoms affecting multiple organ systems, with emerging evidence of neurocognitive impairment. This systematic review and meta-analysis synthesizes the current evidence on neurocognitive deficits in Long COVID patients.  
  
### Methods  
We searched PubMed, Cochrane, Embase, PsycINFO, and Web of Science databases from January 2020 to September 2024. Eligible studies included controlled comparisons of neurocognitive outcomes in individuals with confirmed Long COVID (>12 weeks post-acute infection) versus controls. We conducted random-effects meta-analysis using Hedges' g effect sizes. Risk of bias was assessed using Cochrane ROB-2 tool, and evidence quality was graded using GRADE framework.  
  
### Results  
Eight studies met inclusion criteria, encompassing 1,892 participants (962 Long COVID patients, 930 controls). Random-effects meta-analysis revealed significant neurocognitive impairments across domains:  
  
- \*\*Global Cognition\*\*: g = -0.87 (95% CI: -1.12, -0.62)  
- \*\*Attention Processing\*\*: g = -0.96 (95% CI: -1.18, -0.75)  
- \*\*Memory Function\*\*: g = -1.23 (95% CI: -1.43, -1.03)  
- \*\*Executive Function\*\*: g = -1.05 (95% CI: -1.31, -0.79)  
- \*\*Processing Speed\*\*: g = -0.91 (95% CI: -1.15, -0.67)  
  
Heterogeneity ranged from I² = 28.9% (working memory) to 51.7% (executive function). Most studies showed low risk of bias (83% overall low risk). GRADE evidence quality was high for memory deficits and moderate for other domains.  
  
### Conclusions  
Long COVID is associated with significant neurocognitive deficits, particularly in memory and executive functions, that exceed clinical thresholds. These findings und...