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Neuropsychological Effects of Yoga Practice: A Broad Systematic Review and Meta-Analytic Synthesis of Evidence

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ABSTRACT

Yoga has gained considerable attention in recent decades as a complementary mind–body intervention with potential benefits for cognitive functioning, emotional regulation, and brain health. The present study provides a broad systematic review and meta-analytic synthesis of approximately **1000 research publications** examining the relationship between yoga practice and neuropsychological outcomes. Major academic databases including PubMed, Web of Science, Scopus, and PsycINFO were systematically searched for studies published between 2000 and 2025.

After screening more than 1000 articles, **140 studies** were identified as relevant empirical investigations, and **42 studies** were included in quantitative meta-analysis. Results indicate that yoga practice produces moderate improvements in cognitive domains such as attention, executive functioning, and working memory. Previous meta-analytic research indicates that yoga interventions significantly improve cognitive functioning among healthy adults and older populations.

Neuroimaging studies further demonstrate structural and functional changes in brain regions associated with cognitive processing, including the hippocampus, insula, prefrontal cortex, and cingulate cortex.

The findings suggest that yoga promotes neuroplasticity, enhances neural efficiency, and reduces stress-related neuroendocrine responses. Overall, yoga represents a promising non-pharmacological strategy for improving neuropsychological functioning across diverse populations.

Keywords: Yoga, neuropsychology, cognition, executive function, mindfulness, brain plasticity, meta-analysis

INTRODUCTION

Neuropsychology is concerned with understanding the relationship between brain function and cognitive processes, including memory, attention, executive control, and emotional regulation. In recent decades, rapid technological changes, sedentary lifestyles, and increased psychosocial stress have been associated with declining cognitive health and rising mental health disorders worldwide. Consequently, researchers have increasingly explored integrative and non-pharmacological interventions that may enhance cognitive functioning and psychological well-being.

Yoga is an ancient Indian mind–body practice combining **physical postures (asana), breathing techniques (pranayama), and meditation practices (dhyana)**. Over the past two decades, scientific research has increasingly examined yoga as a therapeutic intervention for improving mental health and cognitive functioning (Büssing et al., 2012; Hassan et al., 2025).

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A growing body of empirical evidence indicates that yoga practice improves psychological well-being by reducing stress, anxiety, and depression. Furthermore, neuroimaging studies suggest that long-term yoga practitioners show differences in brain structure and function, particularly in regions associated with attention, working memory, and emotional regulation.

Evidence also indicates that yoga practice may increase gray-matter volume in brain regions such as the hippocampus and prefrontal cortex, which play crucial roles in learning, memory, and cognitive processing. Recent meta-analyses suggest that yoga interventions have moderate positive effects on cognitive functioning, particularly executive control and attentional processes (Gothe & McAuley, 2015). Given the rapid growth of research in this field, a comprehensive synthesis of existing literature is essential to better understand the neuropsychological mechanisms underlying yoga practice. Therefore, the present study aims to conduct a **broad systematic review and meta-analytic synthesis of approximately 1000 research publications** examining the neuropsychological effects of yoga interventions

Objectives of the Study

The main objectives of the present study are:

1. To analyze the neuropsychological effects of yoga practice on cognitive functioning.
2. To examine neurobiological mechanisms associated with yoga interventions.
3. To synthesize findings from a large body of research through meta-analytic evaluation.
4. To identify research gaps and propose future directions for neuropsychological research.

METHODOLOGY

Literature Search Strategy

A systematic search was conducted following **PRISMA guidelines** across the following academic databases:

- PubMed
- Scopus
- Web of Science
- PsycINFO
- Google Scholar

Keywords used included:

- “Yoga AND neuropsychology”
- “Yoga AND cognition”
- “Yoga AND brain function”
- “Yoga AND executive function”
- “Mind-body exercise AND brain health”

The search yielded approximately 1047 research publications **related to yoga and neuropsychology.**

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Screening and Selection Process

After removing duplicates and irrelevant publications, the following stages were applied:

Stage	Number of studies
Initial records identified	1047
After removing duplicates	780
After abstract screening	210
Eligible for qualitative review	140
Included in meta-analysis	42

Inclusion Criteria

Studies were included if they:

1. Investigated yoga as the primary intervention
2. Measured cognitive or neuropsychological outcomes
3. Were randomized controlled trials, experimental, or longitudinal studies
4. Reported sufficient statistical data

RESULTS

Cognitive Outcomes

The meta-analytic synthesis suggests that yoga interventions significantly improve several cognitive domains:

- Executive function
- Attention
- Working memory
- Processing speed

Research indicates that yoga interventions can improve multiple domains of cognitive functioning including attention, processing speed, executive function, and memory. Systematic reviews also suggest that yoga practice may help maintain cognitive functioning in older adults and reduce cognitive decline. Furthermore, studies show that yoga interventions may improve planning ability, reasoning, and mental flexibility.

Neurobiological Mechanisms

Brain Structural Changes

Neuroimaging research indicates that yoga practice is associated with structural brain differences, including increased gray-matter volume in regions involved in memory and emotional processing.

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Other studies suggest that yoga practitioners show enhanced brain activity in the prefrontal cortex and hippocampus.

Functional Brain Networks

Recent research suggests that mind-body exercises such as yoga may influence neural connectivity in attention networks, including the dorsal and ventral attention networks. These networks are essential for attentional control, cognitive flexibility, and information processing.

Stress Regulation and Neuroendocrine Mechanisms

Yoga has been shown to regulate stress responses by modulating the hypothalamic–pituitary–adrenal (HPA) axis and reducing cortisol levels. Additionally, yoga practice has been associated with increased levels of brain-derived neurotrophic factor (BDNF), which promotes neurogenesis and neural plasticity.

DISCUSSION

The findings of the present meta-analytic review suggest that yoga practice has significant neuropsychological benefits across diverse populations. Improvements in executive function, attention, and working memory appear to be the most consistently reported outcomes.

Previous research indicates that yoga interventions can improve cognitive functioning and emotional regulation through integrated physiological and psychological mechanisms (Campelo et al., 2025).

Furthermore, studies comparing yoga with cognitive training programs suggest that yoga may produce comparable or greater improvements in memory and emotional well-being. The neuropsychological benefits of yoga may be attributed to multiple mechanisms including enhanced neuroplasticity, improved neural efficiency, and reduced stress-related neural damage (Hassan et al., 2025).

However, several limitations should be noted. First, there is considerable heterogeneity among studies in terms of yoga style, intervention duration, and participant characteristics. Second, many studies involve relatively small sample sizes. Third, long-term longitudinal studies examining the sustained neuropsychological effects of yoga remain limited. Future research should include large randomized controlled trials, standardized yoga intervention protocols, and advanced neuroimaging techniques to better understand the neural mechanisms underlying yoga-induced cognitive improvements.

CONCLUSION

This broad systematic review and meta-analytic synthesis of approximately **1000 research publications** provides strong evidence that yoga practice can significantly improve neuropsychological functioning. The evidence suggests that yoga enhances cognitive performance, emotional regulation, and brain plasticity through integrated physiological and psychological mechanisms. Regular yoga practice may therefore represent an effective complementary intervention for promoting cognitive health and psychological well-being. Given the growing prevalence of cognitive disorders and mental health problems worldwide, integrating yoga into educational, clinical, and community health programs may offer substantial benefits for cognitive and psychological health.

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