

## The Role of Morphosyntactic Awareness in Conventional Lexical Segmentation

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**Abstract:** Starting with the alphabetic stage of writing acquisition, the learner struggles with issues related to spelling, including the segmentation of writing in graphic words. This study examined the conventional segmentation of words and its relation to morphosyntactic awareness in a sample of students in the 4<sup>th</sup> and 5<sup>th</sup> years of elementary education in public schools. Results reveal a discrepancy between the oral identification of words and performance in the segmentation of writing, with three criteria being used by students to define “word”: (1<sup>st</sup>) full meaning; (2<sup>nd</sup>) sequence of letters, not only one or two; (3<sup>rd</sup>) frequency of word use. Statistical analyses revealed significant positive correlations between conventional segmentation and morphosyntactic awareness. It is inferred that morphosyntactic skills support the establishment of the conventional notion of the word, and it is suggested that teachers promote the development of these skills, in order to ensure a greater command of the written language.

**Keywords:** writing skills, orthography, morphology (linguistics)

## O Papel da Consciência Morfosintática na Segmentação Lexical Convencional

**Resumo:** A partir do estágio alfabético de aquisição da escrita o aprendiz precisa enfrentar questões relativas à ortografia, entre elas a segmentação do escrito em palavras gráficas. O objetivo deste estudo foi investigar a segmentação convencional de palavras e sua relação com a consciência morfosintática em uma amostra de alunos de 4<sup>o</sup> e 5<sup>o</sup> anos do ensino fundamental de escolas públicas. Os resultados revelaram uma discrepância entre a identificação oral de palavras e o desempenho na segmentação da escrita, sendo três os critérios utilizados pelos alunos para definição de “palavra”: 1<sup>o</sup>) sentido pleno; 2<sup>o</sup>) sequência de letras e não apenas uma ou duas; 3<sup>o</sup>) frequência de utilização do vocábulo. Análises estatísticas mostraram correlações positivas e significativas entre segmentação convencional e consciência morfosintática. Infere-se que as habilidades morfosintáticas favorecem o estabelecimento da noção convencional de palavra e sugere-se que os professores promovam o desenvolvimento dessas habilidades para garantir aos alunos maior domínio na linguagem escrita.

**Palavras-chave:** habilidades para escrita, ortografia, morfologia (linguística)

## El Papel de la Consciencia Morfosintáctica en la Segmentación Lexical Convencional

**Resumen:** Desde la etapa alfabética de adquisición de la escritura, el aprendiz necesita enfrentar cuestiones relativas a la ortografía, entre ellas la segmentación de la escritura en palabras gráficas. Se investigó la segmentación convencional de palabras y su relación con la consciencia morfosintáctica en una muestra de alumnos de 4<sup>o</sup> y 5<sup>o</sup> año de la enseñanza primaria de escuelas públicas. Los resultados revelaron discrepancia entre la identificación oral de palabras y el desempeño en la segmentación de la escritura. Los alumnos utilizaron tres criterios para la definición de “palabra”: 1<sup>o</sup>) sentido pleno; 2<sup>o</sup>) secuencia de letras, no sólo una o dos; 3<sup>o</sup>) frecuencia de utilización del vocablo. Análisis estadísticos mostraron correlaciones positivas y significativas entre segmentación convencional y consciencia morfosintáctica. Se infiere que las habilidades morfosintáticas favorecen la noción convencional de palabra y se sugiere que los profesores promuevan el desarrollo de esas habilidades, garantizando mayor dominio del lenguaje escrito.

**Palabras clave:** habilidades para escribir, ortografía, morfologia (lingüística)

From the end of the 1970's, studies have evidenced a close relationship between the acquisition of the writing system and the metalinguistic awareness of the phonological constituent of the words, called “phonological awareness” (Capovilla & Capovilla, 2009). In accordance with these studies, in the alphabetical languages such as French, English and Portuguese, phonological awareness is necessary for learning the written language, therefore, its writing systems

involve the analysis of the words in minimum phonological units, the phonemes, which are represented by the letters. This, however, does not mean that writing is limited to a phonemic (or phonetic) transcription, as a biunivocal and reciprocal correspondence between letter and sound is not verified in the writing systems. Therefore, when discovering the alphabetic nature of the writing system, the child does not immediately start to write according to the orthographic conventions (Ferreiro & Teberosky, 1984, 1985). From this point, the child needs to develop a “orthographic hypothesis” that, as explained by Zorzi (1998), implies the ability to “think of the words, not only in terms of their acoustic structure, but also from a visual reference, considering the graphical form that words have i.e., the convention” (p. 87).

