

Multidimensional Therapeutic Approaches for Parkinson's Disease

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Abstract

Parkinson's disease (PD) is a multidimensional neurodegenerative disorder involving motor, non-motor, cognitive, psychological, and social impairments that collectively diminish functional independence and quality of life. Motor symptoms such as tremor, rigidity, bradykinesia, gait impairment, and freezing of gait interact with non-motor manifestations including pain, sleep disturbances, fatigue, autonomic dysfunction, and neuropsychiatric complications. These symptoms often contribute to reduced mobility, increased fall risk, cognitive decline, emotional distress, and social withdrawal. Effective management therefore requires an integrated, person-centered, multidisciplinary approach.

Recent evidence highlights the value of physical rehabilitation, exercise, and sensory cueing for improving gait, balance, and motor performance. Cognitive interventions—including cognitive stimulation, structured cognitive training, and individualized cognitive rehabilitation—support attention, memory, executive functioning, and everyday cognitive performance. Psychological and psychosocial interventions, including cognitive behavioral therapy, mindfulness-based approaches, psychoeducation, and social support programs, help reduce depression, anxiety, and isolation while promoting adaptive coping and social participation. Coordinated integration of physical, cognitive, psychological, and social interventions, alongside optimized pharmacological treatment, can enhance functional independence, participation, and overall well-being across the disease course.

Keywords

Parkinson's disease, Multidimensional rehabilitation, Cognitive interventions, Sensory cueing, Psychosocial therapy, Motor and non-motor symptoms, Multidisciplinary management

Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by a broad spectrum of motor and non-motor manifestations that can substantially affect functional independence, psychosocial well-being, and quality of life. Common

motor manifestations include tremor, rigidity, bradykinesia, postural instability, and progressive difficulty performing activities of daily living. As the disease advances, gait impairment, balance disturbances, and freezing of gait may increase the risk of falls and restrict mobility and participation in daily and social activities. In addition to motor impairment, individuals with PD frequently experience non-motor symptoms, including pain, sleep disturbances, fatigue, gastrointestinal dysfunction, and autonomic symptoms. Cognitive and neuropsychiatric complications may also develop, ranging from slowed information processing and difficulties with attention, executive functioning, planning, and decision-making to memory impairment and, in advanced disease, dementia. Psychological and behavioral manifestations may include depression, anxiety, apathy, hallucinations, delusions, and psychosis, which may arise from disease progression, underlying neurodegenerative changes, or medication-related effects.

These symptoms can interact and collectively contribute to substantial reductions in functional capacity and quality of life. Depression and other psychological disturbances may further compromise physical functioning, cognitive performance, motivation, and participation in daily activities. Individuals with younger-onset PD may experience additional psychosocial challenges because the disease can interfere with employment, interpersonal relationships, family responsibilities, and long-term personal and professional goals. Furthermore, motor and non-motor symptoms, psychological distress, and perceived stigma may contribute to social withdrawal and reduced social participation among individuals with PD (Ahn et al., 2022; Crooks et al., 2025). Conversely, reduced social participation and inadequate social support may exacerbate psychological distress and adversely affect overall well-being.

Accordingly, PD should not be conceptualized exclusively as a disorder of motor function. Rather, it is a multidimensional condition affecting physical, cognitive, emotional, social, and functional domains. Effective management therefore requires an integrated, individualized, and person-centered approach that addresses the diverse needs of individuals across the course of the disease. Evidence from recent research supports comprehensive interventions targeting physical functioning, cognition, psychological well-being, and psychosocial participation as important components of multidisciplinary PD management (van Munster et al., 2024).

Physical Therapeutic Interventions

Physical rehabilitation and exercise constitute important components of multidisciplinary management for individuals with PD. Recent systematic reviews and meta-analyses have demonstrated beneficial effects of several forms of exercise, including aerobic exercise, resistance training, balance training, gait training, and mind-body exercise, on motor symptoms, physical impairments, balance, gait, mobility, and overall physical functioning (Ernst et al., 2023; El Hayek et al., 2023). These findings support integrating individualized, appropriately dosed, and supervised exercise programs into routine rehabilitation, with intervention selection guided by disease severity, functional capacity, comorbidities, and individual therapeutic goals.

