

Psychology and Education

# Performance in receptive vocabulary and reading comprehension tests in elementary education students

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**To cite this paper:** Silva, C., & Pereira, F. B. (2019). Performance in receptive vocabulary and reading comprehension tests in elementary education students. *Psicologia: Teoria e Prática*, 21(2), 277-293. doi:10.5935/1980-6906/psicologia.v21n2p277-293

**Submission:** 16/03/2018

**Acceptance:** 28/02/2019



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### Abstract

This article aims to outline the performance profile of students in the 3rd, 4th and 5th years of elementary education, of the public school, from the state of Rio de Janeiro, in receptive vocabulary and reading comprehension tests. 42 students participated, distributed in: GI (15 students of the 3rd year); and GII (15 students of the 4th year); GIII (12 students of the 5th year). The evaluation instruments used were the TVfusp and PROCOMLE tests. The results indicated a statistically significant difference for vocabulary and reading comprehension during the serializations, suggesting the influence of extrinsic factors, such as the medium in which the individual is inserted, and intrinsic factors, such as information processing and memory. We can conclude that there was a growing performance, in the comparison of groups, in vocabulary, as well as in variables related to the comprehension of the analyzed textual genres, making it possible to trace the profile of these students.

**Keywords:** Reading, Reading Comprehension, Vocabulary, Learning, Elementary school

## DESEMPENHO EM PROVAS DE VOCABULÁRIO RECEPTIVO E COMPREENSÃO LEITORA EM ESCOLARES DO ENSINO FUNDAMENTAL

### Resumo

Objetiva delinear o perfil do desempenho de escolares do 3º, 4º e 5º anos do ensino fundamental, da rede pública, do estado do Rio de Janeiro, em provas de vocabulário receptivo e compreensão de leitura. Participaram 42 escolares, distribuídos em: GI (15 escolares do 3º ano); GII (15 escolares do 4º ano); e GIII (12 escolares do 5º ano). Os instrumentos de avaliação utilizados foram os testes TVfusp e PROCOMLE. Os resultados indicaram diferença estatisticamente significativa para vocabulário e compreensão leitora no decorrer das serializações, sugerindo influência de fatores extrínsecos, como o meio em que o indivíduo está inserido, e fatores intrínsecos, como o processamento da informação e a memória. Podemos concluir que houve desempenho crescente, na comparação dos grupos, em vocabulário, assim como, em variáveis relacionadas à compreensão dos gêneros textuais analisados, possibilitando traçar o perfil destes escolares.

**Palavras-chave:** leitura, compreensão de leitura, vocabulário, aprendizagem, ensino fundamental.

# RENDIMIENTO EN PRUEBAS DE VOCABULARIO RECEPTIVO Y COMPRENSIÓN DE LECTURA EN ALUMNOS DE LA ENSEÑANZA FUNDAMENTAL

## Resumen

Objetiva delinear el perfil del desempeño de escolares del 3°, 4° y 5° año de la enseñanza fundamental, de la red pública, del estado de Río de Janeiro, en pruebas de vocabulario receptivo y comprensión de lectura. Participaron 42 escolares, distribuidos en: GI (15 escolares del 3° año); GII (15 escolares del 4° año); GIII (12 escolares del 5° año). Los instrumentos de evaluación utilizados fueron las pruebas TVfusp y PROCOMLE. Los resultados indicaron diferencia estadísticamente significativa para vocabulario y de comprensión lectora en el transcurso de las series, sugiriendo influencia de factores extrínsecos, como el medio en que el individuo está inserto, y factores intrínsecos, como el procesamiento de la información y memoria. Podemos concluir que hubo desempeño creciente, en la comparación de los grupos, en vocabulario, así como en variables relacionadas a la comprensión de los géneros textuales analizados, posibilitando trazar el perfil de estos escolares.

