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### Keywords

Evaluation

Handwriting

Learning

Education

Educational status

### Descritores

Avaliação

Escrita manual

Aprendizagem

Educação

Escolaridade

# Spelling performance of 2<sup>nd</sup> to 5<sup>th</sup> grade students from public school

## *Desempenho ortográfico de escolares do 2º ao 5º ano do ensino público*

### ABSTRACT

**Purpose:** To characterize, compare and classify the performance of 2<sup>nd</sup> to 5<sup>th</sup> grade students from public schools according to the semiology of spelling errors. **Methods:** Participants were 120 students from 2<sup>nd</sup> to 5<sup>th</sup> grades of a public school in Marília (SP), Brazil, 30 students from each grade, who were divided into four groups: GI (2<sup>nd</sup> grade), GII (3<sup>rd</sup> grade), GIII (4<sup>th</sup> grade), and GIV (5<sup>th</sup> grade). The tasks of the Pro-Ortografia test were applied: collective version (writing of alphabet letters, randomized dictation of letters, words dictation, nonwords dictation, dictation with pictures, thematic writing induced by picture) and individual version (dictation of sentences, purposeful error, spelled dictation, orthographic lexical memory). **Results:** Significant difference was found in the between-group comparison indicating better performance of students in every subsequent grade in most of the individual and collective version tasks. With the increase of grade level, the groups decreased the average of writing errors. **Conclusion:** The profile of spelling acquisition of the Portuguese writing system found in these public school students indicates normal writing development in this population.

### RESUMO

**Objetivos:** Caracterizar, comparar e classificar o desempenho de escolares do 2º ao 5º ano do ensino público segundo a semiologia dos erros. **Métodos:** Participaram deste estudo 120 escolares do 2º ao 5º ano de escola pública municipal de Marília-SP, sendo 30 de cada série, divididos em quatro grupos: GI (2º ano); GII (3º ano); GIII (4º ano); e GIV (5º ano). Como procedimento foram aplicadas as provas do Pro-Ortografia: versão coletiva (escrita de letras do alfabeto, ditado randomizado das letras do alfabeto, ditado de palavras, ditado de pseudopalavras, ditado com figuras, escrita temática induzida por figura) e versão individual (ditado de frases, erro proposital, ditado soletrado, memória lexical ortográfica). **Resultados:** Houve diferença na comparação intergrupos, indicando melhor desempenho dos escolares a cada série subsequente, na maior parte das provas da versão coletiva e individual. Com o avanço da seriação escolar, os grupos apresentaram menor média de erros na escrita. **Conclusão:** O perfil de aquisição da ortografia do sistema de escrita do Português observado em escolares do ensino público é indicativo do funcionamento normal de desenvolvimento da escrita infantil.

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Received: 9/19/2010

Accepted: 3/14/2011

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## INTRODUCTION

The Portuguese writing system is characterized by its spelling transparency (regularity, in which each phoneme corresponds to only one grapheme and vice versa) and by its spelling opacity (irregularity, in which graphemes correspond to more than one phoneme and phonemes correspond to several graphemes)<sup>(1)</sup>.

The most transparent relation between phonology and spelling, with regard to the Portuguese language, seems to produce less severe problems to the reading of words and more severe to the spelling<sup>(2-4)</sup>. Therefore, the Brazilian Portuguese presents spelling more transparent from grapheme to phoneme than from phoneme to grapheme<sup>(5)</sup>. Even so contains more transparent configuration than other Hispanic languages, as Italian and Spanish<sup>(6)</sup>.

The spelling activity initiates through a selection of the meaning or concept from what the writer wants to write, resorting firstly to his semantic system. In the next it will be the syntactic structure which will determinate the kind of word that will occupy each position at the sentence, only then the two routes (phonological route and lexical or spelling route) will get into action, permitting the words writing. After the mental spelling representation of the word, come into function two subprocesses for concretize the writing of the word. First is the mechanism of selection of graphemes and the type of letter (capital, small, uppercase, between others) and second consists in purely motors aspects, appointed to execute the corresponding movements to each grapheme<sup>(7)</sup>.

