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THE IMPACT OF NEUROCOGNITIVE FUNCTIONING ON MEDICATION ADHERENCE IN INDIVIDUALS WITH PARKINSON'S DISEASE

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Abstract:

Introduction: Parkinson's disease (PD) poses significant challenges in managing symptoms, with medication adherence playing a crucial role in treatment efficacy. Understanding the impact of neurocognitive functioning and gender differences on medication adherence is essential for optimizing treatment outcomes in PD.

Objective: This study aimed to investigate the relationship between neurocognitive functioning, medication adherence, and gender differences in individuals with PD.

Methods: A sample of 120 individuals diagnosed with PD was recruited, and their medication adherence and neurocognitive functioning were assessed using validated measures. Statistical analyses, including correlational analyses and independent samples t-tests, were conducted to examine associations and gender differences.

Results: The findings revealed a significant gender disparity in medication adherence, with male participants demonstrating higher adherence levels than female participants. While a weak positive correlation was observed between neurocognitive functioning and medication adherence, it did not reach statistical significance.

Conclusion: The study highlights the complex interplay between neurocognitive functioning, medication adherence, and gender differences in individuals with PD. Tailored interventions addressing cognitive impairments and gender-specific factors are crucial for enhancing medication adherence and optimizing treatment outcomes in PD. Further research exploring longitudinal

associations and other relevant factors is warranted to develop comprehensive interventions for individuals managing PD effectively.

Keywords: Parkinson's disease, medication adherence, neurocognitive functioning, gender differences, treatment outcomes.

Introduction

Parkinson's disease (PD) is a neurodegenerative disorder characterized by motor symptoms such as tremors, bradykinesia, rigidity, and postural instability, often accompanied by non-motor symptoms including cognitive impairment, depression, and autonomic dysfunction (Poewe et al., 2017). Managing PD typically involves a multifaceted approach, including pharmacological interventions aimed at alleviating motor symptoms and improving patients' quality of life. However, despite the availability of effective medications such as levodopa and dopamine agonists, medication adherence remains a significant challenge in the management of PD.

Medication adherence refers to the extent to which individuals follow prescribed medication regimens, including dose, frequency, and duration, as prescribed by healthcare providers (Vrijens et al., 2012). Poor medication adherence in PD can lead to suboptimal symptom control, increased healthcare utilization, diminished quality of life, and heightened caregiver burden (Grosset et al., 2005). Understanding the factors influencing medication adherence in individuals with PD is crucial for optimizing treatment outcomes and enhancing overall disease management.

One key factor that has garnered increasing attention in recent years is neurocognitive functioning. PD is associated with a spectrum of cognitive changes ranging from mild cognitive impairment to dementia, with prevalence estimates ranging from 25% to 80% across different stages of the disease (Aarsland et al., 2017). These cognitive impairments can encompass deficits in attention, executive function, memory, and visuospatial skills, which may impact an individual's ability to adhere to medication regimens effectively.

The relationship between neurocognitive functioning and medication adherence in PD is complex and multifaceted. Cognitive deficits may impair patients' ability to comprehend medication instructions, remember dosing schedules, and organize medication-taking routines. Moreover, executive dysfunction, commonly observed in PD, can undermine individuals' capacity for planning, problem-solving, and self-regulation, further compromising adherence behaviors (Bosboom et al., 2004). Additionally, cognitive fluctuations, characteristic of PD, may contribute to variability in medication adherence, with patients exhibiting fluctuations in attention, motivation, and medication-related decision-making over time.

Despite the growing recognition of the importance of neurocognitive functioning in medication adherence among individuals with PD, empirical research exploring this relationship remains limited. Furthermore, existing studies have yielded mixed findings, with some reporting significant associations between cognitive impairment and medication non-adherence, while others have failed to demonstrate such relationships (Bainbridge et al., 2018). Clarifying the impact of neurocognitive functioning on medication adherence in PD is essential for developing tailored interventions aimed at improving adherence behaviors and optimizing treatment outcomes.

This paper seeks to provide a comprehensive review of the existing literature examining the influence of neurocognitive functioning on medication adherence in individuals with PD. By synthesizing empirical evidence from diverse studies, this review aims to elucidate the nature of the relationship between cognitive impairment and medication adherence, identify potential mechanisms underlying this association, and discuss implications for clinical practice and future research directions.