**Palabras clave:** Lectura, Comprensión de lectura, Vocabulario, Aprendizaje, Enseñanza Fundamental

## 1. Introduction

Reading is an act of great importance for human learning. Through it, we are able to acquire new knowledge, gain understanding and information on various subjects, expand the vocabulary, and develop and expand writing, with it being an essential skill for social insertion (Cunha & Capellini, 2016). Models from Cognitive Psychology have contributed considerably to the understanding of the functioning of the cognitive system for the processes involved in reading comprehension, highlighting two fundamental components: decoding, related to letter-sound conversion, and linguistic understanding, directly related to the understanding of the oral language (Gough & Tunmer, 1986; Oliveira, Silva, Dias, Seabra, & Macedo, 2014).

In order for the reading process to take place, it is necessary for the individual to acquire skills that include language, attention, auditory memory, visual memory, word identification, structural and contextual language analysis, logical synthesis, vocabulary expansion, comprehension and fluency in reading (Federmeier, Kutas, & Schul, 2010; Ávila & Chang, 2014; Martins & Capellini, 2014).

Among the skills cited, the present study aimed to verify the relationship between vocabulary and reading comprehension, more specifically, receptive vocabulary.

The vocabulary corresponds to words that are part of an individual's lexicon and can be divided into expressive and receptive vocabulary. Expressive vocabulary refers to what is emitted, to the words that the person is able to pronounce, being directly related to the acquisition of written language and reading. Receptive vocabulary corresponds to the words that the individual is able to comprehend, involving the understanding and knowledge of the meaning of the word. Thus, receptive vocabulary becomes an important part of the reading comprehension process, since the perception and processing of information correspond to the concepts and meanings of words that have been successfully acquired (Miller et al., 2014; Psyri-dou, Eklund, Poikkeus, & Torppa, 2018).

It is known that the recognition of words alone is not sufficient for the reading to be effective, because, although recognition activates the meaning stored in the memory, it is still not able to achieve the main objective of reading, which is the extraction of the content of the written message. In order for this objective to be achieved it is necessary to have an understanding of what has been read (Oliveira & Capellini, 2013; Van Dyke, Johns, & Kukona, 2014; Lucio, Kida, Carvalho, Cogo-Moreira, & Ávila, 2015).

Comprehension is a complex process that, like reading, requires the development of various linguistic and cognitive skills. It can be basically divided into oral and reading comprehension, and for success to occur, both involve complex cognitive aspects such as the reception of information by the entry pathways (visual or auditory), access to previously stored information, interpretation of new content and the association among the aspects mentioned (Avila & Chang, 2014; Zuanetti et al., 2018).

According to Cunha and Capellini (2016) the cognitive aspects involved in the process of reading comprehension are working memory, stored knowledge, monitoring, information integration and inferences. The linguistic aspects involved are syntactic, semantic and lexical elements, and the decoding ability. These abilities participate in the construction and integration of meanings, contributing so that comprehension is effective (Horowitz-Kraus et al., 2014; Hall-Mills & Apel, 2015; Bovo, Lima, Silva, & Ciasca, 2016).

Reading comprehension plays a fundamental role in the teaching-learning process of schoolchildren because in the school phase several practices are used that require reading skills to acquire new knowledge and to solidify the learning. One of the main obstacles to effective learning is difficulty in this comprehension. Therefore, it is necessary for schoolchildren not only to acquire decoding skills, but also to be able to extract meaning from what is read (Silva, 2017; Gray, Catts, Logan, & Pentimonti, 2017).

Machado and Capellini (2016) highlight failures in the decoding process, lack of vocabulary, lack of integration of information and memory, poor oral reading and lack of adequate learning strategies as characteristics of readers with difficulty in reading comprehension. These difficulties are one of the causes of school failure among elementary education students. Reading comprehension can therefore be seen as fundamental for the construction of meaningful learning.

According to Ávila and Chang (2014), consistent with the National Curriculum Parameters (NCPs), the learner is expected to be able to extract meaning from the content read in the text, in an integral and consistent way, by the end of Elementary Education I. At this stage of literacy, the student is expected to have developed skills and to have gradually accumulated experiences that make him/her able to master the alphabetical principles and reach a certain level of reading comprehension. Thus, it is expected that the student at the end of elementary education I will be able to explicitly and implicitly extract meaning from different textual genres, with varied extensions, as the learning from the 3rd year of elementary education has direct contact with the different types of texts included in literacy teaching (Portal MEC, 2018).

