Original Article

Artigo Original

Speech fluency profile on different tasks for individuals with Parkinson's disease

Perfil da fluência da fala em diferentes tarefas para indivíduos com Doença de Parkinson

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Keywords

Speech, Language and Hearing Sciences
Speech
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ABSTRACT

Purpose: To characterize the speech fluency profile of patients with Parkinson's disease. **Methods**: Study participants were 40 individuals of both genders aged 40 to 80 years divided into 2 groups: Research Group - RG (20 individuals with diagnosis of Parkinson's disease) and Control Group - CG (20 individuals with no communication or neurological disorders). For all of the participants, three speech samples involving different tasks were collected: monologue, individual reading, and automatic speech. **Results**: The RG presented a significant larger number of speech disruptions, both stuttering-like and typical dysfluencies, and higher percentage of speech discontinuity in the monologue and individual reading tasks compared with the CG. Both groups presented reduced number of speech disruptions (stuttering-like and typical dysfluencies) in the automatic speech task; the groups presented similar performance in this task. Regarding speech rate, individuals in the RG presented lower number of words and syllables per minute compared with those in the CG in all speech tasks. **Conclusion**: Participants of the RG presented altered parameters of speech fluency compared with those of the CG; however, this change in fluency cannot be considered a stuttering disorder.

Descritores

Fonoaudiologia
Fala
Gagueira
Avaliação
Doença de Parkinson

RESUMO

Objetivo: Caracterizar o perfil da fluência da fala de indivíduos com Doença de Parkinson em diferentes tarefas de fala. **Método**: Participaram do estudo 40 indivíduos, de 40 a 80 anos de idade, de ambos os gêneros, divididos em 2 grupos: GP (grupo pesquisa - 20 indivíduos com diagnóstico de Doença de Parkinson); GC (grupo controle - 20 indivíduos sem qualquer alteração de comunicação e/ou neurológica). Para todos os participantes, foram coletadas três amostras de fala envolvendo diferentes tarefas: monólogo, leitura individual e fala automática. **Resultados:** O GP apresentou um número significativamente maior de rupturas, tanto comuns quanto gagas, e maiores porcentagens de descontinuidade de fala e disfluências gagas nas tarefas de monólogo e leitura quando comparado ao GC. Nas tarefas de fala automática, ambos os grupos apresentaram número reduzido de rupturas comuns e gagas, não apresentando diferença significativa entre os grupos para esta tarefa. Em relação à velocidade de fala, tanto em palavras quanto em sílabas por minuto, os indivíduos com Doença de Parkinson apresentaram velocidade reduzida em relação ao grupo controle em todas as tarefas de fala. **Conclusão**: O GP apresentou alteração em todos os parâmetros da fluência avaliados no presente estudo quando comparado ao grupo controle, porém esta alteração da fluência não se configura como um quadro de gagueira.

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INTRODUCTION

Parkinson's disease (PD) is a movement disorder caused by basal ganglia dysfunction which involves the death of dopamine-producing neurons in the substantia nigra and projection to the striatum. This degeneration is associated with the appearance of cardinal symptoms of the disease: tremor, rigidity, bradykinesia, and postural instability[1,2]. PD affects approximately 50 in 100,000 people over the age of 50 years worldwide[2].

Regarding speech, hypokinetic dysarthria is present in more than 90% of PD cases. The main symptoms are decreased vocal stress, monotony, hoarse and/or breathy vocal quality, reduction in spoken voice, articulatory inaccuracy, hypernasal resonance, and fluency alterations[1,3,4].

Speech dysfluencies have been reported in several studies conducted with individuals who presented hypokinetic dysarthria owing to PD. The most common manifestations cited in these studies were repetition of sounds, syllables, and words; prolongation of sounds; inappropriate and/or excessively long pauses. Another abnormality observed was palilalia, a disorder characterized by compulsive repetition of a statement in a context of increased rate and decreased loudness[1-9]. In some studies, the number of stuttering disruptions presented by individuals with PD was greater than 3% of stuttered syllables, characterizing a stuttering disorder[4,6,8,10].

The vast majority of cases of stuttering are of idiopathic origin, widely known in the specific scientific literature as persistent developmental stuttering (PDS)[11], which begins in childhood, during the phase of language acquisition and development, and is characterized as a chronic disorder, even if it presents periods of fluency. The etiology of PDS suggests a complex interaction of genetic, neurological, motor, linguistic and environmental factors in its manifestation[11-13]. However, changes in speech fluency may be manifested late, and these manifestations are often associated with neurological episodes, side effects of medication use, or in psychological contexts; under these conditions, the term used in the literature is acquired stuttering[13]. The term "acquired stuttering" is used with reservations in the literature, because there is discussion about considering this type of stuttering as an isolated pathology or as a symptom arising from other pathologies[1,10,12-16].

