

# RELATIONS BETWEEN ORTHOGRAPHIC AND PHONETIC-PHONOLOGICAL ASPECTS OF PLOSIVE PHONEMES

## *Relações entre aspectos ortográficos e fonético-fonológicos de fonemas oclusivos*

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### ABSTRACT

**Purposes:** to describe the children's orthographic performance – regarding to the record of plosive consonants from the Brazilian Portuguese; check if the accent influences the occurrence of mistakes inside the words; and classify the pattern of the mistakes distribution. **Methods:** 210 text productions referred to 14 thematic proposals were analyzed, they were collected during the year 2001, when the individuals attended the First grade of Primary School. To describe the children's performance, for the first objective, the data were divided in Hits and Mistakes; for the second objective, the mistakes were classified according to their occurrence in accented and non-accented syllables, and, finally, for the third objective, the mistakes were subclassified in omissions, orthographic and phonological mistakes. The phonological mistakes were even subdivided, according to their occurrence inside and outside the occlusive class. **Results:** for the first objective, 5.746 possibilities of occurrence of plosive consonants in a position of simple syllable onset were found, with a high amount of hits; for the second objective, it was observed a higher occurrence of mistakes in non-accented syllables; and finally, for the third objective, it was possible to observe the predominance of phonological mistakes, followed by omissions and by orthographic mistakes, both inside the non-accented syllables and the accented ones. Still according to the third objective, in the phonological mistakes, a higher occurrence of mistakes inside the class was observed and, again, no accent influence. **Conclusion:** the importance of the phonetic-phonological aspects analysis in the acquisition of child orthography is highlighted, as well as the relevance of the distribution of hits and mistakes in the orthographic performance.

**KEYWORDS:** Handwriting; Language Development; Child; Phonetics; Linguistics

### ■ INTRODUCTION

In the late studies about the acquisition of the writing, primarily, it is pointed out the performance of the students in tasks of orthography codification and decoding. The prominence to this performance can be observed in guided studies: (i) to the orthography errors which describe not only the types of

errors accomplished, but also, mainly, the way as the writing acquisition is expanded <sup>1-3</sup>; (ii) to investigations about the orthographic development in reading, written and phonological awareness tasks <sup>4-10</sup>; and (iii) to the effectiveness of speech therapy programs aiming the improvement of the students performance <sup>11,12</sup>. In other work they are also approached issues related to the infant authorship in the writing and to the criteria which characterize the errors as pathological <sup>13,14</sup>.

Although it is verified a lot of concern in the literature with the orthographic issues, few studies point out the relation among these subjects and phonetic-phonological aspects of language. However, recently, links among orthography and phonology have been investigated by the Group of Research "Studies about the writing language

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acquisition" (GEALE/CNPq), from the Federal University of Pelotas (UFPel)<sup>15-17</sup>. Besides GEALE, other work which investigate these same relations have been produced by the Group of Research "Studies about the language" (GPEL/CNPq)<sup>18-26</sup>, hosted at FFC/UNESP. It is pointed out in the work developed by both groups, the investigation of a very diversified set of orthographic and phonetic-phonological issues. Similarly to the investigations accomplished by both groups, the present research also strove in analyzing the influence of the phonetic-phonological aspects in the infant orthography acquisition. Nevertheless, pointing out on it, the phonology/orthography interface, it was proposed a more specific investigation of the orthographic performance of occlusive consonants of the Brazilian Portuguese (BP) in the position of simple syllabic attack - in other words, in the initial position of the syllable, not followed by another consonant, but by vowel -, investigation not covered yet, more particularly, in the literature.

The goals which guided the development of the research were (1) to describe the orthographic performance of children – regarding the registration of occlusive consonant of the BP; (2) to verify if the accent influences the occurrence of errors inside the words; and (3) to classify the standard of the errors distribution.

## ■ METHODS

The present work had its development approved by the Ethics Committee in Research of Faculdade de Filosofia e Ciências da UNESP/ Marília under the number 0132/2010.