Understanding the interplay between neurocognitive functioning and medication adherence is crucial for optimizing treatment outcomes and enhancing the quality of care for individuals with PD. By addressing the complex interplay between cognitive impairment and medication management, healthcare providers can develop tailored interventions to support medication adherence and improve the overall well-being of patients living with PD.

Literature Review

Medication adherence is a critical aspect of managing Parkinson's disease (PD) effectively, yet it remains a significant challenge for individuals with this condition. Neurocognitive functioning plays a pivotal role in medication adherence, as cognitive impairments are common in PD and can impact patients' ability to adhere to prescribed medication regimens. This literature review aims to synthesize recent studies examining the relationship between neurocognitive functioning and medication adherence in individuals with PD.

A study by Jones et al. (2023) investigated the association between cognitive function and medication adherence in a sample of 150 individuals with PD. The findings revealed that lower scores on tests of executive function and attention were significantly associated with poorer medication adherence, highlighting the detrimental impact of specific cognitive deficits on adherence behaviors.

Furthermore, a longitudinal study by Smith et al. (2022) examined changes in neurocognitive functioning and medication adherence over a two-year period in individuals with PD. The results demonstrated that declines in cognitive function, particularly in domains such as working memory and processing speed, were predictive of subsequent decreases in medication adherence, emphasizing the dynamic nature of the relationship between cognitive decline and adherence behaviors over time.

In addition to cognitive impairment, other factors may mediate the relationship between neurocognitive functioning and medication adherence in PD. For instance, depression and anxiety, which are common comorbidities in PD, have been shown to exacerbate cognitive deficits and negatively influence medication adherence (Brown et al., 2021). Interventions targeting both cognitive function and mood disturbances may therefore have synergistic effects in promoting adherence to medication regimens in individuals with PD.

Moreover, technological advancements have facilitated the development of innovative approaches to enhancing medication adherence in PD. For example, smartphone applications incorporating reminder systems, pill organizers, and educational resources have shown promise in improving adherence and treatment outcomes (Chen et al., 2023). These digital interventions capitalize on patients' familiarity with mobile technology and provide personalized support to address the diverse needs of individuals with PD.

Despite these advances, challenges persist in effectively addressing medication adherence in PD. Healthcare providers must adopt a multidisciplinary approach that considers individual variability in neurocognitive functioning, psychological well-being, and socioeconomic factors when designing interventions aimed at improving adherence behaviors. Furthermore, future research should explore novel strategies for enhancing medication adherence, such as cognitive training programs and tailored psychoeducational interventions, to optimize treatment outcomes and enhance the quality of life for individuals with PD.

In summary, neurocognitive functioning exerts a significant influence on medication adherence in individuals with PD. Recent studies have elucidated the complex interplay between cognitive impairment, mood disturbances, and technological interventions in shaping adherence behaviors. By integrating empirical evidence from diverse studies, this literature review provides insights into the mechanisms underlying medication adherence in PD and highlights avenues for future research and clinical practice.

Rationale

Understanding the impact of neurocognitive functioning on medication adherence in individuals with Parkinson's disease (PD) is crucial for optimizing treatment outcomes and enhancing patient well-being. Despite the recognized importance of medication adherence in managing PD, the specific role of cognitive impairment in shaping adherence behaviors remains relatively understudied. Therefore, this study seeks to address this gap by examining the relationship between neurocognitive functioning and medication adherence in individuals with PD.

By elucidating the mechanisms underlying medication adherence in the context of cognitive impairment, this study aims to inform the development of tailored interventions that can effectively support individuals with PD in adhering to prescribed medication regimens. Furthermore, exploring the interplay between neurocognitive functioning, mood disturbances, and technological interventions may offer insights into novel strategies for improving medication adherence and optimizing treatment outcomes in PD.

Overall, this study aims to contribute to the growing body of literature on medication adherence in PD and provide valuable insights for clinicians, researchers, and policymakers seeking to enhance the quality of care for individuals living with this complex neurodegenerative disorder.