It is known that one of the factors that interfere in effective reading comprehension is the lack of vocabulary. Rapid identification and prior knowledge of words, while not sufficient for reading, facilitate reading comprehension. Readers, when faced with a familiar word in which they are able to extract meaning, become apt in obtaining further details from the material they are reading (Crookston et al., 2013). According to Nalom, Soares, and Cárnio (2015), the greater the number of words students recognizes in graphic material, the easier it is for them to interpret the message. In this way, by recognizing the words of a text (or any material read), the reader is able to better master reading and, consequently, to understand it better.

However, the amplitude of a child's vocabulary is directly influenced by factors extrinsic to the individual, including language stimulation, the variety of vocabulary, the relationship with interlocutors that enable new learning, the environment the child is in and the socioeconomic level, with the child being the manager of new learning and having experiences with the external environment (Capellini, Butareli, & Germano, 2010).

In Brazil, the education system is divided between public and private schools. The deficiencies in the public system are one of the drivers of the development of research in schools belonging to the public school system, aiming to identify deficits in the educational profile and helping to design interventions, through health-care providers and educators (Marques & Marandino, 2018).

Accordingly, this study aimed to outline the profile of the performance in receptive vocabulary and reading comprehension tests of students in the 3rd, 4th and 5th years of elementary education, in the public school, of the state of Rio de Janeiro-RJ/Brazil.

## 2. Method

### 2.1 Participants

A total of 42 schoolchildren enrolled in the 3rd, 4th and 5th years of elementary education I of the public school system of the state of Rio de Janeiro participated in this study. They had no school difficulties reported (with a school mean above 7.0 in reading and writing for two consecutive weeks – Portal MEC), were of both genders, in the age group from 8 to 11 years of age, and were distributed into three groups: Group I (GI): composed of 15 schoolchildren, belonging to the 3rd year; Group II (GII): composed of 15 schoolchildren, belonging to the 4th year; and Group III (GIII): composed of 12 schoolchildren, belonging to the 5th year. The description of the sample by gender and age for each school year is shown in Table 2.1.1.

Table 2.1.1. Distribution of the sample by gender and age for the school year

Participants	3 <sup>rd</sup> year	Age	4 <sup>th</sup> year	Age	5 <sup>th</sup> year	Age
Girls	57% (24)	53% (8)	8y3m	47% (7)	9y5m	75% (9)
Boys	43% (18)	47% (7)	8y11m	53% (8)	10y2m	25% (3)
Total	100% (42)	100% (15)		100% (15)		100% (12)

The selection of schoolchildren was performed according to the pre-established inclusion and exclusion criteria. The inclusion criteria were: absence of indicators of hearing and vision changes or related complaints; absence of indicators of the presence of neurological, behavioral or cognitive disorders or related complaints. The exclusion criteria were: the parents or guardians not signing the consent form, presence of complaints of auditory and/or visual alterations, and the presence of neurological, behavioral or cognitive disorders. The information for the inclusion and exclusion criteria was identified by consulting the school records.

## 2.2 Instruments

For the evaluation of receptive vocabulary, the Vocabulary Test with Images – TVfusp (Capovilla, 2011) – was used: the aim of this test is to evaluate the degree of development of the auditory receptive vocabulary, indicated for children from 7 to 10 years of age, in early childhood education up to the 5<sup>th</sup> year of Elementary Education. The test consists of five training items and 139 test items, ordered by increasing difficulty, being applied individually in this study. Each item contains four alternative images and the student is instructed to indicate the image that best represents the word spoken by the evaluator, with the total number of correct answers calculated for each student. Based on the score established by the instrument, through the total score obtained, it is possible to classify the performance between “very low” and “very high”. Thus, the score is analyzed according to the total number of images (139 items). However, the analysis of the applied items is performed according to the school year, indicating the range of items for each school year.

The results are also ordered by socioeconomic level (SEL) and for this study, a medium SEL was adopted, according to the classification obtained by the Anísio Teixeira National Institute of Educational Studies and Research (INEP, 2015/2017), taking into account the location of the school and the indices obtained in the Brazil Test (2011/2013).

