

# THE IMPACT OF MORPHOLOGICAL AWARENESS ON READING AND SPELLING<sup>1,2</sup>

## O IMPACTO DA CONSCIÊNCIA MORFOLÓGICA NA LEITURA E NA ORTOGRAFIA

Carina COELHO<sup>3</sup>  
Sylvie CAPELAS<sup>4</sup>  
Pedro Sá COUTO<sup>5</sup>  
Rita VINAGRE<sup>6</sup>  
Marisa LOUSADA<sup>7</sup>

**ABSTRACT:** Morphological awareness is characterized by the ability to intentionally reflect and manipulate morphemes. The present study aimed to characterize the development of morphological awareness in school-age children and to analyze its impact on reading and spelling. The sample was comprised of 60 children with typical language development in Portuguese primary schools with a mean age of 8.6 (standard deviation = 0.1), 30 of which attended the 2<sup>nd</sup> grade and 30 the 4<sup>th</sup> grade. The data was analyzed considering the use of language assessment instruments, reading and spelling and morphological awareness tests adapted from other studies. The results showed a significant difference in morphological awareness between the 2<sup>nd</sup> grade and the 4<sup>th</sup> grade. Although with different statistical proportions, there was a positive correlation between morphological awareness and reading, and between this metalinguistic capacity and spelling in both groups. An association is suggested between morphological awareness and reading and spelling and a difference in this correlation between the two degrees.

**KEYWORDS:** Morphological awareness. Primary school. Reading. Spelling.

**RESUMO:** A consciência morfológica é caracterizada pela capacidade de refletir e manipular intencionalmente os morfemas. O presente estudo visou caracterizar o desenvolvimento da consciência morfológica em crianças em idade escolar e analisar o seu impacto na leitura e na ortografia. A amostra foi composta por 60 crianças portuguesas com desenvolvimento linguístico típico a frequentar o 1º ciclo do Ensino Básico, com uma média de idades de 8,6 anos (desvio padrão = 0.1), 30 das quais frequentam o 2º ano e 30 o 4º ano. Os dados foram analisados com recurso a instrumentos de avaliação linguística, leitura e ortografia e testes de consciência morfológica adaptados de outros estudos. Os resultados mostraram uma diferença significativa na consciência morfológica entre o 2º ano e o 4º ano. Embora com diferentes proporções estatísticas, houve uma correlação positiva entre consciência morfológica e leitura, e entre esta capacidade metalinguística e ortográfica em ambos os grupos. É sugerida uma associação entre consciência morfológica e leitura e ortografia e uma diferença nesta correlação entre os dois anos de escolaridade.

**PALAVRAS-CHAVE:** Consciência morfológica. 1º ciclo. Leitura. Ortografia.

## 1 INTRODUCTION

Morphological awareness consists in the ability to consciously reflect, analyze and manipulate the morphological structures of words and morphemes. This metalinguistic ca-

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<sup>3</sup> Escola Superior de Saúde. Universidade de Aveiro. Aveiro/Portugal. E-mail: carina.coelho99@ua.pt. ORCID: <https://orcid.org/0009-0004-8012-5627>

<sup>4</sup> Centro Paroquial de São Bernardo. Aveiro/Portugal. E-mail: sylvie@ua.pt. ORCID: <https://orcid.org/0000-0002-0056-9462>

<sup>5</sup> Centro de Investigação e Desenvolvimento em Matemática e Aplicações (CIDMA). Departamento de Matemática. Universidade de Aveiro. Aveiro/Portugal. E-mail: p.sa.couto@ua.pt. ORCID: <https://orcid.org/0000-0002-5673-8683>

<sup>6</sup> Escola Superior de Saúde. Universidade de Aveiro. Aveiro/Portugal. E-mail: ritagalvao@ua.pt. ORCID: <https://orcid.org/0000-0002-8325-2857>

<sup>7</sup> CINTESIS.UA@RISE. Escola Superior de Saúde. Universidade de Aveiro (ESSUA). Aveiro/Portugal. E-mail: marisalousada@ua.pt. ORCID: <https://orcid.org/0000-0003-0326-0257>

capacity can be divided into two levels, namely implicit and explicit. The first level is related to oral language and, as children's experiences increase, they move to explicit quality, where there is the competence to think and reflect how meanings are transmitted by different morphemes (Guimarães et al., 2019; Rosa, 2003; Santos et al., 2018).

