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Original articles

Prolongations in the speech of adults who do and do not stutter

Prolongamentos na fala de adultos com e sem gagueira

Pâmila Bento da Silva[1]
Eliana Maria Gradin Fabron[1]
Luana Altran Picoloto[1]
Cristiane Moço Canhetti de Oliveira[1]

[1] Faculdade de Filosofia e Ciências da Universidade Estadual Paulista, UNESP, Marília, SP, Brasil.

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Mailing address:
Cristiane Moço Canhetti de Oliveira
Avenida Hygino Muzzi Filho, n. 737
Mirante – Marília, SP
CEP: 17525-000
E-mail: cmcoliveira@marilia.unesp.br

ABSTRACT

Purpose: to carry out a quantitative and qualitative analysis of the prolongations of adults who stutter and who not stutter.

Methods: participants were divided into two groups: Research Group (RG, 15 adults who stutter) and Control Group (GC, 15 fluent adults). Procedures were: fluency assessment, Stuttering Severity Instrument and quantitative and qualitative analyzes of the prolongations.

Results: there was a greater number of non hesitative prolongations in RG, whereas CG showed more hesitative prolongations in relation to the total of disfluencies. Non hesitative prolongations occurred more frequently in the initial and monosyllabic words, and in the medial position of the sentence in RG. Regarding the muscular tension and duration, a difference was observed for the muscular tension in the non hesitative prolongations, with higher mean value for RG.

Conclusion: non hesitative prolongations occurred more frequently in RG, in initial words, monosyllables, and medial position of the sentence. Qualitatively, the muscular tension was a typical characteristic of non hesitative prolongations in RG. No differences were found for hesitative prolongations between the groups in relation to the frequency of the total of speech, the position of prolongations in the words and in the sentences, and for the qualitative characteristics, regarding to muscular tension and duration.

Keywords: Speech Language and Hearing Sciences; Speech; Stuttering; Speech Disorders; Evaluation; Adult

RESUMO

Objetivo: realizar uma análise quantitativa e qualitativa dos prolongamentos de adultos com e sem gagueira.

Métodos: os participantes foram divididos em: Grupo de Pesquisa (GP, 15 adultos com gagueira) e Grupo Controle (GC, 15 fluentes). Os procedimentos utilizados foram: avaliação da fluência, Instrumento de Gravidade da Gagueira e análises quantitativa e qualitativa dos prolongamentos.

Resultados: GP mostrou maior número de prolongamentos não hesitativos, enquanto que GC mostrou maior ocorrência de prolongamentos hesitativos em relação ao total das disfluências. Prolongamentos não hesitativos ocorreram com maior frequência na palavra inicial e monossilábica, bem como na posição medial da frase para GP. Em relação à tensão muscular e duração, observou-se diferença apenas para a tensão muscular nos prolongamentos não hesitativos com maior média de ocorrência para GP.

Conclusão: os prolongamentos não hesitativos ocorreram com maior frequência no GP, nas palavras iniciais, monossílabos e na posição medial da frase. Qualitativamente a tensão muscular foi uma característica típica dos prolongamentos não hesitativos no GP. Com relação aos prolongamentos hesitativos houve semelhança entre os adultos dos dois grupos quanto à frequência em relação ao total da fala, a posição dos prolongamentos nas palavras e nas frases e nos aspectos qualitativos, relacionados a tensão muscular e duração.

Descritores: Fonoaudiologia; Fala; Gagueira; Distúrbios da Fala; Avaliação; Adulto

INTRODUCTION

Persistent Developmental Stuttering is a fluency disorder that affects about 1% of the adult population[1] characterized by disruptions in the speech flow that can be manifested through prolongations, blocks and repetitions[2-5]. These disfluencies are involuntary, occur at a higher frequency in relation to general population[6] and are considered the main characteristic of the disorder[7].

The neurobiological basis of stuttering is widely discussed. In this sense, some researchers believe that stuttering is defined as speech characterized by verbal dysfluencies, but should not be seen as an isolated speech disorder, but as a generalized sensorimotor timing deficit due to impaired communication between speech related brain areas[8]. One of the neurological characteristics of developmental stuttering is the abnormal motor preparation of speech[9].

For proper diagnosis of stuttering, the characterization of disfluencies in speech is fundamental[10], given that the main manifestation of this disorder is the excessive presence of stuttering-like disfluencies[11-14]. In addition, knowledge of the stuttering-like disfluency types contributes to define cases of recovered or persistent stuttering in preschool children[15]. The scientific literature shows tests or assessments with defined criteria for the classification of the types of ruptures and percentage measures of atypical or stuttering-like disfluencies[16-18].

