Moving Forward: The Value of Exercise in Managing Parkinson's Disease.

Discover how exercise can significantly improve motor and non-motor symptoms of Parkinson's disease and the role exercise professionals play in promoting long-term health.

Department of Exercise, Health, and Sports Sciences,
Pennsylvania Western University
EXSC 9150: Evidence-based Doctoral Portfolio I

WRITTEN BY **JENNIFER LARSEN**

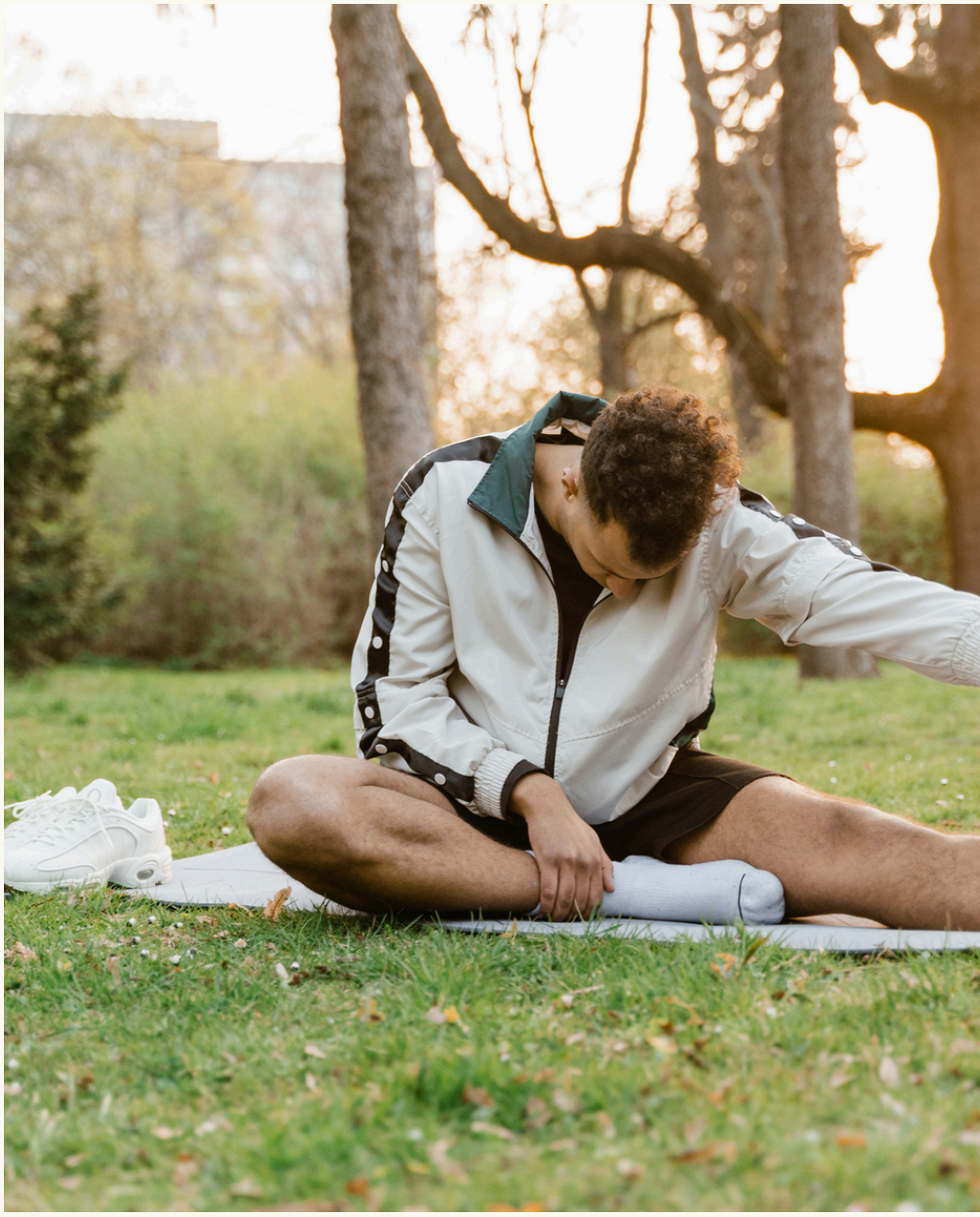
OCTOBER 6, 2024

Parkinson's disease (PD) is a progressive neurodegenerative disease affecting nearly 10 million people globally, with no established cure. Symptoms are controlled mainly through medication cocktails; however, emerging evidence supports the efficacy of exercise in improving the motor and non-motor symptoms of PD. This article reviews the benefits of various exercise modalities, including aerobic fitness, strength training, flexibility, and neuromotor exercises for people with Parkinson's (PWP). Evidence suggests that regular exercise can enhance motor function while also reducing depression and improving cognitive function. Multimodal approaches that integrate different exercise domains show promise in addressing the complex and evolving symptoms of PD. Additionally, the role of trained exercise professionals in supporting long-term physical and mental well-being for PWP is explored. Exercise professionals are key in creating individualized wellness programs that promote consistent exercise adherence. With the anticipated increase in PD diagnoses, the importance of accessible, well-rounded exercise programs is vital to improving health outcomes and quality of life for this population.

Keywords: Parkinson's disease exercise, symptoms of Parkinson's, exercise professionals

Parkinson's Disease

