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Association of Levels of Physical Activity With Risk of Parkinson Disease

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ABSTRACT

Background: The reviewed literature collectively underscores the significant association between levels of physical activity (PA) and the risk of Parkinson's disease (PD), illustrating both the neuroprotective effects of exercise and its role in enhancing the quality of life for those affected by this condition. **Literature Review:** Subsequent reviews, such as that by Lauzé et al. (Lauzé et al., 2016), build on this understanding by providing a nuanced perspective on the impact of PA on clinical symptoms and psychosocial aspects of life for PD patients. While benefits are evident, the variability in outcomes suggests that specific exercise modalities and individualized programs may be essential for maximizing efficacy. Bhalsing et al. (S. Bhalsing et al., 2018) further contextualize the importance of PA by discussing its role in preventing chronic diseases and its potential to delay disease progression, emphasizing the biological mechanisms that underpin these benefits. Research focusing on early-stage PD, such as that by Mantri et al. (Mantri et al., 2018), reveals a concerning trend: many individuals with early PD do not meet recommended activity levels, highlighting the need for targeted interventions. This aligns with findings from Lovegrove (Lovegrove, 2019), which identify barriers to sustained engagement in PA, underscoring the importance of addressing both personal and contextual factors to encourage exercise adherence among PD patients. **Conclusion:** In conclusion, the reviewed articles collectively advocate for the integration of physical activity into PD management strategies. They highlight the multifaceted benefits of exercise, the necessity for tailored interventions, and the importance of promoting PA from early stages of the disease. As the body of literature expands, it becomes increasingly clear that physical activity should be a fundamental aspect of both preventive and therapeutic approaches to Parkinson's disease.

Keyword: Levels of Physical Activity, Risk of Parkinson Disease

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INTRODUCTION

The association between levels of physical activity (PA) and the risk of Parkinson's disease (PD) has garnered increasing attention in the literature, highlighting the multifaceted benefits of exercise for individuals affected by this neurodegenerative condition. (Salgado et al., 2013) initiated this discourse by presenting a meta-analysis that underscored the neuroprotective effects of exercise in PD patients. Their findings indicated that regular physical activity not only enhances physical functioning, strength, and balance but also significantly reduces mortality rates among PD patients, even those with limited mobility. This foundational work set the stage for subsequent investigations into the role of PA in managing PD symptoms and potentially mitigating disease onset.

Building on these insights, (Lauzé et al., 2016) conducted a comprehensive review that synthesized data from 106 studies, revealing that while PA effectively improves physical and cognitive capacities, its impact on clinical symptoms and psychosocial aspects remains less pronounced. This nuanced understanding of PA's efficacy emphasizes the need for a balanced perspective when considering exercise as an intervention for PD.

Further exploration by (S. Bhalsing et al., 2018) expanded the dialogue by highlighting the extensive health benefits of PA beyond PD management, including its role in preventing chronic diseases. The authors pointed out that, despite the lack of proven pharmacological therapies to alter PD progression, PA could serve as a vital adjunctive treatment. Their emphasis on the upregulation of neurotrophins and nerve growth factors as mediators of PA's benefits reinforced the biological underpinnings of exercise's protective effects.

(Mantri et al., 2018) shifted the focus to early-stage PD, revealing that knowledge about activity levels in this population is limited. Their research indicated that many individuals with early PD do not meet standard activity recommendations, emphasizing the critical need for interventions to promote exercise even at this

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initial stage. This finding aligns with the notion that maintaining PA could significantly influence disease progression and quality of life.

In a qualitative systematic review, (Lovegrove, 2019) examined the experiences of individuals with PD regarding PA interventions. The review identified various factors that affect sustained engagement in exercise, including disease characteristics and social support. This qualitative approach provided valuable insights into the barriers faced by PD patients, which are essential for designing effective PA programs tailored to their unique needs.