A traditional assessment in this area entitled *Systematic Disfluency Analysis*[16] defined the prolongation as an atypical disfluency ("inappropriate duration of a phoneme or an element of a diphthong which may or may not be accompanied by qualitative characteristics such as pitch change, increased audible tension or visible tension"). The prolongation was also classified as atypical or stuttering-like disfluency by several authorities in the subject[17-19].

However, studies have shown that prolongations are also used by people who do not stutter[20-22], and consequently hamper the diagnosis process of the disorder. The prolongation of the final part of the word may be a strategy used to achieve fluency by speakers, both of people who stutter and fluent people[21].

The prolongations of speech, also named stretching in the linguistic approach, are one of the characteristics of hesitative marks[23,24]. They usually occur at the end of the words, especially in monosyllables or unstressed final syllables, according to authors mentioned above. From a linguistic perspective, the prolongation may be seen as a resource used by the speaker to maintain possession of the conversational turn[25].

In this context, the studies conducted with people who do not stutter, speakers of English[20] and Brazilian Portuguese [21], who found prolongations with specific characteristics, are also noteworthy. Aiming to assess the effect of sample size and the topic fluency in adults who do not stutter, Roberts et. at. [20] found prolongations in the speech of 11 out of the 25 male participants, and the prolongations that occurred in interjections were not considered as prolongations, but only as interjection. Many of these prolongations occurred at the end of words or beginning of sentences, in places in which interjections might normally occur. The qualitative characteristics of these prolongations were described: they were not accompanied by tension and were brief. Therefore, the necessary care in the classification of all prolongations in the adults' speech as part of stuttering was highlighted. The authors reported that these prolongations seem to have been used for emphasis.

Only people who stutter showed prolongations within the words[21], breaking the lexical unit, main characteristic of disfluencies considered stuttereing-like disfluencies[26]. For fluent speakers, prolongation occurred only in the last phoneme of the final syllable of words, similarly to common disfluencies, taking role of a hesitation and, used as a strategy to facilitate coarticulation between words[21]. A possible explanation for this finding, described by the authors, was that when the speaker is articulating a unit, it means that the motor program of the subsequent unit is already available to the one being articulated[21].

In this sense, the literature shows that the occurrence of prolongations and their position within the words deserve to be analyzed more thoroughly for being a distinctive factor between groups of people who stutter and who do not[21]. The influence of grammatical classes of words (content words and functional words) in relation to the occurrence of speech disruptions should also be investigated[27].

Qualitative and quantitative analyzes of prolongations are, therefore, recommended in an attempt to distinguish the prolongations used as normal linguistic strategies in communication process from the prolongations used by stutterers. Qualitative aspects can be described as excessive muscle tension (auditory or visual), description and position of prolonged sound/syllable, as well as the position and grammatical class of the word with prolonged sound/syllable.

Hence, the aim of this research was to conduct a quantitative and qualitative analysis of speech prolongations in adults with Persistent Developmental Stuttering and adults without stuttering.

METHODS

This research is a cross-sectional, prospective study comparing groups, descriptive of quantitative and qualitative character. The sample consisted of 30 adults between 18-46 years (mean = 26.93 years, SD = 9.12). Research group (RG) was formed by 15 adults with persistent developmental stuttering (11 male and 4 female). Control group (CG) consisted of 15 fluent adults, matched by gender and age to RG.

Adults from the research group came from *Laboratório de Estudos da Fluência* [Fluency Study Laboratory] – LAEF that belongs to the *Centro de Estudos da Educação e da Saúde* [Education and Health Study Center] (CEES) of Universidade Estadual Paulista in Marilia, SP; the adults from the control group came from Universidade Estadual Paulista - Marilia.

This study was approved by the Ethics Committee of Universidade Estadual Paulista under protocol number 0672/2013. All participants signed a consent form before the study. They were followed all the recommendations of Resolution CNS 466/2012.

The inclusion criteria for the two groups were: participant had to be native speaker of Brazilian Portuguese and aged between 18 - 59 years and 11 months. Adults who stutter (RG) should present: stuttering complaint; speech pathology diagnosis of persistent developmental stuttering by a specialist professional; participant had to present a minimum of 3% of stuttering-like disfluencies; minimum duration of 12 months of disfluencies, and; had to present at least mild stuttering classification according to the Stuttering Severity Instrument - SSI-3[17]. For the control group of fluent adults (CG), the inclusion criteria were: participant did not complain of current or previous stuttering; negative family history of stuttering; had to present less than 3% of stuttering-like disfluencies at specific assessment.