The data used were extracted from a bank which supports investigations of the Group of Research "Studies about the Language" (GPEL/CNPq). This bank is composed by textual productions collected by researchers from the GPEL, who followed the writing development of children from two municipal schools from São José do Rio Preto (SP) in the period 2001 and 2004. To select the children who would compose these databases, it was adopted as exclusion criterion complaints of learning or language development trouble.

To compose the corpus of this research it was accomplished a cutout with textual productions of 15 children. As inclusion criterion they were selected only the children who remained enrolled in the school during all the period of the data collection (2001 to 2004). The textual productions chosen for the analysis were about 14 thematic proposals collected during the year 2001, when the children attended the 1<sup>a</sup> degree from the Elementary School.

However it was expected for the analysis a total of 210 textual productions (15 subjects x 14 proposals). Nevertheless due to 26 absences of children and to the discard of nine texts whose writing was characterized by random sequences of graphemes, the final total of analyzed productions was 175 texts.

Regarding the way of analyzing the data, with the intention to describe the orthographic performance in the occlusive consonants in position of simple syllabic attack - first goal -, the data were divided into (1) hits – when the occlusive phonemes were registered according to the conventional orthography of the Brazilian Portuguese (BP); and (2) errors – when these same phonemes were not registered according to the conventional orthography of the BP.

After that, to verify whether the errors could be influenced by the accent or not, of the syllable – second goal -, they were classified as they occurred in (1) stressed syllables – registered occlusive phonemes (or not) in the stressed positions of words and in stressed monosyllables; and in (2) unstressed syllables – registered occlusive phonemes (or not) in pre-stressed, pos tonics positions and in unstressed monosyllables.

Finally, to verify the standard of the errors distribution – third goal -, they were sub classified in: (a) omissions – when the occlusive phoneme was not registered orthographically, as for example, in the word PENTE written as PENE; (b) non phonological orthographic replacements – when the phoneme was registered by a grapheme which did not change its phonological value, as for example the word CORTA written as QORTA; and (c) phonological orthographic replacements – when the phoneme was registered by a grapheme which changed its phonological value, as for example the word GALO written as CALO.

The phonological orthographic replacements were subdivided yet as they occurred: inside the class (IC) and outside the class (OC). Therefore, when the replacement of the phoneme happened inside the class of the occlusive ones – as for example in the word COLA written as GOLA –, this replacement was classified as IC. On the other side when the replacement involved phonemes of classes different from the occlusive ones – as for example the word GUERRA written as GERRA – it was classified as OC.

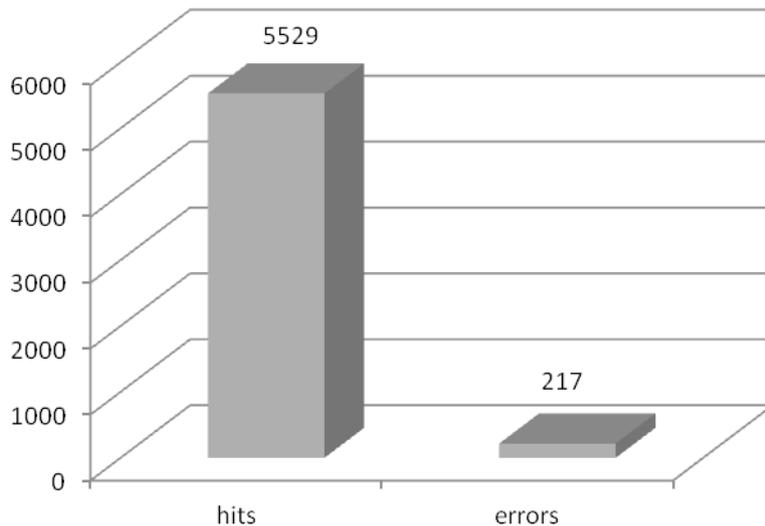
## Statistical analysis

A statistical treatment of the data was carried out with the use of the software Statistica (version 7.0) and descriptive and inferential analyses were accomplished.

