

ORAL READING AND SPONTANEOUS SPEECH FLUENCY OF STUDENTS: COMPARATIVE STUDY BETWEEN STUTTERERS AND NON-STUTTERERS

Fluência da leitura e da fala espontânea de escolares: estudo comparativo entre gagos e não gagos

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ABSTRACT

Purpose: to compare fluency in oral reading and spontaneous speech among children who stutter and who do not stutter regarding to frequency and typology of disfluencies, and speech rate. **Methods:** 40 participants between 8 and 11 years old of both genders, divided in two groups: experimental, composed by 20 children who stutter (CWS), and control with 20 children who do not stutter (CWNS). The data were gathered through the assessment of speech fluency in oral reading and spontaneous speech, by a Fluency Test. **Results:** in oral reading the groups showed statistical difference for frequency of stuttering-like disfluencies (SLDs) ($p=0,038$) and total of disfluencies ($p=0,023$), which CWS showed higher frequency. In spontaneous speech for all variables analyzed, the differences were statistically significant. Regarding the disfluencies for the reading and speech, CWS showed higher frequency. The flow of syllables and words per minute were higher for CWNS in speech, and for the CWS in the reading. **Conclusion:** the oral reading of CWS and CWNS was similar regarding to the percentage of other disfluencies, flow of syllables and words per minute and, the typologies of other disfluencies and stuttering-like disfluencies. However, CWS showed higher occurrence of stuttering-like disfluencies and total of disfluencies. In the spontaneous speech the groups showed differences regarding the total of disfluencies, other disfluencies and stuttering-like disfluencies and flow of syllables and words per minute. Repetition of word, part of word and sound, prolongation, block and intrusion were the typologies that occur more frequent in the CWS.

KEYWORDS: Stuttering; Reading; Speech; Speech, Language and Hearing Sciences; Evaluation; Child

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■ INTRODUCTION

Fluency is a feature related to the production of continuous and smooth flow of speech, in which occurs a chain of syllables in a timely manner, without disruption. An adequate efficiency, integration and synchronization of the cognitive, linguistic, and motor processes are required, in order to produce a fluent emission¹.

The main parameters comprising fluency are: speech rate, disfluencies and the effort employed in speech production. It is also known that there is a relationship between disfluencies and the flow of syllables and words per minute, that is, the higher the occurrence of speech disfluencies, the lower the

flow of syllables and words per minute². This relation is justified considering that disfluencies take time of the speaker or the reader, and do not transmit information. In this sense, fluency is a complex and multifactorial process.

Stuttering is the main fluency disorder, a developmental speech disorder in which motor symptoms are primary. The flow of fluent speech is interrupted when the nervous system fails to generate appropriate command signals to the muscles whose activity must be dynamically controlled for fluent speech to be produced³. So, stuttering is a chronic disorder with involuntary disruptions in fluent speech, which are characterized as central factor^{4,5}. Besides the involuntary syllables repetitions, prolongations and blocks, stuttering is also characterized by physiological, behavioral and emotional reactions to speech disruptions⁶.

In speech, fluency develops according to language acquisition, as well as in reading, fluency increases as the perception of letter sequences becomes more automatic, decreasing attention in visual decoding and increasing attention in the semantic component⁷. Students initially decipher the text in a slow manner, non-automatic pace, ignoring the punctuation marks and expressing themselves with little prosody variation⁸. Later, with the development of reading skills, most children overcome these difficulties and their reading becomes more fluent⁹. Like speech, reading is based on linguistic information processing, and to become fluent, the interaction reading- speech must be appropriate¹⁰.

Reading is a highly complex task as it involves countless mental processes and neuropsychological functions¹¹. Specifically, the interaction of the following processes occurs during reading: Identification of letters, word recognition, access to meaning, and semantic and syntactic integration¹². The efficient and fluent reading is achieved through proper development of the phonological representations of words, in addition to the ability of processing them quickly and automatically, with minimal cognitive resources in decodification¹³. Oral reading fluency is regarded as a fundamental factor for an accurate and proficient reading⁹.

Researches on reading fluency indicate that people who stutter and who not stutter showed a reduction in the number of disruptions in the speech while reading, in relation to spontaneous speech¹³. This result can be explained by the fact that a decrease in demand of motor planning of speech occurs, because the messages, as well as prosodic markings are visible in the written text¹⁴.

Considering that: (1) oral reading is an activity that requires the use of the same praxis-motor speech mechanisms, and it may be impaired in

people who stutter; (2) reading is related to text comprehension, and; (3) fluent reading assists the student's participation in school activities, it becomes important to investigate and compare the reading process in people who stutter and who not stutter, since there are few studies which focus on this relationship.