Morphological awareness allows investigation at the level of derivational morphology and at the level of flexional morphology. The first relates to the process of word formation, by adding prefixes or suffixes to a radical, or to the decomposition of derived words, in order to create primitive words. The flexional morphology allows the words to be flexed regarding gender, number and mode-time (Machado, 2011; Silva & Martins-Reis, 2017).

There is no consensus on the age of acquisition of morphological awareness, however some investigations indicate that this competence should be stimulated as early as possible, being acquired over time. In this sense, the stimulation of the comprehension of early oral language is essential for children to be able to recognize words that are not contained in their lexicon, in the process of learning reading and spelling (Melo, 2002; Villalva, 2021). However, the development of this competence depends on certain parameters, such as the quantity and quality of linguistic data that children are exposed to (Villalva, 2021).

According to Nunes et al. (2006), the child's ability to work with morphemes, understanding their existence and role is important for the learning process because through the reflection of morphemes, the child can find it easier to learn the meaning of new words, besides facilitating the reading and spelling of words that are not so common in their daily repertoire. In addition, it helps in the understanding of new words, if the child realizes that these words are formed by the combination of morphemes, in which each one has its meaning (Flôres, 2019).

Researchers have become increasingly interested in how individuals learn to read and write, a complex mental process that involves recognizing and decoding graphic signals and interpreting their meaning. Several authors have indicated the need to identify the implicit causes of reading and spelling difficulties. They suggested that these may be related to metalinguistic skills (Gomes et al., 2016; Machado, 2018; Maluf et al., 2006). Studies have proven that, despite the foreseeable importance of phonological awareness, this is not the only metalinguistic competence related to reading and spelling performance. Thus, morphological awareness has been crucial for the development and acquisition of the literacy process (Machado, 2011; Silva & Martins-Reis, 2017).

Although the existing literature demonstrates that Portuguese is a transparent language, that is, it presents a more regular correspondence between the letters and sounds of speech, thus governed by the alphabetical principle, there are studies that allow us to conclude that there is a positive relationship between morphological awareness and the development of reading and spelling. This capacity can be established because the knowledge of morphological constituents is based on the possibility of performing generalizations based on the relationship between a grapheme sequence and a morphological constituent that has phonological information and a semantic or grammatical value (Guimarães et al., 2014; Migot, 2018; Mota, 2009).

Recently, an article was published in European Portuguese in which they concluded that there was a significant difference between the 2<sup>nd</sup> and 4<sup>th</sup> grades in terms of knowledge of

morphological awareness. In addition, they recognized that there was a relationship between morphological awareness and reading and spelling (Vinagre et al., 2022). However, the study sample was too small ( $n = 20$ ) for the results to be generalizable. Thus, the aim of this study is to understand more about the development of morphological awareness and the relationship of this metalinguistic capacity with reading and spelling in 2<sup>nd</sup> and 4<sup>th</sup> grade children of the 1<sup>st</sup> Basic Cycle. It answers the following questions: “Are there differences in the knowledge of morphological awareness between the students of the 2<sup>nd</sup> and 4<sup>th</sup> grades?”; “Is there an association between morphological awareness and reading and spelling in 2<sup>nd</sup> and 4<sup>th</sup> grade students?”; and “Are there differences in the impact of morphological awareness on reading and spelling among 2<sup>nd</sup> and 4<sup>th</sup> grade students?”.