For the analysis of the data referring to the three goals proposed it was used the parametric test T-test to dependent variables, been considered statistically relevant when  $\alpha \leq 0,05$ . Also for the analysis of the third goal it was used the non parametric test *Friedman ANOVA and Kendall Coeff. of concordance* to dependent variables been considered statistically relevant when  $\alpha \leq 0,05$ .

## ■ RESULTS

The results will be arranged according to the goals of the present research. As proposed in the first goal, they were found 5.746 possibilities of occlusive consonants registration in the simple syllabic attack position. These possibilities resulted in writings with hits and errors, whose values will be exposed in Figure 1 and in the Table 1:



Source: Research Data

**Figure 1 – Hits and errors in occlusive consonants.**

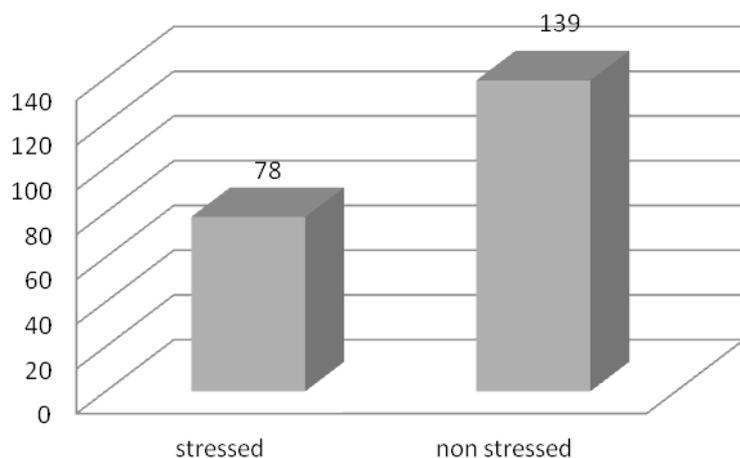
**Table 1 - Hits and errors in occlusive consonants.**

Accuracy	Average	Standard Deviation	T-test
Hits	365,07	193,55	t=7,015 p=0,00
Errors	15,5	10,09	df=13

Source: Research data. Parametric test T-test to dependent variables ( $\alpha \leq 0,05$ ). t: value of the distribution T of Student. df: degree of freedom

It is possible to observe, in the results presented, greater amount of hits, quantity which was shown statistically meaningful.

As proposed in the second goal, the total of errors was related to the stressed and non stressed syllables on which these errors figured. The results will be exposed in Figure 2 and in the Table 2:



Source: Research Data

**Figure 2 – Errors in stressed and non stressed syllables**

**Table 2 - Errors in stressed and non stressed syllables**

Accuracy	Average	Standard Deviation	T-test
Stressed	5,57	6,65	t=-2,33
Non stressed	9,93	5,58	p=0,037 df=13

Source: Research data. Parametric test T-test to dependent variables ( $\alpha \leq 0,05$ ). t: value of the distribution T of Student. df: degree of freedom

Through the results, it is observed that the accent influences meaningfully the emergence of errors in non stressed syllables.

Finally, as exposed in the third goal, the errors were distributed according to their typology. The results will be available in Table 3:

