Research Article

The Relationship between Narrative Discourse Features and Cognitive Functions in Persian-Speaking Patients with Parkinson's Disease

Kiana Ghasrhamidi[1], Arezoo Saffarian[1], Reyhane Mohamadi[1], Seyed Amir Hasan Habibi[2], Nahid Jalilevand[1*]

1. Department of Speech Therapy, Rehabilitation Research Centre, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran.
2. Department of Neurology, School of Medicine, Rasoul Akram Hospital, Iran University of Medical Sciences, Tehran, Iran.

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ABSTRACT

Introduction: Parkinson's disease (PD) affects not only motor function but also cognition and language, including narrative discourse, which relies on linguistic processes and higher-order cognitive functions, such as working memory and executive functions. Therefore, this study aimed to investigate the relationship between narrative discourse features and cognitive functions in Persian-speaking patients with PD.

Materials and Methods: In this cross-sectional study, 26 patients with PD and 26 age-, sex-, and education-matched healthy controls participated. Cognitive performance was assessed using the Persian Montreal cognitive assessment (MoCA-P), digit span, Stroop, verbal fluency, and the Persian cognitive reserve index (CRIq). Narrative discourse was evaluated using the Persian narrative discourse test. Data were analyzed using the Mann-Whitney test and Spearman correlation.

Results: In patients with PD, syntactic complexity correlated positively with MoCA-P (P=0.001, rs=0.627), CRIq (P=0.012, rs=0.487), phonological verbal fluency (P=0.032, rs=0.420), and forward digit span (P=0.015, rs=0.472). Lexical cohesion correlated with MoCA-P (P=0.012, rs=0.484) and CRIq (P=0.002, rs=0.573), while conjunctive cohesion was associated with MoCA-P (P=0.022, rs=0.448) and semantic verbal fluency (fruits) (P=0.041, rs=0.404).

Conclusion: The results of this study demonstrate that higher levels of global cognition, working memory, verbal fluency, and cognitive reserve are associated with increased syntactic complexity and enhanced lexical and conjunctive cohesion in the narrative discourse of patients with PD. These findings indicate that cognitive decline adversely affects narrative organization and structural integrity.

Keywords:

Parkinson's disease; Narrative discourse; Cognition; Persian language

*** Corresponding Author:**
Nahid Jalilevand, Associate Professor.
Address: *Department of Speech Therapy, Rehabilitation Research Centre, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran.*
Tel: *+98 (912) 2979867*
E-mail: *jalilevand@gmail.com*

Introduction

Parkinson's disease (PD) is one of the most common progressive neurodegenerative disorders. In addition to motor symptoms (resting tremor, muscle rigidity, and bradykinesia (slowness of movement), it is also associated with a wide range of non-motor symptoms, such as cognitive and language impairments [1, 2]. Although motor symptoms mainly characterize PD, cognitive deficits occur even in the early stages [1, 3, 4].

Executive functions, including planning, inhibition, and working memory, are impaired in individuals with PD [5]. Neuroimaging studies have shown that these cognitive changes are associated with reduced activity in prefrontal areas, the anterior cingulate cortex, and subcortical structures [6].

Language difficulties are common among individuals with PD, including word retrieval difficulties, reduced informational content, decreased syntactic complexity, semantic errors, and grammatical impairments [7-9]. Narrative discourse, which requires organizing and expressing a sequence of related events coherently, depends on both linguistic processes and higher-order cognitive functions, including working memory and executive functions [10, 11]. Impairments in these cognitive abilities can disrupt narrative cohesion and coherence, leading to fragmented or simplified narratives. Information about the overall structure of a narrative is derived from two underlying levels: the microstructure and the macrostructure [12]. The narrative macrostructure represents the global organizational pattern of stories. Achieving coherence at this level necessitates the integration of successive utterances with each other and with the overarching theme [13]. The microstructural analysis examines the linguistic details that shape a narrative's internal structure. This level of analysis encompasses multiple distinct dimensions, including productivity, lexical variety, and syntactic complexity [14].

