



Investigation of pause in oral reading fluency assessment

Investigação da pausa na avaliação da fluência de leitura oral

Investigación de la pausa en la evaluación de la fluidez de la lectura oral

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Abstract

Introduction: Many studies about reading investigate the reading fluency as an important aspect to be observed in teaching and assessment during the learning process because of its relationship to performance in reading comprehension. **Objective:** This study aimed to map the pauses occurrences in oral reading of students from elementary school and their typology by perceptive evaluation of judges. **Method:** 97 students, two speech language pathologists and a pedagogue participated in the study. Data collection was performed with the recording of the oral production of reading and reading comprehension test, and observed the pauses taken by each student through the auditory trial of judges. **Results:** After statistical analysis it was observed that there was an agreement between at least two judges, but with reliability of power ranging from very low to moderate. **Conclusion:** These results can be explained by the variability in pause concept. These findings indicate the need for auditory training for teachers and/or clinicians.

Keywords: Reading; Reading Comprehension; Speech Language and Hearing Sciences; Students.

Resumo

Introdução: Muitos estudos sobre leitura investigam a fluência da leitura como um aspecto importante a ser observado no ensino e na avaliação durante o processo de aprendizagem devido à sua relação com o desempenho na compreensão textual. Objetivo: Este estudo teve por objetivo mapear as ocorrências de pausas na leitura oral de escolares do Ensino Fundamental I e sua tipologia por meio da avaliação perceptiva de juízes. Método: Participaram 97 escolares, duas fonoaudiólogas e uma pedagoga. A coleta de dados foi realizada com a gravação da produção oral da leitura e teste de compreensão leitora, sendo observadas as pausas realizadas por cada escolar, por meio do julgamento auditivo de juízes. Resultados: Após análise estatística, foi possível observar que houve concordância entre pelo menos dois juízes, porém com força de confiabilidade variando entre muito fraca e moderada. Conclusão: Tais resultados podem ser justificados pela variabilidade no conceito de pausa. Esses achados indicam a necessidade

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de um treinamento auditivo para professores e/ou profissionais clínicos.

Palavras-chave: Leitura; Compreensão Leitora; Fonoaudiologia; Estudantes

Resumen

Introducción: Muchos estudios sobre la lectura investigan la fluidez de la lectura como un aspecto importante que debe observarse en la enseñanza y en la evaluación, durante el proceso de aprendizaje, debido a su relación con el rendimiento en comprensión del texto. Objetivo: Este estudio tuvo como objetivo mapear las ocurrencias de las pausas en la lectura oral de estudiantes de la escuela primaria y su tipología, por medio de la evaluación perceptiva hecha por jueces. Métodos: Participaron 97 estudiantes, dos fonoaudiólogos y una pedagoga. La recolección de datos se realizó con la grabación de la producción oral de lectura y test de comprensión de la lectura, siendo observadas las pausas realizadas por cada estudiante por medio de evaluación auditiva de jueces. Resultados: Tras el análisis estadístico se observó que hubo acuerdo entre al menos dos jueces, pero con fuerza de fiabilidad variando entre muy baja a moderada. Conclusión: Estos resultados pueden explicarse por la variabilidad en el concepto de pausa. Los resultados indican la necesidad de entrenamiento auditivo para profesores y clínicos.

Palabras clave: Lectura; Comprensión de Lectura; Fonoaudiología; Estudiantes.

Introduction

For students that are learning how to read, different skills are necessary, and processes related to decoding and reading comprehension must be developed, in order to obtain success in learning. Competent reading is a skill which involves various cognitive aspects, establishing an interaction with the student and the text read¹. Many studies on reading investigate reading fluency as an important aspect to be observed in teaching and assessment during the learning process, due to its relationship with the performance to understand texts²⁻⁸.

For a successful reading, the reader should have skills for recognizing words and integration with their significance to understand texts, in addition to having a broad vocabulary and fluency during reading⁹. A fluent reader devotes less cognitive efforts to identify words individually, and may allocate more efforts in understanding the message read¹⁰.