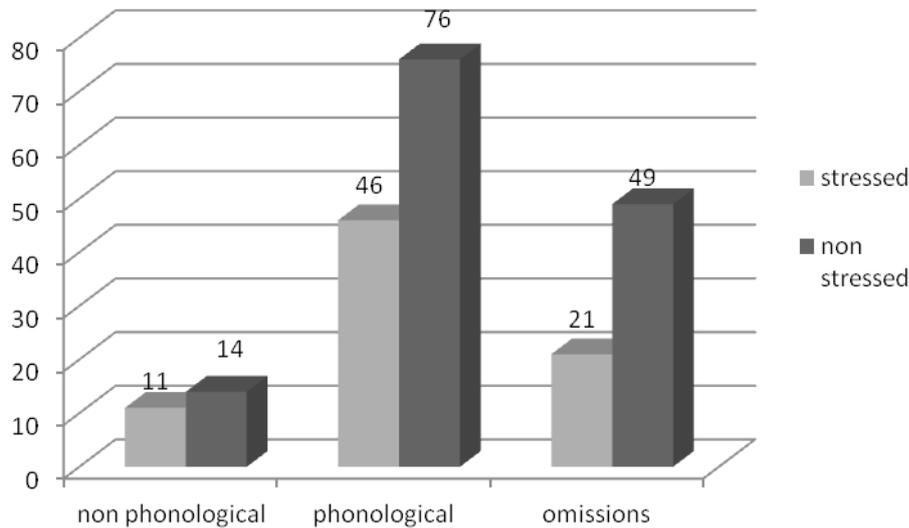
**Table3 - Distributions of errors**

	Total Occurrences	Average	Standard Deviation	Sum of rank	Friedman ANOVA and kendall coeff. of concordance
Non phonological	25	1,78	1,53	20,5	(N= 14 df= 2) = 8,76
Phonological	122	8,71	7,39	36	p=0,01
Omissions	70	5	4,71	27,5	

Source: Research data. non parametric test *Friedman ANOVA and Kendall Coeff. of concordance* ( $\alpha \leq 0,05$ ).

It is possible to observe the predominance of phonological errors, followed by omissions and non phonological errors.

As also exposed in the third goal, the errors were classified (yet considered, the influence of the accent) according to their typology. The results of this classification will be available in Figure 3 and Table 4.



Source: Research Data

Figure 3 – Typology of errors

Table 4 - Typology of errors

	Syllables	Average	Standard Deviation	T-test
Non phonological	Stressed	0,78	1,42	t=-0,37
	Non stressed	1	1,24	p=0,72 df=13
Phonological	Stressed	3,28	4,51	t=-1,89
	Non stressed	5,43	3,99	p=0,08 df=13
Omissions	Stressed	1,5	1,83	t=-2,33
	Non stressed	3,5	3,59	p=0,03 df=13

Source: Research data. Parametric test T-test to dependent variables ( $\alpha \leq 0,05$ ). t: value of the distribution T of Student. df: degree of freedom

It is possible to observe again predominance of phonological errors, followed by the omissions and finally by the non phonological errors, both inside the stressed and non stressed syllables. It was also observed relevant statistic difference among stressed and non stressed syllables, only in the omissions.

Still according to the third goal, the phonological errors were sub classified in IC and OC. The results of these sub classification will be exposed in Table 5.

The results show greater occurrence of phonological errors among graphemes which refer to phonemes of the occlusive phonological class.

Table 5 - Distributions of phonological errors

Accuracy	Total Occurrences	Average	Standard Deviation	T- test
Inside the class	79	5,64	4,70	t=2,73
Outside the class	43	3,07	3,38	p=0,01 df=13

Source: Research data. Parametric test T-test to dependent variables ( $\alpha \leq 0,05$ ). t: value of the distribution T of Student. df: degree of freedom.

## ■ DISCUSSION

Regarding the result found in the first goal – greater quantity of hits – it is possible to point out that the children of the present research, in spite of being in the beginning of their literacy showed meaningful stability regarding the registration of the occlusive consonants. This stability is not emphasized in the literature which, mostly, points out the errors as indicators of the children orthographic performance<sup>1-3</sup> and disregards the importance of hits on their characterization.

About the result found to the second goal – greater occurrence of errors in non stressed syllables – it can be justified by the influence of the phonetic aspects in the registration of the consonants. On account of the stressed syllable presents greater duration, greater intensity and more elevated frequency, this set of acoustic characteristics tends to result into more noticeable aurally syllables. On other hand, on account of the non stressed syllable presents shorter duration, shorter intensity and more lowered frequency, it tends to become less noticeable aurally; therefore the children tend to present greater difficulty in the registration of the occlusive consonants when they are found in non stressed syllables.