Among the different types of acquired stuttering, the term neurogenic stuttering refers to a speech fluency disorder resulting from damage to the central nervous system, and it is the most frequent type of acquired stuttering[10,12-16]. Although this type of stuttering has been reported in the literature for over 100 years, understanding the mechanisms that cause speech disruption in this type of disorder is still predominantly speculative[14,17].

In a study of individuals with PD who complained about stuttering after disease onset, the results indicated that the fluency pattern of these individuals was consistent with characteristics indicative of neurogenic stuttering[16]. The reason for the presence of speech dysfluencies or stuttering in PD has not yet been sufficiently clarified. Some authors relate the presence of speech disruptions in individuals with PD to the use of levodopa[18,19], others associate the occurrence of speech disruptions with the worsening of PD[20], some others indicate the relationship with brain regions[21,22] (involvement of basal ganglia - a finding also associated with the origin of PDS).

Another point to consider with respect to dysfluencies is the difference in speech performance according to the type of task. In neurogenic stuttering, unlike developmental stuttering, speech performance does not present alteration related to the type of task requested (spontaneous speech, individual reading, singing, automatic speech)[10,12-16].

In this context, the objective of the present study was to characterize the fluency profile of individuals with Parkinson's disease in different speech tasks. To this end, the following variables were assessed: typology of dysfluencies, and speech rate and frequency of disruptions in the tasks of monologue, individual reading, and automatic speech.

The results of this study may contribute increased understanding of the possible fluency disorders that can be manifested in individuals with Parkinson's disease, allowing better selection and improvement of the therapeutic techniques used in these cases.

METHODS

This is a cross-sectional, observational, clinical study. The selection and evaluation processes followed pertinent ethical procedures: approval by the Research Ethics Committee of the "Faculdade de Medicina da Universidade de São Paulo" (no. 940.566) and signing of an Informed Consent Form by all participants prior to study commencement.

Study participants

All the participants selected for this research were or are under monitoring for speech-language assessment and therapy at the Speech-Language Pathology and Audiology Department of the "Instituto Central do Hospital das Clínicas" of the "Faculdade de Medicina da Universidade de São Paulo" via medical referral from the various clinics of this complex.

Forty individuals divided into two groups (Chart 1) participated in the study:

Research Group (RG - Parkinson's disease):

The Research Group (RG) comprised 20 individuals of both genders (17 males and three females) aged 41 to 89 years (mean age of 64.3 years), with 12 to 20 years of schooling (mean schooling time of 14.7 years), rated according to the Hoehn and Yahr scale[23] (data collected from medical records) between stages 1.0 (unilateral involvement only) and 4.0 (severe disability; still able to walk or stand unassisted), who were making daily use of levodopa (medication used for Parkinson's Disease), who had not been submitted to any surgical intervention for PD (ablative or electrostimulation procedures), and who did not present any other concomitant neurological and/or degenerative disease.

Control Group (CG):

The Control Group (CG) was composed of 20 fluent, healthy individuals, with no complaints of communication disorders (language, speech, hearing and oral motor skills), and with

Chart 1. Characterization of study participants

Group	Age	Gender	Schooling	Severity [23]
RG				stage 1.5-5 (25%)
	41-89 years	17 males (85%)	12-20 years	stage 2.5-6 (30%)
	(mean 64.7)	3 females (15%)	(mean 14.7)	stage 3.0-5 (25%)
				stage 4.0-4 (20%)
CG	41-89 years	17 males (85%)	12-20 years	Without rating - normal individuals
	(mean 64.7)	3 females (15%)	(mean 14.7)	

Caption: Rating according to the modified Hoehn and Yahr scale[23]: 1.5 (unilateral and axial involvement); 2.5 (mild bilateral disease with recovery on pull test); 3 (mild to moderate bilateral disease; some postural instability; physically independent); 4 (severe disability; still able to walk or stand unassisted)

no neurological and/or degenerative diseases, matched to the Research Group for age, gender, and schooling. Participants in this group were healthy individuals, caregivers of patients treated at the Speech-Language Pathology and Audiology Department of the "Instituto Central do Hospital das Clínicas" of the "Faculdade de Medicina da Universidade de São Paulo", who met all the inclusion criteria for this group.