Exclusion criteria for both groups were: present other complaints such as hearing, neurological, behavioral changes, learning, or other relevant changes that could cause misdiagnosis.

Regarding the characterization of RG adults, it was verified that the average age at onset of stuttering was at 4.13 years. All participants (100%) had family history of persistent developmental stuttering, with a variation in the percentage of stuttering-like disfluencies from 3.5 to 11.5% (mean = 7.00, SD = 2.37) (Table 1). The stuttering severity ranged from mild to severe, with an average SSI-3total score of 26.06 (from 18 to 35). Adults in CG were matched for gender and age to RG, and the percentage of stuttering-like disfluencies ranged from 0 to 1% (mean = 0.33, SD = 0.36).

Procedures

Initially, adults were informed about the objectives of the study and were explained about the performed procedures. They were given a written consent to participate in the study. Data collection was performed through audiovisual recording, transcription and analysis of the fluency of spontaneous speech in both groups (RG and CG).

The adults were filmed in order to obtain the self expressive speech sample containing 200 fluent syllables, elicited from the following instruction statement: "Tell me about your routine, everything you do during the week and on the weekend." The adults' speech was only interrupted (with questions and comments), when there was a need to encourage the production, to achieve the required number of syllables for analysis. The adults were filmed for analysis and comparison of findings; a Sony digital camcorder (HDR-CX350 Digital - 7.1 Mega Pixels) and a tripod (Atek - omega) were used for the filmings.

After collecting the adults' speech, the films were transcribed in full, considering the fluent and non fluent syllables. Subsequently, the analysis of the speech sample was performed, and the type of disfluency was characterized, according to the following description[18]:

- Common disfluencies: hesitations, interjections, revisions, unfinished words, word repetitions, segment repetitions, and phrase repetitions.
- Stuttering-like disfluencies: two or more repetitions of sounds and/or syllables and/or words, prolongations, blocks, pauses and intrusions.

Analysis of prolongations included the non hesitative prolongations (prolongations that broke the lexical unit), and hesitative prolongations. The analysis was divided into 5 steps: (1) frequency of prolongations in the speech sample, frequency of prolongations in the total of disfluencies, frequency of prolongations in stuttering-like disfluencies; (2) frequency of prolongations in content words and functional words; (3) position of the prolongation in the word and in the sentence; (4) presence or absence of muscle tension, and; (5) duration of prolongations.

Table 1. Participant descriptions: research group and control group

Adults	Age	Gender	School Level	Profession	%SLD	%TD	SSI-3 Score	Stuttering Severity
RG 01	42	F	High School	Production Assistant	9.0	15.5	26	Moderate
RG 02	45	M	High School	Doorman	5.0	14.0	18	Mild
RG 03	23	F	Incomplete Higher Education	Student	5.0	14.5	23	Mild
RG 04	27	M	Incomplete Higher Education	Student	5.0	17.0	26	Mild
RG 05	21	M	Incomplete Higher Education	Student	8.5	20.0	30	Moderate
RG 06	18	M	High School	Student	8.5	23.0	28	Moderate
RG 07	19	F	High School	Babysitter	9.0	18.0	35	Severe
RG 08	30	F	High School	Housewife	3.5	16.0	18	Mild
RG 09	18	M	High School	Student	105	19.5	35	Severe
RG 10	32	M	High School	Computer technician	6.5	11.5	24	Mild
RG 11	18	M	Incomplete High School	Student	5.0	8.5	24	Mild
RG 12	46	M	High School	Nursing technician	11.5	17.0	27	Moderate
RG 13	20	M	High School	Student	5.0	12.0	34	Severe
RG 14	37	M	High School	Construction worker	6.5	15.5	21	Mild
RG 15	21	M	Incomplete Higher Education	Student	6.0	18.5	22	Mild
Mean	26.46				7.00	16.03	26.06	
SD	8.96				2.37	3.67	5.56	
CG 01	42	F	Incomplete Higher Education	Manager	0.0	3.5		
CG 02	46	M	High School	Driver	0.0	7.0		
CG 03	21	F	Incomplete Higher Education	Student	0.0	3.5		
CG 04	28	M	Higher Education	SIstems Analyst	0.5	8.5		
CG 05	18	M	Incomplete Higher Education	Student	0.0	9.0		
CG 06	21	M	Incomplete Higher Education	Student	0.5	6.5		
CG 07	19	F	Incomplete Higher Education	Student	0.0	5.0		
CG 08	32	F	Higher Education	Recepcionist	0.0	2.5		
CG 09	18	M	Incomplete Higher Education	Student	1.0	9.0		
CG 10	31	M	Incomplete Higher Education	Doorman	0.5	7.5		
CG 11	20	M	Incomplete Higher Education	Student	0.5	12.5		
CG 12	42	M	Incomplete Higher Education	Secretáry	1.0	8.0		
CG 13	21	M	Incomplete Higher Education	Student	0.0	12.0		
CG 14	32	M	Higher Education	Teacher	0.5	8.0		
CG 15	20	M	Incomplete Higher Education	Student	0.5	6.0		
Mean	27.40				0.33	7.23		
SD	9.6				0.36	2.89		