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For Ferreiro and Pontecorvo (1996), “when the child starts to work on ‘the orthographic within the alphabet’, one of the aspects that must be covered is the definition of a word that the writing imposes” (p. 51). In other words, from the alphabetic stage, the child must also address several issues regarding orthography, with perhaps one of the most important being the acquisition of the ability to segment writing into graphic words. Adopting a psycholinguistic perspective, Ferreiro and Pontecorvo (1996) comparatively studied aspects related to the acquisition of writing in three different languages: Spanish, Italian and Portuguese, investigating what mental representation pre-literate children had of a “word”. These authors found evidence that young children seem to make a clear distinction between what they consider “words” – those that present a solid reference – and other things that they said “put words together”: articles, conjunctions and prepositions.

It can be said that in the initial acquisition of writing, as well as in subjects with difficulty in writing, the notion of a word is based on units of meaning rather than on classes of words. Thus, words that represent ideas are more easily recognized (Monteiro, 2002) i.e., the lexical or content words (Rosa, 2006). Conversely, the slight command of writing makes it difficult to recognize words which do not have meanings that may be construed as a unit of meaning independent of the linguistic universe - as is the case with the prepositions, articles and conjunctions. Such words are referred to as grammatical or form words (Monteiro, 2002; Rosa, 2006).

A study performed with Brazilian children that supports this idea was conducted by Correa and Dockrell (2007). These researchers found a tendency for the articles (the, a, an) and prepositions (of, with, for) not to be separated by blank spaces from the closest lexical words (nouns and verbs). Furthermore, it was found that the hyposegmentation (writing with two or more words agglutinated) are significantly more frequently than hypersegmentation (writing a word in two or more segments) in the texts of infants, where the relative frequency of unconventional segmentations in the writing of the children significantly decreased according to the schooling level. Conversely, Marec-Breton and Gombert (2004) emphasize that writing combines two principles essential for its existence and operation. The first is phonographic and concerns the relationship between sound units or phonemes (/f/l/o/w/e/r/) and graphic units or graphemes (f-l-o-w-e-r). The second principle is semiographic and allows graphic units (flower) to also correspond to a meaning (flower = the sexual reproduction organ of the higher plants). Therefore, it can be said that phonological processing is associated with the phonographic principle, while morphological processing associates with the semiographic principle (Mota, Aníbal, & Lima, 2008).

According to Carlisle (2000), morphological awareness relates to the ability to reflect and intentionally manipulate the morphological structure of the language. In other words, it is the ability to make explicit use of the formation, inflection and classification processes of words in a language. In

turn, syntactic awareness refers to the intentional control and conscious employment of the syntax of the language (Gombert, 1990). More specifically, it concerns the ability to make explicit use of the formal processes relative to the organization of the words for the production and comprehension of sentences. Since the orthographic system simultaneously represents the phonological and morphosyntactic levels, it seems perfectly legitimate to infer that learning the written language is influenced by both phonological awareness and morphosyntactic awareness.

Several studies conducted in the English language maintain the importance of considering the morphosyntactic aspects for the production of spelling. Among these, the study of Deacon and Bryant (2005) is highlighted, which examined the effects of the knowledge of suffixes on the writing of children. The results of this study affirm that children from five to eight years of age demonstrated having awareness of inflections, but not of derivations. The authors concluded that it is more difficult for children to understand the relationships in morphemic derivations than in inflections due to the fact that in derivational morphology there is a change in the grammatical class of the morphologically complex words, which does not occur in inflectional morphology.

A longitudinal study conducted by Deacon, Kirby and Casselman-Bell (2009) investigated how different cognitive abilities evaluated in seven year old children influenced their performance in writing isolated words two years later. The results showed that morphological awareness was an important variable in determining the future performance in general writing (not just in the writing of specific morphemes) and that the contribution of morphological awareness was independent from the contribution of the other evaluated variables.