Some authors<sup>(8,9)</sup> concluded both the phonological processes and the spelling ones are important to the writing apprenticeship. In their researches, they observed that the standard of letters in new words of higher frequency were learned more easily, as the phonological standards that occurred with higher frequency in words were also related to letters more quickly. Nevertheless, only the phonological mediation is insufficient to ensure the correct writing of words at the Portuguese, French, Spanish, Finnish, Hungarian or Germanic languages.

The spelling evaluation must bring information about the spelling level in which the child is, revealing the types of spelling mistakes and the frequency of their occurrences at writing<sup>(11)</sup>.

In general, the evaluation must contains the observation of the own students works, dictated without correction and self-correcting, writing of long and short texts, non-word dictation<sup>(12)</sup>, copy, letters dictation<sup>(13)</sup>, writing of words from pictures, sentences and words dictation, complete words with one or more graphemes, complete sentences with words<sup>(14)</sup> and purposeful error task, which provides information about which spelling knowledge level the students have<sup>(1)</sup>. Wherefore, the analysis of the evaluation data must be based in mistakes observation that affects both the natural spelling and the arbitrary spelling<sup>(12,14)</sup>.

In face of above, this study aimed to characterize, to compare and to classify the performance of students from the 2<sup>nd</sup> to 5<sup>th</sup> grades of public education according to the semiology of spelling errors.

## METHODS

The study was realized after the approval of the Research Ethics Committee of the School of Philosophy and Sciences of Universidade Estadual Paulista “Júlio de Mesquita Filho”, under protocol of number 428/2009.

Participants were 120 students from 2<sup>nd</sup> to 5<sup>th</sup> grades Elementary School, 50% of male gender and 50% of female gender, in the age range between 7 years and 11 years and 11 months. All of them were enrolled in a public school of Marília (SP), Brazil, indicated by the Educational Department of this city. Students were divided into four groups with 30 subjects each: GI (2<sup>nd</sup> grade); GIII (3<sup>rd</sup> grade); GIII (4<sup>th</sup> grade); and GIV (5<sup>th</sup> grade).

As exclusion criteria were considered: presence of sensorial, motor or cognitive deficiency and the non-presentation of the Free and Informed Consent Form (FICF) signed by parents or responsible. As inclusion criteria: students with no constants complaints of learning and behavioral problems in the school record.

As procedure were applied the tests from Spelling Evaluation protocol, denominated Pro-Ortografia<sup>(15)</sup>. This procedure was elaborated to evaluate the spelling knowledge of students from 1<sup>st</sup> to 5<sup>th</sup> grades in elementary school. The protocol is composed by two application versions and ten tests. The collective version is composed by six tests and the individual version by four tests, described as follows.

### *Collective version*

- Letters of the alphabet writing: The students were instructed to write the alphabetic letters, vowels and consonants, in different locals, aiming to verify the knowledge about them and their classification.
- Randomized dictation of letters of the alphabet: The students were instructed to write the dictated letters, aiming to verify the student's knowledge about the correspondence with the name of the letters and the graphic symbol that represents.
- Words dictation: The students were instructed to write 86 dictated words, inside a controlled situation and with the lexical support of visual input, aiming to verify the knowledge level about the coding rules.
- Nonwords dictation: The students were instructed to write 36 dictated nonwords, inside a controlled situation and without lexical support of visual input, aiming to verify the knowledge level of the coding rules. The nonwords were created according the Brazilian Portuguese coding rules<sup>(3,4)</sup>, having as psycholinguistic criteria the regularity, so that the possibility of having more than one way of correct writing was annulled.
- Dictation with pictures: The students were instructed to write 38 words correspondents to animal pictures, aiming to verify the level of knowledge about the codification rules, by recovery of the phonological representation of their own lexicon by semantic field.

### *Individual version*

- Thematic writing induced by picture: The students were

instructed to write a text through representation of a sequence of five pictures, aiming to verify the phonographic conversion inside a context in which they are the writing authors. "The danger of dropping balloons" was selected as thematic activity in order to afford ample creative possibilities to the realization of narrative of the writing.