Legend: RG= research group; **CG=** control group; **SD=** standard deviation; **M=** male; **F=** female; **%SLD=** Percentage of Stuttering-Like Disfluencies; **%TD=** Percentage of Total Disfluencias; **SSI=** Stuttering Severity Instrument

- Frequency of prolongations in the speech sample (percentage in relation to the 200-fluent syllable sample): measures the prolongations rate in the analyzed speech. For the calculation, we counted the prolongations and applied the percentage ratio.
- Frequency of prolongations in the total of disfluencies: measures the prolongations rate in relation to all disfluencies. The calculation was performed by adding the total number of disfluencies, and applying the percentage ratio.
- Frequency of prolongations in relation to stuttering-like disfluencies: measures the prolongations rate in relation to stuttering disfluencies. The calculation was performed by adding all stuttering-like disfluencies, and applied the percentage ratio.
- Position of the prolongations in the word: for each prolongation, the position of the prolonged sound/syllable was analyzed in relation to the word, being classified as initial, medial, final or monosyllabic word.
- - Position of the prolongations in the sentence: for each prolongation, the position of the prolonged word was analyzed in relation to the sentence, being classified as initial, medial or final position.
- Frequency of prolongations in content words and functional words: the analysis of the word type in

which each prolongation occurred was carried out: content words (nouns, adjectives, verbs, adverbs and numerals), and functional words (articles, prepositions, conjunctions, pronouns and interjections)[27].

- Presence of muscle tension: an analysis was performed for each prolongation to verify whether there was or the presence of muscle tension or not.
- Duration of prolongations: for this analysis, all prolongations of the speech samples were identified, and the duration through acoustic analysis using the free software Praat was calculated[28]. The mean value of the prolongations was calculated for each adult.

The Stuttering Severity Instrument (SSI-3)[17] was used for each participant in the group of adults who stutter classifying the stuttering as mild, moderate, severe or very severe. This test assesses the frequency and duration of atypical interruptions of speech, and presence of physical concomitant associated with disfluencies.

Data Analysis

Data were stored and tabulated. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 21.0. We applied the statistical test Mann-Whitney to compare the quantitative results between the groups. Values were considered significant for p smaller than 0.05 ($p < 0.05$), with 95% confidence interval. Significant p values were highlighted with the asterisk (*) symbol.

RESULTS

Results are shown in Tables. The analysis of the frequency of non hesitative prolongations in relation to the total of speech, total of disfluencies and stuttering-like disfluencies showed that RG was significantly more frequent than adults who do not stutter in all analyzed variables. However, fluent adults showed higher frequency of hesitative prolongations in relation to the total of speech than adults who stutter (Table 2).

Table 2. Intergroup comparison of prolongation frequency in relation to total of speech, total of disfluencies and stuttering-like disfluencies

		Non Hesitative Prolongation Frequency				P Value
		M	SD	Min	Max	
Total of speech	RG	1.23	1.25	0.00	5.00	<0.001*
	CG	0.07	0.18	0.00	1.00	
Total of disfluencies	RG	7.19	5.92	0.00	19.10	0.001*
	CG	0.91	2.41	0.00	7.70	
Stuttering-like Disfluencies	RG	16.54	14.22	0.00	52.94	0.004*
	CG	10.00	28.03	0.00	100.00	
Hesitative Prolongation Frequency						
Total of speech	RG	1.67	1.68	0.00	5.50	0.402
	CG	2.07	1.82	0.00	6.50	
Total of disfluencies	RG	10.08	9.98	0.00	34.37	0.006*
	CG	29.82	20.81	0.00	62.50	

Legend: RG= research group; **CG**= control group; **M**= mean; **SD**= standard deviation; **Min**= minimum; **Max**= maximum; **P**= calculated significance value
*statistically significant values ($p<0.05$) - Mann-Whitney Test for intergroup comparison

The comparison of adults who stutter (RG) and fluent adults (CG) as to the position of non hesitative prolongations in words showed that there was a statistically significant difference for the initial position and monosyllabic words (Table 3). It was observed that RG presented higher number of prolongations in the initial positions and monosyllabic words than CG, and no adult had prolongations in the medial position. Regarding the position of hesitative prolongations in words, there was no statistically significant difference in the analyzed positions: initial, medial, final and monosyllabic words.

