Commentary

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Physiotherapy Strategies for Post-stroke Cognitive and Motor Impairments

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Introduction

Stroke remains one of the leading causes of long-term disability worldwide, leaving survivors with a wide spectrum of physical, cognitive and functional impairments. While advances in acute medical management have improved survival rates, the challenge of post-stroke rehabilitation continues to demand innovative, evidence-based strategies. Motor impairments such as hemiparesis, spasticity, balance deficits and impaired gait are among the most common sequelae, significantly limiting independence and quality of life. These dual impairments highlight the complexity of post-stroke rehabilitation and the critical role of physiotherapy in addressing both physical and cognitive domains. Physiotherapy has traditionally focused on motor rehabilitation, employing approaches such as task-specific training, constraint-induced movement therapy, robotic-assisted therapy and neuromuscular re-education to restore function. However, growing evidence underscores the close interrelationship between motor and cognitive recovery, as both rely on neuroplasticity and adaptive changes within the central nervous system. This recognition has expanded the scope of physiotherapy, integrating cognitive strategies into motor training and vice versa. Interventions such as dual-task training, virtual reality, aerobic exercise and combined physical-cognitive therapies have demonstrated potential in enhancing not only motor outcomes but also attention, memory and executive functioning. By leveraging the principles of neuroplasticity, physiotherapy fosters the reorganization of neural networks that support both movement and cognition [1].

Description

Stroke is one of the leading causes of adult disability worldwide, resulting in a diverse range of impairments that often persist long after the acute phase. Among the most significant challenges faced by survivors are motor and cognitive impairments, which together create complex barriers to recovery and independent living. Motor deficits, such as hemiparesis, spasticity, poor balance and reduced gait efficiency, directly affect mobility and daily functioning. At the same time, cognitive impairments—including deficits in attention, memory, language and executive functions—can significantly reduce the effectiveness of motor rehabilitation by limiting the survivor's ability to follow instructions, engage in therapy, or sustain motivation. Physiotherapy has traditionally prioritized motor recovery, but growing evidence indicates that integrated approaches addressing both motor and cognitive domains yield superior outcomes. Understanding the interplay between cognitive and motor deficits is crucial, as each influences the recovery trajectory of the other. This recognition has led to the development of physiotherapy strategies that aim not only to restore physical function but also to enhance cognitive processes through targeted interventions [2].

Physiotherapy strategies for motor recovery have evolved from passive techniques to more active, task-specific and evidence-based interventions. Approaches such as constraint-induced movement therapy (CIMT), task-oriented training, body-weight supported treadmill training and robotic-assisted therapy are widely used to stimulate neuroplasticity and promote functional gains. These interventions emphasize repetition, intensity and specificity, which are essential principles of motor relearning. In addition, technologies such as functional electrical stimulation (FES) and exoskeleton-assisted walking have expanded the therapeutic toolkit, offering new possibilities for patients with severe impairments. Physiotherapists are increasingly incorporating dual-task training and cognitive-motor exercises into rehabilitation programs, recognizing that real-life activities often require simultaneous engagement of physical and mental skills. Such integrative approaches enhance not only muscle strength and coordination but also cognitive flexibility, attention and problem-solving capacity, leading to more meaningful functional recovery [3].

Cognitive rehabilitation through physiotherapy is gaining prominence as research demonstrates the bidirectional relationship between physical activity and brain function. Aerobic exercise, for instance, has been shown to improve cerebral blood flow, promote neurogenesis and support cognitive recovery in domains such as memory and executive functioning. Virtual Reality (VR) and computer-based rehabilitation tools provide interactive platforms where

cognitive and motor tasks are combined in engaging environments, enhancing motivation and adherence. Evidence also supports the use of physiotherapy interventions in improving attention and working memory, which are critical for participation in rehabilitation and daily activities. Importantly, physiotherapists must tailor interventions to individual cognitive profiles, as the type and severity of impairment vary widely among stroke survivors. By adopting a holistic framework, physiotherapy ensures that cognitive gains translate into practical improvements in daily living, social participation and quality of life [4].

The future of physiotherapy for post-stroke cognitive and motor impairments lies in integrated, multidisciplinary and personalized approaches. Collaboration with occupational therapists, speech therapists, neuropsychologists and rehabilitation physicians ensures that rehabilitation is comprehensive and addresses the full spectrum of patient needs. Advances in technology, including brain-computer interfaces, tele-rehabilitation platforms and wearable motion sensors, are expanding access to therapy and enabling personalized monitoring of progress. Patient-centered care, focusing on meaningful activities and long-term goals, enhances engagement and ensures rehabilitation aligns with individual values and lifestyle. Preventing secondary complications such as falls, contractures and depression is also a key part of physiotherapy strategies, as these factors can undermine recovery.. By continuously evolving through evidence-based practice and technological innovation, physiotherapy will remain central to optimizing recovery outcomes for stroke survivors [5].

Conclusion

Physiotherapy plays a central role in addressing the complex interplay of motor and cognitive impairments that follow a stroke. Traditional motor-focused approaches remain vital for restoring mobility, balance and functional independence, but growing evidence highlights the importance of integrating cognitive rehabilitation into physiotherapy practice. Interventions such as dual-task training, aerobic exercise and virtual reality not only enhance motor recovery but also stimulate cognitive processes through neuroplasticity. By adopting individualized, evidence-based strategies, physiotherapists can tailor rehabilitation to the unique needs of each survivor, thereby maximizing functional outcomes.

Collaboration within multidisciplinary teams ensures that recovery encompasses not just physical function but also cognitive resilience, emotional well-being and social participation. Looking ahead, the integration of advanced technologies and patient-centered approaches will continue to refine rehabilitation pathways. Ultimately, physiotherapy strategies that address both motor and cognitive domains offer the most comprehensive route to improved quality of life, independence and long-term recovery in stroke survivors.

Acknowledgment

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Conflict of Interest

None.

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