

# Reading acquisition in beginner readers: Typical errors in European Portuguese<sup>1</sup>

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## Abstract

The study of the strategies that children use in reading words and the analysis of errors that typically occur throughout the learning process are of critical importance for the understanding of reading acquisition. The objective of this study was to understand the process of reading acquisition in European Portuguese in the beginning of elementary school. We sought to know if there would be differences in the frequency of phonological and lexical errors and in the pattern of phonological errors between the first two years of elementary school. The participants were 175 children from the 1st year and 137 from the 2nd year from 6 schools. An oral word reading task was applied. The errors were categorized as phonological, with several subcategories, and lexical. Differences were found in the frequency of phonological and lexical errors between the two years as well as in the subtypes of phonological errors that typically occurred. The most frequent errors were in substitution, occurring mostly in the consonants and digraphs. Errors of addition and suppression mainly occurred in complex syllables. These results that contributed to a characterization of the typical errors in this learning phase are an important tool in the detection of early difficulties in the reading process and in the adequacy of teaching-learning strategies. This study allows for a better understanding of the processes used by children in solving the problems that the characteristics of the Portuguese language poses to them, as well as allowing for an educational intervention that leads to greater success in learning to read.

## Keywords

Beginning learners – Learning – Word reading – Error pattern

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## Introduction

Researchers in different fields such as cognitive psychology, educational psychology, psycholinguistics and education have contributed to the study of reading. This focus reflects the theoretical importance as well as practice of the investigation of reading processes. Indeed, many children experience early reading difficulties that often persist throughout schooling and affect school success in a number of areas for which reading is essential. In this context, the study of the processes involved in this learning is essential to improve teaching strategies and adapt them to the diversity of students who attend the initial years of elementary education.

In order to improve the teaching of reading it is important to understand how the normal development of reading takes place. The study of the strategies that children use in reading words and the analysis of errors that typically occur throughout the learning process in a given orthography, are therefore of great importance.

It is now agreed that the ability to recognize written words is one of the indispensable skills for a strong reading performance (COLTHEART, 2012), as well as a skill that is acquired by the child as she becomes proficient in reading (EHRI, 2005). In this context, word recognition models appear in order to try to characterize the mental processes involved in the proficient reading process. The dual-route model (COLTHEART, 2012; COLTHEART et al, 2001) is one of the most influential in this respect. This model suggests that there are two ways of linking writing and speech: the lexical route and the non-lexical or phonological route. The first one implies a direct access to the pronunciation of a word stored in the lexical memory, sort of internal dictionary in which the known words are being stored. The non-lexical route implies that access to the pronunciation of a word passes through the transformation of graphemes into phonemes, that is, through grapheme-phoneme correspondence rules, and by assembling the pronunciation of that word from that sequence of phonemes.

Based on this model, the acquisition of reading has been studied through oral word reading. Indeed, the analysis of the type of errors that children make in oral word reading may indicate the strategy underlying the performance in reading, such as the change in cognitive processes throughout the individual's development (MCGEOWN et al., 2013). Reading errors are usually divided into two broad categories - lexical errors and phonological errors.

Lexical errors are those in which the target word is replaced by another real word which is visually or phonetically similar. In the literature, this type of error has been called visually similar error, verbal paralexia, orthographic error, or real-word responses. Lexical errors reflect the use of the lexical route or direct access to the mental lexicon.

Phonological errors, the most unanimous designation in the literature, are those in which there is a change in some grapheme-phoneme correspondence of the word, resulting in a non-word reading. These errors, which reflect a difficulty in using the indirect way to access the mental lexicon, can comprise substitution, suppression, addition, inversion, accentuation, tonicity and regularization, among others. Phonological errors reflect a difficulty in using the indirect route to access the mental lexicon. It is natural that a

greater complexity in grapheme-phoneme correspondences may lead to more errors of this type during the reading acquisition process.

Several comparative studies between orthographies with more or less direct phoneme-grapheme correspondence, that is, with different degrees of transparency, have managed to realize that although phonological and lexical strategies are used in all of them, there is a prevalence of phonological strategies in reading words in the initial phases reading acquisition (SEYMOUR et al., 2003; SERRANO et al., 2010).