Parkinson's disease (PD) is a chronic, progressive, neurodegenerative disease affecting nearly one million people in the United States and ten million people worldwide (Statistics, n.d). It is one of the most common neurological disorders with no known cure, second behind Alzheimer's disease (Hoseinipalangi et al., 2023)As the population rises, it is expected the number of people diagnosed with PD will also rise, projected to double by 2050 (Kwok et al., 2023; Wu & Wilson, 2023)



> *As the population rises, it is expected the number of people diagnosed with PD will also rise, projected to double by 2050*
>
> (KWOK ET AL., 2023; WU & WILSON, 2023)

PD is characterized by four main symptoms of motor control, including resting tremors, stiffness, bradykinesia (slow movements), and postural instability. As symptoms progress, PWP may experience gait dysfunction, postural instability with frequent falls, reduced physical function, and difficulties with activities of daily living. Non-motor symptoms associated with Parkinson's include psychological problems (depression and anxiety), cognitive impairment (memory and hallucinations), and sleep disturbances (fatigue, insomnia, nightmares) that impact the health-related quality of life (Kwok et al., 2023; Wu et al., 2021).

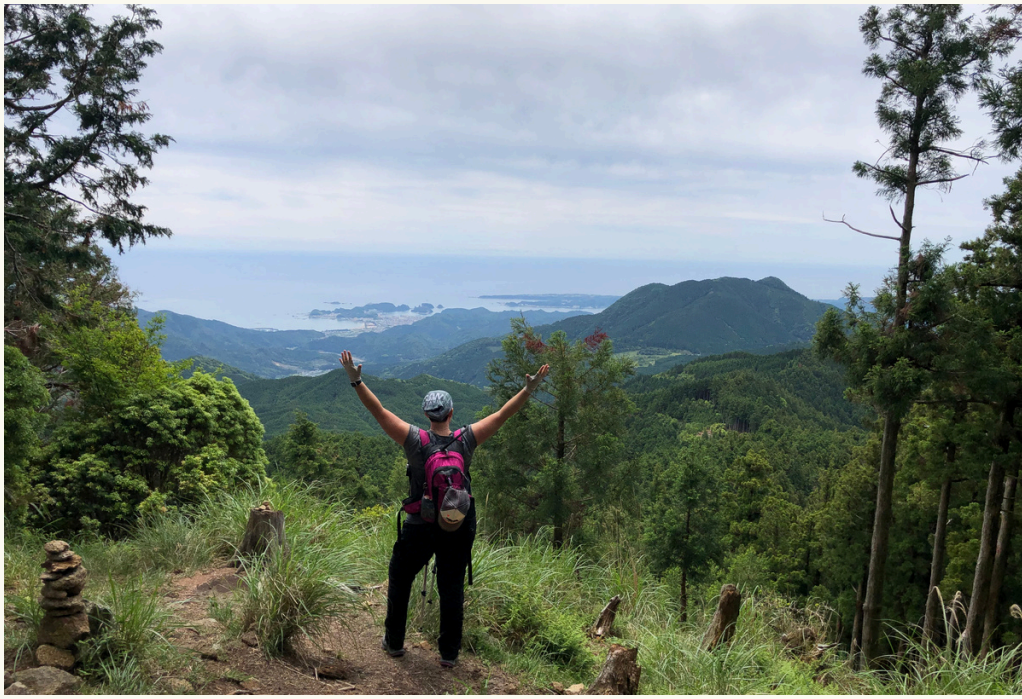
Medication is the primary treatment for PD; however, establishing alternative treatment options, including exercise and meditation, may be an effective intervention therapy to reduce motor symptoms and non-motor symptoms of PD. Trained exercise professionals can provide the ongoing long-term support needed to improve the quality of life for those living with Parkinson's disease by promoting physical and mental health and implementing well-being programs for PD.