Although evidence indicates that executive functions and working memory influence narrative discourse [15-18], some aspects of language, such as intersentential cohesion, may be affected independently of general cognitive decline [18, 19]. Existing findings are inconsistent [18-20], and most previous research has focused on English-speaking populations, limiting the generalizability of results to languages with different structural characteristics, such as Persian. To date, no study has systematically examined the relationship between multiple cognitive functions and both macrostructural and microstructural aspects of narrative discourse in Persian-speaking individuals with PD. This gap highlights the need for further investigation of how cognitive deficits influence narrative production within the linguistic and cultural context of Persian.

Understanding the relationship between cognitive functions and narrative discourse in PD is clinically important because narrative abilities play a fundamental role in patients' daily communication [21]. Identifying the specific cognitive components that contribute to these discourse impairments enables speech-language pathologists to differentiate between language deficits arising from purely linguistic issues and those resulting from cognitive decline. This distinction facilitates the development of more targeted intervention programs that address the cognitive and communicative needs of individuals with PD. Therefore, establishing this relationship provides essential guidance for clinical assessment and treatment planning.

Therefore, the present study was designed to investigate the relationship between narrative discourse characteristics (including syntactic complexity, verbal output errors, cohesion, and coherence) and cognitive functions (attention, working memory, processing speed, executive functions, and cognitive reserve) in Persian-speaking patients with PD.

Materials and Methods

This cross-sectional study compared cognitive and narrative discourse features between individuals with idiopathic PD and healthy controls at a single time point. The following formula (Equation 1) was used to determine the sample size. Accordingly, a total of 26 patients with idiopathic PD (14 men and 12 women; mean age=59.42±8.8 years) and 26 age, sex- and education-matched healthy controls (14 males and 12 females; mean age=59.23±8.42 years) participated. Participants with PD were recruited through a convenience sampling method from the Rehabilitation Clinics of the Iran University of Medical Sciences (IUMS).

$$1.\ n=\frac{2\left(z_{1-\alpha/2}+z_{1-\beta}\right)^2}{d^2}+\frac{z_{1-\alpha/2}^2}{4}$$

The diagnosis of idiopathic PD was confirmed by a neurologist, and all patients were classified as stages 1 to 3 on the Hoehn and Yahr (H&Y) scale [22].

Inclusion criteria (applied to all participants):

Age range: 45-75 years.

Native Persian speaker.

Adequate visual and auditory acuity, with or without correction.

Formal education of at least eight completed years of schooling.

Absence of any diagnosed neurological conditions (e.g. cerebrovascular accident, head trauma).

Exclusion criteria:

(For the PD cohort): patients with PD who had undergone non-pharmacological treatments, including deep brain stimulation or language-based speech therapy interventions, within the previous three months.

Voluntary withdrawal from the study at any stage of participation.

Cases in which the required dataset could not be fully obtained.

All participants provided written informed consent. The study was approved by the Ethics Committee of Iran University of Medical Sciences. Assessments for patients with PD were conducted during the ON-medication phase, approximately one hour after medication intake [23].

All assessments were conducted in a quiet room. At the beginning of the session, the Persian version of Montreal cognitive assessment (MoCA-P) [24] and the Persian narrative discourse test [25] were administered, followed by additional cognitive evaluations. Six sequential pictures from the Persian narrative discourse assessment test [25] were presented to each participant. The images remained visible throughout the task, reducing working memory load. The participants were asked to produce a continuous, coherent story based on the pictures. The examiner gave only minimal non-directive feedback (e.g. "Okay," "Oh," "Another one?") to maintain conversational flow without influencing content. The narrations continued until the participants indicated that they had nothing more to add. All narratives were audio-recorded and subsequently transcribed for analysis. To assess sentence complexity, the ratio of the total number of dependent and independent clauses to the total number of communication units (C-units) in each speech sample was calculated [26].

