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REVIEW

Climate change and neurorehabilitation: a narrative review

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Climate change is reshaping global health, and its neurological implications are gaining recognition. Rising temperatures, increasing air pollution, and more frequent extreme weather events influence the incidence and recovery trajectories of many neurological conditions. This review synthesizes current evidence on how climate-related factors affect neurological injury and neurorehabilitation, highlights emerging vulnerabilities in service delivery, and outlines priorities for clinical practice and research.

Keywords: climate change, neurorehabilitation, neurological disorders, heat exposure, air pollution, neuroplasticity

Introduction

Climate change is no longer an abstract environmental phenomenon; it is an active determinant of health. Neurological disorders, many of which require long-term, structured rehabilitation, are particularly sensitive to environmental stressors. As health systems worldwide face climate-driven disruptions, neurorehabilitation must assess how these shifts influence both patient outcomes and the delivery of care (1).

Climate-related drivers of neurological disease

Heat exposure and neurological events

High ambient temperatures increase stroke incidence, especially among older adults and individuals with cardiovascular risk factors. Heat sensitivity also worsens symptoms in conditions such as multiple sclerosis and autonomic dysfunction, potentially complicating rehabilitation efforts and limiting patient participation (2).

Air pollution and neurotoxicity

Particulate matter, ozone, and nitrogen oxides accelerate cognitive decline, contribute to neurodevelopmental disorders, and elevate the risk of neurodegenerative disease. Chronic exposure impairs attention, processing speed, and executive function—domains essential for effective engagement in cognitive and motor rehabilitation (3).

Extreme weather and traumatic injury

Storms, floods, and wildfires increase the risk of traumatic brain injury and spinal cord injury by creating hazardous environments and straining emergency services. These events also disrupt acute care pathways, delaying rehabilitation during the period when neuroplasticity is most responsive (2, 4).

Climate stressors and rehabilitation outcomes

Physiological burden during recovery

Heat, humidity, and poor air quality elevate fatigue, reduce physical tolerance, and impair cognitive performance.

For individuals recovering from stroke, brain injury, or neurodegenerative conditions, these factors can slow progress and heighten relapse risk (5).

Interference with neuroplasticity

Emerging evidence suggests that environmental stress may modulate neuroinflammatory responses and neuroplastic mechanisms. Although data remain limited, this raises important questions about how climate-related exposures may influence the biological foundations of learning and motor recovery (5, 6).

System-level challenges to neurorehabilitation

Disruption of care delivery

Extreme weather can close clinics, displace patients, and interrupt therapy schedules. These disruptions are particularly problematic in rehabilitation, where continuity and repetition strongly influence outcomes.

Infrastructure vulnerabilities

Rehabilitation centers often rely on specialized equipment, stable electricity, and controlled indoor environments. Climate-related damage threatens these resources and may widen disparities between well-resourced institutions and those in climate-vulnerable regions.

Social and caregiver instability

Climate-related displacement disrupts caregiving networks that support home-based rehabilitation. Loss of transportation, housing, or financial security further reduces adherence to therapy.

Mitigation and adaptation strategies

Integrating environmental risk into assessment

Clinicians can incorporate heat exposure, pollution indices, and living-environment stability into rehabilitation planning. Identifying high-risk patients allows for tailored pacing, monitoring, and safety precautions (7).

Climate-resilient rehabilitation services

Tele-rehabilitation, hybrid care models, and decentralized community programs can preserve continuity, provided that infrastructure is reinforced against climate disruptions. Investment in sustainable, climate-resistant health facilities will be essential (7).

Research priorities

Future work should clarify how environmental stressors interact with neuroplasticity, fatigue, cognition, and functional recovery. Longitudinal studies linking climate metrics with rehabilitation outcomes could guide more precise interventions (7).

Conclusion

Climate change is emerging as a significant modifier of neurological disease and recovery. Its influence extends from biological responses to therapy engagement and system-level delivery of care. For neurorehabilitation, this shift represents both a challenge and a call to action. By integrating environmental determinants into clinical practice and investing in resilient care models, the field can better support patients in an increasingly unstable climate.

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Conflict of interest

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