Exercise for Parkinson's Disease

Promoting physical health through exercise will lessen motor and nonmotor symptoms of Parkinson's disease, improving the quality of life for people with Parkinson's (PWP) The effects of exercise on the motor and non-motor symptoms of PD have been shown to significantly improve function (Choi & Kim, 2022; Feller et al., 2023; Gandolfi et al., 2019; Hao et al., 2022; Ritter & Bonsaksen, 2019; Wu et al., 2021). Four domains of exercise recommended for Parkinson's disease by the Parkinson Foundation and ACSM include aerobic fitness, strengthening, flexibility, and neuromotor exercise, including balance, agility, and multitasking (Parkinson's Foundation, n.d.). The integration of these domains represents a well-rounded multimodal approach to exercise beneficial for PWP. Rafferty et al. (2023) found PWP working with an exercise professional reported practicing all four domains of exercise more frequently than those who did not.

Exercise Effects on Motor Symptoms of Parkinson's Disease

The four main symptoms of motor control for PWP include resting tremor, stiffness, bradykinesia (slow movements), and postural instability. Aerobic exercise is an effective modality to improve and maintain motor function. A systematic review from de Oliveira et al. (2021) found aerobic exercise could promote improvements in gait (walking speed and stride length), mobility, and lower limb muscle strength in individuals with PD in the mild to moderate stages. Hao et al. (2022) conducted a network meta-analysis and found musical dance, walking, virtual reality practices, cycling, and aquatic and water exercises reduced UPDRS (United Parkinson's Disease Rating Scale) motor



> *Building muscle strength and muscle volume, a goal of resistance training is important to those experiencing sarcopenia (muscle loss).*

scores (better movement) when compared to controls. A study from Zhang et al. (2023) also reveals the benefits of dancing and Nordic (walking with exercise poles) walking. The results of their meta-regression reveal that chronic exercise delays the progression of PD motor symptoms, mobility, and balance decline deterioration, whereas, motor function progressively declines in the non-exercise PD group. Results from network meta-analyses suggest that dancing is the optimal exercise for general motor symptoms of PD.

Furthermore, Nordic walking is the most efficient exercise for mobility and balance performance. The variety of aerobic exercises that have shown benefits reveal exercising aerobic capacity is more important than a specific mode of exercise for the PD community.

Resistance training is tolerated and has positive effects on motor symptoms of people with Parkinson's. Sarcopenia is common in an aging population and may prove more deleterious for the PD population as movement difficulties increase. Building muscle strength and muscle volume, a goal of resistance training is important to those experiencing sarcopenia. Hao et al. (2022) performed an updated network meta-analysis yielding evidence for including resistance training for PWP to improve functional outcomes related to mobility, free fat mass, and endurance. This meta-analysis included six random control trials that used resistance training as an independent variable and found improvements in UPDRS-motor scores and the Timed-Up and Go Test (TUGT). Strength training also showed a significant effect over controls in UPDRS motor scores, balance, and mobility in a study by Zhang et al. (2023).