Seymour et al. (2003) conducted a cross-linguistic study in which the acquisition of reading in 13 European languages was analysed through the identification of letters, reading of familiar words and non-words in children of the 1st and 2nd year of schooling. These orthographies varied in their transparency, from the more transparent, such as Spanish, the intermediate, such as Portuguese and French, to the most opaque, like English. They also varied in the level of syllabic complexity, from Spanish or Portuguese with simple syllabic structures, to French and English with complex syllabic structures. Portuguese, French, Danish and English readers were identified as those who showed less acuity and fluency in reading familiar words, and Portuguese readers achieved lower results. In reading non-words, readers of Portuguese and French showed the greatest difficulty in decoding, once again with Portuguese readers obtaining lower results, although Portuguese has a simple syllabic structure. These authors argue that there is a threshold of orthographic complexity from which, instead of using only a base process for reading (transparent orthographies) it would be necessary to use two base processes with distinct mechanisms of word decoding and word recognition. Portuguese is seen from this perspective as being above this threshold, that is, the acquisition of reading is processed in a way which has strong similarities to the more opaque orthographies.

In turn, Serrano et al. (2010) conducted a longitudinal study comparing the acquisition of word reading and writing in Portuguese, French and Spanish. The tasks were very similar to those used in the study by Seymour et al. (2003). With regard to the reading of words and pseudowords, Spanish children achieved better results than Portuguese and French children. The authors explain these results based on the greater inconsistency in grapheme-phoneme correspondence in the Portuguese and French languages.

In a comparative study between European Portuguese and Spanish in the early years of reading acquisition, Defior et al. (2002) found that the number of phonological errors tended to decrease throughout schooling and the number of lexical errors increased. Portuguese children, even in the 4th year of schooling, made more phonological errors than the Spanish children, and there were no differences between the two orthographies in lexical errors, except in the 1st year. Interestingly, in the first year, Portuguese children made a greater number of lexical errors, which seems to indicate that they resort to the processes of the direct or lexical route in reading at an earlier stage. Due to the similarity in the pattern of results, the authors state that the children of the two orthographies use the same reading strategies, although Portuguese children experience more difficulties due to the greater complexity of phoneme-grapheme correspondences. The characteristics of European Portuguese that is considered to be an intermediate or semi-transparent orthography, in which the grapheme-phoneme correspondences are not

one-to-one and in which there are contextual rules and irregularities, may explain the results obtained.

Several studies have been carried out to understand how reading errors develop throughout schooling in Brazilian children. These studies have demonstrated that there is a predominant use of phonological strategies in the early stages of learning to read which are replaced by the use of lexical or orthographic strategies in later stages in reading acquisition (CUNHA et al., 2010; PINHEIRO 1994, 1995; PINHEIRO et al., 2008; SALLES; PARENTE, 2007).

Cunha and Capellini (2010) characterized the reading errors in children from the 1st to the 4th year of schooling using word and pseudoword reading tasks. They classified the reading errors into five categories: regularization, visually similar words, unsuccessful attempts to sound, failure to apply spelling rules and refusals. For the pseudowords regularization error and visually similar word were removed and the latter was replaced with lexicalization (pseudoword reading for a real word). The authors found significant differences for all errors per year of schooling, except for the *refusals* error. The pattern of the typology of errors was the same in all years of schooling either for word reading or for pseudowords, with phonological unsuccessful attempts being the most frequent error. The authors conclude that the use of the phonological route for decoding is important for new and unknown words and that the transition to lexical reading depends on the phonological abilities and the effective learning of the orthographic rules which will form the orthographic lexicon.

In addition, Pinheiro (1994, 1995), in her qualitative analysis of reading errors in real words obtained mostly phonological errors that resulted in neologisms, that is, non-words. These were characterized by omissions, repetition of letters and exchange of letters in consonants and vowels. The author found a number of regularization errors which occurred very often in irregular words with the grapheme <x> as well as in words with context-dependent consonants, such as <s> between vowels. This type of error involving rules tended to decrease with the advance in schooling, although it persisted in children with reading difficulties.

Salles and Parente (2007) in a study on the type of errors in the second school year verified that the children in word reading committed a greater number of errors in regularization than lexical errors and of ignorance of rule dependent on the context, evidencing a predominance of the use of the phonological route over the lexical route in reading.