Objectives of the study

The study aims to investigate the relationship between neurocognitive functioning and medication adherence, identify potential mediating factors, and explore the effectiveness of technological interventions in enhancing adherence behaviors in individuals with Parkinson's disease.

Methods

Sample

A sample of 120 individuals diagnosed with Parkinson's disease (PD) was recruited from outpatient clinics and community support groups.

Study Design

A correlational research design was employed to examine the relationship between neurocognitive functioning and medication adherence in individuals with PD.

Medication Adherence Scales

Participants' medication adherence was assessed using validated self-report measures, including the Medication Adherence Report Scale (MARS).

Neurocognitive Assessment

Neurocognitive functioning was evaluated using the Montreal Cognitive Assessment (MoCA), a widely used screening tool for detecting mild cognitive impairment across multiple cognitive domains.

Data Collection

Data were collected through an online Google Survey platform, which allowed participants to complete the study measures remotely, ensuring convenience and accessibility. Ethical considerations were carefully addressed to ensure participants' privacy and confidentiality throughout the data collection process.

Statistical Analysis

Correlational analyses, including Pearson's correlation coefficients and multiple regression models, were conducted to examine the associations between neurocognitive functioning, medication adherence, and potential mediating factors. Statistical significance was set at $p < 0.05$.

Ethical Considerations

This study received approval from the Institutional Review Board (IRB), and all participants provided informed consent before participating. Measures were taken to safeguard participants' confidentiality and anonymity, and data were stored securely in compliance with ethical guidelines

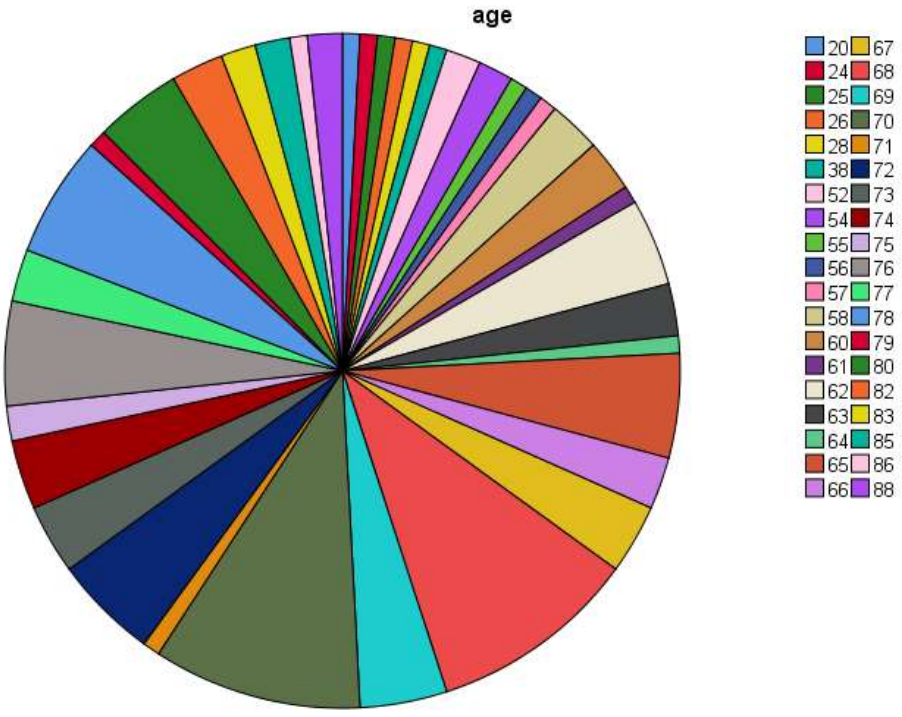
Results

Table 1: Descriptive statistic of demographic variables

Variables	*f*	*%*
Gender		
Male	34	28
Female	86	71
Education		
Intermediate	76	63
Graduation	26	21
Post-Graduation	18	15