- Sentences dictation: The students were instructed to write 12 dictated sentences, aiming to verify the relation/interference of memory with the coding ability and also fit as base text to the number 8 test of purposeful error. 12 sentences with different extensions were formulated, ranging between three and eight words, being dictated two sentences from each extension. The sentences were elaborated in order to contemplate the mainly contextual spelling regularities (r/rr; g/gu; c/qu; j forming syllables with a, o, or, u; s forming syllables with a, o, or, u in the initiation of word; m/n/til to spell nasality; z at the initiation of word; o/u and e/i in the end of word).
- Purposeful error: The students were instructed to re-write the 12 sentences previously dictated, infringing the contextual rules during the re-writing, generating spelling purposeful mistakes. After the re-writing of sentences with purposeful mistakes, the students should explain orally which is the mistake committed and the evaluator should note the explication and verify the knowledge of these rules by the children.
- Spelled dictation: The students were instructed to write 29 dictated words, in a paused way, letter by letter, aiming to verify the capacity of realizing a synthesis of the dictated letters for the words formation (through sequence) and the accessing to the visual input lexical. Twenty nine words were selected, because the authors excluded the ones with acute and circumflex accent, tilde or cedilla, maintaining the words regularity standard.
- Spelling lexical memory: The students were instructed to write 29 words, aiming to verify the capacity of accessing to the spelling lexical and its formation, as the children use the phonological work memory.

The tests general punctuation was realized through the attribution of one point to each hit, except in test 6 (thematic writing induced by picture), in which the errors were analyzed and classified just according to semiology. The semiological classification punctuation was realized through the attribution of one point to each type of error made, in tests 3, 5, 6 and 7. The application of the collective version lasted in average 50 minutes and was realized in two sessions. The individual version lasted in average 40 minutes and also was realized in two sessions.

The errors classification based in their semiology, proposed by some authors<sup>(12)</sup> was realized in both types of mistakes: in the natural spelling and in arbitrary spelling. The mistakes in natural spelling have a direct relation with the language processing, while the mistakes of arbitrary spelling, in the same way to independent or not independent of rules spelling, are directly related to the visual memory, spelling rules knowledge,

lexical and morphology. Among the errors in natural spelling, stand out the univocal phoneme-grapheme correspondence mistakes, the mistakes in the sequencing of graphemes which relate with the errors of omission and addition of segments, and alteration in the order of segments and the error of segmentation of the chain of speech that relates with the improper junctions and separations in the writing. Among the errors in arbitrary spelling, stands out the ones of phoneme-grapheme correspondence dependent of the phonetic context, and the errors of phoneme-grapheme correspondences independent of rules. Furthermore, to this classification were increased the errors by absence or inadequate presence of accentuation and other findings, related with the letters with problems in tracing and/or mirroring, illegible words and writing of other words without a meaning.

### Statistical analysis

For the statistical analysis, were considered the number of hits presented by the four groups, the performance of the students in the spelling rules knowledge level and the number of mistakes (classified according to their semiology). The tests used to the results analysis were: Kruskal-Wallis Test, Mann-Whitney Test, adjusted by Bonferroni correction and analysis of Spearman correlation. The significance level adopted was 5% (0,05).

### RESULTS

The analysis shows average of errors, standard deviation, reference values, minimum and maximum values and p values concerning to the performance of the groups in the spelling evaluation tests (Table 1). There was difference in most of the tests (with the exception of random dictation of letters of the alphabet test and writing by purposeful error), indicating that the averages became superior to each subsequent grade.

In relation to the letters of the alphabet writing (LAW), the students from GIV showed superior performance compared with GI participants at words dictation, figures and sentences dictation; the students from GII, GIII and GIV showed superior performance at letters of the alphabet writing (LAW) compared with GI. At nonwords dictation, the students from GII, GIII and GIV showed superior performance when compared with children from GII, jointly with the students from GIV in relation to the ones from GII and GIII. At spelling lexical memory test, the students from GII, GIII and GIV showed superior performance compared with the students from GI and GIV in relation to GIII. These data evidence students from GII and GIII showed spelling knowledge level similar and close to the Brazilian Portuguese rules for all the evaluated tests.