Several studies have shown that the complexity of phoneme-grapheme correspondences, as well as the syllabic structure affect the acquisition of reading (BARCA et al., 2007; RAHBARI et al., 2010; SPRENGER-CHAROLLES; SIEGEL, 1997).

In terms of errors produced in the vowels and consonants, Loff and Vale (2007) verified in the European Portuguese that the children of the 1st year presented more errors in the vowels than in the consonants, which can be explained by the complexity of the rules of phoneme-grapheme correspondence in which the 5 vowel letters correspond to 18 phonemes. However, in Spanish (GOIKOETXEA, 2006), Italian (COSSU et al., 1995) and French (SPRENGER-CHAROLLES; SIEGEL, 1997) the consonant substitution

errors were more frequent than the vowel substitution errors. Substitution errors frequently appeared in the dependent consonants context (GOIKOETXEA, 2006; VALLE-ARROYO, 1989) where children regularized these consonants, reading them with the most common phonetic value.

In several orthographies children also show reading difficulties in the case of digraphs. There is evidence that children, even after receiving explicit instruction in the digraphs, tend to develop a delayed understanding of their use (EHRI; SOFFER, 1999). Nunes and Aldinis (1999), in Brazilian Portuguese, found that children in the first years of schooling made more mistakes in words that contained digraphs as opposed to those that did not, and that weaker readers had greater difficulties with digraphs. They put forward the hypothesis that these readers do not understand the need for the consonantal digraph to represent a sound due to phonological difficulties (eg. difference between <n> and <nh>), or because of the difficulty of using graphemes involving more than one (Nunes; Byrant, 2014). Even in oral language, the digraphs present a certain order of acquisition, and the digraph <nh>, nasal consonant [ɲ] is the first to be acquired, followed by the <ch>, fricative consonant [ʃ] and the <lh> lateral consonant [ʎ] (FREITAS et al., 2012).

In Portuguese there are also rules of position, that is, double consonants can only appear in the middle of two vowels and never at the beginning or end of words. Rego and Buarque (1999) in Brazilian Portuguese, verified that children, in the first years of schooling, choose to substitute the <rr> for <r>, perhaps because they are based on the alphabetical principle, that each corresponds to a letter. In relation to the syllabic structure, Sprenger-Charolles et al. (1997) studied the effects of syllabic structure on the development of reading and writing in French children of the first year of schooling. They verified that there was better performance in pseudowords with simple CV syllabic structure when compared to complex syllabic structures like CCV and CVC. Goikoetxea (2006) in Spanish and Monteiro (2007) and Monteiro and Soares (2014) in Brazilian Portuguese also verified that children demonstrated many difficulties in reading complex syllables and used different reading strategies in order to transform the most complex syllables into canonical syllables.

In a study by Monteiro (2007) with children with reading difficulties, the strategies most used to solve the difficulty of reading complex syllables were: the omission of the ramification of the attack in syllables of the type CCV; the omission of the coda in CVC-type syllables and the insertion of graphemes in the reading of syllables of CVC type. According to Monteiro and Soares (2014), the conjugation of a consonant with a vowel would be the base - decoding model, to which the children would return when they face difficulties with the complex syllables. However, this strategy becomes inefficient to decode words with complex syllables or even grapheme-phoneme correspondences subject to context rules. Thus, the difficulty of acquiring grapheme-phoneme correspondence rules, as well as the orthographic patterns of the language lead children into making reading errors. The development of these skills becomes fundamental to learning how to read and for the effective use of the lexical route.

Few studies have been done in European Portuguese concerning the way in which errors in reading evolve in the first years of elementary school. We will mention those of Gomes (2001), Loff and Vale (2007) and Fernandes et al. (2008).

Gomes (2001) verified through the reading error analysis of children from 1st to 3rd year of schooling that most errors occurred in words with complex syllables. The greatest number of reading errors occurred in the first year of schooling, and in the 2nd and 3rd year the errors were already small in number. Based on the analysis of the cross syllabic structure with the type of errors, it was verified that in the VCVC and CCVCV structure, the children of the 1st year mostly use addition, while in the CVCCV structure omission error predominates. In the CV ~ CV structure, children also showed a tendency to add a vowel or to omit nasalization.