Reading fluency can be observed in different ways, either in oral reading, as for silent reading of words, sentences or texts. Analyzing the fluency of oral and silent reading, a research aimed to observe how these types of fluency contributed to reading comprehension. A sample of 124 students from the 1st grade (when oral reading is emphasized in education), and, from this total, 118 also participated when they were on 3rd grade (when silent reading is emphasized in education). As measures in assessing the temporal fluency dimension, the

total time of oral reading of texts, the fluency rate (words per minute) and accuracy were employed, in addition to other measures, such as words decoding test and oral vocabulary¹¹.

According to the researchers, the results lead to two findings substantiating the multiple fluency dimensions: (1) automatic reading of real words and pseudo words (decoding) contribute to oral reading fluency; and (2) reading comprehension is related with fluency, which, in turn, is related to reading comprehension bidirectionally¹¹.

Comprising the reading fluency assessment measures (accuracy, prosody and speed), the evaluation of prosody can be carried out by observing the duration of pauses in the phrases, comma pause duration at the end of phrases, pause duration, number of pauses, fundamental frequency and intonation pitch. By analyzing prosody, some special precautions are necessary, such as using text passages presenting easy and accessible decoding levels, to enable fluency assessment in absence of numerous decoding errors, which would hinder prosody analysis, specifically¹².

With some measures in common, considered for prosody assessment in reading, Brazilian researchers assume that intonation is part of the speech syntactic structure, being an important factor in the reading process. Questioning the relationship between syntax, intonation and access to meaning, researchers conducted a study with 30 public school students from 3rd to 5th grade; 15 students without learning disabilities and 15 diagnosed with alterations associated to learning disorders. The students

who took part of this research were submitted to text reading recordings, oral texts retelling and an objective test, in which they should mark the phrases which corresponded to the text read. For fluency analysis, fundamental frequency measures, temporal aspects (duration of pauses, total utterance time, speech rate, articulation time and articulation rate) were considered, in addition to definition of prominent stressed syllable¹³.

The study demonstrated that students with learning disorders presented a reading pattern characterized by little use of intonation (melodic variation, deficient definition of tonic prominence, difficulty in phrasal pitch definition), as well as improper and excessive use of pauses, low-speed reading and articulation. In the correlation between the correct number for understanding and prosodic acoustic variables, the authors reported a significant correlation only for students without learning disabilities.

Analyzing the role of prosodic reading for the development of fluent reading and its relationship with understanding, a longitudinal study comprising students from 1st to 3rd grades was carried out with efficient measures for words reading fluency, oral reading (speed, accurate reading) and reading comprehension. The study sought to determine specifically how changes in prosodic reading skills and words reading are related to further development of reading fluency and comprehension skills¹².

According to the results obtained, it was possible to demonstrate that several characteristics related to pause and voice frequency are developed over the first years of reading acquisition. The number of pauses in initial readings was predictive for the development of an appropriate intonation pitch and the subsequent ability to understand, and the development of an appropriate intonation pitch leads to better reading fluency performance.

As the students start learning how to read, they should be instructed to read aloud expressively, using elements such as rhythm, intonation, speech rate, volume and voice quality, according to the reading modes suitable for different types of listeners and circumstances, in which reading is performed. This procedure would enable the text comprehension, especially in the stage when students are highly dependent on decoding writing to perform reading, turning their cognitive resources such as attention and working memory to the

interpretative aspects of the text, phonetically and semantically¹⁴.

It is evident that reading fluency may vary from individual to individual, but in reading, there is a standard recognized as appropriate reading model, conducted by punctuation marks and clues that writing can provide, developing reading with accuracy and automaticity, that is, without many errors, in a suitable speed, according to the reading context and reason, reaching the final result, which leads to comprehension.

Considering that studies use prosody for assessing reading fluency and its importance due to its relation concerning understanding, this study hypothesis is that the pauses, as one of prosody measures, can be aurally observed in oral reading fluency assessment, by professionals who work with students who depend directly on reading, to succeed in learning any subject of the curriculum.