Portuguese is a more transparent alphabetical language than the English language, i.e., it presents a higher degree of correspondence between letters and speech sounds, suggesting a less significant contribution of morphological processing in the acquisition of the written language. However, in the last decade studies of the Portuguese language have presented evidence of a relationship between morphological awareness and performance in the written language. Queiroga, Lins and Pereira (2006), in a study that involved 120 students of the 2<sup>nd</sup> and 4<sup>th</sup> years of elementary education of public and private schools, investigated the relationship between morphosyntactic awareness and orthographic performance. Their results showed a predictor effect of the morphosyntactic knowledge regarding the orthographic performance, as well as an evolution between the series in the explanation of the morphosyntactic knowledge and in the writing of words and pseudowords. Similarly, Mota et al. (2008) conducted an investigation aiming to verify the contribution of derivational morphology processing for reading and writing in Portuguese, also analyzing whether this contribution is dependent on phonological awareness, i.e., a byproduct of phonological processing. Their results show that the ability to reflect on the morphemes contributes greatly for reading

and writing, and this contribution is, to some extent, independent of phonological processing.

Correa (2010) highlighted two important aspects of morphological awareness for the command of the conventional segmentation of written words. The first aspect concerns the fact that sensitivity to the morphology may help the individual to separate a grammatical word from the closest lexical word. The second aspect refers to support in maintaining the integrity of the word. In other words, morphological awareness can facilitate the conventional segmentation in the writing of words (nouns, verbs, or adjectives) which begin with syllables that are similar to a grammatical word (article, preposition or conjunction), for example, in *thesis*, *wither* and *internal*. In fact, this second aspect also relates to the contribution of the command of vocabulary for conventional writing, both regarding the morphology and the semantics, since as the subject knows the meaning of the word that is being written, it is easier to segment it properly.

It is in this theoretical context that this study aimed to investigate the conventional segmentation of words and their relationship to morphosyntactic awareness in a sample of students of the 4<sup>th</sup> and 5<sup>th</sup> years of elementary education in public schools. It was sought to analyze the “word” concept of these students and to verify possible correlations between their performance in morphosyntactic awareness tasks and the performance in oral word identification tasks and tasks of conventional segmentation in the writing of words. It was hypothesized that the scores of the participants in the tasks that evaluate morphosyntactic awareness would correlate positively with the performance rates in both the tasks: identification of spoken words and conventional segmentation of writing.

## Method

### Participants

The study universe consisted of students from the 2<sup>nd</sup> cycle (4<sup>th</sup> and 5<sup>th</sup> years) of Elementary Education of Public Schools of the Regional Center of Pinheiro, municipality of Curitiba. As described in the procedure, three schools of this Teaching Center were contacted and, among the students attending the 2<sup>nd</sup> cycle, four groups of participants were selected according to their writing performance (conventional segmentation in graphic words). A total of 40 students participated in the study, divided into four groups (each with six students from the 4<sup>th</sup> year and four students from 5<sup>th</sup> year), as follows:

Group 1: Composed of 10 students (two girls and eight boys) aged eight years and three months to 11 years and one month (mean of nine years and two months) and whose writings presented a high frequency of hyposegmentation;

Group 2: Composed of 10 students (six girls and four boys) aged eight years and four months to 10 years and 11 months (mean of nine years and six months) and whose writings showed a high frequency of hypersegmentation;

Group 3: Composed of 10 students (four girls and six boys) aged between eight years and 10 months to nine years and 11 months (mean of nine years and four months) and whose writings had a high frequency of both hyposegmentation and hypersegmentation;

Group 4 (control): Composed of 10 students (two girls and eight boys) aged eight years and four months to 10 years and one month (mean of nine years and one month) that did not present lexical segmentation problems, coming from the same classes as the group 3 participants.

### Instruments

The study was based on two types of data collection instruments:

#### 1. Identification of words in popular sayings.

This task was planned using the study of Ferreira (2000) as the reference and aimed to verify the ability of the participants to identify orally and in writing the words of eight popular sayings that contained a total of 58 words. For example: “The rope always breaks at its weakest point”, “Who goes to the mill, comes out floury”. The sayings were orally presented to the participants and the student was asked to: 1) repeat the phrase counting “on the fingers” the number of words; and 2) write the sentence and count the words; 3) answer questions similar to the following: How do you know where to separate the words? When you talk, is the number of words different from when you write? Is “the” a word? What is the difference between words like: “rope”, “the” and “is”?

#### 2. Evaluation of morphosyntactic awareness tasks.

*2.1 Grammatical categorization task* (Sá, 1999): In this task 15 words (on small cards) of three different grammatical categories were presented to the participants, these being: five nouns, five adjectives and five verbs. Then the examiner asked the student to form three groups of words. If the student managed to distribute the words correctly, i.e., form the three groups according to the grammatical classes, the task was terminated. A second opportunity was offered to the participants who failed to classify the words into grammatical categories. In this second stage, the examiner selected three words – a verb, an adjective and a noun – and asked the student to put all actions by the verb, all the names next to the noun and all the qualities with the adjective.