Table 3. Intergrup comparison in relation to the position of prolongations in words

Position of non hesitative prolongation in word																
	Initial				Medial				Final				Monosyllabic word			
	M	SD	Min	Max	M	SD	Min	Max	M	SD	Min	Max	M	SD	Min	Max
RG (n=15)	1.93	2.31	0.00	9.00	0.00	0.00	0.00	0.00	0.13	0.35	0.00	1.00	0.40	0.74	0.00	2.00
CG (n=15)	0.13	0.35	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P value	0.001*				>0.999				0.150				0.035*			
Position of hesitative prolongation in word																
	Initial				Medial				Final				Monosyllabic word			
RG (n=15)	0.07	0.26	0.00	0.40	0.74	0.00	2.00	2.00	0.80	0.78	0.00	2.00	2.33	2.69	0.00	8.00
CG (n=15)	0.13	0.52	0.00	0.00	0.00	0.00	0.00	7.00	1.53	1.60	0.00	4.00	2.00	1.69	0.00	6.00
P Value	0.962				0.962				0.325				0.833			

Legend: RG= research group; **CG**= control group; **N**= number of adults; **M**= mean; **SD**= standard deviation; **Min**= minimum; **Max**= maximum; **P**= calculated significance value

* statistically significant values (p<0.05) - Mann-Whitney Test for intergroup comparison

The intergroup comparison in relation to the position of non hesitative prolongations in sentences showed that adults who stutter showed higher frequency of prolongations in the medial position. There was no statistically significant difference between the groups in relation to the position of hesitative prolongations in sentences (Table 4).

Table 4. Intergroup comparison in relation to the position of prolongations in sentences

Position of non hesitative prolongations in sentences												
	Initial				Medial				Final			
	M	SD	Min	Max	M	SD	Min	Max	M	SD	Min	Max
RG (n=15)	0.53	1.13	0.00	4.00	1.87	1.85	0.00	5.00	0.07	0.26	0.00	1.00
CG (n=15)	0.07	0.26	0.00	1.00	0.07	0.26	0.00	1.00	0.00	0.00	0.00	0.00
P Value	0.133				0.001*				0.317			
Position of hesitative prolongations in sentences												
	Initial				Medial				Final			
	M	SD	Min	Max	M	SD	Min	Max	M	SD	Min	Max
RG (n=15)	0.67	0.90	0.00	2.00	2.33	2.29	0.00	7.00	0.33	1.05	0.00	4.00
CG (n=15)	0.53	0.64	0.00	2.00	3.40	3.09	0.00	9.00	0.20	0.78	0.00	3.00
P Value	0.871				0.292				0.550			

Legend: RG= research group; **CG**= control group; **N**= number of adults; **M**= mean; **SD**= standard deviation; **Min**= minimum; **Max**= maximum; **P**= calculated significance value

* statistically significant values (p<0.05) - Mann-Whitney Test for intergroup comparison

As for the presence of muscle tension in the prolongations, it was observed that adults who stutter expressed significantly higher number of non hesitative prolongations with tension in comparison to fluent adults. Fluent adults showed a tendency to manifest more hesitative prolongations without muscle tension.

The comparative analysis between groups as to the duration of non hesitative and hesitative prolongations showed no statistically significant difference. It was observed a tendency for adults who stutter in presenting slightly longer duration time of prolongations in comparison with fluent adults (Table 5).

Table 5. intergroup comparison in relation to muscular tension of prolongations and in relation to the duration of prolongations

Muscular Tension								
	Variable	**Group**	**N**	**M**	**SD**	**Min**	**Max**	**P Value**
Non hesitative Prolongation	With tension	RG	15	1.51	1.51	0.00	4.00	<0.001*
		CG	15	0.00	0.00	0.00	0.00	
Hesitative Prolongation	Without Tension	RG	15	3.35	3.35	0.00	11.00	0.242
		CG	15	4.43	3.59	0.00	13.00	
Duration								
Non hesitative Prolongation	Duration	RG	15	0.48	0.16	0.22	0.77	0.068
		CG	15	0.28	0.08	0.22	0.34	
Hesitative Prolongation	Duration	RG	15	0.51	0.15	0.23	0.70	0.159
		CG	15	0.11	0.11	0.25	0.61	

Legend: RG= research group; **CG**= control group; **N**= number of adults; **M**= mean; **SD**= standard deviation; **Min**= minimum; **Max**= maximum; **P**= calculated significance value
* statistically significant values (p<0,05) - Mann-Whitney Test for intergroup comparison

Regarding the distribution of prolongations on content and functional words, results showed that RG showed significantly more non hesitative prolongations both for content words and function words. There was no difference between the groups regarding the distribution of hesitative prolongations in content and functional words (Table 6).