At words dictation test there was a difference to the univocal phoneme-grapheme correspondence mistakes (P/GC), omission and addition of segments (OAS), phoneme-grapheme correspondence dependent of the phonetic context (P/GCDC), phoneme-grapheme correspondences independent of rules (P/GCIR) and absence or inadequate presence of

**Table 1.** Comparison of groups for the variables studied

	Tests	Groups	n	Mean	SD	Minimum	Maximum	p-value
Collective version	LAW	GI	30	11.77	9.55	0.00	26.00	0.001*
		GII	30	20.50	9.27	0.00	26.00	
		GIII	30	18.13	9.18	0.00	26.00	
		GIV	30	21.90	8.27	0.00	26.00	
	RDLA	GI	30	23.07	4.67	2.00	26.00	0.244
		GII	30	22.50	6.40	0.00	26.00	
		GIII	30	23.40	5.21	0.00	26.00	
		GIV	30	24.30	3.79	6.00	26.00	
	WD	GI	30	11.53	13.16	0.00	40.00	<0.001*
		GII	30	31.67	13.62	0.00	55.00	
		GIII	30	31.30	16.99	1.00	65.00	
		GIV	30	37.50	14.09	15.00	76.00	
	NWD	GI	30	2.57	2.86	0.00	10.00	<0.001*
		GII	30	6.37	3.87	0.00	14.00	
		GIII	30	6.77	3.61	0.00	16.00	
		GIV	30	10.13	5.39	1.00	28.00	
	DF	GI	30	12.07	9.56	0.00	28.00	<0.001*
		GII	30	21.20	7.55	0.00	30.00	
		GIII	30	18.80	7.06	3.00	31.00	
		GIV	30	23.50	5.23	13.00	34.00	
Individual version	SDi	GI	30	17.37	18.55	0.00	51.00	<0.001*
		GII	30	41.13	19.84	0.00	64.00	
		GIII	30	38.37	18.30	0.00	64.00	
		GIV	30	46.27	14.28	17.00	66.00	
	PE	GI	30	0.00	0.00	0.00	0.00	0.323
		GII	30	0.03	0.18	0.00	1.00	
		GIII	30	0.10	0.31	0.00	1.00	
		GIV	30	0.07	0.25	0.00	1.00	
	SP	GI	30	12.83	6.79	1.00	24.00	0.006*
		GII	30	17.03	6.55	0.00	27.00	
		GIII	30	13.47	5.49	4.00	24.00	
		GIV	30	17.57	6.45	7.00	29.00	
SML	GI	30	7.93	7.45	0.00	24.00	<0.001*	
	GII	30	15.97	6.28	0.00	25.00		
	GIII	30	13.17	5.95	3.00	26.00		
	GIV	30	17.27	4.87	7.00	27.00		

\* Significance level ( $p \leq 0.050$ ) – Kruskal-Wallis test

**Note:** LAW = letters of the alphabet writing; RDLA = randomized dictation of letters of the alphabet; WD = words dictation; NWD = nonwords dictation; DF = dictations with figures; SDi = sentences dictation; PE = purposeful error; SP = spelled dictation; SLM = spelling lexical memory; SD = standard deviation

accentuation (AIPA) and other findings (OF) in words dictation test (Table 2). Such results indicate that the average of errors in each one of these classifications became lower to each subsequent grade.

At pictures dictation test there was a difference to the omission and addition of segments (OAS), improper junctions and separations at word, phoneme-grapheme correspondences independent of rules (P/GCIR) and other errors

(OE) in pictures dictation test (Table 3). The average of errors in each one of these classifications became lower to each subsequent grade.

At sentences dictation test there was a difference to the univocal phoneme-grapheme correspondence mistakes (P/GC), omission and addition of segments (OAS), improper junctions and separations at word, phoneme-grapheme correspondences independent of rules (P/GCIR), absence or inadequate presence