*2.2 Inflectional graph-morphology task*: Developed by Paula and Besse (Paula, 2007), the task considers the inflection of nouns (gender variance) and verbs (verbal tenses), based on the paradigm of the intruder. Altogether the task presents 14 items (two for practice and 12 experimental): six with *gender* inflection and six with verb *tense* inflection – three past/future and three present/past. To perform the task (which was applied in the printed form, as employed by the authors of the task), the students needed to find which of two words are different from the keyword presented. One of the items used in the practice is presented as an example: What is the word that is not

just for women - “wife” (keyword): “carioca” (a person from Rio de Janeiro) or “girl”? In this case the intruder is “carioca”.

**2.3 Task generative use of morphemes** (Guimarães, 2005): This task requires the children to orally perform inflexion of verb forms presented in the context of two or three sentences. The items were designed to verify the adequacy of the answers of the students with regard to the following situations: considering the Portuguese language, pronunciation or omission of the “r” at the end of verbal infinitives; pronunciation or omission of the final “u” in verbs in the past tense, third person, singular; pronunciation or omission of the final “s” in verbs in the past, first person, plural; pronunciation or omission of the nasalization of the unstressed nasal diphthong in verbs in the past tense, third person, plural. In this task, 14 items were used (two for practice and 12 for the test). For example: This morning I *tidied (arrumei)* up my entire bedroom. When my mother saw, she said: - Very good, you *tidied (arrumou)* everything without me asking you to \_\_\_\_\_. Also in relation to this task it is important to point out that as it was applied orally, probably the performance of the participants suffered interference due to the linguistic variation in their speech, which may represent a limitation of the task in the evaluation of morphosyntactic awareness.

**2.4 Morphosemantic decision task** (Paula, 2007): In this task the participant has to decide whether a word is constructed in the same way as another, from the explanation of how we can get new words by adding a *prefix* or *suffix* on a *primitive* word. For example: the word “uncover” comes from “cover”. The same situation occurs with “undo” and “do”, in which “un” is added to the beginning of “do”. However, for the student to discriminate a derived word from another not derived, the word “universe” could be presented as an example that has the syllable “un” in front, but not from “iverse”. After the explanation, the test is performed with the participant, asking: “Which word is made in the same way as “uncover”: is it “universe” or “undo”? If the student answers correctly, the activity begins. If the student answers incorrectly, the correct answer is provided explaining the reason. The task consists of 12 groups of three words involving prefixes (example: unclear-universe-unwilling) and 12 groups of three words involving suffixes (example: comfortable-enjoyable-stable).

**2.5 Morphological analogies task** (Guimarães, 2005): This task was assembled according to the scheme traditionally used in analogy tasks, i.e., “A” is for “B” as “C” is for “D”. It was applied orally with the participants, and to answer the students should use the root of “C” and generate a word of the same grammatical category as “B”. The task consisted of 12 items (two of practice and 10 experimental). It is noteworthy that in the preparation of the pairs (“B” and “D”) words were selected that did not rhyme; this procedure was to avoid possible phonological interference in the performance of the task. This task was

administered orally with the children. One of the items used in the practice is presented as an example:

- |              |           |
|--------------|-----------|
| A - goodness | B - good  |
| C - badness  | D - _____ |

### Procedure

After obtaining the consent to perform the study from those responsible (Pedagogical Administrative Teams) for the Schools chosen, the teachers of the 4<sup>th</sup> and 5<sup>th</sup> year classes were asked to dictate to the students the fable of “The grasshopper and the ants”, a text composed of 86 words. A total of 536 texts were collected and 40 of these were selected according to an arbitrary decision so that two groups (1 and 2) were formed by students whose texts presented more than three unconventional segmentations of a specific type (hypersegmentation or hyposegmentation). The third group was composed of students whose texts presented six or more unconventional segmentations (three or more of each type, i.e. texts with hypersegmentations and hyposegmentations). The fourth group was composed of students whose texts did not present lexical segmentation problems. The authors of the texts were identified and invited to participate in the study. During the application of the instruments, the students were evaluated individually in two sessions of 20 to 30 minute durations. In the first session tasks were performed related to identifying oral and written words from popular sayings and in the second, the morphosyntactic awareness tasks were applied.