Table 6. Intergroup Comparison In Relation To Prolongation Distribution In Content Words And Functional Words

	Content words				**Functional words**			
Non hesitative Prolongation	**M**	**SD**	**Min**	**Max**	**M**	**SD**	**Min**	**Max**
RG (n=15)	1.73	1.83	0.00	6.00	0.73	1.03	0.00	3.00
CG (n=15)	0.13	0.35	0.00	1.00	0.00	0.00	0.00	0.00
P Value	0.002*				0.007*			
Hesitative Prolongation	**M**	**SD**	**Min**	**Max**	**M**	**SD**	**Min**	**Max**
RG (n=15)	1.47	1.51	0.00	6.00	1.87	2.13	0.00	7.00
CG (n=15)	1.87	2.19	0.00	10.00	1.87	1.51	0.00	5.00
P Value	0.591				0.684			

Legend: RG= research group; **CG**= control group; **N**= number of adults; **M**= mean; **SD**= standard deviation; **Min**= minimum; **Max**= maximum; **P**= calculated significance value
* statistically significant values (p<0.05) - Mann-Whitney Test for intergroup comparison

DISCUSSION

Prolongation is one of the stuttering-like disfluencies described as the main clinical manifestation of the disorder[3-5,9,17-19,29,30]. However, fluent people can also show prolongations in the speech flow, especially at the end of words[20,21]. In this sense, this research conducted a quantitative and qualitative analysis in the prolongations of speech of adults with persistent developmental stuttering and adults without stuttering.

The prolongations were separated into non hesitative prolongations or typical of stuttering, and hesitative prolongations. The analysis initially discusses non hesitative prolongations, and subsequently, hesitative prolongations.

Adults who stutter showed higher number of non hesitative prolongations compared with adults without stuttering, in relation to the total of speech, total of disfluencies and total of stuttering-like disfluencies. This finding reinforces that this type of prolongation is a typical manifestation of stuttering. Similarly, a study with 15 adults who stutter and 15 who do not stutter, Brazilian Portuguese speakers, showed that adults with the disorder showed higher number of prolongations when compared to fluent adults (p =

0.010)[22]. According to the authors' description, the higher number of prolongations can be justified by the possible relationship of stuttering with difficulties in the basal ganglia functioning, which is believed to negatively influence the time required to achieve the production of speech and language.

In addition to the neurobiological basis of stuttering, which can justify the increase in the number non hesitative prolongations in the flow of speech of people who stutter, the instability of planning and motor production of speech[9] can also contribute to the stuttering-like disfluencies, due to the speed and complexity of speech behavior[31].

Interestingly, an investigation with 38 adults who do not stutter, speakers of Brazilian Portuguese and 38 European Portuguese speakers showed that among the stuttering-like disfluencies, the prolongation was the most frequent[32]. Through the data presented by the authors we can conclude that prolongations represented 75.34% of stuttering-like disfluencies for speakers of Brazilian Portuguese. Our findings showed that non hesitative prolongations accounted for only 10% of the total disfluencies in the control group. The sum of the two types of prolongations showed that 39.82% of stuttering-like disfluencies of adults who do not stutter was represented by hesitative and non hesitative prolongations.

As for the position of non hesitative prolongations in adults who stutter, it occurred significantly more frequently in the initial position of the word, in monosyllabic words, and medial position of the sentence when compared to fluent adults. These findings are in line with findings that described prolongations that occur in the speech of people who stutter occur within the word, breaking the lexical unit, which is the main characteristic of stuttering-like disfluencies[21,26]. We found no studies that analyzed the position of prolongations in sentences in the literature.

It is noteworthy that the presence of muscle tension associated with non hesitative prolongations was a characteristic occurring only in the research group, therefore suggesting that this is a typical manifestation of stuttering. For some scholars the manifestation of muscle tension may or may not accompany prolongations[16].

Regarding the duration of non hesitative prolongations, adults who stutter did not show significant differences compared with adults who do not stutter. Although the literature points out that the temporal aspect of prolongations is an important aspect to be analyzed in the speech of people who stutter[16], the data found here do not confirm this report.