Loff and Vale (2007) analysed the types of errors that children from the first four years of elementary school committed in oral word reading. The results show that the average percentage of errors decreased dramatically from the 1st to the 2nd year, and there were no statistically significant differences from the 3rd year to the 4th year. With regard to the categories of errors, they observed that errors involving phonemic analysis of the word were more frequently committed than regularization errors. Only in year 4 this pattern is reversed. However, the study did not reveal significant differences between the years of schooling for the different categories of error. In conclusion, the authors maintain that the quantitative progression is made clearly over the 4 years, but the reading strategies, except for the change between the 1st and 2nd year, tend to be very similar both in the beginning readers and in the more advanced. The children seem to construct an orthographic lexicon right from the 1st year of schooling, but the reading strategy continues to be mostly phonological decoding until the end of the 4th year.

Fernandes et al. (2008), in a study with Portuguese children of the 1st year of schooling, through the evaluation of the reading and writing of words and pseudowords, verified an effect of regularity and grapheme complexity indicating that children depend on the grapheme-phoneme conversion process for reading words at this early stage of reading.

Given the importance of these types of studies in understanding the learning process in reading and given the fact that research in European Portuguese is still narrow, our objectives were to understand which types of errors were most frequent in the first two years of schooling and, through a qualitative analysis, to see in which phoneme-grapheme correspondences the errors were most often committed, in order to recognize which correspondences are most problematic for the children. We therefore sought to answer the following research questions:

Are there differences in the frequency of phonological and lexical errors between the 1st and the 2nd year of schooling?

Is there a difference in the pattern of phonological errors between the 1st and 2nd year of schooling?

## Method

### Participants

The participants were 175 children attending the 1st year of elementary school and 137 attending the 2nd of elementary school from six primary schools (four public schools / five 1st grade classes and five 2nd grade classes; two private schools / four 1st grade classes and two 2nd grade classes) in Lisbon, Portugal. In the 1st grade there were 75 female participants and 100 male participants; in the 2nd grade there were 63 females and 74 males. The average age of children in the 1st grade was 84.01 months ( $SD = 4.06$ ) and in the 2nd grade 95.63 months ( $SD = 4.51$ ).

With regard to the level of schooling of the parents, the majority had the equivalent of secondary education (parents: 27%, mothers: 25.3%) or had attended higher education (parents: 32.1%, mothers: 36%). Public schools were in medium/ medium-low socioeconomic environments, while private schools were located in medium-high / high socioeconomic environments.

Participation consent was requested from the schools as well as from the parents of all children.

A questionnaire was applied to teachers regarding their method of teaching how to read. Most teachers claimed to use an analytical-synthetic approach.

We selected only children whose first language was Portuguese and who had no special educational needs.

### Tasks

An Oral Word Reading Task (ALVES MARTINS; SIMÕES, 2008) was given to the 1st and 2nd grade. It consisted of a list of 32 words that vary in regularity, frequency, extension and syllabic structure. There are 16 regular and 16 irregular words; 21 are non-frequent and 11 are frequent. The number of letters in the words varies between 4 and 9, with 19 short words and 13 long words. As regards the syllabic structure, words with different syllabic formats were considered.

Regarding the internal consistency of the test, the value of Cronbach's  $\alpha$  coefficient was .97. It may be considered, therefore, that the test has high internal consistency.

The task was individually administered and was presented on paper.

The following instructions were given:

*“Read aloud the words in this list, the best you can and as fast as you can.”*

Each correct answer was quoted with 1 point, and the results could range from 0 to 32 points. The task was timed, which allowed for the calculation, for each child of the number of correctly read words per minute.

## Procedure

The test was held in a room near the classroom free of distractions and with reduced noise in the vicinity. The test was conducted individually with the child and the investigator. The reading was recorded in audio format, with the *Audacity* program and transcribed into the written form of the word orally read.

In order to be able to analyse the results we proceeded to the categorization of the reading errors committed. A classification grid of error types was used adapted from studies conducted in Brazilian Portuguese (ÁVILA et al., 2009; PINHEIRO et al., 2008; SALLES, 2005; SALLES; PARENTE, 2007) and authors of other languages (DEFIOR et al, 2002; GOIKOETXEA, 2006; GOULANDRIS, 2004).