### Ethical Considerations

This study was conducted with the approval of the Department of Elementary Education Board of Directors of the Municipal Education Department of Curitiba. After authorization from the Municipal Department, three Elementary Education Schools of the Regional Center of Pinheiro were contacted randomly and the research project was submitted to the Pedagogical Administrative Teams of the Schools, who consented to the performance of the study. The students that were the potential study participants were identified and their inclusion in the study occurred with the permission of a parent or guardian through the Terms of Free Prior Informed Consent, which guaranteed the voluntary participation of children in the activities (tasks they should perform) and their anonymity in the dissemination of the results.

### Results

As the number of correct answers could vary according to the different tasks used in this study, the results are presented as percentages. With the exception being the mean number of hyposegmentations and hypersegmentations produced by students of the different groups in the writing of the popular sayings (Table 2).

### Identification of Words in Popular Sayings

Table 1 shows the mean age of the 40 study participants, as well as the means and respective standard deviations of the percentages of correct answers in the tasks of

oral identification and written segmentation of the words presented in the popular sayings. As can be seen in Table 1, in the identification of words in popular sayings, both orally and in writing, the participants of groups 1, 2 and 3 performed worse than the participants of group 4.

Table 1

*Mean Age of the Participants and Mean and Standard Deviation of the Percentage of Correct Responses in the Oral and Written Identification Tasks for the Words Presented in Popular Sayings by Group*

GROUP	N	Mean	Age	% of correct responses in the		% of correct responses in the	
				Oral Identification		Writing Segmentation	
				M	S.D.	M	S.D.
Group 1	10	9y.	2m.	70.51	13.9	84.82	11.43
Group 2	10	9y.	6m.	72.58	14.62	86.71	12.08
Group 3	10	9y.	4m.	67.93	9.89	79.64	13.09
Group 4	10	9y.	1m.	90.51	6.96	96.72	2.75
Total	40	9y.	3m.	75.38	15.90	86.97	12.55

The comparison of the means using the Kruskal-Wallis test showed that the performance difference between the groups was significant, both in the oral counting ( $\chi^2 = 17.38$ ,  $gl = 3$ ;  $p = .001$ ) as well as in the written ( $\chi^2 = 17.54$ ,  $gl = 3$ ;  $p = .001$ ). The pairwise comparison of the groups, using the Bonferroni *post hoc* test, showed that in the oral counting of words there were no significant differences among groups 1, 2 and 3 and that the performance of all three was significantly lower than that of group 4. However, with regard to the performance in the writing, the pairwise comparison showed a significant difference only between groups 3 and 4, with the performance of group 3 being significantly lower than that of group 4. There were no significant differences among the other groups.

Analyzing the set of words identified by the participants of the four groups, it appears that the total percentage of correct identifications of oral words is lower (75.38%) than the total percentage of correct written identifications (86.97%), suggesting that it was easier for the participants to write the words in the conventional way than to express the same words orally. The paired Wilcoxon test, used to compare the mean percentage of correct responses in the oral identification and the written identification of the words, for each of the groups of participants, revealed that only group 3 presented no significant difference in the percentage of correct responses ( $Z = -1.82$ ;  $p = .07$ ). However, there were significant differences in these percentages in groups 1 ( $Z = -2.60$ ;  $p < .01$ ), 2 ( $Z = -2.40$ ;  $p < .05$ ) and 4 ( $Z = -2.21$ ;  $p < .05$ ).

Considering the criteria adopted by the students to determine what the word is, it was verified that the explanations of the participants could be grouped into three main categories: 1) the word requires full meaning; 2) in the word there must be a sequence of letters and not just one or two, 3) the frequency of use of the word defines it as a “word”. Focusing on just the writing of the

popular sayings, Table 2 shows the mean hyposegmentations and hypersegmentations made by the students of the four groups (separately). Analyzing the number of hyposegmentations and hypersegmentations made by the participants, it appears that, irrespective of the group, the number of hyposegmentations is higher, even among those students who were selected because they presented a greater amount of hypersegmentations in the text selection (Group 2).