To calculate the total verbal output error score, the sum of all lexical errors (semantic or phonological paraphasias, incorrect word formation, deletions [27]) plus mazes (filled pauses, word repetitions, speech revisions [28]) was divided by the total number of C-units. Cohesion was measured as the number of complete cohesive ties (reference, conjunction, substitution, ellipsis, lexical) per C-unit according to Halliday and Hasan's framework [29, 30]. In addition, coherence was evaluated using the 4-point scale developed by Wright et al. [31], in which each C-unit was rated from 1 (irrelevant to the topic) to 4 (fully relevant). The average coherence score was computed for each participant. Working memory was assessed using the forward digit span test (FDST) and backward digit span test (BDST) [32, 33]. Attention, executive functions, and processing speed were evaluated with the Stroop test [34]. These tests are components of the paper and pencil cognitive assessment package for Persian-speaking subjects [35], which comprehensively evaluates working memory, attention, and executive functioning. The validity and reliability of these assessments have been confirmed in the Iranian population by Rezapour et al. [35]. Additionally, executive functions were further assessed using verbal fluency tasks [36]. In the semantic fluency test, participants were asked to name as many animals and fruits as possible within 60 seconds. In the phonological fluency test, participants generated words beginning with the letters /a/, /f/, and /s/ within the same time limit [37]. In the verb fluency task, participants produced as many action verbs as possible in 60 seconds. Repetitions and proper nouns were excluded [38]. They also completed the Persian version of cognitive reserve index questionnaire (CRIq) to estimate their level of cognitive reserve. The CRIq developed by Nucci et al. (2012) was used to measure participants' cognitive reserve [39]. This standardized instrument evaluates three subscales: education, occupational activities, and leisure time. The total CRIq score is derived from the combined scores of these subscales. A higher CRI score indicates a higher estimated cognitive reserve (CR) [39]. The psychometric properties of the Persian version of CRIq have been validated, with reliability coefficients of 0.76 for men and 0.79 for women (Cronbach's α) and a convergent validity coefficient of 0.74 [40].

All test scores were recorded and analyzed using SPSS software, version 16. The Shapiro–Wilk test was applied to assess the normality of data distribution. Since the data did not follow a normal distribution, the Mann–Whitney

Table 1. Demographic characteristics of PD patients and healthy controls

Variables		Mean±SD/No.(%)		P
		Healthy (n=26)	PD (n=26)	
Age (y)		59.23±8.42	59.42±8.8	0.936
Gender	Male	14(53.8)	14(53.8)	1.000
	Female	12(46.2)	12(46.2)	1.000
Education (y)		13.62±3.18	12.62±2.98	0.247
Disease duration (y)		—	6.12±4.93	—
Disease severity (H&Y)		—	1.53	—

PD; Parkinson's disease; H&Y: Hoehn and Yahr.

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U test was used for between-group comparisons, and the Spearman correlation coefficient was employed to examine relationships among quantitative variables.

The effect size (r) was calculated for the Mann–Whitney test, with values of 0.1–0.3, 0.3–0.5, and >0.5 indicating small, medium, and large effect sizes, respectively [41]. The significance level was set at P<0.05.

Results

This study examined the relationship between cognitive functions and narrative discourse in 26 Persian-speaking patients with PD and 26 healthy control participants. Table 1 presents the demographic characteristics of patients with PD and healthy controls.

As shown in Table 1, the Mean±SD ages of the healthy and PD groups were 59.23±8.42 and 59.42±8.8 years, respectively. An independent t-test indicated no statistically significant difference in age between the two groups (P=0.936). The Mean±SD years of education were 13.62±3.18) for the healthy group, and 12.62±2.98 for the PD group, with no significant difference observed (P=0.247). Spearman's correlation coefficient was utilized to analyze the relationships between narrative discourse variables and cognitive test scores among participants. Tables 2, 3, 4, 5, 6, 7, and 8 present the correlations between syntactic complexity, verbal output errors, referential, conjunctive, lexical, Ellipsis and substitution cohesion, and coherence scores with cognitive test results. Table 2 presents the Spearman correlations between syntactic complexity measures and cognitive test scores in patients with PD, healthy controls, and the total sample.

Table 3 presents the Spearman correlations between verbal output error measures and cognitive test scores in patients with PD, healthy controls, and the total sample.

Table 4 presents the Spearman correlations between referential cohesion measures and cognitive test scores in patients with PD, healthy controls, and the total sample.