Material

An Ipad mini-128Gb computer and an external Hard Drive were used for the recording, analysis, and storage of the speech samples.

Speech samples were collected and analyzed according to the methodology proposed by the Speech Fluency Assessment Protocol[24] (to evaluate the typologies of dysfluencies, speech rate, and frequency of disruptions).

Procedure

Three speech samples were from collected from all participants involving different tasks: self-expressive speech (monologue), individual reading, and non-expressive speech (automatic speech). During all sample collections, the participants remained sitting in front of the Ipad computer for the video recording.

1. Collection of speech samples

1.1. Self-expressive speech task (monologue) - for this task, spontaneous speech was obtained from stimulus figures. Participants were requested to speak freely about the theme presented on the figure and to expand on considerations of their interest. The time frame for the video recording was five to 10 minutes - sufficient to collect the 200 fluent syllables needed for analysis according to the proposed methodology[24].

1.2. Individual reading task - for this task, participants were asked to read a text containing 200 syllables aloud.

1.3. Non-expressive speech task (automatic speech) - for this task, participants were requested to count to 10, say the days of the week and the months of the year, and repeat the phrase "*Barco na água*" (Boat on the water) for 1 minute.

2. Analysis of speech samples

After the collection of three speech samples from each participant, these were literally transcribed until 200 expressed syllables (free of disruptions) were gathered, which were analyzed as follows:

2.1. Typology of dysfluencies - the disruptions in the speech samples of participants were classified, analyzed, and divided into typical dysfluencies (hesitation, interjection, revision, unfinished word, word repetition, segment repetition, and phrase repetition) and stuttering dysfluencies (sound repetition, syllable repetition, prolongation, block, pause, and segment insertion).

2.2. Speech rate - analysis of this component considered the total speech time of each participant (excluding the therapist's interruptions), total number of syllables, and total number of words, in the sample. The following rates were considered: words per minute (it measures the information production rate - the total time of the participant's speech sample was timed, the total number of words in the sample was calculated in 200 syllables, and the rule of compatibility per minute was applied) and syllables per minute (it measures the articulatory rate - the total time of the participant's speech sample was timed, the total number of 200 syllables in the sample was calculated, and the rule of compatibility per minute was applied).

2.3. Frequency of disruptions - the disruption percentages in speech were divided into percentage of speech discontinuity (it measures the rate of the total number of disruptions in speech - the total number of typical and stuttering-like dysfluencies in the sample were added, the number obtained was divided by 200 and multiplied by 100 to obtain the percentage) and percentage of stuttering-like dysfluencies (it measures the rate of exclusively stuttering disruptions in speech - the total number of stuttering-like dysfluencies in the sample was considered, which was divided by 200 and multiplied by 100 to obtain the percentage).

For analysis of the fluency profile, the research (RG) and control (CG) groups were compared regarding each of the six fluency parameters assessed in the three different speech tasks.

Because of the large number of variables in the study, only two fluency parameters were considered to analyze the difference in performance between speech tasks: the number of stuttering dysfluencies and the speech rate in syllables per minute.

RESULTS

The data collected were statistically analyzed using the SPSS (version 24) software. Considering that data distribution was not normal for all variables, nonparametric tests were applied. In addition to descriptive analysis, non-parametric inferential analysis was performed using the Friedman and the Wilcoxon paired tests to compare the tasks in each studied variable (intra-rater reliability analysis) and the Mann-Whitney test for comparison between the groups. A significance level of 5% (p<0.05) was adopted and the significant results were marked with an asterisk (*).

Table 1 shows the inter-rater comparison for the speech fluency parameters in the three different speech tasks.

Regarding typical dysfluencies, the RG presented a significantly larger number of this type of disruption compared with the CG in the monologue and individual reading tasks. No statistically significant difference was observed for the automatic speech task. Similar results were found with respect to stuttering-like dysfluencies: the RG presented a larger number of this type of disruption compared with the CG in the monologue and individual reading tasks. As for the automatic speech task, the groups did not differ significantly.