Error coding was performed separately by two investigators with high levels of agreement ( $\kappa = 0.91$ ).

The classification of the types of errors that served as the basis for the analysis of the incorrect answers is presented.

Two major categories of errors were considered: phonological and lexical.

- Phonological errors: occur when there is a substitution, addition, suppression inversion or change of accentuation.

- *Substitution errors*: substitution of one or more phonemes – a vowel (eg. <oval> read as *uval*), a consonant (eg. <fritar> read as *britar*) or digraphs (eg. <unhas> read as *ulhas*).

- Addition errors: adding one or more phonemes to a word (eg <blusa> read as *belusa*; <fritar> read as *fritare*; <clarão> read as *calarão*).

- Omission errors: deletion of one or more sequential phonemes or syllables (or suppression of a vowel in a diphthong) (eg. <clarão> read as *carão*; <próximo> read as *póximo*).

- Inversion errors: inversion of two or more graphemes constituting the word, or change the order of the syllables in the word (eg. <clarão> read as *calrão*; <lavrador> read as *lavardor*).

- Accentuation errors: changing the word tonicity, ie. the incorrect reading of stress or the change of accentuation in the word (eg. <arroz> read as *árroz*; <hortelã> read as *hortéla*).

All these errors can occur more than once per word. Each incorrect response was subject to error rates up to a maximum of 4 errors per word.

- Lexical errors: occur when a target word is read as another real word, this reading being caused by orthographic or phonological proximity with the stimulus word (eg <vozes> read as *você*; <blusa> read like *bolsa*). This type of error occurs only once per word.



## Results

The means and standard deviations of phonological and lexical errors for the first two years of schooling are presented in Table 1. Although phonological errors may occur more than once per word, in this analysis they were only counted once per word to allow comparisons with lexical errors.

**Table 1-** Means and standard deviations of phonological and lexical errors in the 1st and 2nd year of schooling.

Error Types	1 <sup>st</sup> Year		2 <sup>nd</sup> Year	
	M	SD	M	SD
Phonological	8.68	7.67	4.03	4.31
Lexical	0.21	0.49	0.52	0.88

Source: survey data

As can be seen in Table 1, the mean of phonological errors is higher than the mean of lexical errors in both the 1st and the 2nd years. However, the frequency of phonological errors decreases from the 1st to the 2nd year, while the frequency of lexical errors increases from the 1st to the 2nd year. Phonological errors occurred in 87% (160/175 children) of the 1st year sample. In the second year phonological errors occurred in 85.1% (120/137 children) of the sample. The lexical errors occurred in

18.3% (32/175 children) of the first year sample. In the second year the lexical errors occurred in 34.3% (47/137 children) of the sample. Lexical errors found more frequently in the 2nd year, were the following words: <quadro> read as *quadrados*; <blusa> read like *bolsa*; <raiz> read as *reis* and <vozes> read like *voçê*.

In order to make the comparison between the 1st and 2nd year of schooling, two independent samples t-tests were performed, having as an independent variable the year of schooling and as dependent variables lexical errors and phonological errors. The results show that there were statistically significant differences in the phonological errors between the 1st and the 2nd grade ( $t(283.63) = 6.77, p < .001$ ), the 1st year having a greater number of phonological errors compared with the 2nd year. As for the lexical errors, statistically significant differences were also obtained between the 1st and the 2nd grade ( $t(200.55) = -3.68, p < .001$ ), the 2nd year children having an average of errors higher than in those in the first year.

## Subcategories of Phonological Errors

The mean and standard deviations for the subcategories of the phonological errors of the 1st and 2nd year children are presented in Table 2. As previously mentioned, these errors can occur more than once per word. In this analysis we took into account the total number of phonological errors committed by the children.

**Table 2-** Means and standard deviations of the subcategories of phonological errors in the 1st and 2nd year of schooling.