Table 5 presents the Spearman correlations between Ellipsis and substitution cohesion measures and cognitive test scores in patients with PD, healthy controls, and the total sample.

Table 6 presents the Spearman correlations between conjunctive cohesion measures and cognitive test scores in patients with PD, healthy controls, and the total sample.

Table 7 presents the Spearman correlations between lexical cohesion measures and cognitive test scores in patients with PD, healthy controls, and the total sample.

Table 8 presents the Spearman correlations between coherence measures and cognitive test scores in patients with PD, healthy controls, and the total sample.

Among Persian-speaking patients with PD, a significant positive correlation was found between sentence complexity score and the CRIq (P=0.012, rs=0.487), and MoCA-P scores (P=0.001, rs=0.627), additionally, between phonological verbal fluency (letter F) (P=0.032, rs=0.420), and FDST (P=0.015, rs=0.472) scores. Furthermore, conjunctive cohesion scores were positively correlated with MoCA-P (P=0.022, rs=0.448) and semantic verbal fluency (fruits) scores (P=0.041, rs=0.404).

Table 2. Syntactic complexity and cognitive tests in PD and healthy controls

Cognitive Tests		Healthy		PD		Total	
		rs	P	rs	P	rs	P
P-MoCA		-0.16	0.435	0.627	0.001	0.423	0.002
CRIq		0.15	0.464	0.487	0.012	0.531	<0.001
Verbal fluency	Semantic (fruits)	-0.027	0.896	0.278	0.169	0.271	0.052
	Semantic (animal)	0.24	0.237	0.363	0.068	0.492	<0.001
	Phonemic (letter a)	0.025	0.905	0.078	0.706	0.356	0.010
	Phonemic (letter f)	0.042	0.840	0.42	0.032	0.453	0.001
	Phonemic (letter s)	0.05	0.808	0.208	0.308	0.371	0.007
	Verb fluency	0.192	0.347	0.318	0.113	0.547	<0.001
Digit span	FDST	0.23	0.258	0.472	0.015	0.51	<0.001
	BDST	0.093	0.651	0.361	0.070	0.436	0.001
Stroop test	Interference	-0.066	0.750	-0.075	0.715	-0.096	0.496

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Abbreviations: rs: Spearman correlation coefficient; PD: Parkinson's disease; P-MoCA: Persian Montreal cognitive assessment; CRIq: Cognitive reserve index questionnaire; FDST: Forward digit span test; BDST: Backward digit span test.

Table 3. Verbal output errors and cognitive tests in PD and healthy controls

Cognitive Tests		Healthy		PD		Total	
		rs	P	rs	P	rs	P
P-MoCA		0.322	0.109	-0.174	0.396	-0.079	0.577
CRIq		0.261	0.198	-0.044	0.830	-0.225	0.109
Verbal fluency	Semantic (fruits)	0.463	0.017	-0.153	0.454	-0.028	0.842
	Semantic (animal)	0.441	0.024	-0.147	0.473	-0.133	0.348
	Phonemic (letter a)	0.099	0.630	-0.265	0.190	-0.282	0.043
	Phonemic (letter f)	0.133	0.519	-0.083	0.686	-0.197	0.161
	Phonemic (letter s)	-0.121	0.556	-0.173	0.399	-0.286	0.040
	Verb fluency	0.372	0.061	0.061	0.768	-0.159	0.261
Digit span	FDST	0.132	0.520	-0.258	0.203	-0.323	0.020
	BDST	0.34	0.090	-0.279	0.168	-0.254	0.070
Stroop test	Interference	-0.199	0.329	-0.027	0.896	-0.038	0.791

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Abbreviations: rs: Spearman correlation coefficient; PD: Parkinson's disease; P-MoCA: Persian Montreal cognitive assessment; CRIq: Cognitive reserve index questionnaire; FDST: Forward digit span test; BDST: Backward digit span test.

