

# Pauses and hesitations in speech of adults with and without stuttering

## Pausas e hesitações na fala de adultos com e sem gagueira

## Pausas y hesitaciones en el habla de adultos con y sin tartamudez

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### **Abstract**

**Background:** Stuttering is a neurodevelopmental disorder and its main manifestation is the excess of stuttering like-disfluencies. Disfluencies such as pauses occur in the speech of stutterers and non-stutters. **Objective:** To analyze and compare pauses and hesitative pauses in the speech of adults with stuttering and fluent adults. **Method:** The participants will be 30 adults, divided in: Research Group (RG), composed of 15 adults with stuttering, and Control Group (CG), composed of 15 fluent adults. The procedures were: fluency assessment, analysis of the spontaneous speech sample and characterization of typologies of disfluencies, analysis of pauses and hesitative pauses, which included: frequency, duration and position in sentences and application of the Stuttering Severity Instrument. **Results:** Adults with stuttering had longer duration and frequency of pauses than fluent adults. The groups were similar for the duration and frequency of the hesitative pauses. In the comparison between the groups in relation to the positions of the pauses in the sentences, there was a significant difference for the initial and medial position. No pauses in final position were observed for both groups. However, fluent adults presented a higher frequency of hesitative pauses in final position when compared to adults with stuttering. **Conclusion:**

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The quantitative analysis of the pauses showed that there are relevant differences between adults with and without stuttering, which will provide the diagnosis and more appropriate therapy.

**Keywords:** Speech; Stuttering; Speech Disorders; Evaluation Studies; Adult.

### Resumo

**Introdução:** Gagueira é um distúrbio do neurodesenvolvimento e sua principal manifestação é o excesso de disfluências gegas. Disfluências como as pausas ocorrerem na fala de pessoas com e sem gagueira. **Objetivo:** Analisar e comparar as pausas e as pausas hesitativas na fala de adultos com gagueira e de adultos fluentes. **Método:** Participaram 30 adultos, divididos em: Grupo Pesquisa (GP), composto por 15 adultos com diagnóstico de gagueira e Grupo Controle (GC), composto por 15 adultos fluentes. Os procedimentos foram: avaliação da fluência, análise da amostra de fala espontânea e caracterização das tipologias das disfluências, análise das pausas e das pausas hesitativas, a qual englobou: frequência, duração e posição nas frases e aplicação do Instrumento de Gravidade da Gagueira. **Resultados:** Os adultos com gagueira apresentaram maior duração e frequência das pausas do que os adultos fluentes. Os grupos foram similares quanto à duração e frequência das pausas hesitativas. Na comparação entre os grupos em relação às posições das pausas nas frases, houve diferença significativa para a posição inicial e medial. Não foram observadas pausas em posição final para ambos os grupos. Entretanto, os adultos fluentes apresentaram maior frequência das pausas hesitativas em posição final quando comparados aos adultos com gagueira. **Conclusão:** A análise quantitativa das pausas mostrou que existem diferenças relevantes entre os adultos com e sem gagueira, que propiciarão o diagnóstico e terapia mais adequada.

**Palavras-chave:** Fala; Gagueira; Distúrbios da Fala; Estudos de Avaliação; Adulto.

### Resumen

**Introducción:** Tartamudez es un trastorno del neurodesarrollo y su principal manifestación es el exceso de disfluencias tartamudeadas. Disfluencias como las pausas ocurren en el habla de personas con y sin tartamudez. **Objetivo:** Analizar y comparar las pausas y las pausas vacilantes en el habla de adultos con tartamudez y fluentes. **Método:** Participaron 30 adultos: 15 con tartamudez (Grupo de Investigación) y 15 fluentes (Grupo Control). Los procedimientos fueron: evaluación de la fluencia, análisis de la muestra del habla espontáneo y caracterización de las tipologías de las disfluencias, análisis de las pausas y las pausas vacilantes, que incluyen: frecuencia, duración y posición en las frases y aplicación de la Prueba de Gravedad de la Tartamudez. **Resultados:** Adultos con tartamudez presentaron mayor duración y frecuencia de las pausas que los fluentes. Los grupos fueron similares en cuanto a la duración y frecuencia de las pausas vacilantes. En la comparación entre los grupos en relación a las posiciones de las pausas en las frases, hubo diferencia significativa para la posición inicial y medial. No se observaron pausas en posición final para ambos grupos. Sin embargo, los fluentes presentaron mayor frecuencia de las pausas vacilantes en posición final en comparación con los adultos con tartamudez. **Conclusión:** El análisis cuantitativo de las pausas mostró que existen diferencias relevantes entre los adultos con y sin tartamudez, que propiciarán el diagnóstico y la terapia más adecuada.