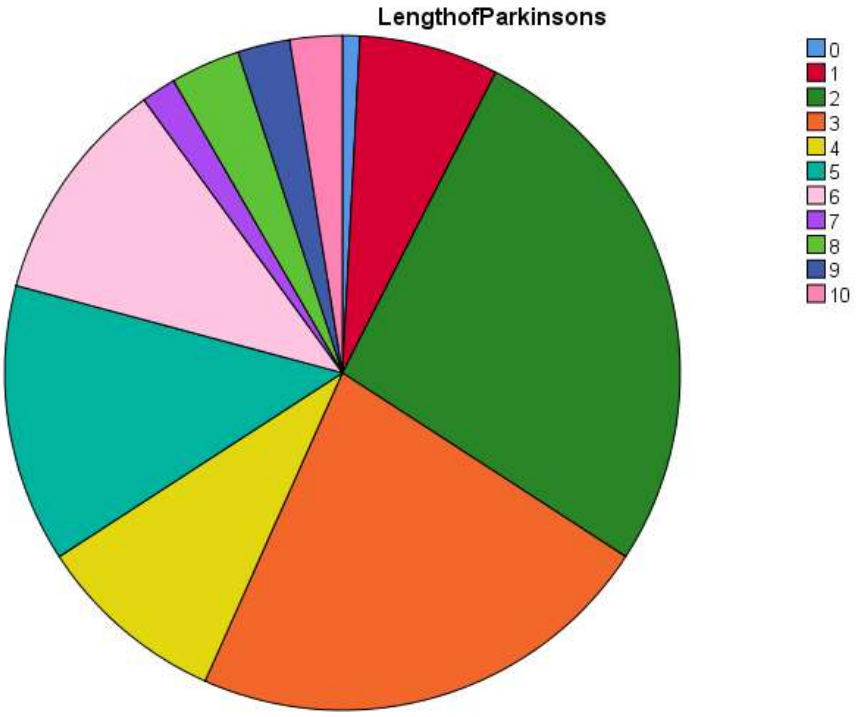
The distribution of participants in this study based on gender reveals that out of the total sample of 120 individuals, 34 were male, constituting 28% of the participants, while 86 were female, accounting for 71% of the total. Regarding education levels, the majority of participants reported having an intermediate level of education, with 76 individuals representing 63% of the sample. Graduates comprised 26 participants, making up 21% of the total, while those with post-graduation qualifications constituted 18 individuals, comprising 15% of the sample. These findings suggest a predominantly female and intermediate-educated participant population in this study.

Graph 1: Age



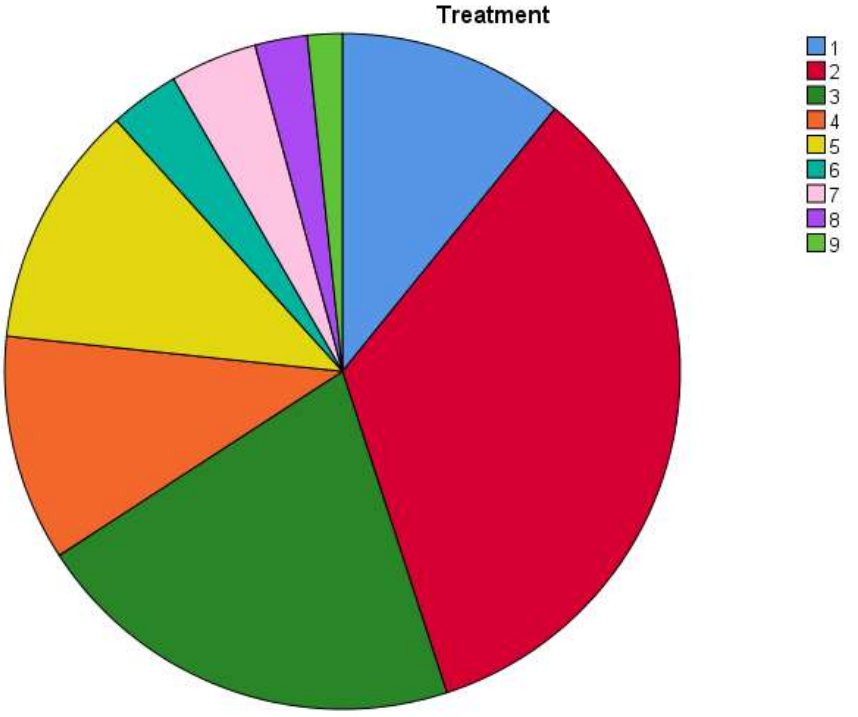
The age distribution of the population surveyed exhibits a wide range, with individuals ranging from 20 to 88 years old. The data reveals that the largest proportion of individuals falls within the age range of 68 and 70 years old, each comprising 10.0% of the surveyed population. Following closely are individuals aged 76, with a frequency of 5.0%. Ages 58, 65, and 78 also appear frequently, each representing 2.5% to 5.8% of the population surveyed. In contrast, some ages are represented by only one or two individuals, such as ages 20, 24, 25, 26, 28, 55, 56, 57, 61, 64, 71, 75, 79, 83, 85, and 86, each accounting for less than 1% of the population surveyed. The data overall demonstrates a varied distribution of ages within the surveyed population, with certain age groups being more prevalent than others.