In face of the scientific evidence and lack of exploration on the subject in Brazilian literature, this study aimed to map the occurrences of pauses in oral reading of students from elementary school and their typology by the perceptive evaluation of judges.

Methods

Participants

Students

The selected initial sample consisted of 137 students, and afterwards 21 students from the 3rd grade, and 12 from 5th grade were excluded, prior to starting data collection, due to transference to other schools, students whose tutors did not sign the free and informed consent and those who often missed classes, due to health reasons. Figure 1 presents the flow chart for selection of participants in this study, in order to show the process for obtaining the number of participants in data collection.

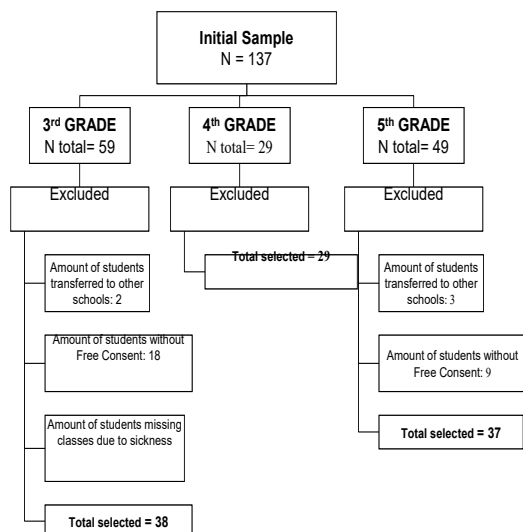


Figure 1. Sample Selection

After data collection, at the analysis stage, students from the 3rd and 4th grades that did not present a satisfactory reading level domain for observing the variables proposed in the study (students with slow reading level and/or syllable), and those whose files presented recording errors in audio (breaks or interruptions in the audio files) were excluded, totaling 6 students from the 3rd grade, 1 from the 4th and none from the 5th.

After sample selection, a total of 97 students took part in this study, both genders, from 7 years and 9 months to 11 years and 3 months, of a municipal public school, that accepted to take part in the research.

The age range was considered appropriate for the application date of the survey procedures, conducted in the first two months of the school year. This age group was selected for this research due to the literacy level, since students from the 3rd grade should be literate, so this research procedure was possible to be realized. According to the Goals Plan, Commitment to Education for All, Article 2, section II, provides the guideline “literate children, at the latest, eight years old, assessing the results by specific regular review.”¹⁵ For this reason, this study did not include students from the 1st and 2nd grades, since they were still under literacy training, literacy implementation plan participants described above, and under evaluations for monitoring compliance of the established guidelines.

The students were divided into three groups, as shown below:

- **Group I (GI):** composed by 32 students from the 3rd grade; 68.76% males and 31.25% females;
- **Group II (GII):** composed by 28 students from the 4th grade; 35.71% males and 64.28% females;
- **Group III (GIII):** composed by 37 students from the 5th grade; 56.75% males and 43.24% females.

Sample selection inclusion criteria included the signature of the Informed Consent by the student’s parents or guardians; students with visual acuity, hearing and cognitive performance within normal range, as described in medical records and reporting’s of the school teachers. Sample selection exclusion criteria included presence of sensory, motor or cognitive impairment of students, enrolled in school, as described in medical records and reporting’s of the school teachers; presence of genetic or neurological syndromes; students whose parents refused to sign the Informed Consent; students who did not have a satisfactory reading level domain to observe the proposed variables in the study; and those, whose files presented audio recording errors.

Judges

Three judges were selected to judge the pauses: two speech language pathologists and one Elementary school educational coordinator of a private school. t

Instruments

The text used for recording the oral reading was denominated “The umbrella”, which was part of the Assessment Protocol for Reading Comprehension¹⁶.

The equipment employed for recording was one unidirectional (cardioid) karsect head microphone. This type of microphone has a mechanism in which sound is captured with greater intensity to the direction it is positioned, while other sounds are recorded at lower intensity, such as: researcher speech, noise coming from the street or from the school halls, where it was possible to hear voices of employees and coordinators¹⁷.