Error Subtypes	1 <sup>st</sup> Year		2 <sup>nd</sup> Year	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Substitution	6.99	7.46	2.82	3.93
Addition	2.51	4.25	0.5	1.02
Omission	2.11	3.02	0.74	1.41
Accentuation	1.9	1.77	1.26	1.33
Inversion	0.64	1.11	0.38	0.97

Source: survey data

We can see that substitution errors, both in the 1st year and the 2nd year, are the most frequent (eg. <mentiu> read as *mendiú*, or <arroz> read as *arruz*). In the first year, addition errors come in second place (eg. <fritar> read as *feritar*), followed by omission errors (eg. <crystal> read as *crital*) and accentuation errors (eg. <hortelã> read as *hortéla*). In the second year, the order of these three types of errors changes, with accentuation errors being the most frequent, followed by omission errors and finally addition errors. Inversion is the least frequent error in both years (eg. <clarão> read as *calrão*). The hierarchy of subtypes of phonological errors is not the same, revealing that the pattern of errors is different between the two years of schooling.

In order to compare the various subcategories of phonological errors between the 1st and 2nd year of schooling the non-parametric Mann-Whitney test was used. We found that there were statistically significant differences among all the subcategories: substitution errors ( $U = 7908.00$ ;  $p < .001$ ); addition error ( $U = 8263.50$ ;  $p < .001$ ); omission errors ( $U = 8475.50$ ;  $p < .001$ ); accentuation errors ( $U = 9349.00$ ;  $p < .001$ ) and inversion errors ( $U = 10170.50$ ;  $p < .01$ ).

Since substitution errors are the most frequent, we will look at the substitution error subtypes in more detail further on. With regard to the addition errors, these occurred more frequently in the words initiated by a CCV syllable, the children adding mostly a vowel to

this syllable, usually the phoneme [e] (eg. <blusa> read as *belusa*; <trincha> as *terincha* or <glutões> as *guelutões*).

With regard to omission errors, children also used this strategy to solve the reading of CCV syllables (eg. <plantei> read as *pantei* or <próximo> read as *póximo*) for reading the plural (eg. <vozes> read as *voz*; <jovens> read as a *jovem*) and words like <zarolho> read as *zaro* to solve the digraph difficulty.

Regarding the accentuation errors, these are common in the two years of schooling in the following words: <raiz, vozes, águias, hortelã, exercício>. In the words <águias> and <hortelã>, children derive the accentuation of words resulting in reading *aguias* and *hortéla*. In the words <vozes> or <exercício> children alter the tone of vowels, resulting in reading *vozés* and *éexercício*, where [e] is replaced by [ɛ] as this phonetic value is the most common and is also the letter's name. Finally, the word <raiz>, children read *rais*, ie. ignored the hiato.

Finally, inversion errors, the less frequent errors, mostly occurring in the 1st grade, mainly took place in words containing the CCV syllable (eg. <próximot> read as *póximo*; <blusa> read as <bulsa> or <clarão> as *calrão*).

### Subtypes of substitution errors

Substitution errors were subdivided into four subtypes: vowel, consonant, vowel digraph and consonantal digraph error.

Table 3 presents the percentage of these errors in the 1st and 2nd year. This percentage was calculated using the number of errors divided by the number of possible occurrence of the error type in question. The results were converted into percentages.

**Table 3-** Percentage index of substitution error subtypes.

Substitution error subtypes	1 <sup>st</sup> Year		2 <sup>nd</sup> Year	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Consonant	15.81	23.45	5.72	13.17
Vowel	7.1	12.43	2.71	7.25
Vowel digraph	3.78	4.14	1.47	2.01
Consonantal digraph	2.42	3.06	1.1	1.66

Source: survey data

Consonant substitution subtype is the most common error in both 1st year and 2nd grade. The words in which children commit the consonant substitution error more often

are, for example: <vozes> read as *vosses*; <zarolho> read as *sarolho* or <crystal> read as *sristal*.

There are also errors associated with explicit rules that are disregarded in both the 1st and 2nd year, such as the <s> between vowels corresponding to the phoneme [z], as in <casa> or the grapheme <g> which, followed by <e> or <i> corresponds to the phoneme [ʒ] instead of [g]. Common examples of this type of error are: <girassol> read as *quirassol* and <blusa> read as *blussa*. In these words the children replace the consonant by its more common phonetic value. In reading irregular words we can also observe this mechanism as in <táxi>, <próximo> or <exerço> where the consonant <x> is read [ʃ] (eg. <táxi> read as *tachi*).