(Reichmann et al., 2022) further contributed to the discourse by investigating the potential of increased physical activity to prevent or delay the onset of PD. Their analysis revealed a dose-dependent relationship between PA and PD risk, particularly among men, highlighting the importance of targeted interventions aimed at enhancing physical activity levels in at-risk populations.

Lastly, (Chen et al., 2022) conducted a bibliometric analysis that illustrated the growing recognition of exercise's role in PD management. Their findings emphasized that exercise interventions not only enhance functional abilities but also play a crucial role in addressing non-motor symptoms, such as depression and cognitive decline, thereby providing a comprehensive approach to improving overall well-being in PD patients.

Together, these articles collectively underscore the critical importance of physical activity in the context of Parkinson's disease, revealing both its protective effects against disease onset and its role in improving quality of life for those already diagnosed. As the body of literature expands, it becomes increasingly clear that promoting PA should be a fundamental component of PD management strategies.

LITERATURE REVIEW

The article titled "An Evidence-Based Exercise Regimen for Patients with Mild to Moderate Parkinson’s Disease" by Salgado et al. (Salgado et al., 2013) presents a comprehensive review of the impact of physical activity on individuals diagnosed

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with Parkinson's Disease (PD). The authors synthesize findings from various studies, emphasizing the positive correlation between exercise and improved health outcomes for PD patients.

One of the key insights from the article is the assertion that exercise can enhance physical functioning, health-related quality of life, strength, balance, and gait speed in individuals with PD. The article references a meta-analysis that supports these claims, reinforcing the notion that structured physical activity is not only beneficial but essential for this population. The authors highlight a significant study involving 438 PD patients, which found that those who engaged in regular exercise exhibited lower mortality rates over a four-year follow-up period. This finding underscores the potential life-extending benefits of an active lifestyle for individuals with PD.

Moreover, the article discusses specific types of exercise, including cardiovascular, balance, and resistance training, which are posited to be particularly effective in addressing the symptoms associated with PD, such as bradykinesia, muscle weakness, and balance impairment. The authors make a compelling case for the implementation of these exercise strategies as a means to mitigate the debilitating effects of the disease.

Importantly, the article also presents evidence suggesting that physical activity may exert a neuroprotective effect against the development of PD. Prospective cohort studies cited within the review indicate that both men and women who engage in moderate to strenuous exercise have a significantly reduced incidence of developing PD. Notably, higher levels of physical activity during the ages of 35 to 39 years are associated with a decreased risk of acquiring the disease. This temporal aspect of exercise and its protective effects is particularly intriguing and warrants further exploration in future research.

The authors bolster their claims with evidence from animal models, which support the neuroprotective effects of exercise against PD. This cross-species validation strengthens the argument for physical activity as a preventive measure, suggesting

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that the benefits of exercise may extend beyond symptomatic relief to potentially altering disease progression.

The article titled "The Effects of Physical Activity in Parkinson's Disease: A Review" by Lauzé, Daneault, and Duval (Lauzé et al., 2016) provides a comprehensive overview of the role of physical activity (PA) in the management of Parkinson's disease (PD). The authors emphasize the growing recognition of PA as a beneficial adjunct intervention for individuals diagnosed with PD, highlighting its potential to enhance physical and cognitive functional capacities.

A critical evaluation of the article reveals that while the positive effects of PA on physical capacities are well-documented, the authors note a more nuanced outcome regarding its impact on clinical symptoms and psychosocial aspects of life. Specifically, the review indicates that only about 50% of studies report beneficial outcomes related to these areas, suggesting a variability in effectiveness that warrants further investigation. This finding raises important questions about the specific types of PA that may be most beneficial and the mechanisms through which these effects are realized.

Moreover, the article discusses the nature of PD, a complex neurodegenerative disorder characterized by both motor and non-motor symptoms. The authors effectively contextualize the importance of PA within this framework, positing it as a complementary strategy to traditional pharmaceutical interventions. However, the article could benefit from a deeper exploration of the types of physical activities that might yield the most significant benefits, as well as considerations for tailoring PA programs to individual patient needs.