## 2 METHODS

### 2.1 PARTICIPANTS

The present study was descriptive and correlational. The sample comprised of 60 children in the 2nd grade ( $n = 30$ ) and the 4th grade ( $n = 30$ ). Twenty-two were boys (36.7%) and 38 were girls (63.3%). The average age for the 2nd grade was 7.6 years old ( $SD = 0.5$ ) and 9.6 ( $SD = 0.5$ ) (Table 1) for the 4th grade. The mean age of the total sample was 8.6 ( $SD = 0.1$ ). The data was collected from three institutions in the Aveiro district, in Portugal. The inclusion criteria were as follows: the children had to: (a) attend the 2nd or 4th grade; (b) be monolingual native speakers of European Portuguese. Exclusion criteria included: (a) to present a language disorder; (b) to present a reading and spelling disorder. All procedures met the requirements of the Ethics Committee, Research Unit in Health Sciences (UICISA-E) (reference number 715/10-2020). Before the data was collected, informed consent was given by all caregivers.

**Table 1**

*Sociodemographic characterization (n=60)*

Variables		N	N (%)	M	SD
Gender	Male	22	36.7	-	-
	Female	38	63.3	-	-
	Total	60	100	-	-
Age	grade	30	50	7.6	0.5
	grade	30	50	9.6	0.5
	Total	60	100	8.6	0.1

### 2.2 INSTRUMENTS

- **Questionnaire for parents:** Caregivers filled out a sociodemographic questionnaire relating to the children (e.g., birth date, native language, and enrolment in speech-language therapy).
- **Language Observation Test – School Level ‘Grelha de Observação da Linguagem – Nível Escolar’ (GOL-E):** Language abilities were assessed using the GOL-E, a valid instrument standardized for children aged between 5 years 7 months old and 10 years

old. This instrument allows for the analysis of the domains of semantics, morphosyntax, and phonology (Sua-Kay & Santos, 2014). The children were only included in the study if their results were within the average ( $SD = 1.5$ ), fulfilling the inclusion criteria.

- Morphological awareness subtests:** The first set of morphological awareness subtests are those proposed by Capelas (2021). The *derived word analogy task* aims to analyze the child's competence to form new words through nominalization, adjectivization, and verbalization using bases and suffixes or prefixes. The explanation given to the child was as follows: "I'm going to say a word and then I'm going to change it into another word similar to it. Then I say a new word and you have to transform it too", After the explanation, an example was made with the child: "Listen to my example: *Fúria / Furioso* → *Sabor / Sabor...oso*". In the *pseudoword interpretation task*, the child's knowledge of the meaning of a pseudoword, generated by the derivation process, is analyzed. Each stimulus presented contains a radical with different suffixes. Thus, the following explanation was given: "I'm going to say a word and then I'm going to invent a similar word, but it doesn't exist. I want you to tell me what you think that word would mean, if it existed". Finally, an example was made with the child: "For example, we have the word '*abelhador*'. '*Abelhador*' could be someone who has bees or raises bees". Finally, the *judgement of word relations task* aims to analyze the child's ability to identify the presence of morphological and semantic relationships between two words. The explanation given would be: "I'm going to tell you two words and I'm going to ask you if they have a meaning that relates to each other. You have to answer yes, if they are from the same family, or no if they are not from the same family". Next, an example is given: "Are the word '*casa*' and '*casinha*' from the same family? Yes".

The second set of morphological awareness subtests were adapted from Mota et al. (2008). First, the *morphosemantic decision (affix) task* assesses the child's ability to identify the words that are formed in the same way, making an association with the affix. For example, is the word "*replantar*" formed in the same way as "*reservar*" or "*relembra*"? The child would have to choose an option. In the *morphosemantic decision (stem) task*, the child has to decide which word belongs to the same family as the target word, for example: Is the word "*gole*" from the same family as "*engorda*" or "*engole*"? The child would have to choose an option. The *spelling words with suffixes* test aims to evaluate the child's orthographic performance. The word spelling assessment with suffixes was carried out through two tests using different forms of assessment, namely dictation and thematic elicitation. Each of the subtests consisted of six radical spelling items and six word-spelling items with suffixes (radical + suffix). Regarding the dictation teste, the evaluator asked the child to write isolated words without visual support, such as the words "*normal*" and "*normalidade*". In relation to the thematic elicitation, the child was asked to read the sentence, such as "Soft drinks have a lot of sugar, so I prefer orange juice...". Subsequently, the child evoked the word and wrote if it was appropriate. If there were difficulties in evocation, semantic clues were provided. The choice of stimuli was based on a set of criteria namely: familiarity with the target words (ESCOLEX database), the semantic process, the phonological features that affect spelling at the age of the participants, productivity and the syntactic category suffixes, opacity/transparency and regularity.