Table 4. Referential cohesion and cognitive tests in PD and healthy controls

Cognitive Tests		Healthy		PD		Total	
		rs	P	rs	P	rs	P
P-MoCA		0.018	0.930	-0.106	0.608	0.037	0.797
CRIq		0.081	0.694	0.038	0.856	0.174	0.218
Verbal fluency	Semantic (fruits)	-0.104	0.614	-0.044	0.832	0.027	0.847
	Semantic (animal)	-0.009	0.964	0.186	0.362	0.202	0.150
	Phonemic (letter a)	-0.126	0.539	-0.009	0.967	0.088	0.536
	Phonemic (letter f)	0.039	0.851	0.061	0.768	0.176	0.211
	Phonemic (letter s)	0.16	0.435	0.017	0.935	0.151	0.284
	Verb fluency	0.313	0.119	-0.079	0.700	0.271	0.052
Digit span	FDST	0.066	0.748	-0.048	0.815	0.124	0.380
	BDST	-0.21	0.303	-0.052	0.800	0.026	0.852
Stroop test	Interference	0.189	0.356	0.252	0.214	0.194	0.167

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Abbreviations: rs: Spearman correlation coefficient; PD: Parkinson's disease; P-MoCA: Persian Montreal cognitive assessment; CRIq: Cognitive reserve index questionnaire; FDST: Forward digit span test; BDST: Backward digit span test.

Table 5. Ellipsis and substitution cohesion and cognitive tests in PD and healthy controls

Cognitive Tests		Healthy		PD		Total	
		rs	P	rs	P	rs	P
P-MoCA		-0.084	0. 682	0.01	0.960	0.213	0.129
CRIq		-0.25	0.218	-0.045	0.826	0.334	0.015
Verbal fluency	Semantic (fruits)	-0.195	0.340	-0.014	0.945	0.176	0.211
	Semantic (animal)	-0.227	0.266	0.325	0.106	0.353	0.010
	Phonemic (letter a)	0.044	0.831	0.158	0.442	0.485	0.001
	Phonemic (letter f)	-0.036	0.862	0.182	0.374	0.404	0.003
	Phonemic (letter s)	0.052	0.799	0.175	0.393	0.461	0.001
	Verb fluency	-0.355	0.076	-0.035	0.867	0.284	0.041
Digit span	FDST	0.195	0.339	-0.017	0.936	0.382	0.005
	BDST	-0.097	0.637	-0.108	0.601	0.271	0.052
Stroop test	Interference	-0.257	0.205	-0.205	0.316	-0.199	0.157

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Abbreviations: rs: Spearman correlation coefficient; PD: Parkinson's disease; P-MoCA: Persian Montreal cognitive assessment; CRIq: Cognitive reserve index questionnaire; FDST: Forward digit span test; BDST: Backward digit span test.

Table 6. Conjunctive cohesion and cognitive tests in PD and healthy controls

Cognitive Tests	Healthy		PD		Total	
	rs	P	rs	P	rs	P
P-MoCA	-0.015	0.941	0.448	0.022	0.3	0.031
CRIq	0.129	0.531	0.15	0.464	0.227	0.106
Semantic fluency (fruits)	0.083	0.688	0.404	0.041	0.283	0.042
Semantic fluency (animal)	0.121	0.557	0.329	0.101	0.315	0.023
Phonemic fluency (letter 'a')	0.181	0.376	-0.242	0.234	0.112	0.428
Phonemic fluency (letter 'f')	0.094	0.647	0.091	0.657	0.214	0.128
Phonemic fluency (letter 's')	0.392	0.047	0.202	0.322	0.316	0.022
Verb fluency	0.293	0.146	0.323	0.107	0.356	0.010
FDST (digit span)	0.577	0.002	0.327	0.103	0.429	0.001
BDST (digit span)	0.011	0.958	0.273	0.176	0.214	0.128
Interference (stroop)	0.191	0.350	0.108	0.599	0.117	0.410

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Abbreviations: rs: Spearman correlation coefficient; PD: Parkinson's disease; P-MoCA: Persian Montreal cognitive assessment; CRIq: Cognitive reserve index questionnaire; FDST: Forward digit span test; BDST: Backward digit span test.