Parents of students who stutter reported that their children often presented behavioral alterations in school¹⁵. In this sense, this research will provide to the speech pathologist better understanding of the possible consequences of stuttering in reading, which will help reducing the impairments for stuttering students.

Therefore, this study aimed to compare reading fluency and the spontaneous speech of students who stutter and who not stutter, concerning the frequency of disruptions, type of disfluencies and speech rate.

METHODS

This study was approved by the Ethics Committee of the Faculty of Philosophy and Sciences, Universidade Estadual Paulista – CEP / FFC / UNESP under Protocol No. 0395/2011.

This research is an experimental and cross-sectional study, which compared 2 groups; it was realized with a total of 40 students, aged between 8 and 11 years and 11 months (mean = 9.58 years, SD = 1.13). The experimental group (EG) consisted of 20 children diagnosed with Persistent Developmental Stuttering, with 18 males and 2 females, with mean age of 9.55 years, SD = 1.14. The control group (CG) consisted of 20 children who not stutter, matched by gender and age, with mean age of 9.60 years, SD = 1.10. The experimental group consisted of students, assessed in the *Laboratório de Estudos da Fluência* [Fluency Study Laboratory] – LAEF of the *Centro de Estudos da Educação e da Saúde* [Education and Health Study Center] (CEES) of Universidade Estadual Paulista – FFC – Marília; the control group was comprised students from a public school in Marília, a Municipal Elementary School.

The requirements for inclusion of the students were: age ranging from 8-11 years and 11 months of age; native speaker of Brazilian Portuguese and being enrolled from the second to the sixth year of primary education in public schools. The students who stutter (EG) should present: (1) diagnosis of persistent developmental stuttering, by a professional expert in the field; (2) at least 3% of stuttering-like disfluencies; (3) onset of stuttering must have occurred during childhood (developmental); (4) minimum duration of 12 months of disfluency without remission (persistent); (5) stuttering classified in

the minimum as mild according to the Stuttering Severity Instrument – SSI-3¹⁶. For composing the control group of students who not stutter (CG), the following inclusion criteria was employed: (1) not reporting current or previous stuttering, by parents / family and the student (2) negative family history of stuttering; (3) present less than 3% of stuttering-like disfluencies, in the fluency assessment of spontaneous speech.

The following exclusion criteria for both groups were established: presentation of any complaint or hearing, visual, neurological, cognitive, behavioral and learning disorder, or school performance, and lack of retention in school content.

All students in this study underwent the reading fluency assessment and spontaneous speech, and audiovisual records were employed in these two situations. For reading activity, texts were selected from textbooks used in public municipal schools of the city. The texts selected comprised 200 syllables, increasing the degree of complexity and extent of the syllabic words in accordance with the scholastic grade. For data collection of the spontaneous speech sample, the student was asked to speak about his/her routines and the transcription and analysis was performed on a sample containing 200 fluent syllables. Data collection was performed in a session which lasted approximately 15 minutes.

After collecting the spontaneous speech from the participants, they were transcribed, considering the fluent and non-fluent syllables. Subsequently, the reading and spontaneous speech samples were analyzed, and the types of disfluencies were characterized, in accordance to the following description: *other disfluencies*: hesitations, interjections, revisions, unfinished words, words repetitions, phrase repetitions, and segment repetitions; *stuttering-like disfluencies*: part of word repetitions, sounds repetitions, prolongations, blocks, pauses and intrusions¹⁷. To characterize the frequency of disruptions, the following measures were used: percentage of total disfluencies, of other disfluencies and stuttering-like disfluencies. The speech rate was measured according to flow of syllables and words per minute.

For students from EG, the Stuttering Severity Instrument (SSI-3)¹⁶ was also applied, in order to

classify stuttering as: mild, moderate, severe or very severe. This test assessed the frequency and duration of stuttering-like disfluencies, as well as the presence of physical concomitants to disfluencies.

The statistical analysis was performed by using the *Statistical Package for Social Sciences* (SPSS), version 20.0. The statistical test of Mann-Whitney was applied to compare the quantitative results between groups. *The Wilcoxon Signed Posts Test* was used, in order to verify possible differences between reading and spontaneous speech, within each group, for the variables of interest. Values were considered significant for p , inferior than 0.05 ($p < 0.05$) with a confidence interval of 95%. Significant p values were highlighted with an asterisk (*) symbol.