Finally, the reading test consisted of two subtests from the *Bateria de Avaliação da Leitura em Português Europeu*, a standardised instrument for Portuguese children aged 6 to 10 years old. Reading items vary in terms of orthographic characteristics and syllable length. Regarding the spelling characteristics, half of the items have a consistent spelling and the other half have an inconsistent spelling. In relation to syllable length, there are disyllables, trisyllables and quadrisyllables that are equitably distributed. Each subtest consists of a list (B and C), each with four training items and twenty four words with different levels of complexity (Sucena & Castro, 2012). In the two lists, the first twelve words are formed by CV syllables, the next six words have a CV, CVC and CCV constitution, the last six are formed by VV, VC, CV, CVC and CCV syllables. List C can only be used when children are in the second semester of the school year.

## 2.3 PROCEDURE

The assessments took place in a quiet room in the children's schools. The children were assessed individually in two sessions (a 45-minute and a 20-minute sessions). The first session consisted of the GOL-E, and the second comprised morphological awareness tests, reading and spelling. The data were analysed using SPSS Version 24.0 (SPSS Inc., Chicago, IL);  $p$  values  $< .05$  were considered significant. The analysis of the homogeneity of the groups was performed using the Levene test and the residuals' normality was checked by visual inspection of the QQ plot. Based on this, the  $t$ -student test for independent samples was chosen. Pearson's correlation test (normality and linearity principles were verified) was also conducted.

## 3 RESULTS AND DISCUSSION

For the morphosemantic decision task, the affixes, prefixes, and suffixes were analysed separately, with the aim of answering the question: "Are there differences in knowledge of morphological awareness between 2<sup>nd</sup> and 4<sup>th</sup> graders?"

In order to answer the question, the results of the morphological awareness tests for the 2<sup>nd</sup> and 4<sup>th</sup> grades were analysed. Table 2 shows the mean and standard deviation (SD) for the number of correct answers and their percentage in each task.

**Table 2**

*Mean and standard deviation for the number of correct answers for each morphological awareness task per group*

Tasks	2 <sup>nd</sup> grade Mean (SD)	4 <sup>th</sup> grade Mean (SD)
Morphosemantic decision task: affix	4.8 (2.0)	5.7 (1.7)
Morphosemantic decision task: affix (Prefixes)	2.5 (1.1)	3.4 (0.86)
Morphosemantic decision task: affix (Suffixes)	2.3 (1.5)	2.3 (1.1)
Morphosemantic decision task: stem	10.4 (1.6)	11.6 (0.9)
Morphosemantic decision task: stem (Prefixes)	5.1 (1.2)	5.8 (0.7)
Morphosemantic decision task: stem (Suffixes)	5.4 (0.8)	5.8 (0.5)

Tasks	2 <sup>nd</sup> grade Mean (SD)	4 <sup>th</sup> grade Mean (SD)
Derived word analogy task	7.1 (1.9)	8.6 (1.2)
Derived word analogy task (Affixes)	7.1 (1.8)	8.7 (1.2)
Pseudoword interpretation task	2.2 (1.6)	3.2 (2.1)
Judgement of word relations task	6.1 (1.0)	6.6 (0.6)
Total morphological awareness	30.9 (5.2)	36.0 (4.5)

Table 3 shows the percentages of correct answers in the morphological awareness tests.