Table 7. Lexical cohesion and cognitive tests in PD and healthy controls

Cognitive Tests	Healthy (n=26)		PD (n=26)		Total (n=52)	
	rs	P	rs	P	rs	P
P-MoCA	0.561	0.003	0.484	0.012	0.566	<0.001
CRIq	0.121	0.556	0.573	0.002	0.493	<0.001
Semantic fluency (fruits)	0.272	0.179	0.019	0.925	0.277	0.046
Semantic fluency (animal)	0.101	0.622	0.269	0.184	0.375	0.006
Phonemic fluency (letter 'a')	0.311	0.122	0.344	0.085	0.435	<0.001
Phonemic fluency (letter 'f')	-0.024	0.908	0.276	0.172	0.354	0.010
Phonemic fluency (letter 's')	0.214	0.294	-0.065	0.753	0.290	0.037
Verb fluency	-0.220	0.279	0.227	0.265	0.280	0.045
FDST (digit span)	0.238	0.242	0.312	0.121	0.413	0.002
BDST (digit span)	0.205	0.316	0.168	0.411	0.354	0.010
Stroop test (Interference)	0.084	0.685	0.080	0.697	0.076	0.591

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Abbreviations: rs: Spearman correlation coefficient; PD: Parkinson's disease; P-MoCA: Persian Montreal cognitive assessment; CRIq: Cognitive reserve index questionnaire; FDST: Forward digit span test; BDST: Backward digit span test.

Table 8. Coherence and cognitive tests in PD and healthy controls

Cognitive Tests		Healthy (n=26)		PD (n=26)		Total (n=52)	
		rs	P	rs	P	rs	P
P-MoCA		-0.044	0.832	0.361	0.070	0.452	0.001
CRIq		0.089	0.666	0.039	0.848	0.608	<0.001
Verbal fluency	Semantic fluency (fruits)	0.059	0.774	0.115	0.576	0.369	0.007
	Semantic fluency (animal)	-0.256	0.206	0.272	0.178	0.48	<0.001
	Phonemic fluency (letter a)	-0.164	0.422	0.188	0.357	0.571	<0.001
	Phonemic fluency (letter f)	-0.38	0.055	0.126	0.541	0.456	0.001
	Phonemic fluency (letter s)	0.098	0.633	-0.086	0.677	0.516	<0.001
	Verb fluency	-0.293	0.147	0.312	0.121	0.5	<0.001
Digit span	FDST	0.187	0.360	0.373	0.061	0.572	<0.001
	BDST	-0.114	0.578	0.196	0.337	0.437	<0.001
Stroop test	Interference	0.094	0.649	-0.075	0.715	-0.028	0.843

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Abbreviations: rs: Spearman correlation coefficient; PD: Parkinson's disease; P-MoCA: Persian Montreal cognitive assessment; CRIq: Cognitive reserve index questionnaire; FDST: Forward digit span test; BDST: Backward digit span test.

Moreover, lexical cohesion scores were positively associated with MoCA-P (P=0.012, rs=0.484) and CRIq (P=0.002, rs=0.573) scores. In contrast, verbal output errors did not show a significant correlation with any of the cognitive functions (P>0.05). In the healthy control group, a positive correlation was observed between verbal output errors and both semantic verbal fluency (fruits) (P=0.017, rs=0.463) and semantic verbal fluency (animals) scores (P=0.024, rs=0.441). Additionally, a positive correlation was found between conjunctive cohesion and FDST scores (P=0.002, rs=0.577), as well as between lexical cohesion and MoCA-P scores (P=0.003, rs=0.561).

Overall, both groups showed correlations between narrative discourse measures and cognitive performance. Notably, certain correlations (e.g. sentence complexity with MoCA-P and CRIq) were stronger or only present in patients with PD, whereas others (e.g. verbal output errors with semantic fluency) were observed only in healthy controls.

Discussion

The present study aimed to examine the relationship between narrative discourse features and cognitive functions in Persian-speaking patients with PD. The findings revealed that aspects of narrative discourse, such as sentence complexity, lexical cohesion, and conjunctive cohesion, were positively and significantly associated with higher-level cognitive functions, including working memory, verbal fluency, and cognitive reserve. This aligns with previous research highlighting the critical role of executive functions and working memory in discourse production [18, 17]. Previous studies have shown that narrative discourse production relies on complex interactions among multiple linguistic levels (phonological, lexical, and syntactic) and higher-order cognitive processes, such as planning, organizing, and inhibiting irrelevant responses [17, 42].