■ RESULTS

The comparison between disfluencies and speech rate presented by the students who stutter and who not stutter while reading texts and spontaneous speech, was presented in Table 1. In reading context, groups differed in relation to total disfluencies and stuttering-like disfluencies, expressed with more frequently by EG. In spontaneous speech, all the variables were statistically different. As for disfluencies (total, other disfluencies and stuttering-like disfluencies), EG presented a higher amount than CG, both in reading and in spontaneous speech. Flows of syllables and words per minute were higher for CG in speech, while in reading, were higher for EG, without statistically significant differences (Table 1).

The intragroup comparison showed that there were differences in the amount of total disfluencies and other disfluencies presented in reading and spontaneous speech, for both groups (Table 1). The behavior of the groups was similar, regarding the total number of disfluencies and other disfluencies presented more frequently in spontaneous speech than in reading. However, the groups showed different behaviors regarding the amount of stuttering-like disfluencies, considering that only EG presented statistically significant difference. As for the speech rate in reading contexts and spontaneous speech in intragroup analysis, there was no difference, in both groups.

Table 1 – Comparison intragroup and between the groups regarding to the occurrence of total of disfluencies, other disfluencies and stuttering-like disfluencies, flow of syllables and words per minute, in the reading and spontaneous speech.

Variables		EG (N=20)				CG (N=20)				p-value
		Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum	
Total of disfluencies	Reading	3.63	1.65	1.00	8.00	2.25	1.54	0.41	5.70	0.023*
	Speech	11.70	4.92	5.50	25.00	4.18	2.14	0.50	9.00	< 0.001*
p-value		< 0.001*				0.002*				
Other disfluencies	Reading	2.33	1.37	0.50	5.50	1.80	1.13	0.20	4.13	0.229
	Speech	7.58	4.68	0.50	20.00	3.93	2.20	0.50	9.00	0.005*
p-value		< 0.001*				0.001*				
Stuttering-like disfluencies	Reading	1.30	1.12	0.00	3.50	0.45	0.48	0.00	1.55	0.038*
	Speech	4.18	1.39	3.00	8.00	0.30	0.52	0.00	1.50	< 0.001*
p-value		< 0.001*				0.232				
Syllables per minute	Reading	154.05	76.98	64.00	430.00	146.65	57.43	79.00	279.00	0.839
	Speech	125.60	31.38	80.00	190.00	160.10	31.44	100.00	226.00	0.002*
p-value		0.163				0.478				
Words per minute	Reading	79.51	39.47	33.00	220.00	79.17	30.84	41.00	143.00	0.860
	Speech	79.37	22.94	51.00	150.00	90.15	16.26	57.00	121.00	0.017*
p-value		0.906				0.287				

* Statistical significance ($p \leq 0.05$) – Mann-Whitney Test – Test for the comparison between the groups – and Wilcoxon Signed Posts Test for the comparison between reading and speech.

Note: EG= experimental group; CG= control group; N= number of individuals; SD = standard deviation.

In the intragroup comparison of the different other disfluencies, results indicated that the amount presented in reading, for: hesitation, interjection, revision, unfinished words, phrase repetition, segment repetition and word repetition, were similar (Table 2). Hesitation, interjection and word repetition were not presented by the CG. None of the students from EG presented unfinished words. The most frequent type of occurrence in EG was word repetition, whereas for CG was revision.

The analysis of the other disfluencies in spontaneous speech showed that the groups were different regarding the occurrence of word repetition, manifested in higher amount by EG (Table 2). Phrase repetition was the only other disfluency typology, not manifested by both groups. Hesitation was the most other disfluency, presented in both groups.

Table 2 – Comparison between the groups regarding to the typology of other disfluencies in the reading and spontaneous speech.

Sample of speech	Groups	Hesitation		Interjection		Revision		Unfinished word		Phrase repetition		Segment repetition		Word repetition	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Reading	EG (N=20)	0.10	0.45	0.05	0.22	1.30	1.13	0.00	0.00	0.05	0.22	0.75	1.02	2.40	1.73
	CG (N=20)	0.00	0.00	0.00	0.00	4.60	2.44	0.05	0.22	0.00	0.00	0.40	0.68	2.30	2.34
	p-value	0.317		0.317		0.169		0.317		0.317		0.033		0.028	
Spontaneous speech	EG (N=20)	5.65	4.90	2.25	3.02	0.85	1.09	0.45	0.83	0.00	0.00	1.15	2.80	4.65	3.60
	CG (N=20)	3.55	3.27	2.50	3.00	0.45	0.89	0.15	0.37	0.00	0.00	0.45	0.83	0.60	1.00
	p-value	0.157		0.450		0.141		0.220		>0.999		0.789		<0.001*	

* Statistical significance (p≤0.05) – Mann-Whitney Test

Note: EG= experimental group; CG= control group; N= number of individuals; M= mean; SD = standard deviation.