**Palabras claves:** Habla; Tartamudeo; Trastornos del Habla; Estudios de Evaluación; Adulto.

## Introduction

Oral communication facilitated by the speech production without effort and fluent, is one of the characteristics that define the human being<sup>1</sup>. Stuttering is a communication disorder, specifically a fluency disorder, whose atypical development of the auditory-motor and thalamic-cortical circuits of the basal ganglia interfere in the speech planning and execution processes required achieving motor control of the fluent speech<sup>2</sup>. Thus, persons with stuttering have important speech impairments that may impact on the activities and participation, and personal and social aspects<sup>3</sup>.

Also considered as a neurodevelopmental disorder<sup>4,5</sup>, stuttering has predominantly a genetic etiology<sup>6</sup> and its main manifestation is the excess of stuttering-like disfluencies in the flow of speech<sup>7-10</sup>.

Thus, for the diagnosis of this communication disorder, the gold standard measurement in the fluency evaluation is the percentage of stuttered syllables or stuttering-like disfluencies<sup>11</sup>. However, some disfluencies, such as pauses, occur in the speech of persons with stuttering and fluent persons, and make diagnosis difficult. Moreover, there is no consensus in the literature on the classification of pauses.

The pauses can be used as a time gain strategy for the formulation of the statement without adding words<sup>12</sup> in speech of persons with and without stuttering. They still can be inserted in unexpected places and moments<sup>13</sup>. Generally, they occur when there is information overload linked to the linguistic process, or when the speaker faces difficulties in the formulation of concepts, in the activation and retrieval of syntactic, semantic and lexical patterns<sup>12</sup>. The textual function of the pauses is to segment the spoken production into semantic, syntactic and/or prosody units<sup>14-15</sup>.

Studies have reported that pauses and hesitations, also described as moments of slowdown at any linguistic level<sup>15-17</sup>, occur in greater concentration at the beginning of spoken texts due to process of the speaker's decision to focus on the text<sup>16</sup>. For Merlo and Barbosa<sup>18</sup> pauses and hesitations occur throughout the spoken text and work together for the maintenance of fluency.

In this context, a quantitative analysis of the pauses is recommended to distinguish pauses used as normal language strategies in the communication process and pauses used by person who stutter.

For clinical and research purposes, it is essential to characterize differences and similarities between disfluencies of persons with stuttering and fluent persons to favor the diagnostic conclusion, as well as speech therapy. Thus, researchers have studied comparatively the typologies of disfluencies between persons with and without stuttering. In the compiled literature, no studies were found comparing pauses and hesitation pauses in these populations.

Based on the above considerations, this study aims to analyze and compare pauses and hesitation pauses in speech of adults with stuttering and fluent adults.

## Methods

This study was conducted at a clinic licensed in the Unified Health System linked to the University, and previously approved by the Research Ethics Committee of the Faculty of Philosophy and Sciences – UNESP/Marília, under number 60689416.9.0000.5406. The research was showed to the participants for consent and signing of the Informed Consent Term (Resolution 466/2012 and its complementary ones), which detailed the objectives of the study and ensured the confidentiality of personal data.

This study was clinical, cross-sectional and observational. The participants consisted of 30 adults, native speakers of Brazilian Portuguese, of both genders and age range between 19 and 46 years. The participants were divided into two groups: Research Group (RG), composed of 15 adults with persistent developmental stuttering, 12 males and 3 females, and Control Group (CG), composed of 15 fluent adults, matched by sex and age to RG.

Participants of the Research Group were recruited from a specialized laboratory linked to the university where this study was conducted, and participants in the Control Group were recruited from the local community.

To participate in the study, the following inclusion criteria were established for the RG: to be a native speaker of Brazilian Portuguese; report complaint of stuttering; the onset of stuttering must have occurred in childhood (developmental stuttering); minimum duration of 36 months of disfluencies without remission (persistent); speech-language diagnosis of stuttering, by specialist in the area; have at least 3% of stuttering-like disflu-

encies; and a minimum score of 18 points on the Stuttering Severity Instrument (SSI-4)<sup>19</sup>, which corresponds to a stuttering classified as mild. For the CG composition, the inclusion criteria were: no have complaint of previous or current stuttering; negative familial history for stuttering and have less than 3% of stuttering-like disfluencies in the specific evaluation.