A collective approach to movement may provide greater benefit to PWP by addressing the multiple symptoms of PD than aerobic exercise, resistance training, or one specific type of exercise alone. Ritter and Bonsaksen (2019) examined whether a brief rehabilitation program that included access to occupational therapists, physical

therapists, doctors, neurologists, nurses, sports educators, cognitive behavioral therapists, and nutritionists could promote positive changes. Data showed participants experienced significant improvements in functional status, general self-efficacy, and quality of life. In another study utilizing a multi-modal exercise protocol, Choi and Kim (2022) aimed to use a task-based LSVT-BIG (an evidence-based PD voice and movement program) with actual tools to assess the changes in hand function, activities of daily living, emotional state (anxiety and depression), and quality of life. They found that the experimental group performing thirty minutes of conventional occupational therapy and forty minutes of the task-based LSVT-BIG (an evidence-based PD voice and movement program) significantly improved the hand function, activities of daily living, mental health, and quality of life of PD patients. Gandolfi et al. (2019) presented another randomized control study with a multi-modal exercise intervention. The purpose of this study was to compare the effects of a four-week trunk-specific rehabilitation program on the severity of forward trunk flexion. The experimental group performed active self-correction exercises with visual and proprioceptive feedback, passive and active trunk stabilization exercises, and functional tasks. The control group participated in joint mobilization, muscle strengthening and stretching, and gait and balance exercises. Results revealed a significant reduction for the experimental group in forward trunk flexion, static balance, and quality of life improvements. Both groups significantly improved UPDRS and MiniBESTest and had a significant reduction in pain, indicating both exercise protocols benefited the participants' motor function. Integrating the domains of exercise into a multimodal approach for PWP will positively affect the symptoms of PD.

Exercise Effects on Non-Motor Symptoms of Parkinson's Disease

Symptoms of PD are not only manifested in motor symptoms but non-motor symptoms as well. Autonomic dysfunction (constipation, hyperhidrosis), sensory dysfunction (paresthesia, pain), psychological disorders (depression, major neurocognitive disorder), anxiety, fatigue, and sleep disturbances commonly accompany PD (Candel-Parra et al., 2022). Exercise and mindfulness programs have also shown promise in reducing non-motor symptoms of PD and improving quality of life (Kwok et al., 2023; Prell et al., 2021; Reitano et al., 2023).

Feller et al. (2023) found depressive symptomology significantly decreased in an exercise group compared with usual care. Physical exercise also improved the patient's quality of life. In a systematic review and meta-analysis of one hundred twenty-two studies, Dauwan et al. (2021) found exercise improved QoL, depressive symptoms, the cognitive domains of attention and working memory, executive functioning, memory, and psychomotor speed. The effects of exercise were dose-responsive on depressive symptoms, indicating that more time spent exercising showed a larger reduction of depressive symptoms. The medium-sized effect on QoL and the large effect on mood in patients with chronic brain disorders indicate exercise is an effective and safe add-on therapy intervention.

The importance of physical activity and its link to depressive and cognitive functioning in PWP was reported by Timblin et al. (2022). Individuals who became more depressed over time

> *Data showed participants in a multimodal exercise program experienced significant improvements in functional status, general self-efficacy, and quality of life.*
>
> RITTER AND BONSAKSEN (2019)

became less physically active and subsequently experienced cognitive decline over the five years. The authors support interventions that promote physical activity as they have implications for preserving cognition and mental health. Another systematic review and network meta-analysis looked at thirty-five non-pharmaceutical

Depressive symptoms improved better with mindful meditation than with a stretch and resistance training program alone.

KWOK ET AL. (2023)

treatments for depression in PWP and found dance, LSVT BIG therapy, and cognitive behavior therapy were the best interventions (Wang et al., 2022). These findings, again, support movement therapies for improving depression in PWP. Kwok et al. (2023) performed a study focusing on mindfulness meditation. Their findings discovered depressive symptoms improved better with mindful meditation than with a stretch and resistance training program alone. Mindfulness meditation also showed improvements in maintaining emotional non-reactivity twelve weeks after the end of the intervention. Similarly, Reitano et al. (2023) showed their protocol might enhance residual cognitive function, revealing an improvement in overall cognitive functions and long-term verbal memory for the experimental group. They concluded the innovative experimental multiapproach protocol based on mindfulness training might help enhance residual cognitive functions like memory, executive functions, attention, concentration, working memory, and language functions in patients with PD. In patients experiencing the

the progressing symptoms of PD, mindfulness training has a place in a wellness protocol and may help to improve long-term mental health.

Delivering Exercise to the Parkinson's Community

With the growing body of evidence that supports ongoing daily exercise, ensuring all people living with Parkinson's disease have access to a PD wellness program is imperative. Barriers for the PD community that may prevent engagement in such programs include geography, economics, transportation, computer literacy, support, class availability, and fatigue. Advances in technology and the global Covid pandemic introduced many to telehealth and other remote communication venues. Providing remote opportunities for PWP to gain access to wellness and exercise programs may decrease some of the barriers preventing participation.