The microphone was positioned on the child’s head at a distance of about 6 to 9 cm from the mouth, at a 45° angle approximately, depending on the voice tone. The microphone was connected to an Acer notebook, with an Intel Core processor type, 3 GB memory, 32-bit operating system. The recording was made by Praat¹⁸, version 5.1.05, with

16-bit input quantization and sampling frequency of 22050 Hz. For those students whose silent reading time exceeded 7 minutes, the selected sampling frequency of 16000 Hz was selected, for reading aloud, due to the time limit for recording in frequency 22050 Hz, which was at an average of 7 minutes, thereby adjusting the buffer size. Files of the recordings were saved in wav file extension.

Each one of the judges received 97 texts printed for the trial, referring to each student, a pen drive containing the audio files of the children reading, and a protocol to conduct the pauses trial. The text format delivered to the judges was modified from the original punctuation offered during the student's readings. The characteristic graphic marks were removed (as period, exclamation mark, question mark, ellipsis, blanks delimitation for paragraphs, capital letters, etc.) in order to avoid any visual clues which might influence the pauses judgment, by the judges.

Procedures

Data collection:

Students

Data collection was carried out by oral reading recordings of the students, in school. The students were asked to conduct a silent text reading, prior to oral reading recording, in order to minimize difficulties concerning grapheme-phoneme decoding during oral reading recording, since the difficulties could interfere on the prosodic/intonational analysis. Right after reading, the students were given an interpretation activity of the text read, composed of eight questions with multiple choice alternatives, from the Procedure "Reading Comprehension Assessment Protocol"¹⁶

Judges

The judges were asked to judge and mark the moments of silent pause during reading, from hearing the oral readings of the students, presented in audio files. The judges received along with the pen drive, a protocol in which everyone should proceed similarly as for judging and scoring points, in case of pauses. This protocol contained the steps which should be followed by the judges, who were required to hear each reading twice. During the first hearing procedure, they should mark the breaks with a blue pen, according to the criteria they considered as pause. During the second hearing, they should proceed the confirmation of the marked pauses, and with a red pen they should

mark the pauses not observed previously. Each one of the judges also received 97 texts printed for the trial, from each student.

The judges were asked to define the concept of pause, according to their own knowledge. The purpose of not defining the concept of pause beforehand and choosing professionals from different backgrounds (but on the same working field) was to observe how each professional would perform the trial; if there were different types of pauses, how they could be presented, from a phenomenon described in the literature as non-consensual concept.

Thus, two speech language pathologists were selected for the panel of judges, professionals, who, even with hearing sensitivity, due to practice, were able to observe different types of breaks, and who have also distinguished from the third judge selected, an educational professional with daily experience and practice of teachers inside the classroom.

Data analysis:

It was taken into account, for data analysis purposes, the sites marked in the text of each student as pauses aurally perceived by the judges. Pauses marked in the text by each judge were computed in excel spreadsheet and were considered just when obtained a concordance index equal to or greater than 70% (two or more judges agreeing with each other), a rate considered as high significance in statistical analysis, considered as reliable registers¹⁹

Statistical analysis:

To obtain and confirm the results, statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), version 20.0 and MS-Excel spreadsheet was used, version of MS-Office 2010 for data organization. Significance of 5% (0.050) for statistical tests was adopted, that is, when the calculated significance (p) was less than 5% (0.050).

The statistical analysis was performed by the employment of Kendall W test to check the agreement level among the three judges concerning the perception of pause occurrence in oral reading. It was also applied the Tau-b Kendall pattern, in order to identify judges who agreed with each other when studied in pairs, and also aiming to observe whether the employed category was well defined, and if the behavior was identified, with or without difficulties.

Ethical Considerations

This study was conducted after approval by the Ethics Committee of the Faculty of Philosophy and Sciences of Universidad Estadual Paulista “Júlio de Mesquita Filho” (UNESP) under Protocol n° 0096/2011 of 03/05/2011.