In the present study, the significant correlations between sentence complexity and MoCA-P, CRIq, and the FDST scores in patients with PD suggest that the production of complex syntactic structures depends on working memory and cognitive reserve [32, 33, 43]. This finding is consistent with theoretical models proposing that working memory plays a central role in the generation and maintenance of complex syntactic constructions [44]. The observed correlation between syntactic complexity and CRIq suggests that individuals with greater cognitive reserve can produce more complex syntactic structures in their discourse. Delage et al. (2019) reported that individuals with higher cognitive reserve scores tended to use more complex syntactic constructions, such as dependent clauses and compound sentences [44]. Furthermore, the relationship between syntactic complexity and FDST scores reinforces the role of working memory in generating complex syntactic structures, consistent with previous findings [45, 46, 47].

Lexical and conjunctive cohesion are also associated with cognitive performance. This relationship can be explained by the dependence of discourse cohesion on higher-order cognitive functions such as attention, working memory, and cognitive flexibility [17, 48]. A higher MoCA-P score reflects better overall cognitive health, including attention, memory, and executive functions [24], which are essential for establishing logical and semantic connections within narrative discourse [49].

Additionally, the correlation between conjunctive cohesion and semantic verbal fluency likely arises from the ability to efficiently access and retrieve lexical information. This process involves activating the semantic representations of concepts [50]. This capacity enables individuals to effectively link related concepts and maintain the semantic organization of discourse [51, 52]. Previous research has shown that discourse cohesion plays a vital role in effective communication [18]. The process of comprehending and expressing narratives requires continuous integration and organization of information into a coherent structure [53]. Within this framework, individuals with greater cognitive reserve exhibit a superior ability to employ complex linguistic devices to maintain coherence. These results align with cognitive-linguistic models proposing that the processing of coherent discourse depends on the integration of linguistic and cognitive resources [44, 54].

In contrast, neither lexical errors nor verbal mazes showed a significant relationship with cognitive performance. This finding may be attributed to the fact that such errors are influenced primarily by basic linguistic processes or individual speaker characteristics rather than by cognitive deficits [42, 55].

This study has several limitations. First, the sample size was relatively small (n=26), which may limit the generalizability of the findings. Second, all participants were Persian-speaking, introducing potential linguistic and cultural specificity that may not apply to speakers of other languages. Third, the cross-sectional design of the study limits the ability to infer causal relationships between narrative discourse features and cognitive functions, as only associations at a single point in time were examined. Finally, all participants with PD were assessed in the ON-medication state, and the study did not control for differences in dopaminergic medications or ON/OFF medication status, which may influence both cognitive and linguistic performance.

Conclusion

In conclusion, this study's findings highlight the clinical importance of assessing narrative discourse in patients with PD. Cognitive deficits, including impairments in executive functions, working memory, and cognitive reserve, can affect the cohesion and complexity of speech, ultimately influencing everyday communication. Incorporating narrative discourse assessments alongside standard cognitive tests may provide a more comprehensive understanding of patients' functional abilities. Furthermore, interventions targeting executive functions and working memory may help improve sentence complexity and discourse cohesion, supporting more effective communication.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Research Ethics Committee of Iran University of Medical Sciences, Tehran, Iran (Code: IR.IUMS.REC.1402.1127).

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Authors' contributions

Conceptualization and study design: Arezoo Saffarian, Kiana Ghasrhamidi, and Reyhane Mohammadi; Data acquisition: Kiana Ghasrhamidi, Seyed Amir Hassan Habibi; Data analysis and interpretation: Arezoo Saffarian, Reyhane Mohammadi, Kiana Ghasrhamidi, and Seyed Amir Hassan Habibi; Statistical analysis: Nahid Jalilevand; Initial draft preparation: Kiana Ghasrhamidi, Nahid Jalilevand, Arezoo Saffarian, Reyhane Mohammadi; Review, editing, and final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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