The Reading Comprehension protocol (PROCOMLE) (Cunha & Capellini, 2014) was used to evaluate reading comprehension. This instrument was used to identify which levels of the text structure present difficulties related to the reading comprehension of the student. This instrument can be applied collectively or individually and is composed of four texts, two narrative and two expository. Each text is accompanied by eight multiple choice comprehension questions, four of which are related to the microstructure of the text (two literals and two inferentials) and four related to the macrostructure of the text (two literals and two inferentials).

In the present study, the narrative text (N1), entitled “The umbrella”, and the expository text (E1), entitled “The flea”, were applied individually to evaluate the reading comprehension of the students. All participants were asked to read the text aloud and then to answer the questions related to the comprehension of the text. The texts were presented to the schoolchildren on A4 paper, typed in size 12, black, Arial font, double spaced.

The analysis of the reading of the texts was carried out from the total reading time and reading speed, which is expressed as words per minute, as described by Condemarin and Blomquist (1989). The number of words per minute was calculated by multiplying the number of text words by 60 (seconds), with this value being divided by the total reading time in seconds, according to the following formula:

$$\text{Reading speed} = \frac{\text{number of words in text} \times 60}{\text{total reading time of the text}}$$

### 2.3 Data collection procedure

The students were invited to participate in the study and informed about the confidentiality of the answers. The instruments were applied individually, in a room provided by the school, after authorization from the principal and teachers, with

the instruments being applied during class time. The application of both instruments lasted approximately 40 to 50 minutes.

## 2.4 Ethical procedures

This research project was submitted and approved by the Research Ethics Committee of the Fluminense Federal University – CEP/UFF – under the authorization number 1870.336. The institution signed a form authorizing the performance of the study and those responsible for the students signed a consent form, in accordance with resolution CNS 466/12 of the National Health Council, with an assent form signed by the research participants.

## 2.5 Data analysis procedure

The results were statistically analyzed, with the quantitative variables presented as mean and standard deviation. The data normality test was performed using the Shapiro–Wilk test. The Kruskal–Wallis test was performed to compare the variables and to correct responses and errors in the vocabulary test with images, according to the comparison groups, with Dunn’s test used for the post-hoc. In order to associate the performances of the PROCOMLE variables according to the comparison groups, the Kruskal–Wallis and ANOVA tests were performed, based on the data normality test. Dunn’s post-hoc test was used followed by the Bonferroni test. The level of significance was set at  $p < 0.05$ . The statistical program used was Stata version 11.0.

## 3. Results

Table 3.1 presents the results of the comparison of the GI, GII and GIII students’ performances in the vocabulary test with the TVfusp, in which it can be seen that there was a statistically significant difference for the two variables analyzed, these being the number of correct responses and number of errors.

Table 3.1. Comparison of the performance of GI, GII and GIII for the vocabulary test with images – TVfusp

Variables	Group I		Group II		Group III		P-value
	Mean	SD	Mean	SD	Mean	SD	
Correct responses	109.66	10.06	115.33	9.84	123.5	6.81	0.001*
Errors	29.33	10.06	23.66	9.84	15.5	6.81	0.001*

Regarding the analysis of the results of the PROCOMLE narrative text test, Table 3 presents the distribution of the means, standard deviations and p values, for the comparison of the GI, GII and GIII groups. There was a statistically significant difference for the literal macrostructure comprehension variables (LMA) in the comparisons between GI x GII and GI x GIII, number of correct responses and errors between GI x GII and GI x GIII, words per minute (WPM) between GI x GIII and GII x GIII, and total reading time (TRT) in the comparisons of GI x GII, GI x GIII and GII x GIII.

Table 3.2. Comparison of the performance of GI, GII and GIII for the PROCOMLE narrative text comprehension test.