In the intragroup comparison of each stuttering-like disfluency typology in the reading, the groups presented similar results (Table 3). Block, pause and intrusion did not occur in reading of both groups; EG also did not express prolongation, and CG did not present sound repetition. The most common type for both groups, was the part of the word repetition.

As for stuttering-like disfluencies in spontaneous speech, EG and CG showed statistically significant differences for part of the word repetition, sound repetition, prolongation, block and intrusion. The groups were similar just in relation to the amount of pause (Table 3). CG did not show sound repetition, block and intrusion. The most frequent stuttering-like disfluency for EG was the part of the word repetition, while for CG was the pause.

Table 3 – Comparison between the groups regarding to the typology of stuttering-like disfluencies in the reading and spontaneous speech.

Sample of speech	Groups	Part of word repetition		Sound repetition		Prolongation		Block		Pause		Intrusion	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Reading	EG (N=20)	2.35	2.18	0.25	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	CG (N=20)	1.75	1.71	0.00	0.00	0.05	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	p-value	0.082		0.076		0.317		>0.999		>0.999		>0.999	
Spontaneous Speech	EG (N=20)	3.00	2.32	1.25	1.74	1.70	2.25	1.50	1.61	0.70	1.08	0.20	0.41
	CG (N=20)	0.10	0.45	0.00	0.00	0.05	0.22	0.00	0.00	0.40	0.82	0.00	0.00
	p-value	< 0.001*		< 0.001*		< 0.001*		< 0.001*		0.304		0.037*	

* Statistical significance (p≤0.05) – Mann-Whitney

Note: EG= experimental group; CG= control group; N= number of individuals; M=mean; SD = standard deviation.

■ DISCUSSION

In this research, students who stutter and who not stutter had similar performances in reading, concerning other disfluencies, flow of syllables and words per minute, which suggests no influence of disorder on the performance of reading texts, for these variables. However, data on the total number of disfluencies and stuttering-like disfluencies showed statistically significant differences. A previous investigation in adults who stutter and who not stutter, also showed differences in reading, among total disfluencies¹³. However, the results for the flow of syllables and words per minute were discordant in this study, since the authors found statistically significant differences for these variables¹³.

Stuttering, which is classified as a fluency disorder, differentiated the performance of spontaneous speech of students who stutter and who not stutter, in all measures of disfluencies and speech rate. These results corroborate the literature which states that stuttering disfluencies suggest disruptions in the subjacent motor programming for speech production¹⁸, which does not seem to occur in the speech of students without stuttering problems.

All the students (who stutter and who not stutter), showed a higher amount of total disfluencies and other disfluencies in spontaneous speech, when compared to reading. These results indicate that during speech, due to the concurrence of the linguistic and motor processing^{13,19}, stuttering and non-stuttering readers, require an additional production of the spoken message time, resulting into a higher amount of disfluencies. However, for students who stutter, there was difference between the amount of stuttering-like disfluencies expressed in reading and spontaneous speech, but this fact did not occur for students who not stutter.

With respect to the flow of syllables per minute, it was observed that the EG had higher speech rate in reading, and CG in speech; however, these differences were not significant. This finding corroborates what was described a study which analyzed people who stutter, and found that the flow of syllables per minute was lower in reading²⁰. Data suggest that for people who stutter, the increase in the amount of stuttering-like disfluencies reduces the flow of fluent syllables, resulting in a lower articulation rate. As for reading, due to the reduction in the number of disfluencies, the flow of fluent syllables per minute increases.

The results related to the flow of syllables and words per minute in spontaneous speech, were consistent with a previous study, since the authors have also found statistically significant differences between adults who stutter and who not stutter,

for these variables¹³. Other investigators have also found a lower speech rate for people who stutter, when compared with non-stutterers². Possible explanations for this fact, are: the necessity of additional time to process language and phonological information; neuromotor and subjacent rhythmic disorder, which are directly linked to articulation rates and are reflected in compensatory control movements^{2,21}, and; it is also acknowledged that disfluencies which occur in speech, reduce the flow of fluent syllables and words per minute².