In addition to conventional exercise-based interventions, external sensory cueing has emerged as a useful complementary rehabilitation strategy for addressing gait and

movement impairments. Cueing techniques provide auditory, visual, or somatosensory stimuli to facilitate the initiation, timing, and execution of movement. Recent evidence suggests that different cueing modalities may affect gait parameters differently. Auditory cueing, particularly rhythmic auditory stimulation, may improve gait speed, whereas visual and somatosensory cueing may contribute to improvements in gait velocity and stride length. Furthermore, walking training combined with auditory cueing has been reported to produce greater improvements in walking speed than walking training alone (Nascimento et al., 2024). More recent evidence indicates that somatosensory and visual cueing may be particularly beneficial for gait velocity and stride length, respectively (Terachinda et al., 2026). Cueing strategies may also be useful for specific gait-related difficulties, including gait initiation, turning, and freezing of gait, although treatment effects may vary by cue type, individual symptom profile, and task demands (Ginis et al., 2023).

Sensory cueing can therefore be incorporated into individualized rehabilitation programs as a complementary approach to conventional physical therapy. By facilitating movement initiation and gait performance, such strategies may help individuals maintain mobility, improve postural control, and perform functional activities more effectively. When combined with broader exercise and rehabilitation programs, these interventions may contribute to preservation of functional independence, reduction of disability, and improvement in health-related quality of life.

Cognitive Therapeutic Interventions

Cognitive impairment is increasingly recognized as an important component of PD and may affect attention, memory, executive functioning, information processing, visuospatial abilities, problem-solving, and everyday functioning. Cognitive difficulties may consequently interfere with independence, social participation, treatment adherence, and caregiver relationships. Cognitive interventions therefore represent an important component of comprehensive multidisciplinary management, particularly for individuals who demonstrate subjective or objective cognitive difficulties.

Cognitive interventions are commonly conceptualized within three broad approaches: cognitive stimulation, cognitive training, and cognitive rehabilitation (Krellman & Mercuri, 2023; Pigott et al., 2024). Although these approaches overlap, they differ in their primary objectives and methods. Cognitive stimulation involves participation in structured and socially engaging activities intended to promote general cognitive functioning and mental engagement. Cognitive training, in contrast, focuses on repeated and structured practice of specific cognitive processes, such as attention, memory, processing speed, and executive functioning. Cognitive rehabilitation is generally more individualized and goal-oriented, emphasizing strategies to compensate for cognitive difficulties and improve performance in everyday activities.

Computerized cognitive training has received increasing attention as a non-pharmacological intervention for cognitive difficulties associated with PD. Recent systematic reviews suggest that structured and computerized cognitive training may improve aspects of overall cognitive functioning, including global cognition, executive

functioning, working memory, and processing speed (Gavelin et al., 2022). Such interventions can provide structured and potentially individualized exercises targeting specific cognitive domains and may be delivered through computer-based or remotely accessible platforms. More recent evidence similarly suggests that structured cognitive training may contribute to the maintenance of cognitive functioning and mental engagement among individuals with PD (Gattoni et al., 2025).

Cognitive training programs may specifically target processing speed, sustained and selective attention, working memory, executive functioning, and visuospatial processing. A recent systematic review reported improvements across several cognitive domains, including attention, processing speed, working memory, executive functioning, and visuospatial abilities, following cognitive training interventions in individuals with PD (Gattoni et al., 2025). These findings suggest that structured and individualized cognitive exercises may support cognitive abilities relevant to everyday functioning and participation. Nevertheless, treatment effects may vary according to the intervention modality, intensity, duration, treatment setting, and cognitive domain targeted.

Cognitive rehabilitation provides an additional approach by linking cognitive strategies directly to functional goals. Interventions may include memory strategies, environmental modifications, attention-management techniques, problem-solving approaches, compensatory strategies, and training in the use of external memory aids. Such interventions are particularly relevant when cognitive difficulties interfere with activities of daily living. Overall, cognitive interventions should be individualized according to the person's cognitive profile, functional needs, disease stage, and therapeutic goals. Early identification and appropriate management of cognitive difficulties may help preserve independence, optimize daily functioning, and potentially reduce the demands placed on caregivers.