Regarding the results found to the third goal – greater quantity of phonological orthographic errors – it can be justified by the predominance of the orthographic transparency of the occlusive phonemes. As a matter of fact, out of the six phonemes of this class, four (/p/, /b/, /t/ e /d/) present transparent spelling, in other words, present only one possibility of orthographic representation; thereby, a replacement which involves one of these phonemes will necessarily cause change of phonological value of the word. It can also be justified, by the predominance of the transparency, the low occurrence of non phonological orthographic errors, once that, only two of the phonemes from this class (/k/ e /g/) do not present transparent relation among phoneme-grapheme.

Still regarding the results found to the third goal, the low number of omissions indicates that these children are already perceptible to the syllabic structure – because they tend to fill the position of simple syllabic attack with a grapheme, even if

they do not register it correctly. The greater number of omissions in the non stressed syllables, on its turn, is justified for being less aurally noticeable as exposed previously.

Finally, but still considering the results found for the third goal, the greater occurrence of phonological orthographic errors which mobilized phonemes of the occlusive class suggests that the children studied in the present research understood well the phonetic-phonological aspects which distinguish the occlusive phonemes from the phonemes which compose other phonological classes. It also suggests that these children already recognize which graphemes correspond to the phonemes of the occlusive phonological class.

On account of not being found studies developed with subject and methodology similar to the ones of the present study, it was not possible to establish comparisons among results. It is suggested then the accomplishment of more studies based in theoretical-methodological aspects similar to this one to future comparison of results.

## ■ CONCLUSION

The results of the present research point to the importance to take into account the influence of the phonetic-phonological aspects to a better comprehension of the orthographic performance of the occlusive phonemes in the infant orthography, to the extent that:

because of these aspects the children are more likely to hit than to misspell the occlusive phonemes;

the presence/absence of the accent interferes in the distribution among hits and errors;

this distribution is also affected by the transparency or by the opacity in the relation phoneme/grapheme in the occlusive class.

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**RESUMO**

**Objetivos:** descrever o desempenho ortográfico de crianças - quanto ao registro de consoantes oclusivas do Português Brasileiro; verificar se a acentuação influencia a ocorrência de erros no interior das palavras; e classificar o padrão da distribuição dos erros. **Métodos:** foram analisadas 210 produções textuais referentes a 14 propostas temáticas, coletadas durante o ano de 2001, quando os sujeitos cursavam a 1ª série do Ensino Fundamental. Para descrever o desempenho das crianças, para o primeiro objetivo, os dados foram divididos em Acertos e Erros; para segundo objetivo, os erros foram classificados em sílabas acentuadas e não-acentuadas, e, por fim, para o terceiro objetivo, os erros foram subclassificados em omissões, erros ortográficos e erros fonológicos. Os erros fonológicos foram subdivididos, ainda, conforme ocorressem dentro e fora da classe. **Resultados:** para o primeiro objetivo, encontraram-se 5.746 possibilidades de ocorrência de consoantes oclusivas na posição de ataque silábico simples, com maior quantidade de acertos; para o segundo objetivo, observou-se maior ocorrência de erros em sílabas não-acentuadas; e por fim, para o terceiro objetivo, foi possível observar predomínio de erros fonológicos, seguidos pelas omissões e pelos erros ortográficos, tanto no interior das sílabas não-acentuadas quanto das acentuadas. Ainda conforme o terceiro objetivo, nos erros fonológicos, observou-se sua maior ocorrência dentro da classe; e novamente, não-influência do acento. **Conclusão:** conclui-se, então, a importância da análise dos aspectos fonéticos-fonológicos na aquisição da ortografia infantil, bem como a relevância da distribuição dos acertos tanto como dos erros.

**DESCRITORES:** Escrita Manual; Desenvolvimento da Linguagem; Criança; Fonética; Linguística

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