Directed home exercise programs, through both telehealth and following videos, have shown to be feasible and acceptable in delivering exercise instruction to PWP (Flynn et al., 2022; Wu et al., 2021). Together, these studies suggest the importance of home exercise programs as a treatment option for this population. These programs can increase accessibility to those who cannot attend in-person events or offer supplemental sessions to those attending clinic or group programs. Home exercise programs, in addition to telehealth, can remove some of the barriers to exercise, allowing for consistent treatment of exercise.

Research shows PWP who maintain a consistent exercise routine (two and a half hours per week) or community-based multimodal

exercise routine have demonstrated a smaller decline in health-related quality of life and functional mobility maintained cognitive function with the potential to foster neuroprotection than those who exercise less (Ferrusola-Pastrana et al., 2023; Rossi et al., 2018). Related qualitative studies (Cleary et al., 2020; Ferrusola-Pastrana et al., 2024) examined exercise adherence in Parkinson's exercise programs to determine the factors that keep participants engaged in a program. Both studies concluded support from the instructors and other participants, the enjoyment of the exercise, and gaining the benefits of exercise as medicine led to participants' long-term engagement in the program in efforts to improve overall functional mobility and quality of life.

Exercise Professionals Working with the Parkinson's Community

Exercise professionals, including certified athletic trainers, certified personal trainers, group exercise, yoga, and Pilates instructors, possess specific knowledge and expertise about exercise. These professionals can individualize wellness programs designed to include the four domains of exercise that help PWP stay active and achieve their goals. PD-specific knowledge is important for exercise professionals working with the PD community. Integrating the expertise of trained exercise professionals into the PD healthcare team will benefit PWP by enabling healthcare providers to confidently refer patients to skilled practitioners (Rafferty et al., 2023). Exercise professionals are in a unique position to maintain long-term relationships with their clients,

motivating, teaching, and guiding PWP to incorporate exercise into daily living.

A Framework for Exercise Professionals working with people with Parkinson's: the Key Domains

- *Foundational information on the disease and role of exercise*
- *Exercise screening*
- *Group and individual exercise design*
- *Behavior and counseling for exercise*
- *Interprofessional communication and program development*

(RAFFERTY ET AL., 2023)

Implications for Working with the PD Population for Exercise Professionals

People with Parkinson's interact with their exercise professionals more often than their traditional healthcare providers. It is not uncommon for a PWP to see their exercise professional weekly. Over 40% of PWP use exercise professionals in the first year of diagnosis, while referrals to physical therapy occur most frequently when PWP experience falls or mobility issues rather than at diagnosis (Agley et al., 2024; Rafferty et al., 2023). Understanding exercise is an important treatment for PWP; standards should be in place to maintain continuity of care. The Parkinson's Foundation has established expectations for exercise professionals to reduce discrepancies in care and exercise prescriptions for PWP. Following these guidelines will enable the traditional healthcare team of neurologists, physicians, physical therapists, and occupational therapists to confidently refer PWP to skilled exercise professionals who know about Parkinson's disease. The competencies establish a framework for the required knowledge and skills of an exercise professional to work with PWP and a list of curriculum criteria for education programs designed to prepare exercise professionals to work with PWP. The five key domains included in the framework: (1) foundational information on the disease and role of exercise, (2) exercise screening, (3) group and individual exercise design, (4) behavior and counseling for exercise, and (5) interprofessional communication and program development (Rafferty et al., 2023). Creating a unified approach in the education and training of exercise professionals will not only improve the confidence of the referral team but also the confidence in PWP, ensuring they are receiving the best care possible from skilled individuals with knowledge of their disease.