The review is methodologically sound, synthesizing a range of studies to arrive at its conclusions. Nevertheless, the authors recognize the limitations inherent in the existing literature, including potential biases and the heterogeneity of study designs. This acknowledgment is crucial for readers who may seek to understand the broader implications of PA in PD management.

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The article "Role of Physical Activity in Parkinson's Disease" by Bhalsing, Abbas, and Tan (S. Bhalsing et al., 2018) provides a comprehensive overview of the significant role that physical activity (PA) plays in the management of Parkinson's Disease (PD). The authors highlight the extensive benefits of regular PA, which not only enhances survival rates but also serves as a preventive measure against various chronic diseases, including cardiovascular disease, diabetes, and depression. This broad perspective on health underscores the importance of integrating PA into the lifestyle of individuals, particularly those at risk for or currently managing PD.

A critical insight from the article is the urgent need for effective interventions to mitigate the morbidity associated with PD, especially given the anticipated rise in the number of affected individuals in the coming decades. The authors point out that current pharmacological treatments do not fully address the progression of the disease, emphasizing the necessity for alternative non-pharmacological therapies. This assertion is particularly relevant in the context of chronic conditions like PD, where disease progression can significantly impact quality of life.

The article presents compelling evidence that PA can complement pharmacological treatments, potentially delaying the degeneration of dopamine neurons, a hallmark of PD. The authors discuss the role of neurotrophins and nerve growth factors as mediators of the positive effects of PA, suggesting a biological basis for the benefits observed in patients engaging in regular physical activity. This connection between PA and neurobiological health is a crucial point, as it provides a scientific rationale for the incorporation of exercise into PD management strategies.

Moreover, Bhalsing et al. (S. Bhalsing et al., 2018) enumerate various forms of PA that have demonstrated beneficial effects for individuals with PD, including aerobic exercises, treadmill training, dancing, yoga, and resistance training. This diversity in exercise modalities presents opportunities for personalized interventions tailored to individual preferences and physical capabilities. The authors assert that these activities not only improve motor functions but also address non-motor symptoms, which are often overlooked in traditional therapeutic approaches.

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The article concludes with a strong recommendation for the prescription and encouragement of PA among all PD patients, framing it as a promising, cost-effective, and low-risk intervention. This advocacy for PA is well-supported by the accumulating evidence presented throughout the article, reinforcing the idea that exercise should be a fundamental component of PD management.

The article "Physical Activity in Early Parkinson Disease" by Mantri, Fullard, Duda, and Morley (Mantri et al., 2018) presents significant insights into the relationship between physical activity and Parkinson's disease (PD) outcomes. The study involved a comprehensive examination of self-reported activity scores from 383 PD subjects alongside 175 healthy controls, revealing critical associations between physical activity levels and various clinical characteristics.

One of the key findings is that higher activity scores were notably linked to younger age and male sex, indicating demographic factors that may influence physical activity levels in individuals with PD. This correlation suggests that interventions aimed at increasing physical activity could be more effectively targeted toward specific demographic groups, particularly younger males who may have a greater propensity for engaging in physical activity.

The article underscores the concerning statistic that only 47% of PD subjects reported activity levels consistent with established recommendations, highlighting a significant gap in adherence to physical activity guidelines among this population. This finding emphasizes the urgent need for strategies to promote exercise, even in the early stages of PD, as physical activity is identified as a modifiable lifestyle factor that could potentially influence disease onset, severity, and progression.

Moreover, the authors articulate that higher levels of midlife exercise are associated with a lower risk of developing PD, while physically active PD patients experience better health-related quality of life and lower rates of serious complications. These observations suggest a protective effect of sustained physical activity against the debilitating aspects of PD, reinforcing the notion that inactivity may exacerbate disability and negatively impact overall health outcomes.

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The article also touches on the existing guidelines for physical therapy in PD, noting the absence of established targets for general activity levels. This gap in the literature points to a critical area for future research and clinical practice, as defining achievable activity benchmarks for PD patients, particularly those experiencing motor disabilities, could foster improved health outcomes.