All participants had their fluency evaluated. For each participant, samples of spontaneous speech were collected through the audiovisual recording, using a Sony digital camcorder (Digital HDR-CX350-7.1 Mega Pixels) and a tripod (Atek – Omega). The adults were recorded to obtain a self-expressive speech sample containing 200 fluent syllables, elicited from the following statement: “Tell me about your weekly routine and what you do on weekends”. The adults’ speech was only interrupted, with questions and comments from the evaluator, in cases where it was necessary to encourage their continuity, to reach the necessary number of syllables for analysis.

After collection of the spontaneous speech samples, they were transcribed in full and the disfluencies events were recorded and coded in the transcribed text, using a transcription protocol, regarding the fluent and non-fluent syllables. Subsequently, the speech sample was analyzed and the typology of disfluencies was characterized, based on the following description<sup>20</sup>:

- Common disfluencies: hesitations, interjections, revisions, unfinished words, word repetitions, segment repetitions and sentence repetitions.
- Stuttering-like disfluencies: two or more sound and/or syllable and/or words repetitions, prolongations, blocks, pauses and intrusions.

Then, the analysis of pauses was carried out, which included pauses that broke the lexical unit (over two seconds) and hesitation pauses (short pauses of one to two seconds)<sup>20</sup>. This analysis was divided into three stages: (1) frequency of pauses (2) duration of pauses and (3) position of pauses in sentences.

(1) Frequency of pauses (percentage regarding the sample of 200 fluent syllables): The parameters of the pause rate in the analysis of the speech were measured. For the calculation, the pauses were counted and applied in relation to the percentage.

(2) Duration of pauses: All pauses in speech samples were identified. The duration time was calculated through acoustic analysis of the free software Praat<sup>21</sup>. The mean of pauses was analyzed for each participant.

(3) Position of pauses in sentences: For each pause, the position was analyzed in relation to the sentence, classifying them as initial, medial or final position.

The Stuttering Severity Instrument (SSI-4)<sup>19</sup> was applied to all the adults with stuttering to classify it as mild, moderate, severe or very severe. This test evaluates the frequency and duration of atypical speech interruptions, as well as the presence of physical concomitants associated with disfluencies, based on a protocol proposed by Riley<sup>19</sup>.

### Statistical analysis

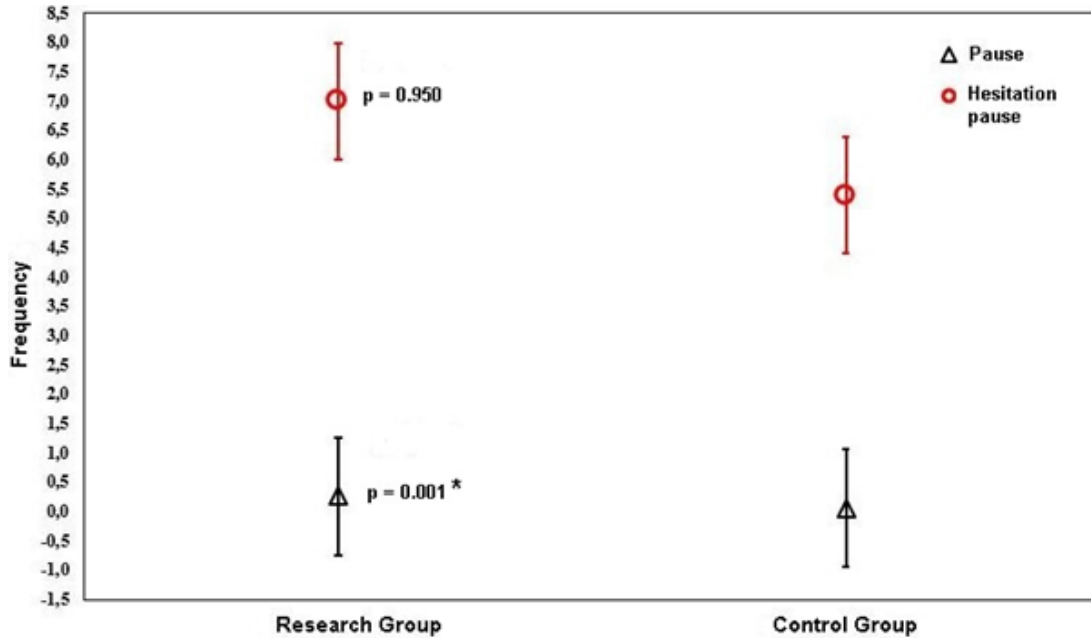
A descriptive analysis was made by means of absolute and relative frequencies, measurements of central tendency (mean and median) and measurements of dispersion (standard deviation, minimum and maximum).