**Table 2.** Comparison of the performance of the groups at words dictation test

Errors semiology	Group	n	Mean	SD	Minimum	Maximum	p-value
P/GC	I	20	24.05	10.87	7.00	43.00	<0.001*
	II	28	11.39	8.03	1.00	35.00	
	III	30	13.53	12.15	0.00	57.00	
	IV	30	10.33	6.94	2.00	33.00	
OAS	I	20	25.80	17.90	3.00	65.00	<0.001*
	II	28	9.57	5.84	0.00	27.00	
	III	30	11.53	12.04	1.00	60.00	
	IV	30	8.57	7.10	0.00	29.00	
AOS	I	20	0.95	1.88	0.00	7.00	0.125
	II	28	0.36	0.87	0.00	4.00	
	III	30	0.80	1.90	0.00	10.00	
	IV	30	0.20	0.61	0.00	3.00	
IJSW	I	20	0.20	0.41	0.00	1.00	0.697
	II	28	0.68	1.85	0.00	8.00	
	III	30	0.37	1.16	0.00	6.00	
	IV	30	0.17	0.46	0.00	2.00	
P/GCDC	I	20	10.15	4.28	5.00	23.00	<0.001*
	II	28	17.93	5.52	10.00	33.00	
	III	30	12.23	6.49	2.00	32.00	
	IV	30	15.63	5.80	4.00	26.00	
P/GCIR	I	20	24.70	7.06	10.00	38.00	0.005*
	II	28	17.32	5.70	5.00	32.00	
	III	30	20.67	8.77	4.00	37.00	
	IV	30	18.13	6.46	4.00	29.00	
AIPA	I	20	16.30	3.74	7.00	21.00	0.002*
	II	28	14.25	2.47	6.00	20.00	
	III	30	12.53	4.78	0.00	21.00	
	IV	30	13.13	3.27	1.00	20.00	
OF	I	20	3.40	6.65	0.00	22.00	0.008*
	II	28	0.25	0.97	0.00	5.00	
	III	30	1.20	4.00	0.00	21.00	
	IV	30	1.63	2.61	0.00	12.00	

\* Significance level ( $p \leq 0.050$ ) – Kruskal-Wallis test

**Note:** P/GC = univocal phoneme-grapheme correspondence mistakes; OAS = omission and addition of segments; AOS = alteration in the order of segments; IJSW = improper junctions and separations at word; P/GCDC = phoneme-grapheme correspondence dependent of the phonetic context; P/GCIR = phoneme-grapheme correspondences independent of rules; AIPA = absence or inadequate presence of accentuation; OF = other findings; SD = standard deviation

of accentuation (AIPA) and other findings (OF), words omission (WO) in sentences dictation test (Table 4). The average of errors in each one of these classifications became lower to each subsequent grade.

Due to the differences obtained in tables 2, 3 and 4, the Mann-Whitney test adjusted by Bonferroni Correction was applied and verified that at words dictation, the students from GII, GIII and GIV showed lower performance to GI in relation to the univocal phoneme-grapheme correspondence mistakes (P/GC). The students from GII and GIV showed lower performance compared with GI and the same occurred with GII in relation to GII about the phoneme-grapheme correspondence

dependent of the phonetic context (P/GCDC). The students from GII and GIV showed lower performance to GI about phoneme-grapheme correspondences independent of rules (P/GCIR). The students from GIII and GIV showed lower performance to GI about absence or inadequate presence of accentuation (AIPA). The students from GIV showed lower performance to GI about other findings (OF).

At pictures dictation, the results show the students from GIV present lower performance to GI in relation to omission and addition of segments (OAS). The students from GIII and GIV showed lower performance to GI about phoneme-grapheme correspondences independent of rules (P/GCIR). The students

**Table 3.** Comparison of the performance of the groups at dictation with pictures test.

Errors semiology	Group	n	Mean	SD	Minimum	Maximum	p-value
P/GC	I	20	5.85	5.06	0.00	21.00	0.066
	II	28	3.14	3.31	0.00	14.00	
	III	30	4.03	3.72	0.00	16.00	
	IV	30	2.97	2.47	0.00	8.00	
OAS	I	20	4.95	4.84	0.00	21.00	0.038*
	II	28	2.64	3.07	0.00	16.00	
	III	30	2.77	2.49	0.00	10.00	
	IV	30	2.10	2.54	0.00	12.00	
AOS	I	20	0.20	0.41	0.00	1.00	0.132
	II	28	0.04	0.19	0.00	1.00	
	III	30	0.13	0.57	0.00	3.00	
	IV	30	0.07	0.37	0.00	2.00	
IJSW	I	20	0.35	0.75	0.00	3.00	0.045*
	II	28	0.07	0.38	0.00	2.00	
	III	30	0.20	0.48	0.00	2.00	
	IV	30	0.03	0.18	0.00	1.00	
P/GCDC	I	20	2.40	1.39	0.00	5.00	0.583
	II	28	2.21	1.95	0.00	7.00	
	III	30	2.07	1.62	0.00	7.00	
	IV	30	2.77	2.45	0.00	12.00	
P/GCIR	I	20	3.70	1.42	1.00	6.00	0.015*
	II	28	2.68	1.28	0.00	5.00	
	III	30	2.53	1.91	0.00	9.00	
	IV	30	2.40	1.75	0.00	6.00	
AIPA	I	20	1.85	1.69	0.00	6.00	0.118
	II	28	1.29	0.98	0.00	5.00	
	III	30	1.97	1.25	0.00	4.00	
	IV	30	1.57	1.14	0.00	5.00	
OF	I	20	3.60	1.27	0.00	6.00	<0.001*
	II	28	0.14	0.53	0.00	2.00	
	III	30	4.97	3.34	1.00	17.00	
	IV	30	1.57	1.91	0.00	6.00	