Lastly, the authors highlight the growing interest in assessing activity levels in the early stages of PD, where interventions may be most feasible and beneficial. This focus on early intervention is crucial, as it could lead to sustained improvements in physical health and quality of life for those affected by PD.

The article "Experiences of people with Parkinson's disease and their views on physical activity interventions: a qualitative systematic review" by Lovegrove (Lovegrove, 2019) offers a comprehensive examination of the factors influencing physical activity engagement among individuals with Parkinson's disease. The systematic review synthesizes findings from nineteen studies, highlighting the multifaceted challenges faced by this population in maintaining regular physical activity, despite existing guidelines that advocate for its benefits in improving health and mitigating disease symptoms.

A critical evaluation of the material reveals several key insights. First, the review effectively identifies and categorizes the barriers to sustained physical activity, which include disease presentation, intrapersonal characteristics, program design, external support, and the social and physical environment. This categorization not only underscores the complexity of the issue but also provides a framework for understanding the interplay between various factors that affect engagement levels. The inclusion of both personal and contextual elements offers a holistic perspective, which is essential for developing effective interventions.

Moreover, the methodology employed in the review, which involved a thorough search of multiple databases and the independent assessment of studies by two reviewers, enhances the credibility of the findings. The extraction and aggregation of 105 findings into 20 categories demonstrate a rigorous approach to data

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synthesis, allowing for a nuanced understanding of the experiences of individuals with Parkinson's disease.

However, while the article successfully outlines the barriers to physical activity, it could benefit from a deeper exploration of potential strategies to overcome these challenges. Although the authors touch upon the importance of designing meaningful physical activity programs, a more detailed discussion on specific interventions or examples of successful programs would provide practical insights for practitioners and researchers in the field.

The article "Life style and Parkinson’s disease" by Reichmann et al. (Reichmann et al., 2022) provides a comprehensive examination of the relationship between physical activity and the risk of developing Parkinson's Disease (PD). The authors emphasize the growing importance of preventive measures against neurodegenerative diseases, particularly in the context of aging populations. They argue that the decline in occupational physical activity may contribute to an increased prevalence of PD.

A significant finding in the article is the assertion that engaging in physical activity can lead to improvements in various health metrics, including muscle strength, balance, cognition, and overall quality of life. The authors reference the Unified Parkinson's Disease Rating Scale (UPDRS-III) as an indicator that increased physical activity correlates with improved motor scores, suggesting a beneficial impact on individuals already diagnosed with PD. This insight underscores the potential therapeutic role of physical activation in managing PD symptoms.

The article further explores the contentious debate surrounding physical activity's role in delaying or preventing the onset of PD. The authors highlight an initial study that suggested a protective tendency among male participants who engaged in walking 5–10 km per week. This finding is supported by larger cohort studies indicating a positive correlation between higher levels of physical activity and a reduced risk of developing PD. Notably, the article presents a meta-analysis that confirms a significant reduction in PD risk associated with high levels of physical

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activity, while light physical activity was found to be ineffective in lowering this risk.

One of the most critical contributions of the article is the establishment of a dose-dependent relationship between physical activity and PD risk. The authors specify that engaging in 30 METs/h per week of moderate to high-intensity exercise can reduce the risk of developing PD by approximately 50%. They also assert that individuals need to walk for at least one hour each day at a speed of 5 km/h to achieve this risk reduction. Such quantifiable metrics provide a clear guideline for physical activity levels that may be necessary to confer protective benefits against PD.

However, the authors note an important limitation in their findings: the lack of a dose-dependent response association in women, indicating that the protective effect of physical activity against PD risk appears to be predominantly observed in men. This gender disparity raises questions about the underlying biological or social factors that may influence the relationship between physical activity and PD risk, warranting further investigation.