The number of non hesitative prolongations was higher in adults who stutter, both in content words and function words. These results reinforce that the influence of grammatical word classes should be investigated in the analysis of stuttering-like disfluencies[27].

Next, we present the analysis of hesitative prolongations. The frequency of hesitative prolongations in relation to the total of disfluencies was higher in fluent adults. Fluent adults showed a tendency to manifest higher frequency of hesitative prolongations in comparison to adults who stutter. Given that these prolongations are considered hesitative marks[23,24], and can be used as a strategy to achieve fluency by speakers[21], a difference in numbers was not expected between the groups.

There was no difference of hesitative prolongations in the intergroup analysis concerning the positions of prolongations in words and sentences. Data showed a trend fluent adults have in presenting higher occurrence of hesitative prolongations in the initial and final positions of words, and the medial position of sentences. While adults who stutter showed a tendency to manifest more hesitative prolongations in the medial position of words, in monosyllabic words and initial and final positions of sentences. These data partially corroborate the literature, which found that hesitative prolongations usually occur at the end of words and monosyllabic words[23,24].

We found no different regarding muscle tension and the duration in hesitative prolongations expressed by adults who do and do not stutter, as was expected, considering that these prolongations are characterized by not being accompanied by tension and by being short[20].

Regarding the distribution of hesitative prolongations in content and functional words, the groups had similar results. It is therefore believed that speakers, regardless whether they stutter or not, use these prolongations to maintain possession of conversational turn[25] in the various grammatical classes of words.

CONCLUSION

The analysis of non hesitative prolongations showed that, quantitatively, adults who stutter showed higher occurrence in relation to fluent adults, both in content and functional words. Qualitatively, the presence of muscle tension differentiated the groups. However, there was similarity in relation to the duration of these

prolongations in the speech of adults who do and do not stutter. Typically, these prolongations occurred more frequently in the speech of people who stutter in the initial position of words and in monosyllables, and in the medial position of sentences.

Regarding hesitative prolongations, it is concluded that they were more common in the speech of fluent adults in relation to the total of disfluencies. The groups were similar in the analysis of these prolongations as to the position in the word and sentence, the presence or absence of muscle tension, the distribution in the content and functional words, and as to the frequency in relation to the total of speech.

REFERENCES

1. Kronfeld-Duenias V, Amir O, Ezrati-Vinacour R, Civier O, Bem-Shachar M. Dorsal and ventral language pathways in persistent developmental stuttering. Cortex. 2016;4:1-14.
2. Hudock D, Kalinowski J. Stuttering inhibition via altered auditory feedback during scripted telephone conversations. Int J Commun Disord. 2014; 49(1):139-47.
3. Kronfeld-Duenias V, Ezrati-Vinacour R, Civier O, Ben-Schachar M. The frontal aslant tract underlies speech fluency in persistent developmental stuttering. Brain Struct Funct. 2014;14:912-8.
4. Vanhoutte S, Santens P, Cosyns M, Mierlo PV, Batens K, Corthals P, Letter M, Borsel JV. Increased motor preparation activity during fluent single word production in DS: A correlate for stuttering frequency and severity. J Fluency Disord. 2015;75:1-10.
5. Tumanova V, Zebrowski PM, Goodman SS, Arenas RM. Motor practice effects and sensorimotor integration in adults who stutter: Evidence from visuomotor tracking performance. J Fluency Disord. 2015;45:52-72.
6. Ritto AP, Juste FS, Andrade CRF. Impacto do uso do SpeechEasy nos parâmetros acústicos e motores da fala de indivíduos com gagueira. Audiol Commun Res. 2015;20(1):1-9.
7. Ambrose NG, Yairi E, Loucks TM, Seery CH, Thoroneburg R. Relation of motor, linguistic and temperamento factors in epidemiologic subtypes of persistente and recovered stuttering: Initial findings. J Fluency Disord. 2015;45:12-26.
8. Joos K, Ridder D, Boey RA, Vannester S. Functional connectivity changes in adults with developmental stuttering: A preliminar study using quantitative electro-encephalography. Front Hum Neurosci. 2014;8(783):1-9.
9. Vanhoutte S, Cosyns M, Mierlo PV, Btens K, Corthals P, Letter MD, Borsel JV, Santens P. When will a stuttering moment occur? The determining role of specch motor preparation. Neuropsychol. 2016;86:93-102.
10. Tumanova V, Conture EG, Lambert EW, Walden TA. Speech disfluencies of preschool-age children who do and do not stutter. J Commun Disord. 2014;49:3-41.
11. Bleek B, Reuter M, Yaruss JS, Cook S, Faber J, Montag C. Relationship between personality characteristics of people who stutter and the impact of stuttering on everyday life. J Fluency Disord. 2012;37(4):325-33.
12. Civier O, Bullock D, Max L, Guenther FH. Computation modeling of stuttering caused by impairments in a basal ganglia thalamo-cortical circuit involved in syllable selection and initiation. Brain Lang. 2013;126:263-78.
13. Foundas AL, Mock JR, Corey DM, Golob EJ, Conture EG. The Speech Easy device in stuttering and nonstuttering adults: Fluency effects while speaking and reading. Brain Lang. 2013;126(2):141-50.
14. Andrade CRF, Cunha MC, Juste FS, Ritto AP, Almeida BPB. Auto percepção da pessoa que gagueja quanto à avaliação de suas experiências e dos resultados de seu(s) tratamento(s) para a gagueira. CoDAS. 2014;26(5):415-20.
15. Spencer C, Weber-Fox C. Preschool speech articulation and nonword repetition abilities may help predict eventual recovery or persistence of stuttering. J Commun Disord. 2014;41:32-46.
16. Campbell J, Hill D. Systematic disfluency analysis. In: Northwestern University & Stuttering Foundation of America. Stuttering Therapy. Memphis: Northwestern University & Stuttering Foundation of America. 1998. p.51-75.
17. Riley G. Stuttering severity instrument for young children (SSI-3) (3rd ed.). Austin, TX:Pro-Ed. 1994.
18. Andrade CRF. Fluência. In: Andrade CRF, Befi-Lopes DM, Fernandes FDM, Wertzner HF. (Ogs.). ABFW – Teste de Linguagem Infantil nas Áreas de Fonologia, Vocabulário, Fluência e Pragmática. Carapicuíba: Pró-Fono. 2011; P. 61-75.