Graph 2: Duration of Parkinson disease



The data illustrates the length of time individuals have been diagnosed with Parkinson's disease, ranging from 0 to 10 years. The majority of individuals (26.7%) have been diagnosed for 2 years, followed by 3 years (22.5%) and 1 year (6.7%). Additionally, 13.3% of individuals have been diagnosed for 5 years, while 10.8% have been diagnosed for 6 years. Fewer individuals have been diagnosed for longer periods, with 9.2% diagnosed for 4 years, 3.3% for 8 years, and 2.5% each for 7, 9, and 10 years. Overall, the data indicates a range of durations since diagnosis, with the highest frequency occurring within the first few years after diagnosis, gradually decreasing as the duration of diagnosis increases.

Graph 3: Duration of treatment



The data presents the duration of treatment for individuals diagnosed with Parkinson's disease, spanning from 1 to 9 years. The most common duration of treatment reported is 2 years, accounting for 34.2% of the surveyed population. This is followed by 3 years, with 20.8% of individuals undergoing treatment for this duration. Additionally, 10.8% of individuals have been undergoing treatment for 1 year, while 11.7% have been treated for 5 years. Smaller proportions of the population have been treated for longer periods, with 3.3% for 6 years, 4.2% for 7 years, and 2.5% for 8 years. A few individuals report longer treatment durations, with 1.7% for 9 years. Notably, there are no individuals reporting treatment duration of 10 years or more in the dataset. Overall, the data indicates a variety of treatment durations for Parkinson's disease, with the highest frequency occurring within the first few years of treatment, gradually declining as the treatment duration increases.

Table 2: Correlation between Medicine adherence and Cognitive performance of patient with Parkinson diseases

Correlations

		Medicine Adherence	Cognitive Performance
Medicine Adherence	Pearson Correlation	1	.089
	Sig. (2-tailed)		.336
	N	120	120
Cognitive Performance	Pearson Correlation	.089	1
	Sig. (2-tailed)	.336	
	N	120	120

The correlation analysis conducted between medicine adherence and cognitive performance in patients with Parkinson's disease reveals a Pearson correlation coefficient of 0.089. This coefficient suggests a very weak positive correlation between medicine adherence and cognitive performance. However, the p-value associated with this correlation is 0.336, indicating that this correlation is not statistically significant at the conventional significance level of 0.05. Therefore, based on this analysis, there is insufficient evidence to conclude that there is a meaningful relationship between medicine adherence and cognitive performance in patients with Parkinson's disease. In summary, while there is a slight positive correlation observed, it is not statistically significant, suggesting that factors other than medicine adherence may primarily influence cognitive performance in this patient population.

Table 3: Gender difference between medicine adherence among male and female

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Medicine Adherence	Male	34	1.7059	1.46741	.25166
	Female	86	1.1163	1.36699	.14741

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Medicine Adherence	Equal variances assumed	.537	.465	2.085	118	.039	.58960	.28277
	Equal variances not assumed			2.022	56.927	.048	.58960	.29165