\* Significance level ( $p \leq 0.050$ ) – Kruskal-Wallis test

**Note:** P/GC = univocal phoneme-grapheme correspondence mistakes; OAS = omission and addition of segments; AOS = alteration in the order of segments; IJSW = improper junctions and separations at word; P/GCDC = phoneme-grapheme correspondence dependent of the phonetic context; P/GCIR = phoneme-grapheme correspondences independent of rules; AIPA = absence or inadequate presence of accentuation; OF = other findings; SD = standard deviation

from GII and GIV showed lower performance to GI, the students from GIII and GIV showed lower performance to GII and the students from GIV showed lower performance to GIII about other findings (OF).

At words dictation, the results revealed the students from GII and GIV showed lower performance to GI about univocal phoneme-grapheme correspondence mistakes (P/GC) and errors by omission and addition of segments (OAS). The students from GIV showed lower performance to GI about improper junctions and separations at word (IJSW). The students from GII, GIII and GIV showed lower performance to GI about phoneme-grapheme correspondences independent

of rules (P/GCIR). The students from GIII showed lower performance to GII about absence or inadequate presence of accentuation (AIPA). The students from GII showed lower performance to GI about other findings (OF) and the students from GIII and GIV showed lower performance to GI about words omission (WO), the same occurring with GII in relation to GII.

The relation between the number of produced words (NPW) at thematic writing induced by picture was realized and the classification of words according to their semiology. There was a positive correlation between the groups to univocal phoneme-grapheme correspondence mistakes, phoneme-

**Table 4.** Comparison of the performance of the groups at sentences dictation test

Errors semiology	Group	n	Mean	SD	Minimum	Maximum	p-value
P/GC	I	19	8.05	5.85	4.00	28.00	<0.001*
	II	28	3.36	3.46	0.00	14.00	
	III	28	6.11	5.83	0.00	25.00	
	IV	30	3.87	3.39	0.00	14.00	
OAS	I	19	6.16	6.09	1.00	25.00	0.001*
	II	28	1.64	1.85	0.00	5.00	
	III	28	3.68	3.78	0.00	15.00	
	IV	30	2.57	3.31	0.00	13.00	
AOS	I	19	0.37	0.83	0.00	3.00	0.214
	II	28	0.07	0.26	0.00	1.00	
	III	28	0.04	0.19	0.00	1.00	
	IV	30	0.17	0.59	0.00	3.00	
IJSW	I	19	8.89	8.80	0.00	25.00	0.008*
	II	28	2.93	5.98	0.00	26.00	
	III	28	3.00	4.36	0.00	16.00	
	IV	30	2.10	4.36	0.00	18.00	
P/GCDC	I	19	2.58	1.87	0.00	7.00	0.905
	II	28	2.29	1.80	0.00	6.00	
	III	28	2.46	2.70	0.00	12.00	
	IV	30	2.50	2.30	0.00	8.00	
P/GCIR	I	19	6.00	2.36	2.00	9.00	<0.001*
	II	28	2.57	1.37	0.00	6.00	
	III	28	3.82	2.45	0.00	8.00	
	IV	30	3.30	2.41	0.00	10.00	
AIPA	I	19	1.84	1.50	0.00	6.00	0.007*
	II	28	1.04	1.20	0.00	5.00	
	III	28	2.36	1.81	0.00	9.00	
	IV	30	1.83	1.56	0.00	5.00	
OF	I	19	4.00	2.11	0.00	8.00	0.043*
	II	28	2.04	1.37	0.00	5.00	
	III	28	3.39	3.00	0.00	9.00	
	IV	30	3.00	3.16	0.00	14.00	
WO	I	19	3.16	3.04	0.00	9.00	0.001*
	II	28	2.11	2.56	0.00	10.00	
	III	28	1.07	3.41	0.00	18.00	
	IV	30	1.13	2.15	0.00	11.00	
WA	I	19	0.63	1.21	0.00	5.00	0.079
	II	28	0.32	0.82	0.00	3.00	
	III	28	1.14	1.82	0.00	7.00	
	IV	30	0.80	1.03	0.00	3.00	