Table 1. Comparison of fluency parameters between groups in different speech tasks

	Group	Mean	Standard deviation	Median	Interquartile Range (IQR)		Z	P
					1st quartile	3rd quartile		
Monologue								
Typical dysfluencies	Research	8.65	5.4	7.0	5.5	12.0	1.454	0.04*
	Control	6.7	4.1	5.0	4.0	9.0		
Stuttering dysfluencies	Research	3.8	4.2	2.0	1.0	5.5	5.345	<0.001*
	Control	0.0	0.0	0.0	0.0	0.0		
Words per minute	Research	98.9	23.3	101.6	85.0	117.4	3.030	0.002*
	Control	131.7	40.4	121.1	108.7	140.8		
Syllables per minute	Research	175.1	57.7	181.8	153.9	212.5	3.235	0.001*
	Control	237.9	51.4	237.6	200.0	250.0		
% of speech discontinuity	Research	6.2	4.1	5.2	3.5	8.0	2.646	0.008*
	Control	3.4	2.0	2.5	2.0	4.5		
% of stuttering dysfluencies	Research	1.9	2.1	1.0	0.5	3.0	5.344	<0.001*
	Control	0.0	0.0	0.0	0.0	0.0		
Individual Reading								
Typical dysfluencies	Research	3.6	3.6	3.0	1.0	5.0	3.673	<0.001*
	Control	0.7	0.9	0.0	0.0	1.0		
Stuttering dysfluencies	Research	1.8	2.0	1.0	0.0	2.5	3.319	<0.001*
	Control	0.3	1.0	0.0	0.0	0.0		
Words per minute	Research	94.4	32.6	101.1	72.2	116.3	3.627	<0.001*
	Control	133.6	36.8	137.8	124.4	159.3		
Syllables per minute	Research	148.9	51.2	159.2	115.4	183.2	5.414	<0.001*
	Control	324.1	50.2	322.6	300.0	358.9		
% of speech discontinuity	Research	2.7	2.5	1.5	1.0	3.5	4.248	<0.001*
	Control	0.5	0.8	0.2	0.0	0.75		
% of stuttering dysfluencies	Research	0.9	1.0	0.5	0.0	1.5	3.567	<0.001*
	Control	0.1	0.5	0.0	0.0	0.0		
Automatic Speech								
Typical dysfluencies	Research	0.1	0.3	0.0	0.0	0.0	1.433	0.15
	Control	0.0	0.0	0.0	0.0	0.0		
Stuttering dysfluencies	Research	0.2	0.5	0.0	0.0	0.0	1.777	0.07
	Control	0.0	0.0	0.0	0.0	0.0		
Words per minute	Research	126.5	33.0	121.1	108.4	140.3	3.613	<0.001*
	Control	171.3	28.8	171.9	153.2	186.5		
Syllables per minute	Research	220.6	75.1	226.7	183.9	252.8	3.788	<0.001*
	Control	303.4	32.6	308.2	288.3	329.9		
% of speech discontinuity	Research	0.1	0.4	0.0	0.0	0.0	2.080	0.07
	Control	0.0	0.0	0.0	0.0	0.0		
% of stuttering dysfluencies	Research	0.1	0.3	0.0	0.0	0.0	1.777	0.07
	Control	0.0	0.0	0.0	0.0	0.0		

*Significant difference (p<0.05) – Mann-Whitney test

As for speech rate, both in words and in syllables per minute, the RG presented significantly decreased speech rate compared with the CG in all the tasks analyzed.

With regards to the percentage of speech discontinuity, the RG presented higher percentage of speech disruptions compared with the CG in the monologue and individual reading tasks, and no statistically significant difference was observed between the groups in the automatic speech task. As for the percentage of stuttering-like dysfluencies, the RG presented higher percentage in relation to the CG in the monologue and individual reading tasks. The groups did not differ with respect to the automatic speech task.

Table 2 shows the comparison between the number of stuttering dysfluencies and speech rate in syllables per minute for the RG in the three speech tasks assessed. As for stuttering dysfluencies, comparison applying the Wilcoxon paired test shows that there was no statistically significant difference between the number of stuttering dysfluencies for the monologue and individual reading tasks (p=0.07). A larger number of stuttering dysfluencies was observed in monologue compared with automatic speech (p<0.001), as well as in individual reading compared with automatic speech (p<0.001). Regarding speech rate in syllables per minute, the two-to-two comparison conducted using the Wilcoxon paired test showed no statistically significant difference in speech rate in syllables per minute for the monologue and individual reading tasks (p=0.08). Speech rate was slower in the monologue task compared with that in the automatic speech task (p=0.04), as well as in individual reading in relation to that in automatic speech (p=0.003).