Variables	Group I		Group II		Group III		p-value
	Mean	SD	Mean	SD	Mean	SD	
LMI	1.35	0.63	1.73	0.45	1.83	0.38	0.062
LMA	0.78	0.57	1.40	0.63 <sup>a</sup>	1.58	0.66 <sup>b</sup>	0.005*
IMI	1.00	0.78	1.33	0.81	1.41	0.79	0.367
IMA	0.85	0.66	1.33	0.72	1.33	0.77	0.147
Acertos	4.00	1.79	5.80	1.47 <sup>a</sup>	6.16	2.03 <sup>b</sup>	0.006*
Erros	4.00	1.79	2.20	1.47 <sup>a</sup>	1.83	2.03 <sup>b</sup>	0.006*
PPM	63.07	18.44	81.86	22.57	110.83	19.48 <sup>bc</sup>	< 0.001*
TTL	281.14	100.10	219.00	94.58 <sup>a</sup>	149.83	25.91 <sup>bc</sup>	< 0.001*

LMI: literal microstructure, LMA: literal macrostructure, IMI: inference microstructure, IMA: inference macrostructure, CRs: correct responses, WPM: word per minute, TRT: total reading time. a – Difference between Group I and Group II; b – Difference between Group I and Group III; c – Difference between Group II and Group III.

Table 3.3 shows that there was a statistically significant difference, in the comparison among GI, GII and GIII, for the inference macrostructure comprehension variables (IMA) between the groups GII x GIII, number of correct responses and errors in the comparison between GI x GIII, words per minute (WPM) for GI x GIII and GII x GIII, and total reading time (TRT) for GI x GII, GI x GIII and GII x GIII, according to the distribution of the means, standard deviations and p values.

Table 3.3. Comparison of the performance of GI, GII and GIII for the PROCOMLE expository text comprehension test.

Variables	Group I		Group II		Group III		p-value
	Mean	SD	Mean	SD	Mean	SD	
LMI	1.14	0.77	1.26	0.79	1.58	0.66	0.325
LMA	1.28	0.82	1.26	0.79	1.75	0.45	0.202
IMI	1.07	0.91	1.46	0.63	1.66	0.65	0.166
IMA	1.07	0.82	1.00	0.65	1.66	0.49 <sup>c</sup>	0.033*
CRs	4.57	2.47	5.00	1.51	6.66	1.23 <sup>b</sup>	0.016*
Erros	3.42	2.47	3.00	1.51	1.33	1.23 <sup>b</sup>	0.016*
WPM	55.64	19.06	71.80	24.38	109.83	24.52 <sup>bc</sup>	<0.001*
TRT	299.57	81.60	244.13	105.48 <sup>a</sup>	149.16	34.29 <sup>bc</sup>	<0.001*

LMI: literal microstructure, LMA: literal macrostructure, IMI: inference microstructure, IMA: inference macrostructure, CRs: correct responses, WPM: word per minute, TRT: total reading time. a – Difference between Group I and Group II; b – Difference between Group I and Group III; c – Difference between Group II and Group III

#### 4. Discussion

The results of this study allowed us to describe the performance of elementary education students of the 3rd, 4th and 5th years of a public school of medium SEL, in the State of Rio de Janeiro/Brazil. The performances obtained in the Vocabulary with Images (TVfusp) test and the PROCOMLE narrative and expository text comprehension test were compared.

In the analysis of the results of the receptive vocabulary test, it was verified that there was an increase in the means of performance, over time, based on the correct responses presented by the groups. The knowledge of the meaning of the word is a variable that expands according to the development, is associated with

social factors and knowledge of the world, and is also influenced by the learning obtained in the school process during literacy teaching. Thus, receptive vocabulary is a reflection of the association between extrinsic factors (related to sociocultural experiences and formal educational learning) and intrinsic factors (associated with the processing of auditory and/or visual information for memory formation) (Martins & Capellini, 2014; Van Dyke et al., 2014; Gray et al., 2017).

For the analysis of the comprehension of the narrative text, there was an increase in the means of performance for the literal macrostructure comprehension variable (LMA) in the comparisons of GI x GII and GI x GIII. These findings suggest that the students had greater proficiency in comprehending literal information related to the text as a whole, in the broad sense of the information provided by the narrative text. Furthermore, it allows us to infer that it was more difficult to make inferences related to the textual microstructure, suggesting a specific difficulty in the ability to extract information that is implicit and in specific parts of the text. This performance identifies the complexity of making inferences, since this ability requires the association and elaboration of perceptual mechanisms associated with experiences and knowledge of the world, which are specific and unique to each individual (Crookston et al., 2013; Hall-Mills & Apel, 2015).

