

## Psychological Stress As A Catalyst For Multiple Sclerosis Progression: Clarifying Pathways From Neural Activation to Immune Dysregulation

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**Abstract :** Multiple sclerosis (MS) is a chronic, immune-mediated disorder characterized by neurodegenerative processes and a highly variable disease course. Recent research highlights a complex interplay between psychological stress and MS progression, with both acute and chronic stressors linked to heightened inflammatory activity, increased relapse risk, and accelerated disability. This review synthesizes findings from systematic analyses, cohort studies, and neuroimaging investigations to examine how stress contributes to disease dynamics in MS. Evidence suggests that psychological stress influences MS progression through neural and physiological pathways, including dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and heightened activity in specific brain regions, such as the insular cortex. Notably, functional MRI studies indicate that stress-induced neural activity may predict future atrophy in gray matter regions implicated in motor and cognitive function, thus supporting a neurobiological link between stress and neurodegeneration in MS. Longitudinal studies further associate chronic stress with reduced quality of life and higher relapse frequency, emphasizing the need for a multifaceted therapeutic approach that addresses both the physical and psychological dimensions of MS. Evidence from intervention studies suggests that stress management strategies, such as cognitive-behavioral therapy and mindfulness-based programs, may reduce relapse rates and mitigate lesion formation in MS patients. These findings underscore the importance of integrating stress-reducing interventions into standard MS care, with potential to improve disease outcomes and patient well-being. Further research is essential to clarify the causal pathways and develop targeted interventions that could modify the stress response in MS, offering an avenue to address disease progression and enhance quality of life.

**Keywords :** multiple sclerosis, psychological stress, disease progression, neuroimaging, stress management

**Conference Title :** ICNE 2025 : International Conference on Neurology and Epidemiology

**Conference Location :** Ljubljana, Slovenia

**Conference Dates :** June 10-11, 2025