Results

Tables 1, 2 and 3 show the distribution of the mean, standard deviation and *p* value related to

the agreement analysis among the three judges (Judge 1: pedagogical coordinator, Judge 2: speech language pathologist, Judge 3: speech language pathologist) concerning the number of pauses judged in reading, from students of GI, GII and GIII.

When Kendall W test was applied, it was possible to observe in Table 1, a statistically significant difference among the judges, for students of GI. The same analysis was observed in Tables 2 and 3 for groups GII and GIII, respectively.

Table 1. Distribuição da média, desvio-padrão e valor de *p* para o número de pausas julgados pelos juízes na leitura dos escolares do GI

Number of Pauses	Mean	SD	<i>p</i>
Judge 1	60.97	45.25	
Judge 2	30.00	11.11	< .001.*
Judge 3	72.00	34.67	

Significant values **p* < .005. Kendall W Test

Table 2. Distribution of mean, standard deviation and *p* intervals for the number of pauses, analyzed by judges, referring to reading of GII students

Number of Pauses	Mean	SD	<i>p</i>
Judge 1	33.18	8.40	
Judge 2	37.54	8.31	< .001.*
Judge 3	49.57	9.37	

Significant values **p* < .005. Kendall W Test

Table 3. Distribution of mean, standard deviation and *p* intervals for the number of pauses, analyzed by judges, referring to reading of GIII

Number of Pauses	Mean	SD	<i>p</i>
Judge 1	37.32	7.93	
Judge 2	37.24	10.61	< .001.*
Judge 3	44.62	7.44	

Significant values **p* < .005. Kendall W Test

In view of the statistically significant differences shown in the results listed in Tables 1, 2 and 3, the Tau-b Kendall test was applied, trying to identify which judges agreed with one another, when the variable pause was analyzed. The results are shown in Tables 4, 5 and 6.

In Table 4, there was a statistically significant difference between the judges 1 and 3, showing moderate agreement among them, referring to the number of pauses performed by the students of GI.

Table 4. Distribution of p value, referring to the application of the agreement test between judges, of GI students

VARIABLES	Statistics	NUMBER OF PAUSES - Judge 1	NUMBER OF PAUSES - Judge 2
NUMBER OF PAUSES - Judge 2	Tau-b Coef.	.109	
	<i>p</i>	.389	
	<i>n</i>	32	
NUMBER OF PAUSES - Judge 3	Tau-b Coef.	.644	-.110
	<i>p</i>	< 0,001*	.380
	<i>n</i>	32	32

Significant values **p* < .005. Kendall W Test

Table 5 shows a statistically significant difference between judges 1 and 2, showing little agreement between them, referring to the number of pauses performed by students of GII.

Table 5. Distribution of p value, referring to the application of the test of agreement, between judges of GII students

Variables	Statistics	NUMBER OF PAUSES - Judge 1	NUMBER OF PAUSES - Judge 2
NUMBER OF PAUSES - Judge 2	Tau-b Coef.	.329	
	<i>p</i>	.017*	
	<i>n</i>	28	
NUMBER OF PAUSES - Judge 3	Tau-b Coef.	.088	.206
	<i>p</i>	.524	.140
	<i>n</i>	28	28

Significant values **p* < .005. Kendall W Test

In Table 6, the results show a statistically significant difference for the pairs of judges 1 and 2 and judges 1 and 3, indicating concordance ranging from little to moderate between them, referring to the number of pauses performed by students from GIII.

Table 6. Distribution of p value, referring to the application of the test of agreement, between judges of GIII students

Variables	Statistics	NUMBER OF PAUSES - Judge 1	NUMBER OF PAUSES - Judge 2
NUMBER OF PAUSES - Judge 2	Tau-b Coef.	.655	
	<i>p</i>	< 0,001*	
	<i>n</i>	37	
NUMBER OF PAUSES - Judge 3	Tau-b Coef.	.392	.346
	<i>p</i>	0,001*	.004*
	<i>n</i>	37	37

Significant values **p* < .005. Kendall W Test

Discussion

In all the results it is possible to observe an agreement between at least two judges, with reliability ranging from very little to moderate. These results can be explained by the lack of a common definition, not only among the judges of this study, but also by the variability in pause concept used by authors in national and international literature^{1,20-24}.