Conclusion

Exercise as a treatment for the symptoms of Parkinson's disease is well supported in the literature, with benefits improving both motor and non-motor symptoms of the disease. Working within the framework of the four domains of exercise for PD (aerobic fitness, strengthening, flexibility, and neuromotor exercises), PWP can participate in an action-based solution that can reduce the debilitating symptoms of PD. Exercises like dance, Nordic walking, strength training, and yoga yield benefits to those with PD (Hao et al., 2022; Zhang et al., 2023). The goal of any exercise program for Parkinson's disease

should be to target the symptoms of the disease. This includes the motor symptoms of resting tremor, stiffness, bradykinesia, and postural instability, as well as the nonmotor symptoms. This cannot be accomplished with a single exercise but a collective and complementary program that includes different exercise modes. Deciding what exercise is best is confusing, but exercise professionals are skilled at creating effective exercise programs. Although neurologists know the advantages of exercise, they lack experience in exercise prescription, and it is not within their professional scope to offer continuous monitoring or supervision of exercise regimens(Rafferty et al., 2023). The role exercise professionals can play as a part of the PD healthcare team is important. As exercise professionals receive training and education surrounding working with the Parkinson's community, accessibility to exercise programs for PWP will improve and lead to better outcomes for PWP.

Jennifer is a doctoral candidate enrolled in the Doctor of Health and Science program at Pennsylvania Western University. Her research focuses on integrating non-pharmaceutical therapies to improve the quality of life for people living with Parkinson's disease.

References

Agley, L., Hartley, P., & Lafortune, L. (2024). Exercise and physical activity promotion for people newly diagnosed with Parkinson's disease: a UK survey exploring current practice and the views of healthcare professionals. Physiotherapy, 122, 17-26.

Candel-Parra, E., Córcoles-Jiménez, M. P., Delicado-Useros, V., Ruiz-Grao, M. C., Hernández-Martínez, A., & Molina-Alarcón, M. (2022). Predictive model of quality of life in patients with Parkinson's disease. International Journal of Environmental Research and Public Health, 19.

Choi, Y., & Kim, D. (2022). Effects of task-based LSVT-BIG intervention on hand function, activity of daily living, psychological function, and quality of life in Parkinson's disease: A randomized control trial. Occupational Therapy International, 1-13.

Cleary, A. S., Rossi, A., & States, R. A. (2020). Parkinson's Disease: Exploring motives for long-term adherence to a group exercise program. Rehabilitation Nursing: The Official Journal of the Association of Rehabilitation Nurses, 45(3), 131-139.

References

Dauwan, M., Begemann, M. J. H., Slot, M. I. E., Lee, E. H. M., Scheltens, P., & Sommer, I. E. C. (2021). Physical exercise improves quality of life, depressive symptoms, and cognition across chronic brain disorders: A transdiagnostic systematic review and meta-analysis of randomized controlled trials. Journal of Neurology, 268, 1222-1246.

de Oliveira, M. P. B., Lobato, D. F. M., Smaili, S. M., Carvalho, C., & Borges, J. B. C. (2021). Effect of aerobic exercise on functional capacity and quality of life in individuals with Parkinson's disease: A systematic review of randomized controlled trials. Archives of Gerontology and Geriatrics, 95.

Feller, D., Fox, I., Gozzer, P., Trentin, F., & Papola, D. (2023). Exercise for depressive symptoms in Parkinson's disease: A systematic review and meta-analysis of randomized controlled trials. Archives of Physical Medicine and Rehabilitation., 104(2), 331-339.

Ferrusola-Pastrana, A., Davison, G., & Meadows, S. N. (2023). The therapeutic effects of multimodal exercise for people with Parkinson's: A longitudinal community-based study. Parkinsonism & Related Disorders, 110, 105366-105366.

Ferrusola-Pastrana, A., Fullerton, C. L., & Meadows, S. N. (2024). Group-based exercise for Parkinson's: A qualitative study of participants and partners' perceptions of an exercise class delivered through a community-university collaboration. BMC Geriatrics, 24(1), 1-488.

Flynn, A., Dennis, S., Preston, E., Canning, C. G., & Allen, N. E. (2022). Exercising with Parkinson's: The good, the bad and the need for support to keep exercising. A qualitative study. Clinical Rehabilitation, 36(10), 1332-1341.

Gandolfi, M., Tinazzi, M., Magrinelli, F., Busselli, G., Dimitrova, E., Polo, N., Manganotti, P., Fasano, A., Smania, N., & Geroin, C. (2019). Four-week trunk-specific exercise program decreases forward trunk flexion in Parkinson's disease: A single-blinded, randomized controlled trial. Parkinsonism Related Disorder, 64, 268-274.