Table 2

*Mean and Standard Deviation of the Number of Hyposegmentations and Hypersegmentations in the Writing of the Popular Sayings by Group*

GROUP	N	Hyposegmentations		Hypersegmentations	
		M	S.D.	M	S.D.
Group 1	10	3.80	4.44	1.80	1.40
Group 2	10	2.70	2.87	1.80	1.69
Group 3	10	5.00	4.00	2.60	2.27
Group 4	10	1.00	0.82	0.20	0.42
Total	40	3.13	3.54	1.60	1.77

The statistical comparison of the hyposegmentation and hypersegmentation means of each of the four groups of participants, performed through the Wilcoxon paired test, revealed no significant difference between the frequency of hyposegmentation and hypersegmentation in the cases of groups 1 ( $Z = -0.93$ ;  $p = .36$ ) and 2 ( $Z = -0.57$ ;  $p = .57$ ). However, a significant difference was verified between the means in the cases of groups 3 ( $Z = -2.14$ ;  $p < .05$ ) and 4 ( $Z = -1.99$ ;  $p < .05$ ).

The qualitative analysis of the data revealed that the hyposegmentations occurred mainly when the participants had to isolate words of few letters, for example: *therope*

(the rope), *thelife* (the life), *acar* (a car), *thebest* (the best), *byitself* (by itself), *forher* (for her), *ofit* (of it), *onfoot* (on foot). Conversely, the analysis of the hypersegmentations indicates that they constitute groups of letters that correspond to words with “autonomous existence in the language” and not mere assemblage of letters, for example: *percent age* (percentage), *high light* (highlight). In addition to the situations of hypo and hypersegmentations described, there were cases where students took a sequence of letters corresponding to two words and performed first one hyposegmentation and then a hypersegmentation, for example: *morenar row* (more narrow), *emptyb ag* (empty bag), or the reverse, first a hypersegmentation and then a hyposegmentation, for example: *ahе adof* (ahead of) *be stof* (best of), *lea vefloury* (leave floury).

Table 3

*Mean Percentage of Correct Responses in the Five Morphosyntactic Awareness Tasks and Overall Morphosyntactic Awareness Score*

GROUP	N	Mean percentages of the morphosyntactic awareness tasks					Morphosyntactic awareness score	
		Grammatical categorization	Inflectional graph-morphology	Generative morpheme use	Morphosemantic decision	Morphological Analogies	M	S.D.
1	10	57.50	56.70	75.87	78.75	72.00	68.16	5.34
2	10	53.33	64.20	85.83	77.50	69.50	70.07	8.53
3	10	55.00	60.07	76.70	76.67	71.00	67.89	9.20
4	10	68.33	70.03	97.50	95.00	84.00	82.97	9.00
Total	40	58.54	62.75	83.97	81.98	74.12	72.27	10.07

The pairwise comparison of the performance of the groups in two tasks where the performance difference was significant, using the Bonferroni *post hoc* test, showed that the generative use of morphemes task did not differ among groups 1, 2 and 3, the performance of groups 1 and 3 were significantly lower than group 4 and there was no significant difference between groups 2 and 4. As regards the morphosemantic decision task, the comparison between the pairs showed that the performance of groups 1, 2 and 3 did not differ and that the performance of all three was significantly lower than that of group 4.

Considering the combined score of the five tests, i.e., the overall morphosyntactic awareness performance, the comparison of the four groups through the Kruskal-Wallis test showed that the differences between the groups were significant ( $\chi^2 = 13.51$ ,  $gl = 3$ ;  $p = .004$ ). The pairwise comparison of the groups, using the Bonferroni *post hoc* test, showed that the overall morphosyntactic awareness performances were not significantly different among groups 1, 2 and 3. However, the morphosyntactic awareness scores of these groups were significantly lower than that of group 4. In addition, the relationships between the morphosyntactic

## Morphosyntactic Awareness

Table 3 presents the means obtained in the five morphosyntactic awareness tasks (grammatical categorization, inflectional graph-morphology, generative use of morphemes, morphosemantic decision and morphological analogies) as well as the overall morphosyntactic awareness score derived from the mean of the percentage scores in the five tasks. Although in all the tasks the performance means of groups 1, 2 and 3 were lower than the mean of group 4, the comparisons of these means, using the Kruskal-Wallis test only indicated significant differences between the groups in the generative morphemes use ( $\chi^2 = 12.42$ ,  $gl = 3$ ;  $p < .01$ ) and morphosemantic decision tasks ( $\chi^2 = 16.10$ ,  $gl = 3$ ;  $p = .001$ ). There were no significant differences verified between the groups in the grammatical categorization, inflectional graph-morphology and morphological analogies tasks.

awareness scores and the lexical segmentation ability of the participants were analyzed through Spearman's correlation test. This test showed that the overall morphosyntactic awareness scores correlated positively and significantly with the performance in both the oral counting of the words that appeared in the popular sayings presented ( $r_s = .53$ ;  $p < .01$ ) and with the performance in the written segmentation of the words ( $r_s = .72$ ;  $p < .01$ ).