Table 3 presents a comparison between the number of stuttering-like dysfluencies and speech rate in syllables per minute for the CG in the three speech tasks evaluated. With respect to stuttering dysfluencies, the CG presented stuttering dysfluencies only in the individual reading task, but with no statistically significant difference. Regarding speech rate in syllables per minute, the results presented no significant difference between the three speech tasks tested for this group.

DISCUSSION

The present study aimed to characterize the speech fluency profile of individuals with Parkinson's disease (PD) in different speech tasks. In order to understand the data more comprehensively, individuals with PD were compared with those of a control group composed of healthy individuals with no changes in speech fluency.

The results obtained show that individuals with PD presented a significantly larger number of disruptions, both typical and stuttering-like, and higher percentages of speech discontinuity and stuttering dysfluencies in the tasks of monologue and individual reading compared with those in the control group. In the automatic speech tasks, both groups presented reduced numbers of typical and stuttering disruptions, and no statistically significant difference was found between the groups for this task. In relation to speech rate, both in words and in syllables per minute, individuals with PD presented decreased rate compared with those of the control group in all speech tasks.

The presence of dysfluencies in the speech of individuals with PD has been discussed in several studies in the specific scientific literature[1-9,16,18-20,23]. The results of the present study corroborate the findings of a study[4] which reported that individuals with PD presented a larger number of stuttering-like dysfluencies and lower speech rate when compared with those of a control group. The difference found in the present study

Table 2. Results of the descriptive and inferential analyses of the number of stuttering dysfluencies and syllables per minute in the different speech tasks for the research group (RG)

Parameter	Speech Task	Mean	Standard Deviation	Median	Interquartile Range (IQR)		X^2	gl	p
					1st quartile	3rd quartile			
Stuttering dysfluencies	Spontaneous speech	3.8	4.2	2.0	1.0	5.5	21.96	2	<0.001*
	Individual reading	1.8	2.0	1.0	0.0	2.5			
	Automatic speech	0.2	0.5	0.0	0.0	0.0			
Syllables per minute	Spontaneous speech	175.1	57.7	181.8	153.9	212.5	16.74	2	0.003*
	Individual reading	148.9	51.2	159.2	115.4	183.2			
	Automatic speech	220.6	75.1	226.7	183.9	252.8			

*Significant difference (p<0.05) – Friedman test

Table 3. Results of the descriptive and inferential analyses of the number of stuttering dysfluencies and syllables per minute in the different speech tasks for the control group (CG)

Parameter	Speech Task	Mean	Standard Deviation	Median	Interquartile Range (IQR)		X^2	gl	p
					1st quartile	3rd quartile			
Stuttering dysfluencies	Spontaneous speech	0.0	0.0	0.0	0.0	0.0	0.88	1	0.12
	Individual reading	0.3	1.0	0.0	0.0	0.0			
	Automatic speech	0.0	0.0	0.0	0.0	0.0			
Syllables per minute	Spontaneous speech	237.9	51.4	237.6	200.0	250.0	23.83	1	0.16
	Individual reading	324.1	50.2	322.6	300.0	358.9			
	Automatic speech	303.4	32.6	308.2	288.3	329.9			

Friedman test

was with regards to typical dysfluencies, which were also more frequent in individuals with PD.

Occurrence of typical dysfluencies is directly related to the linguistic planning of the message[25]. These disruptions may reflect linguistic uncertainties and/or inaccuracies, may serve as an additional resource for timing the processing involved in speech[25], or may also indicate difficulties in lexical access[6]. This type of disruption is present in the speech of all speakers; however, it can indicate problems in conceptualization and linguistic planning in a marked number of speakers[1] - symptoms observed in some degenerative neurological diseases.

As Parkinson's disease evolves, in addition to involvement of the neurons of the substantia nigra, cortical areas are affected, reaching the associative cortices and prefrontal areas, leading to cognitive loss, memory deficit, and decreased performance of executive functions[26].

With respect to stuttering dysfluencies, the findings of this study indicated that individuals with PD presented a larger number of this type of disruption compared with those in the control group, corroborating abundant research found in the literature[1-9,16,18-20,23]. Despite the consensus reported in the literature on the existence of stuttering-like dysfluencies in PD, the reasons for their occurrence are still controversial and not sufficiently clarified. It is worth mentioning that, although presenting a larger number of stuttering disruptions when compared with individuals of the control group, on average, the individuals with PD that participated in this study did not reach 3% of stuttered syllables - a parameter used internationally for the diagnosis of stuttering[27]. Therefore, individuals in the RG presented altered speech fluency pattern compared with those in the CG, but these changes in fluency cannot be considered a stuttering disorder.