Hao, Z., Xiaodan, Z., & Ping, C. (2022). Effects of ten different exercise interventions on motor function in Parkinson’s disease patients—A network meta-analysis of randomized controlled trials [article]. Brain Sciences, 12(698), 698-698.

Hoseinipalangi, Z., Kan, F. P., Hosseinifard, H., Doustmehraban, M., Masoumi, M., Rafiei, S., Barmayoon, P., Ahmadi, N., Dehnad, A., Eshtod, H., Asl, M. T., Hoseini, B. S., Nasiri, M., Arian, M., Aghalou, S., & Ghashghaee, A. (2023). Systematic review and meta-analysis of the quality-of-life of patients with Parkinson's disease. Eastern Mediterranean Health Journal, 29(1), 63-70.

Kwok, J. Y. Y., Choi, E. P. H., Wong, J. Y. H., Lok, K. Y. W., Ho, M.-H., Fong, D. Y. T., Kwan, J. C. Y., Pang, S. Y. Y., & Auyeung, M. (2023). A randomized clinical trial of mindfulness meditation versus exercise in Parkinson's disease during social unrest. NPJ Parkinson's Disease, 9(1), 1-11.

Parkinson’s Foundation. (n.d.). Parkinson’s exercise recommendations. Parkinson’s Foundation.

References

Prell, T., Liebermann, J. D., Mendorf, S., Lehmann, T., & Zipprich, H. M. (2021). Pain coping strategies and their association with quality of life in people with Parkinson's disease: A cross-sectional study. PLoS ONE, 16(11), 1-15.

Rafferty, M. R., Hoffman, L., Feeney, M., Schulte, C., Hutber, A., Galati, T., Neric, F., & Ellis, T. D. (2023). Parallel development of Parkinson's-specific competencies for exercise professionals and criteria for exercise education programs. Parkinsonism & Related Disorders, 112, 105407-105407.

Reitano, M. R., Guidetti, M., Maiorana, N. V., De Sandi, A., Carusi, F., Rosci, C., Ruggiero, F., Poletti, B., Ticozzi, N., Mameli, F., Barbieri, S., Silani, V., Priori, A., & Ferrucci, R. (2023). The effects of a new integrated and multidisciplinary cognitive rehabilitation program based on mindfulness and reminiscence therapy in patients with Parkinson's disease and mild cognitive impairment: A pilot study. Brain Sciences (2076-3425), 13(2), 201.

Ritter, V. C., & Bonsaksen, T. (2019). Improvement in quality of life following a multidisciplinary rehabilitation program for patients with Parkinson's disease. Journal of Multidisciplinary Healthcare, 12, 219-227.

Rossi, A., Torres-Panchame, R., Gallo, P. M., Marcus, A. R., & States, R. A. (2018). What makes a group fitness program for people with Parkinson’s disease endure? A mixed-methods study of multiple stakeholders. Complementary Therapies in Medicine, 41, 320-327.

Statistics. (n.d). Parkinson’s Foundation. Retrieved September 7 from
Timblin, H., Rahmani, E., Ryczek, C. A., Hill, C. R., & Jones, J. D. (2022). Physical inactivity links depressive symptoms and cognitive functioning among individuals with Parkinson’s disease. Neuropsychology, 36(6), 505-512.

Wang, Y., Sun, X., Li, F., Li, Q., & Jin, Y. (2022). Efficacy of non-pharmacological interventions for depression in individuals with Parkinson's disease: A systematic review and network meta-analysis. Frontiers in Aging Neuroscience, 14, 01-20.

Wu, A. D., & Wilson, A. M. (2023). Parkinson's disease population-wide registries in the United States: Current and future opportunities. Frontiers in Digital Health, 5.

Wu, P.-L., Lee, M., Wu, S.-L., Ho, H.-H., Chang, M.-H., Lin, H.-S., & Huang, T.-T. (2021). Effects of home-based exercise on motor, non-motor symptoms and health-related quality of life in Parkinson's disease patients: A randomized controlled trial. Japan Journal of Nursing Science, e12418.

Zhang, M., Li, F., Wang, D., Ba, X., & Liu, Z. (2023). Exercise sustains motor function in Parkinson's disease: Evidence from 109 randomized controlled trials on over 4,600 patients. Frontiers in Aging Neuroscience, 15.