The Spearman's test results highlight the relationships between the percentage of correct responses of the participants in the writing segmentation and their performance in each of the five morphosyntactic awareness tasks. The results showed a significant positive correlation between all five morphosyntactic awareness measures and the percentage of correct responses of the participants in the writing segmentation: for the grammatical categorization task ( $r_s = .45$ ;  $p < .01$ ), for the inflectional graph-morphology ( $r_s = .48$ ;  $p < .01$ ), for the generative use of morphemes ( $r_s = .59$ ;  $p < .01$ ), for the morphosemantic decision ( $r_s = .43$ ;  $p < .01$ ) and for the morphological analogies task ( $r_s = .38$ ;  $p < .05$ ).

Table 4  
Spearman's Correlation Coefficient

	2	3	4	5	6	7	8
1. Morphosyntactic awareness score	.53**	.72**	.64**	.64**	.69**	.60**	.63**
2. Performance in oral counting of words		.65**	.41**	.40**	.60**	.34*	.17
3. Performance in writing the words			.45**	.48**	.59**	.43**	.38*
4. Grammatical categorization				.32*	.35*	.37*	.24
5. Inflectional graph-morphology					.29	.13	.29
6. Generative morpheme use						.36*	.22
7. Morphosemantic decision							.38*
8. Morphological analogies							

\* $p < .05$ , \*\* $p < .01$

## Discussion

It should be initially noted that the analysis of the total words identified by the set of participants showed that all the groups presented a greater ability to write words according to the standard graphical criteria than to count them orally. This result is understandable considering that speech presents a continuous flow in which the boundaries between words are inaccurate. Therefore, writing provides “concepts and categories for thinking about the structure of spoken language, rather than the reverse” (Olson, 1994, p. 68). Furthermore, the analysis of the number of hyposegmentations and hypersegmentations made by the participants showed that, regardless of the group, the number of hyposegmentations was greater than the number of hypersegmentations. These results corroborate those of the studies of Correa and Dockrell (2007) and Ferreiro and Pontecorvo (1996) who, when examining the incidence of unconventional segmentations, found a lower frequency of hypersegmentations than hyposegmentations.

The qualitative analysis of the hyposegmentations confirms the second criterion adopted by the students for defining a word, i.e., there was a tendency to write words using a sequence of letters and not just one or two. The occurrences of hyposegmentations identified confirm the findings of Correa and Dockrell (2007), who evidenced the tendency not to separate the articles and the prepositions from the closest lexical words in the writing of Brazilian students. The cases of hypersegmentation are also in accordance with what has been discussed both by Correa and Dockrell (2007) and by Ferreiro and Pontecorvo (1996), as a large proportion of these cases resulted in a group of letters which represented real words i.e., the segments resulting from the hypersegmentations do not constitute a mere assemblage of letters. Apparently, this type of orthographic alteration is due to the fact that, after comprehending that there are grammatical

words, that is, the prepositions, articles and conjunctions, the learners start to isolate segments of the lexical words that correspond to those words (grammatical). It can be considered that this form of written representation is equivalent to an intermediate level of knowledge acquisition regarding the grammatical words, i.e., the learners already recognize that they are independently represented, however, this knowledge is improperly applied.

It is important to highlight that there were cases where the participants performed both types of unconventional segmentation and in these cases, both occurred taking a sequence of letters corresponding to two words and first performing a hyposegmentation and then a hypersegmentation, as well as the contrary. It is difficult to interpret and draw conclusions about these types of unconventional segmentation, since they do not present an identifiable pattern. However, it is assumed that they are the product of the insufficient experience of the students in activities involving written language, which means that they have not acquired orthographic representations possible in Portuguese. However, these cases require further investigation. Conversely, regarding the performance of the participants in the morphosyntactic awareness evaluation tasks, it was found that, irrespective of the group, the two tasks in which the participants presented lower performance were: grammatical categorization (worst performance of the groups, with the exception of group 1) and inflectional graph-morphology (second worst performance of the groups, with the exception of group 1, which presented its worst performance in this task). Considering these results, it can be said that these were the more complex tasks for the students. Probably they are still not oriented to reflect on this type of categorization, i.e., morphological analysis. Furthermore, the fact that the participants presented the second-worst performance in the inflectional graph-morphology task was an unexpected result. Taking the study of Deacon and Bryant (2005) as a reference, which concluded that it is more difficult for children to understand the morphemic relationships in the derivations than in the inflections, it was expected that the performance in this task would be higher than in the morphosemantic decision task.