In relation to vowel substitution error children tend to replace the reading of the phoneme [o] by [u] or vice versa, for example, <oval> read as *uval*; <jovens> read as *juvens* and <glutões> read as *glotões*.

Within substitution digraph errors, we found that the vowel digraph error is the most frequent in both grades. However, there is a change in the reading strategy of the vowel digraph from the 1st to the 2nd grade. In the 1st year, children replaced a nasalized syllable by a non - nasalized one and added a vowel (eg. <jovens> read as *juvenes*; <plantei> read as *planetei*). By the 2nd year the error in vowel digraph is mostly by suppressing the nasal, replacing the CV syllable by V (eg. <trincha> read as *tricha* or <serpentes> read as *serpetes*).

Both in the 1st year and the 2nd year, the subtype consonant digraph error appears in second place. Children tended to replace a consonant digraph with another, such as <unhas> read as *ulhas*; <trincha> read as *trinha* and <zarolho> read as *zaronho*. However, the replacement of the digraph [ch] and [lh] by the digraph [nh] was more frequently observed.

Both in the 1st year and the 2nd year, children replaced the digraph <gui> in the word <águas> for <gu>, resulting in *águ-ias*. In the 1st grade in particular children substitute reading the <gui> by reading [ʒ i] resulting in reading <águas> as *agías*.

With regard to the digraph, <rr> only children in the 1st year make mistakes, replacing the reading of the digraph <rr> by [r], reading for example <arroz> as *aroz*. In the 2nd year the children master the reading of this digraph.

In relation to the digraph <ss>, only the children of the 1st year replaced the digraph <ss> by [z] as for example in the word <girassol> read as *girazol*, incorrectly applying the spelling rule that the grapheme <s> in the middle of two vowels matches the phoneme [z]. In the 2nd year the children master the reading of this digraph.

In order to compare the 1st to the 2nd grade for the various subtypes of substitution errors, we used the non-parametric Mann-Whitney test. We found that there were statistically significant differences between all subtypes of errors: consonant substitution error (U = 8943.50;  $p < .001$ ); vowel substitution error (U = 7853.50;  $p < .001$ ); vowel digraph error (U = 9767.00;  $p < .001$ ) and consonantal digraph error (U = 9143.00;  $p < .001$ ).

## Discussion

The first question we attempted to answer was whether there would be differences in the frequency of phonological and lexical errors between the 1st and 2nd grade, aiming

to contribute to the understanding of the role of lexical and phonological routes in the recognition of words in the process of learning to read.

The results showed that from 1st to the 2nd year, phonological errors decreased and lexical errors increased. They also showed that the frequency of phonological errors is higher than that of lexical errors. These results are in the same line as those obtained by several authors (ÁVILA et al., 2009; CUNHA; CAPELLINI, 2010; LOFF; VALLEY, 2007; LUCIUS; PINHEIRO, 2011; MCGEOWN et al., 2013; PINHEIRO, 1994, 1995; PINHEIRO et al., 2008; SALLES; PARENTE, 2007). However, with regard to the increase in lexical errors from the 1st to the 2nd, our results differ from those of Defior et al. (2002) in which the lexical errors decreased from the 1st to the 2nd year.

We think that the lexical errors occur due to the fact that the lexical representations are still being consolidated, not yet being fully defined in the lexical memory, which can lead to confusion between visually similar words. These errors seem to reflect the use of the direct route to the mental lexicon. Conversely, the phonological errors that occur due to insufficient decoding strategies reflect the use of the indirect route in reading.

The children in our study were found to use both of these strategies to read in the first two years, which is in line with the dual route model (COLTHEART, 2005; COLTHEART et al., 2001) and with Fernandes et al. (2008: 819) when they say that,

It might be thought that these two processes - phonological mediation and orthographic lexicon - are competitive. At this stage of learning to read and write their relationship seems to be one of cooperation. The heavy reliance on phonological mediation probably creates the conditions for the consolidation of the orthographic representation of words.

With regard to our second research question aimed at understanding if there would be differences in the pattern of phonological errors between the 1st and 2nd grade, we found that the error pattern in the first two years is not the same. If the substitution error is the most common error in the two years and the inversion the less frequent, in the 1st year the second most common error is addition while in the 2nd year it is accentuation. The omission error is 3rd in the two years of schooling. These results are different from those of Cunha and Capellini (2010) who observed the same pattern in every year of schooling.