Data analyses on other disfluencies, suggest that stuttering does not interfere significantly in the occurrence of disfluencies in reading. This finding was already expected, given that these disfluencies occur in the speech of all speakers, whether presenting stuttering or not. Similar results were also found in the population of adults who stutter¹³. In spontaneous speech, there was increased frequency of word repetition in stuttering children, when compared to fluent ones. These results partially support a study realized with adults, since, besides the difference observed in the words repetition, there was also difference regarding hesitation¹³.

As for word repetition, it is important to emphasize, that in this study it was classified as other disfluency, according to the fluency test employed¹⁷. However, the literature presents different classifications to word repetition. For some researchers, the classification will depend on qualitative factors such as the presence of muscle tension, age and amount of repetitions^{16,22}. For others, the word size will determine the classification as other disfluency or stuttering-like disfluency, since the repetition of monosyllabic words is classified as stuttering-like disfluency²³.

Comparison of groups regarding the amount of stuttering-like disfluencies in reading situations and spontaneous speech showed dissonant results. In reading, the two groups showed similar results for the various stuttering-like disfluencies types. This finding was different from a previous study, conducted with adults who stutter, as the results showed differences concerning part of word repetition, sound repetition and block¹³.

In spontaneous speech, the groups showed statistically significant differences for all stuttering-like disfluencies types, except for pause. Therefore, despite the stuttering-like disfluencies occur both in reading and in spontaneous speech, there was a decrease in the amount of these disfluencies in reading, according to previous data^{13,14,24}. A possible explanation for this finding, is that in reading, there is absence of spontaneous speech, since the message is formulated in a written text¹³, reducing

the possibility of disfluencies in this situation. Another suggestion proposed, consists in the fact that the message and its prosodic contents are formulated in a pre-established manner in a written text, facilitating motor planning and speech process^{13,24}.

Therefore, from these results, it becomes possible to state that the impact of stuttering occurs in reading, but in a lower proportion than in spontaneous speech. The results demonstrate the importance of assessing the spontaneous speech into the fluency disorders diagnosis, as well as the use of that speech sample during the therapeutic process. The assessment of reading should be incorporated into the diagnostic process, but the speech pathologists need to know that the amount of disfluencies in reading is lower when compared to spontaneous speech, and generally does not reach 3%, reported in the literature as diagnosis criterion²³.

■ CONCLUSION

Analysis of the results shows that the performance of students who stutter and who not stutter

in reading was similar, considering the percentage of other disfluencies and flow of syllables and words per minute. However, students who stutter showed higher amount of stuttering-like disfluencies and in total disfluencies in the reading, than students who not stutter. Concerning the analysis of each type of disfluency, the groups were similar, in relation to all other disfluencies and stuttering-like disfluencies, in reading.

Data on spontaneous speech showed differences between the groups regarding total disfluencies, other disfluencies and stuttering-like disfluencies, flow of syllables, and words per minute. The most frequent types presented in students who stutter, were: word repetition, parts of word repetition and sound repetition; prolongation; block, and intrusion.

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RESUMO

Objetivo: comparar a fluência da leitura e da fala espontânea entre escolares com e sem gagueira, quanto à frequência e tipologia das disfluências, e taxa de elocução. **Métodos:** participaram 40 escolares, de ambos os gêneros (8-11anos), divididos em dois grupos: experimental (GE – 20 escolares com gagueira), e controle (GC – 20 escolares sem gagueira). A coleta de dados foi realizada por meio da avaliação da fluência da leitura e da fala espontânea, utilizando um Teste de Fluência. **Resultados:** na leitura os grupos mostraram diferença estatisticamente significativa para a frequência de disfluências gegas ($p=0,038$) e do total de disfluências ($p=0,023$), sendo que o GE apresentou maior frequência. Na fala ocorreu diferença estatisticamente significativa para todas as variáveis analisadas. Em relação às disfluências da leitura e da fala, o GE mostrou maior frequência. O fluxo de sílabas e de palavras por minuto foi maior no GC na fala, e no GE durante a leitura. **Conclusão:** a leitura dos grupos foi semelhante quanto à porcentagem de disfluências comuns, ao fluxo de sílabas e de palavras por minuto e as tipologias comuns e gegas. Porém, o GE manifestou maior quantidade de disfluências gegas e do total das disfluências. Na fala espontânea os grupos se diferenciaram quanto ao total de disfluências, disfluências comuns e gegas, fluxos de sílabas e de palavras por minuto. Repetição de palavra, de parte da palavra e de som, prolongamento, bloqueio e intrusão foram mais frequentes no GE.

DESCRITORES: Gagueira; Leitura; Fala; Fonoaudiologia; Avaliação; Criança

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