The results presented here should be taken with caution, given that the items of the morphosemantic decision task and the inflectional graph-morphology task were restricted to some particular cases of derivation and inflection. Thus, in the morphosemantic decision task the student had to identify words derived from two prefixes (*des-* (*un-*), *re-* (*re-*)) and two suffixes (*-eiro* (*-er*), *-or* (*-er*)), i.e., the formation of words was focused exclusively on the additional of four specific affixes. Regarding the inflectional graph-morphology task, the items involving verbal inflection were restricted to the discrimination of verbs in the 1<sup>st</sup> person singular past/future (I worked/I will walk) and the 3<sup>rd</sup> person plural present/past (they pinch/they dreamed). A limitation should be highlighted in the ability of the two tasks (morphosemantic decision and inflectional graph-morphology)

that evaluate the skills of the students related to derivational and inflectional morphology. This is due to the fact that the answers for the tasks were chosen from two alternatives, which increases the possibility of correct responses by chance. For future studies, the use of tasks in which the participants must “produce” the correct answer instead of just “recognize it” is suggested.

With regard to the morphological analogies task, groups 1, 2 and 3 presented a mean performance of around 70% and group 4 of 80%, which reveals the relative ability of the participants to identify the “lexical group” and to generate words belonging to the same “group”. The generative use of morphemes task was the one that resulted in the best performance of the groups, again with the exception of group 1, showing that the participants had the facility to perform inflexion with verb forms presented in the context of two or three sentences. One explanation for the ease the participants had in these tests may be related to the fact that good performance in them does not require explicit morphosyntactic knowledge, i.e., the items can be solved from implicit knowledge.

It is emphasized that the results of the correlation test between the percentage of correct responses of the participants in the writing segmentation and their performance in each of the five morphosyntactic awareness tests seem to reinforce the arguments of Deacon et al. (2009) that morphological awareness is an important variable in determining the overall writing performance (not just in the writing of specific morphemes explicitly taught to students). For example, 19 students (of the 40 study participants) improperly segmented the word “floury”. However, it is believed that if they had known that the prefixes “em-, en-” appear in various formations with the meaning “transition to a state or form” (for example: empedrado (*gravelly*), encaderado (*bound*), they would probably have used this knowledge and generated the correct orthography for the word “floury”.

The analysis of the other two types of unconventional segmentation performed by the participants – *therope* (hypossegmentation of the words “the” and “rope”) and *lear ned* (hypersegmentation of the word “learned”) – helps to explain how morphosyntactic awareness can contribute to writing according to the standard graphical criteria. In reality, the words written by the participants and the words that they should have written, i.e., the words of the popular sayings, are “real” words and therefore likely to occur in writing. However, the words of the popular sayings and those which were produced by the students, although they have different meanings, have the same sound sequence and therefore cannot be spelled correctly based only on their acoustic structure. Thus, if the participants had reflected on the context of the sentences (popular sayings) in which the words occurred, i.e., the syntagmatic relationships between the linguistic units, they would have realized that the written word could not appear in those contexts.

### Final Considerations

From the results obtained, it can be said that the hypothesis of this study was confirmed, given that the analysis of the data showed the existence of a significant positive correlation

between the scores of the participants in morphosyntactic awareness and their performances in both the oral word identification as well as the conventional segmentation of the writing. In other words, the empirical data presented here suggest that explicit morphosyntactic skills can contribute to the construction of the concept of the word and to the development of the capacity for segmentation of the writing in graphic words. Therefore, it was concluded that an important aspect of the orthographic command, which is precisely the ability to segment writing according to standard grammar, requires not only regular and frequent contact with the language, but also the development and integration of diverse metalinguistic skills, including morphosyntactic awareness. Finally, given the correlational nature of this study, the need is highlighted for further research, especially intervention studies that may promote the learning of morphosyntactic knowledge accessible to the awareness and evaluate the impact of such knowledge on the development of writing.

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