Some studies have suggested that speech dysfluencies are exacerbated by levodopa - a medicine used to control the motor symptoms of PD[2,3,18,19]. Another study emphasizes that the increase in speech dysfluency in PD is more closely associated with disease progression than with levodopa levels[20]. Some other studies suggest a correlation between the increased dysfluency and brain regions (alteration of basal ganglia) present in PD. According to these studies, stuttering is caused by a mismatch in the basal ganglia-thalamocortical circuits. A mismatch in this circuit prevents the basal ganglia from producing cues for the initiation of the next motor segment in speech, hindering phonemic transition (coarticulation)[2,6,10].

As demonstrated in neuroimaging studies conducted with individuals who stutter, stuttering seems to be associated with overactivation in the midbrain, more precisely in the substantia nigra region, extending to the pedunculopontine, red and subthalamic nuclei[21,22]. This overactivation seems to be consistent with other findings on a relationship between speech production and changes in the functioning of basal ganglia or excessive dopamine production in individuals who stutter[6].

Regarding speech rate, both in words and in syllables per minute, individuals with PD presented reduced rate compared with those in the CG in all speech tasks. This result corroborates the findings of other research in the literature[4-7], indicating that symptoms resulting from hypokinetic dysarthria, present in more than 90% of PD cases, eventually lead to this decrease in speech rate.

It is also important to emphasize the presence of great instability in the speech rate pattern of individuals with PD compared with those in the CG. Speech rate reduction was observed in the RG, but in some moments, these individuals presented small acceleration in speech rate, known in the literature as "speech bursts"[4].

Structures of the basal ganglia are related to initiation and coordination actions and movements, which are compromised in cases of hypokinetic dysarthria, resulting in the acceleration or reduction of speech rate, among other symptoms. Another objective of the present study was to analyze the fluency profile in different speech tasks. This may be an important point to differentiate the characteristics of disruptions between PD, persistent developmental stuttering (PDS), and neurogenic stuttering.

The specific literature suggests that, in PDS, speech performance varies according to the task performed, that is, speech disruptions are more frequent in spontaneous speech tasks (monologue or conversation) compared with tasks of individual reading and automatic speech[10,11,14,27]. In this study, individuals with PD presented a larger number of disruptions, both typical and stuttering-like, in the monologue and individual reading tasks compared with automatic speech, but these tasks (monologue and individual reading) showed no difference from each other.

Some conditions such as singing, choral speaking, repetition of words and phrases, previously memorized speech (numerical sequences, days of the week, months of the year) are referred in the literature as automatic speech tasks or speech fluency inducers[10].

The Internal Model for Sensorimotor Control[28] suggests that, for the precise control of all the information involved during speech production (motor, auditory, and somatosensory), the central nervous system maintains internal representations of the motor sequences used. These representations, or internal models, are the basis for motor speech control. According to this model, repetition of the same speech sequence would update and refine the existing internal model, facilitating fluency.

It is important to emphasize one piece of information learned during data analysis in this study. Of the 20 participants in the RG, six (30%) presented percentage of stuttering dysfluencies greater than 3% - a parameter used internationally for the diagnosis of stuttering[27]. In a future study, we intend to investigate these participants more comprehensively, establishing possible relationships with disease severity, time of diagnosis, and dosage of the medication used.

In addition, aiming to establish another point of differentiation between PD, PDS, and neurogenic stuttering, the six characteristics suggestive of neurogenic stuttering will be investigated[15] (type of disrupted word, locus of speech disruption within the word, performance in different speech tasks, physical concomitants, effect of adaptation, and anxiety).

This information on the speech fluency profile of individuals with PD is fundamental for better selection and improvement of the therapeutic techniques applied to this population.

CONCLUSION

Individuals with Parkinson's disease (PD) presented a significantly larger number of disruptions, both typical and stuttering-like, and higher percentages of speech discontinuity and stuttering dysfluencies in the tasks of monologue and individual reading compared with those in the control group (CG). Regarding speech rate, both in words and in syllables per minute, individuals with PD presented reduced rate compared with those in the CG in all speech tasks. These results indicated that individuals with PD presented altered speech fluency in all parameters assessed, but these changes in fluency cannot be considered a stuttering disorder.

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Author contributions

FSJ was responsible for the study design, collection, classification and interpretation of the data, writing and final revision of the manuscript; CRFA was responsible for the study design, interpretation of the data, and final revision of the manuscript.