\* Significance level ( $p \leq 0,050$ ) – Kruskal-Wallis test

**Note:** P/GC = univocal phoneme-grapheme correspondence mistakes; OAS = omission and addition of segments; AOS = alteration in the order of segments; IJSW = improper junctions and separations at word; P/GCDC = phoneme-grapheme correspondence dependent of the phonetic context; P/GCIR = phoneme-grapheme correspondences independent of rules; AIPA = absence or inadequate presence of accentuation; OF = other findings; WO = word omission in the sentence; WA = word addition in the sentence; SD = standard deviation

grapheme correspondence dependent of the phonetic context, phoneme-grapheme correspondences independent of rules and absence or inadequate presence of accentuation (AIPA). With

the advancement of school grading, also occurred the increase of this type of error.

**Table 5.** Correlation between the errors classification and the number of produced words (NPW) of the groups

Errors semiology	Statistics	GI, GII, GIII, GIV
		NPW
P/GC	Correlation coefficient (r)	+0.322
	p-value	0.001*
	n	105
OAS	Correlation coefficient (r)	+0.074
	p-value	0.450
	n	105
AOS	Correlation coefficient (r)	+0.045
	p-value	0.647
	n	105
IJSW	Correlation coefficient (r)	+0.001
	p-value	0.990
	n	105
P/GCDC	Correlation coefficient (r)	+0.398
	p-value	<0.001*
	n	105
P/GCIR	Correlation coefficient (r)	+0.316
	p-value	0.001*
	n	105
AIPA	Correlation coefficient (r)	+0.391
	p-value	<0.001*
	n	105
OF	Correlation coefficient (r)	-0.117
	p-value	0.235
	n	105

\* Significance level ( $p \leq 0.050$ ) – Analysis of Spearman Correlation

**Note:** P/GC = univocal phoneme-grapheme correspondence mistakes; OAS = omission and addition of segments; AOS = alteration in the order of segments; IJSW = improper junctions and separations at word; P/GCDC = phoneme-grapheme correspondence dependent of the phonetic context; P/GCIR = phoneme-grapheme correspondences independent of rules; AIPA = absence or inadequate presence of accentuation; OF = other findings

## DISCUSSION

The results appoint to the fact that the students show a better performance to each subsequent grade in most part of the tests in the collective and individual version of spelling evaluation. This indicates that with the advancement of the school grading, there is a higher knowledge about the spelling rules, corroborating studies which appoint that students in the beginning of the appropriation process of the language spelling system show more occurrence of errors than the ones most advanced at grading<sup>(8,16,17)</sup>.

Besides that, the results appoint to the fact that with the advancement of grading, the students showed less number of writing mistakes with base in error's semiology. This is due to children committing writing appropriation "errors" during the apprenticeship until, progressively, dominate the spelling system in a securer way<sup>(2,8,18)</sup>.

However, in this study was verified that the students from 2<sup>nd</sup> and 3<sup>rd</sup> grade showed a similar level of spelling knowledge. Such level is superior to students from 1<sup>st</sup> grade, demonstrating that from the 3<sup>rd</sup> grade could have occurred higher emphasis in spelling instruction as to rules and use. This can be explained by spelling acquisition or writing appropriation, an evolutionary process in which the apprentice elaborates hypothesis that reveal different degrees of knowledge that are being constituted. In this way, not learn to write immediately and the "errors" may occur during this process<sup>(19,20)</sup>.

As to the errors classification based on their semiology, could be verified that occurred a higher frequency of natural spelling errors than the arbitrary ones. The mistakes in natural spelling have a direct relation with the language processing, while the mistakes of arbitrary spelling, in the same way to independent or not independent of rules spelling, are directly related to the visual memory, spelling rules knowledge, lexical and morphology. Among the errors in natural spelling, stand out the univocal phoneme-grapheme correspondence mistakes, which are directly related with the speech processing and with the letter and sound relation, justifying the graphemic substitution errors. The mistakes in the sequencing of graphemes also are related to the speech processing. The errors of omission and addition of segments and alteration in the order of segments generate difficulty in the identification of the right phonemic sequence during the speech processing and its graphemic correspondence<sup>(12,19)</sup>.