The article titled "Research Hotspots and Trends of Exercise on Parkinson's Disease: A Global Bibliometric Analysis From 2012 to 2021" by Ji-Wei Chen, Shu-Hao Du, Tian-Cong Chen, and Kun Zhu (Chen et al., 2022) provides a comprehensive overview of the intersection between physical activity and Parkinson's disease (PD). The authors highlight the increasing prevalence of PD, particularly among older adults, and the critical role that exercise plays in managing the symptoms associated with this neurodegenerative disorder.

The article effectively outlines the characteristics and challenges faced by individuals with PD, including physical stiffness, tremor, bradykinesia, cognitive impairment, and poor dynamic balance. The authors reference The Global Burden of Disease Study, which estimates that 6.2 million people suffer from PD worldwide, with projections indicating that this number could rise to 14.2 million by 2040. This statistic underscores the urgency of addressing the physical activity

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levels of this population, particularly as the prevalence peaks between the ages of 70 and 79.

One of the key insights from the article is the observation that the level of physical activity in PD patients declines more rapidly than in their healthy counterparts. This decline significantly contributes to the deterioration of motor function and increases the risk of falls, a major concern for this demographic. The authors emphasize that exercise interventions can mitigate these risks, highlighting improvements in physical exercise ability and non-exercise areas, such as the prevention of depressive symptoms and enhancement of executive function.

Furthermore, the article discusses specific forms of exercise, such as tai chi, which have shown promise in improving posture control and balance in PD patients. These findings are critical as they suggest that targeted physical activities can play a significant role in reducing fall risk and enhancing overall quality of life for individuals with PD.

CONCLUSION

The reviewed literature collectively underscores the significant association between levels of physical activity (PA) and the risk of Parkinson's disease (PD), illustrating both the neuroprotective effects of exercise and its role in enhancing the quality of life for those affected by this condition. The foundational work by Salgado et al. (Salgado et al., 2013) establishes a clear link between regular physical activity and improved health outcomes, including reduced mortality rates among PD patients. This meta-analysis not only highlights the benefits of exercise in enhancing physical functioning but also emphasizes the necessity of structured PA interventions.

Subsequent reviews, such as that by Lauzé et al. (Lauzé et al., 2016), build on this understanding by providing a nuanced perspective on the impact of PA on clinical symptoms and psychosocial aspects of life for PD patients. While benefits are evident, the variability in outcomes suggests that specific exercise modalities and individualized programs may be essential for maximizing efficacy. Bhalsing et al.

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(S. Bhalsing et al., 2018) further contextualize the importance of PA by discussing its role in preventing chronic diseases and its potential to delay disease progression, emphasizing the biological mechanisms that underpin these benefits.

Research focusing on early-stage PD, such as that by Mantri et al. (Mantri et al., 2018), reveals a concerning trend: many individuals with early PD do not meet recommended activity levels, highlighting the need for targeted interventions. This aligns with findings from Lovegrove (Lovegrove, 2019), which identify barriers to sustained engagement in PA, underscoring the importance of addressing both personal and contextual factors to encourage exercise adherence among PD patients.

The literature also points to the importance of a dose-dependent relationship between PA and PD risk, as noted by Reichmann et al. (Reichmann et al., 2022), suggesting that higher levels of physical activity can significantly reduce the risk of developing PD, particularly in men. This emphasizes the need for clear guidelines regarding activity levels necessary for protective benefits, as well as the potential for tailored interventions based on demographic factors.

Finally, the bibliometric analysis by Chen et al. (Chen et al., 2022) illustrates the growing recognition of exercise's role in managing PD, reinforcing the idea that PA not only addresses motor symptoms but also contributes to improvements in non-motor symptoms, such as cognitive decline and depression.

In conclusion, the reviewed articles collectively advocate for the integration of physical activity into PD management strategies. They highlight the multifaceted benefits of exercise, the necessity for tailored interventions, and the importance of promoting PA from early stages of the disease. As the body of literature expands, it becomes increasingly clear that physical activity should be a fundamental aspect of both preventive and therapeutic approaches to Parkinson's disease.

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