This higher frequency of substitution errors is also observed in other studies (ÁVILA et al. 2009; GOIKOETXEA, 2006; GOMES, 2001; JIMENEZ; HERNANDEZ, 2000; PINE, 1994). It should be noted that the consonant substitution error was more frequent than the vowel, as in the Italian and Spanish studies (COSSU et al., 1995; GOIKOETXEA, 2006), and unlike the results obtained by Loff and Vale (2007) in European Portuguese.

Specifically with regard to the consonants which are pronounced differently according to the context in which they appear, they are generally replaced by the most frequent phonetic value to which they correspond, which is in accordance with what has been found in other studies (BARCA et al., 2007; FOWLER et al., 1977; GOIKOETXEA, 2006; PINHEIRO, 1994, 1995; SALLES; PARENTE, 2007; VALLE-ARROYO, 1989). These data are due, perhaps, to the high variability of consonant phonemes, particularly in the case of fricatives [s, z, ʃ, ʒ] which may give rise to greater difficulty because these

phonemes present several possible graphemes in writing, requiring a consolidated learning of contextual rules of phoneme-grapheme correspondence (FREITAS et al., 2012). The same happens to the consonant <x> in the context of irregular words (PINHEIRO, 1995; PINHEIRO et al., 2008; SALLES, 2005).

Vowel substitution errors occur predominantly in the vowel <o>, read as [u]. The grapheme <o> has several phonetic values that may lead to this confusion between the phonemes [o] and [u], especially at this early stage of learning to read.

In terms of the consonant digraph group there are many errors mainly in the type of substitution of one phoneme by another, both in the 1st year and the 2nd year. The digraphs <ch> and <lh> are often replaced by digraph [j]. This replacement may possibly be explained because the digraph [j] is the earliest acquired in oral language (FREITAS et al., 2012).

In the vowel digraphs group, children from 1st year, suppress nasalization or add a vowel to the syllable to overcome the difficulty of reading these digraphs, turning the syllable into two CV syllables. In the 2nd year, this mechanism of adding a vowel disappears, which seems to show that the nasal suppression strategy is a more basic process. Gomes (2001) also found similar results.

Another subcategory of phonological errors is the addition errors that mostly occur in complex syllables CCV where children experienced greater difficulty. These syllables are often transformed into CVCV. According to Monteiro and Soares (2014), the combination of a consonant with a vowel would be the decoding model - base, to which children return when struggling with the complex syllables. We also found that addition in these types of syllables is mainly of vowels, namely [e], as Gomes (2001) also reports.

With regard to the subcategory of omission errors, they are in the same place in the error hierarchy in the 1st and 2nd year. The deletion occurs mostly with the consonants and children make this type of error to solve different situations, without a well-defined pattern. However, we could observe that the omission arises mainly as a way of solving the reading of complex syllables or syllables containing digraphs.

In the subcategory of accentuation errors, these are common throughout the two years of schooling and mainly occur through the failure of reading the accent of the word.

Inversion errors are less frequent. However, when they occur the usual transformation is from CCV syllables into CVC syllables, that is, to simplify the syllabic structure of the word. The syllabic complexity influences the performance in reading, as highlighted by Goikoetxea (2006) and Gomes (2001).

When acquiring the alphabetic principle at the onset of literacy, children generally learn to read syllables with a canonical structure and initially make a syllabic reading. The letter combination mechanism is undertaken in the context of canonical syllable or standard CV (Monteiro, 2007).

In conclusion, the initial difficulties that children have in reading can be attributed to issues of phonological recoding, lack of grapheme-phoneme correspondence rules, as well as the poor internalized knowledge of certain complex syllabic structure of Portuguese orthography.

As for the educational implications of this study, we maintain that knowledge of the differences in the pattern of errors of beginning readers in oral word reading can allow for a better assessment of the reading acquisition process. Furthermore, the knowledge of grapheme-phoneme correspondences and of the syllabic structures where these errors often occur may enable the design of specifically targeted teaching strategies for these difficulties. Finally, a better understanding of the processes used by children in solving the problems that the Portuguese language characteristics pose could allow for an intervention that will lead to greater success in learning to read.

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