In order to conduct a statistical analysis, it was applied the Moses test of Extreme Reactions to compare the intragroup quantitative results. To obtain the statistical results, the analyses were made with Statistical Package for Social Science (SPSS, Chicago, IL, USA) in its version 22.0 for Windows. For all the conclusions obtained through the inferential analyses, a significance level of 5% or less was adopted ( $p < 0.05$ ).

### Results

The analysis of the frequency of pauses in relation to the sample of 200 fluent syllables showed that adults with stuttering had greater number of pauses when compared with the fluent adults. In the comparison of hesitation pauses, regarding the same sample, there was no significant difference between the groups (Figure 1).

Regarding the duration, there was a significant difference only for the pauses, and adults with stuttering (RG) showed longer duration than the fluent adults (CG) (Table 1).



Caption: \*Moses test of extreme reactions.

**Figure 1.** Intergroup comparison of the frequency of pauses and hesitation pauses manifested by adults.

**Table 1.** Intergroup comparison of the duration of pauses and hesitation pauses manifested by adults.

Variable	Group	M	SD	Min.	Max.	p*
Pause	RG	3.50	1.71	2.50	5.00	0.005**
	CG	0.25	0.98	0.00	0.20	
Hesitation Pause	RG	1.04	0.47	0.00	2.01	0.500
	CG	1.11	0.62	0.30	2.50	

Caption: \*Moses test of extreme reactions: RG = Research Group; CG = Control Group; M = Mean; SD = Standard Deviation; Min. = Minimum; Max = Maximum. \*\*p<0.05.

A comparison between groups regarding positions of pauses in the sentences showed a statistically significant difference for the initial position and medial position. It was determined that the RG (adults with stuttering) showed greater number of pauses in both positions when compared to CG (fluent adults). No pauses were observed in the final position for any of the groups studied.

In the hesitation pauses, there was a statistical significant difference only in the final position, in

which fluent adults had greater amount of hesitation pauses than adults with stuttering (Table 2).

Regarding the position of the pauses in speech, the results showed that the RG had more pauses in both predictable and unpredictable positions when compared to the CG. When analyzing the position of hesitation pauses in speech, it was verified that there was no difference between adults with stuttering and adults without stuttering (Table 3).

**Table 2.** Intergroup comparison regarding the positions of pause in the sentences.

	Position of pauses in the sentences											
	Initial				Medial				Final			
	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.
RG	0.07	0.26	0.00	1.00	0.20	0.41	0.00	1.00	0.00	0.00	0.00	0.00
CG	0.00	0.00	0.00	0.00	0.07	0.26	0.00	1.00	0.00	0.00	0.00	0.00
p*	0.001**				0.001**				0.999			

	Position of hesitation pauses in the sentences											
	Initial				Medial				Final			
	M	SD	Min.	Max.	M	SD	Min.	Max.	M	SD	Min.	Max.
RG	1.53	1.46	0.00	5.00	5.13	4.24	0.00	15.00	0.33	0.62	0.00	2.00
CG	0.60	0.74	0.00	2.00	4.27	3.20	1.00	11.00	0.53	0.74	0.00	2.00
p*	0.341				0.999				0.001**			

Caption: \*Moses test of extreme reactions; RG = Research Group; CG = Control Group; M = Mean; SD = Standard Deviation; Min. = Minimum; Max. = Maximum. \*\*p<0.05.

**Table 3.** Intergroup comparison regarding the distribution of pauses in predictable position or unpredictable position.

Variable	Group	Predictable position					p*
		M	SD	Min.	Max.		
Pause	RG	0.13	0.35	0.00	1.00	0.001**	
	CG	0.00	0.00	0.00	0.00		
Hesitation pause	RG	1.07	1.22	0.00	4.00	0.213	
	CG	2.00	1.51	0.00	5.00		

Variable	Group	Unpredictable position					p*
		M	SD	Min.	Max.		
Pause	RG	0.13	0.35	0.00	1.00	0.001**	
	CG	0.07	0.26	0.00	1.00		
Hesitation Pause	RG	5.93	3.88	0.00	16.00	0.835	
	CG	3.40	2.44	0.00	9.00		

Caption: \*Moses test of extreme reactions; RG = Research Group; CG = Control Group; M = Mean; SD = Standard Deviation; Min. = Minimum; Max. = Maximum. \*\*p<0.05.