The findings of this study corroborate the results described by researchers²⁵; according to them, pause perception is not always consensual among evaluators. Given this definition of variability, the participant judges of this study were asked to describe their own conception of pause, thus, seeking a better understanding of the results obtained.

The statements provided by the three judges are given below:

Judge 1 (pedagogical coordinator):

“For me, pause is done by children who do not know intonation, when it becomes necessary to breathe. When the reader is skilled, pause is made when the thought of a sentence is completed; then pause connects a sentence (thought) to the other, helping the intonation (in case of oral reading) or text comprehension (silent reading)”.

Judge 2 (speech language pathologist):

“Pause, for me, may be represented by conventional punctuation signs, aimed at establishing intonation and accent to the expressions, in order to avoid ambiguity, therefore, essential to help understanding the text read”.

Judge 3 (speech language pathologist):

“I have considered as pause, every silent moment held by the student, excluding the articulatory trials. When it became clear during the reading recording, that the student was performing an articulatory trial, I did not consider it as pause”.

Due to non-defining previously the concept of pause to the judges, it was possible to observe three facts. The first is related to all groups, but especially the students of GI, because as two of the judges, according to their concept of pause, tended to mark all the pauses, it was possible to distinguish several categories. Among them, are: representative pauses from the text prosody; pauses presenting difficulties for decoding, and finally pauses improperly performed, for several reasons.

The results also identified a second event, due to different concepts about pauses. There were short pauses which were not marked by the majority, or none of the judges. The discrepancy for pause perception, either among judges or judges and the researcher may be due to the acoustic characteristics that pause can assume in different functions. These characteristics may be related to frequency changes and duration^{25,26}.

The findings of this study corroborate the results of a research²⁷ which observed by hearsay analysis, short pauses unnoticed by the judges. The research demonstrated through acoustic analysis that when the judges marked the places where they thought there were breaks, following only their auditory impressions, the average duration was 0,435s; when there was a pause not perceived by the judges, the pause duration average was 0,283s. For the author, either the presence, or the longer

the pause, both constitute distinct predictors of the prosodic limit perception. Due to the diversity of punctuation marks in writing, presenting interval pauses which differ during oral reading, this behavior can be justified when observing the pauses made by the judges. For example, in one study, it was noted that the period constitutes the most important time marker, while the question mark and comma present lower pause markers²⁸.

The third fact refers to reading of GI students, as in several samples it was observed a slow rhythm pattern, that is, reading held from word to word, making it difficult to distinguish between certain categories of pauses, especially regarding those whose function consists on prosodic marks, thus hindering the completion of a prosodic analysis for students who showed this reading pattern. As limitation of this study, these findings point to the need of auditory training, as well as a study on the prosody of teachers and/or clinical professionals, so that they may be able to use the prosody evaluation effectively with their students, since the acoustic analysis or instrumental pauses become impaired in our country, due to lack of resources (electronic/computer/operating) resources, and even technical training required for such analysis.

Reading fluency evaluation can not be ignored in the present context regarding the performance of students in relation to reading, particularly concerning pauses, since this is a prosody measure easily understood by education professionals and teachers, to whom technology is not provided. Future researches concerning this subject are important, so that fluency measurements and optimal ways to evaluate them in clinical and educational contexts can be defined.

Conclusion

In conclusion, according to the initial hypothesis, it is possible to observe pause aurally, when evaluating oral reading fluency. However, the complexity comprised by pause and its various functions demand careful attention. This study observed that pause can take the representative function of the text prosody, which may demonstrate decoding difficulties and, finally, it may be improperly performed for various reasons. Due to these findings, it becomes important to emphasize a proper assessment of prosody through pauses, so that professionals need to be trained to do this evaluation aurally.

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