Psychosocial Therapeutic Interventions

Psychological and psychosocial difficulties are common in PD and may substantially influence disease-related disability and quality of life. Although cognitive interventions may contribute indirectly to psychological well-being, evidence for their direct effects on depression and anxiety remains less consistent. In contrast, psychological interventions, including cognitive behavioral therapy (CBT) and other psychosocial approaches, have demonstrated potential benefits for reducing psychological distress and supporting adaptive coping with the challenges associated with chronic neurological disease (Wu et al., 2024).

Social support is another important component of psychosocial management. Support from family members, friends, peer groups, and community organizations may facilitate social engagement and participation. A recent systematic review reported an association between greater social support and increased social participation among individuals with PD (Kleynen et al., 2024). These findings highlight the importance of addressing social connectedness alongside physical and cognitive rehabilitation, particularly for individuals experiencing isolation, stigma, reduced mobility, or loss of previous social roles.

CBT is among the more extensively studied psychological interventions for PD. It focuses on identifying and modifying maladaptive patterns of thoughts, emotions, and behaviors while promoting effective coping and behavioral strategies. Recent evidence indicates that CBT, including remotely delivered, telephone-based, and internet-based formats, can reduce symptoms of anxiety and depression in individuals with PD (Alnajjar et al., 2024; Zhang et al., 2025). Remote delivery may be particularly valuable for individuals whose mobility limitations, transportation difficulties, or geographic location restrict access to conventional face-to-face psychological services.

Mindfulness-based interventions have also emerged as a potentially beneficial non-pharmacological approach. Recent evidence suggests that mindfulness-based interventions may improve psychological well-being and reduce symptoms of depression and anxiety among individuals with PD (Zhao et al., 2024). These approaches may promote greater awareness of thoughts, emotions, and bodily experiences while supporting adaptive responses to disease-related stress.

Psychoeducational and group-based interventions may provide additional psychosocial benefits. Education concerning the nature and progression of PD, symptom management, treatment options, coping strategies, and available community resources may improve patients' understanding of the disorder and facilitate active participation in their care. Group-based interventions may additionally provide opportunities for social interaction, peer support, normalization of illness-related experiences, and reduction of perceived isolation. Collectively, psychoeducational and psychosocial interventions may promote psychological adjustment, strengthen coping resources, and support continued social participation (Pigott et al., 2024).

Integration of Multidimensional Therapeutic Approaches

Because PD affects multiple domains of functioning, isolated treatment of individual symptoms may be insufficient to address the overall burden of the disease. A multidimensional therapeutic model should therefore integrate physical rehabilitation, cognitive interventions, psychological treatment, psychoeducation, and strategies to promote social participation. Intervention planning should be individualized according to disease stage, symptom profile, cognitive status, functional limitations, psychosocial circumstances, and personal goals.

Pharmacological treatment remains central to the management of motor and non-motor symptoms; however, non-pharmacological interventions can provide important complementary benefits. When motor symptoms remain inadequately controlled despite optimized pharmacological therapy, advanced treatment options may be considered in appropriately selected individuals. Deep brain stimulation (DBS), for example, may be used for selected patients with PD who meet appropriate clinical criteria. Such interventions are part of advanced neurological management and should be evaluated according to disease characteristics, symptom severity, treatment response, cognitive and psychiatric status, and overall suitability for surgery.

Ultimately, multidimensional management should be viewed as a coordinated and dynamic process rather than a collection of independent interventions. Collaboration among neurologists, physiotherapists, occupational therapists, speech and language

therapists, psychologists, neuropsychologists, nurses, social workers, and other relevant professionals can facilitate comprehensive assessment and treatment. A person-centered, multidisciplinary approach has the potential to address the interconnected physical, cognitive, emotional, and social consequences of PD, thereby supporting functional independence, participation, and quality of life throughout the course of the disease.

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