The words per minute (WPM) and total reading time (TRT) variables presented means of increasing and decreasing performance, respectively, indicating reciprocity in terms of performance. According to the literature, the efficacy of word decoding in a fast and precise way generates an increase in the reading speed, since the access to the information occurs in an automated way for decoding high, medium or low frequency words without errors (Horowitz-Kraus et al., 2014). This characteristic suggests a relationship between precision and speed (automatism) in word recognition, reflected in the execution time for decoding (Saine, Lerkkanen, Ahonen, Tolvanen, & Lyytinen, 2010; Miller et al., 2014; Bovo et al., 2016; Psyridou et al., 2018).

Regarding the expository text, for inference macrostructure comprehension (IMA), the students presented a statistically significant difference in performance in the comparison of GII x GIII, suggesting that the performance in the reading of expository text intensifies from the 4th year of elementary education on. This being a period in which greater abilities are required to extract information from the reading material in a specific and punctual way. It is believed that students in

the final school years have already been exposed to specific learning associated with the reading of expository texts, such as the decoding of symbols, use of orthographic rules, syntactic integration and semantics in the sentences, resulting in reading fluency. These aspects are reflected in the analysis of the information for the abstraction of the content, so that the information makes sense to the reader (Federmeier et al., 2010; Nalom et al., 2015). These factors may contribute to the lower means of performance of the students of GI and GII, since these students had not been explicitly and conceptually exposed to this learning.

The increase in the mean for the number of words read per minute (WPM) and the decrease in total reading time (TRT), in the use of expository text, suggests the influence of progression over time, as well as the associated use of the comprehension of the meaning of the words and junctions of statements present in the text. Studies suggest that the mechanisms of expository text comprehension require associative maneuvers with respect to the monitoring of the type of information accessed, being directly influenced by short-term verbal memory for information retrieval after the reading and understanding of the information (Van Dyke et al., 2014; Murphy, Pagan-Neves, Wertzner, & Schochat, 2015; Cunha & Capellini, 2016).

According to the national and international literature, access to narrative texts is present in the child's life from moments prior to schooling, since contact with this textual genre occurs through storytelling, which makes this structure familiar to the child. On the other hand, contact with expository texts is formally carried out in the more advanced years, since the expository textual genre is used to transfer information, as a tool for the formal learning of specific contents, which suggests that students have already developed basic skills to make them fluent readers and able to understand and interpret denser content (Nalom et al., 2015; Cunha, Martins, & Capellini, 2017).

Thus, the comparison between the performances in the reading of narrative and expository texts indicates an increase in the mean of performance, suggesting a continuous formal and informal learning process that is influenced by the external/social environment and the stimulation received within and outside of the educational context. In the comprehension of a narrative or expository text, the reader must make use of abilities that evolve from the recognition of the word, the extraction of the meaning of the vocabulary within a sentence, followed by the inte-

gration of the sentences and the knowledge of the world associated with the content. Accordingly, the absence of connections between these factors generates failures in the comprehension process, making it inefficient in capturing literal or inferential information, associated with the textual micro or macrostructure (Van Dyke et al., 2014, Cunha & Capellini, 2016, Marques & Marandino, 2018).

## 5. Conclusion

According to the results, when comparing the GI x GII x GIII groups in relation to their performance in receptive vocabulary and reading comprehension of the narrative and expository genres, it was possible to outline the performance profile for this specific sample. For the receptive vocabulary test, there was increasing performance over time, with a similar pattern of performance in the comprehension of the macrostructure, however, not in the comprehension of the microstructure. This implies a profile that results from better performance in the comprehension of narrative text than of expository text, specified in the increase in the mean performance obtained in the macrostructure for the literal comprehension of the narrative text and for inference in the expository text.

Although the study aimed to contribute to the reflection regarding the profile of schoolchildren of public elementary schools located in the state of Rio de Janeiro, we identified as a limitation the need to expand the sample to compare school students from different schools and NSE, in the same municipality, in order to broaden the findings. Furthermore, the application of the instruments with students with specific reading and comprehension difficulties could possibly identify findings directly related to the influence of receptive vocabulary.

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