19. ASHA – Special Interest Division 4: Fluency and Fluency Disorder (1999, march). Terminology pertaining to fluency and fluency disorders: Guidelines. Asha. 1999;41(Suppl. 19):29-36,.
20. Roberts PM, Meltzer A, Wilding J. Disfluencies in on-stuttering adults across sample lengths and topics. J Commun Disord. 2009;42:414-27.
21. Juste FS, Andrade CRF. Influência da tonicidade e local da ruptura na palavra em adolescentes e adultos gagos e fluentes. Pro-Fono R Atual Cient. 2010; 22(3):175-82.
22. Pinto JCBR, Schiefer AM, Ávila CRB. Disfluencies and speech rate in spontaneous production and in oral reading in people who stutter and who do not stutter. Audiol Commun Res. 2013;18(2):63-70.
23. Marcuschi LA. A hesitação. In: Neves MHN (Org). Gramática do português falado: novos estudos. Campinas: Unicamp/Fapesp, 1999. p. 159-94.
24. Nascimento JC. Fenômeno hesitativo na linguagem: um olhar para a doença de Parkinson. Dissertação (Mestrado Letras). Instituto de Biociências, Letras e Ciências Exatas. Universidade Estadual Paulista, São José do Rio Preto, 2005.
25. Pinto JCBR, Andrade CRF, Juste FS. Análise das rupturas de fala de gagos em diferentes tarefas. In: Anais do 17º Congresso Brasileiro de Fonoaudiologia; 2009. 21-24; Salvador. Anais. São Paulo: RSBFa; 2009.
26. Andrade CRF. Protocolo para a avaliação da fluência da fala. Pro-Fono R Atual Cient. 2000;2(12):131-4.
27. Juste F, Andrade CRF. Tipologia das rupturas de fala e classes gramaticais em crianças gagas e fluentes. Rev Atual Cient Pró-Fono. 2006;18(2);129-40.
28. Boersma P, Weenink, D. Praat: doing phonetics by computer [Computer program]. Version 5.4.01, revisado em 9 de novembro de 2014. Disponível em http://www.praat.org/
29. Jackson ES, Yaruss JS, Quesal RW, Terranova V, Whalen DH. Responses of adults who stutter to the antecipation of stuttering. J Fluency Disord. 2015;45:38-51.
30. Briley PM, Barnes MP, Kalinowski JS. Carry-over fluency induced by extreme prolongations: A new behavioral paradigm. Med Hypotheses. 2016;89:102-6.
31. Mock JR, Foundas AL, Golob EJ. Speech preparation in adults with persistent developmental stuttering. Brain Lang. 2015;149:97-105.
32. Castro BSA, Reis VOM, Baptista AC, Celeste LC. Perfil da fluência: comparação entre falantes do português brasileiro e do português europeu. CoDAS. 2014;(26)6:444-6.