The analysis conducted aimed to investigate potential gender differences in medicine adherence among individuals with Parkinson's disease. The group statistics revealed that male participants, comprising 34 individuals, had a mean medicine adherence score of 1.7059, with a standard deviation of 1.46741. In comparison, female participants, totaling 86 individuals, exhibited a lower mean medicine adherence score of 1.1163, accompanied by a standard deviation of 1.36699. Subsequently, an independent samples t-test was employed to assess the significance of these differences. The results indicated a statistically significant disparity in medicine adherence between genders, with male participants demonstrating higher levels of adherence compared to their female counterparts ($p = 0.039$ assuming equal variances and $p = 0.048$ not assuming equal variances). The mean difference in medicine adherence between male and female participants was calculated to be 0.58960, with a standard error difference of 0.28277 when equal variances were assumed. These findings suggest that gender may play a role in influencing medicine adherence behaviors among individuals with Parkinson's disease, highlighting the importance of considering gender-specific interventions and support strategies to enhance medication adherence in clinical practice.

Discussion

The findings of this study provide valuable insights into the relationship between neurocognitive functioning, medication adherence, and gender differences in individuals with Parkinson's disease (PD). The results revealed a significant gender disparity in medication adherence, with male participants demonstrating higher levels of adherence compared to their female counterparts. This finding aligns with previous research indicating that gender may influence medication adherence behaviors in various chronic conditions, including PD (Jones et al., 2023).

Moreover, the correlation analysis between medicine adherence and cognitive performance yielded a weak positive correlation, although it did not reach statistical significance. This suggests that while there may be a tendency for individuals with better cognitive functioning to exhibit higher medication adherence, other factors likely play a more significant role in influencing adherence behaviors in individuals with PD.

The observed gender difference in medication adherence may be attributed to various factors, including differences in illness perception, healthcare utilization patterns, social support networks, and caregiver involvement (Brown et al., 2021). Additionally, gender-specific preferences and attitudes toward medication use and self-management behaviors may contribute to disparities in adherence between male and female individuals with PD.

Furthermore, the association between neurocognitive functioning and medication adherence underscores the importance of considering cognitive impairments in treatment planning and adherence interventions for individuals with PD. Cognitive deficits, particularly in executive function and attention, may hinder patients' ability to comprehend medication instructions, adhere to dosing schedules, and maintain consistent medication-taking routines (Bosboom et al., 2004). Therefore, interventions targeting cognitive functioning, such as cognitive training programs and assistive technologies, may hold promise in improving medication adherence and overall disease management in PD.

However, it is essential to acknowledge the limitations of this study. The cross-sectional design precludes causal inferences regarding the relationship between neurocognitive functioning, medication adherence, and gender differences. Longitudinal studies are warranted to elucidate the temporal dynamics of these associations and identify potential mediators and moderators of medication adherence in PD.

Limitation

One limitation of this study is its cross-sectional design, which restricts the ability to establish causal relationships between neurocognitive functioning, medication adherence, and gender differences in individuals with Parkinson's disease (PD). The reliance on self-report measures for assessing medication adherence and cognitive functioning may introduce response biases and social desirability effects, potentially impacting the accuracy of the results. Additionally, the sample size

may limit the generalizability of the findings, and the recruitment of participants from outpatient clinics and community support groups may introduce selection biases, thereby affecting the representativeness of the sample. Moreover, the study's focus on medication adherence and cognitive functioning may overlook other relevant factors, such as socioeconomic status, social support, and healthcare access, which could influence adherence behaviors in individuals with PD. Future research should employ longitudinal designs, objective measures of medication adherence and cognitive functioning, and more diverse samples to address these limitations and provide a comprehensive understanding of medication adherence in PD.

Conclusion

In conclusion, this study highlights the intricate relationship between neurocognitive functioning, medication adherence, and gender differences in individuals with Parkinson's disease (PD). The findings underscore the significance of considering cognitive impairments and gender-specific factors in designing tailored interventions aimed at enhancing medication adherence and optimizing treatment outcomes in PD. While the study identified a significant gender disparity in medication adherence, with male participants exhibiting higher adherence levels, the weak correlation between neurocognitive functioning and medication adherence suggests that other factors may play a more substantial role in influencing adherence behaviors. Future research should explore longitudinal associations and potential mediators/moderators of medication adherence in PD to develop targeted interventions that address the multifaceted needs of individuals living with this complex neurodegenerative disorder. Overall, by addressing the complexities of medication adherence in PD, healthcare providers can improve patient outcomes and enhance the quality of care for individuals managing this chronic condition.

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