## Discussion

The present study analyzed and compared pauses and hesitation pauses in the speech of adults with stuttering and fluent adults.

Adults with stuttering showed more pauses when compared to adults without stuttering regarding the total of speech analyzed. This finding was already expected, since the pauses are typical manifestations of stuttering, which along with the other stuttering-like disfluencies (prolongations, blocks, sound and syllable repetitions, intrusions) are the main characteristics of the disorder, which occur in excess in this population<sup>7-10</sup>.

This result disagrees with a study of 15 adults with stuttering and 15 without stuttering, speakers of Brazilian Portuguese, which showed that adults with and without the disorder did not show differences in the number of pauses manifested in spontaneous speech<sup>22</sup>. A possible justification for

the disagreement of the findings is that this study separated the pauses and the hesitation pauses, whereas the mentioned authors classified all the pauses into a single category. Moreover, the authors also affirmed that pauses, hesitations or false initiations in spontaneous speech may be a phenomenon of peripheral production, which accompanies speech and occurs at random.

In this perspective, speech production reflects a dynamic and complex process dependent on the interaction between multiple cortical and subcortical regions for the fine motor control of more than 100 muscles that occurs in hundreds of milliseconds<sup>23</sup>. Therefore, there is a consensus that all speakers may have speech disruptions, regardless of manifesting or not stuttering. It was also observed in this study that there was similarity between the groups regarding the amount of hesitation pauses, which are considered common disfluencies<sup>20</sup>.



The greatest occurrence of pauses in adults with stuttering suggests that the neurological basis of the disorder<sup>2</sup> prevents the rapid readiness of the motor execution of speech, which occurs in the fluent ones, and for this reason they present excessive use of this typology. Thus, the pauses may have been used as a time gain, without addition of words, as previously described<sup>12</sup>.

The adults with stuttering showed more frequency of pauses in the initial position and in the medial position of sentences, when compared to the fluent ones. These results corroborate with the previous ones that the probability of occurrence of disfluencies is greater at the beginning of the sentences than at the end<sup>24</sup>. Another justification for the large number of pauses in the beginning can be applied to the decision-making process by the speaker<sup>16</sup>, as well as the retrieval of linguistic information, such as activation and retrieval of syntactic, semantic and lexical patterns<sup>12</sup>.

The numerous number of pauses used at the middle of sentences by adults with stuttering is justified by its own function, which is to segment speech production into semantic, syntactic and/or prosody units<sup>14,15</sup>. The pauses at the beginning and middle of the sentences used by adults with stuttering are explained as an attempt to maintain fluency, as described by Merlo and Barbosa<sup>18</sup>.

Regarding the duration of pauses, adults with stuttering showed longer pauses compared to adults without the disorder, reaffirming the description by Britto<sup>25</sup>, in which reports that the type and frequency of the onset of disfluencies are factors that differentiate a fluent speaker of a stutterer speaker. Thus, the higher frequency, as well as the longer duration of the pauses, are also indicative of typical manifestations of stuttering.

However, both adults with stuttering and without stuttering did not show differences in the hesitation pauses, confirming that this type of disfluency is not only a characteristic of persons with stuttering and that are used as linguistic function to reorganize the statement, and therefore, they are present in the speech of any speakers due to complexity of the speech production.

Although this study consisted of adult participants, they are not enough to determine the behavior of a population. Consequently, it is recommended other studies in this field of study, encompassing pauses in the speech of adolescents, school-age children and preschoolers who stutter.

## Conclusion

This study verified that adults with stuttering showed higher frequency and duration of pauses when compared to the fluent ones. Moreover, they also presented greater number of pauses in the initial and medial position. The hesitation pauses were more frequent in the final position of the sentences in fluent adults.

The data show that pauses are typical manifestations of persons with stuttering, who distinguished themselves from controls. However, hesitation pauses are common disfluencies to all speakers.

The findings of this research contributed to facilitate the speech-language diagnosis of stuttering, since the pauses can be classified as stuttering like- disfluencies, regarding the quantitative characteristics.

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