In this study, the average of errors based in their semiology became lower to each subsequent grade. The type of errors decrease throughout the school years may be considered mark of the acquisition of the Portuguese writing system spelling, appointing to a normal functioning of children's writing development, as described in the national literature<sup>(3)</sup>. The same phenomenon can be evidenced in Welsh Language, as described in literature<sup>(21)</sup>.

However, the high average of errors of natural spelling found in the initial series demonstrated that is not occurring formal instruction about the phoneme-grapheme correspondence. This instruction is needed to the apprenticeship of the writing system with alphabetic base, like Portuguese<sup>(22-24)</sup>, Spanish<sup>(12,25)</sup>, French<sup>(10)</sup> and Italian<sup>(26)</sup>.

A result that also highlights the need of the formal instruction referent to the phoneme-grapheme correspondence in Portuguese refers to the superior average of the classification referent to other findings (OF) found in this same population. These refer to the use of letters with problems in tracing and/or mirroring, illegible words and writing of other words without a meaning.

With de advancement of schooling, the participants of this study began to acquire the alphabetic base from the Brazilian Portuguese writing system. The average of errors was decreasing during the seriation, making that the students from the most advantage years leave to write words with no meaning and start to write words using the mechanism of phoneme-grapheme conversion.

The association between these two findings meets the describing of the national literature<sup>(8)</sup> and the international



one<sup>(9)</sup>. The two refer that both the phonological processes and the spelling ones are important to the writing apprenticeship, because the standard of phoneme-grapheme conversion can be learned with the increase of the exposition to the frequency of the occurrence and the use of the spelling annotations. This fact leads to a reflection about the occurrence of the lack of formal instruction of the phoneme-grapheme conversion mechanism needed in the initial phase of alphabetization to the students of this study. Still on the aspect of alphabetization, it was found in this study a type of error classified like errors by absence or inadequate presence of accentuation (AIPA). This was a significant data in this study, found in the analysis of thematic writing induced by picture. With the increase of the number of words production due to the greater use and exposition to writing during the school seriation, also occurred an increase of these errors by absence or inadequate presence of accentuation (AIPA). This occurred because the accentuation is considered a complex spelling rule, which requires knowledge of the types last, second to last, antepenultimate stressed and unstressed syllable, spelling syllable separation and classification in oxytone, paroxytone, proparoxytone<sup>(27)</sup>. Such results appoint to the lack of formal instruction in classroom context to these spelling aspects.

The result above described, jointly with the others, corroborates the literature, which reveals that many students in initial phase of alphabetization may show alteration in writing due to the school not emphasize the teaching of spelling by the weak theoretical and practical foundation of their educators<sup>(3,20,28-30)</sup>.

The data of this present study appoint to the need of continuation of the researches with other school population, with the finality to establish a profile of acquisition and development of spelling of students in initial phase of alphabetization. Only that way it will be possible identify which are the errors common to the appropriation of the writing system and which are the errors persistent in learning disorders, like dyslexia and learning disorder.

In spite of having other procedures of spelling evaluation in national literature, the evaluation proposal showed in this study differs from others because it has been based in characteristics of the Brazilian Portuguese writing system as to the standard of transparency and opacity spelling, both to its elaboration as to its analysis. This may proportionate to the clinical or educational speech and hearing therapist a reliable analysis of the errors with base on their semiology.

## CONCLUSION

The application of Pro-Ortografia results in students from 2nd to 5th grade revealed that with the advancement of school grading, occur an increase at the average of hits in all the tests from the collective and individual version, indicating that during the school years occur a greater domain of the spelling knowledge. In this study, the classification according to errors semiology reveals more frequency in natural spelling errors than the arbitrary ones.

The results appoint to a profile of acquisition of spelling from the Portuguese writing system by students from public education, revealing that this is, maybe, the normal functioning of development of children's writing in this population.

## ACKNOWLEDGEMENTS

We thank the Research Support Foundation of São Paulo State (FAPESP), by the concession of research-support (2009/01517-1), fellowships for scientific initiation (2009/18333-0, 2009/18343-6) and technical training fellowships ((2009/10464-9, 2010/05083-3).

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