**Table 3**

*Percentages of correct answers in the morphological awareness tests*

Tasks	Percentage of correct answers in the 2 <sup>nd</sup> grade	Percentage of correct answers in the 4 <sup>th</sup> grade
Morphosemantic decision task: affix	60.0%	71.7%
Morphosemantic decision task: affix (Prefixes)	63.3%	85.0%
Morphosemantic decision task: affix (Suffixes)	56.7%	58.3%
Morphosemantic decision task: stem	86.9%	96.7%
Morphosemantic decision task: stem (Prefixes)	84.4%	96.1%
Morphosemantic decision task: stem (Suffixes)	89.4%	97.2%
Derived word analogy task	70.7%	86.3%
Derived word analogy task (Affixes)	71.3%	86.7%
Pseudoword interpretation task	25.0%	37.5%
Judgement of word relations task	87.1%	94.8%

Based on the above tables, in the morphosemantic decision task (Affixes) it was found that the 2<sup>nd</sup> grade obtained an average of 4.8 ( $SD = 2.0$ ) and those of the 4<sup>th</sup> grade obtained an average of 5.7 ( $SD = 1.7$ ), with  $.908$  and  $p = .062$ . Therefore, there were no significant differences between the two groups.

For the *morphosemantic decision (stem) task*, individual analysis of the affixes, prefixes and suffixes was carried out. The 2<sup>nd</sup> grade obtained an average of 10.4 ( $SD = 1.6$ ) and the 4<sup>th</sup> grade obtained an average of 11.6 ( $SD = 0.9$ ) for the affixes, with significant differences between the two groups ( $.502$  and  $p = .001$ ). The 2<sup>nd</sup> grade correctly answered 86.9% and the 4<sup>th</sup> grade correctly answered 96.7%. There were significant differences between the two groups in the prefix ( $p = .006$ ) and suffix ( $p = .008$ ) subtests.

In the *derived word analogy task*, the 2<sup>nd</sup> grade obtained an average of correct words of 7.1 ( $SD = 1.9$ ) and the 4<sup>th</sup> grade obtained 8.6 ( $SD = 1.23$ ,  $793$  and  $p < .001$ ). The 2<sup>nd</sup> grade obtained an average of 7.1 ( $SD = 1.8$ ) of correct answers and the 4<sup>th</sup> grade obtained an average of 8.7 ( $SD = 1.2$ ) ( $3.876$  and  $p < .001$ ) for the correct affix. Therefore, the results of the words and the affix showed significant differences between the two groups. In the *pseudoword interpretation task*, the 2<sup>nd</sup> grade obtained an average of 2.2 ( $SD = 1.6$ ) and the 4<sup>th</sup> grade obtained

3.2 ( $SD = 2.1$ ). Thus, significant differences ( $.083$  and  $p = .042$ ) were observed. In total, the 2<sup>nd</sup> grade obtained a percentage of correct answers of 25.0% and the 4<sup>th</sup> grade obtained 37.5%.

There were significant differences between the two groups for the *judgement of word relations task*. The 2<sup>nd</sup> grade obtained an average of 6.1 ( $SD = 1.0$ ) and the 4<sup>th</sup> grade obtained 6.6 ( $SD = 0.6$ ), with  $2.498$  and  $p = .015$ . The 2<sup>nd</sup> grade scored 87.1% for correct answers and the 4<sup>th</sup> grade scored 94.8%.

In short, it was found that the 2<sup>nd</sup> grade obtained an average of 30.9 ( $SD = 5.2$ ) and the 4<sup>th</sup> grade obtained an average of 36.0 ( $SD = 4.5$ ). In this case, significant differences were observed ( $.074$  and  $p < .001$ ).

In addition to the above, the reading and spelling measures for both groups were analysed. The spelling of correct words and the suffix were analysed at the level of *thematic elicitation spelling (TE)*. For the former, the 2<sup>nd</sup> grade obtained an average score of 9.7 ( $SD = 2.0$ ) and the 4<sup>th</sup> grade obtained an average of 11.0 ( $SD = 1.43$ ,  $.041$  and  $p = .004$ ). For the spelling of the suffix, the 2<sup>nd</sup> grade scored an average of 5.8 ( $SD = 0.4$ ) and the 4<sup>th</sup> grade scored an average of 6.0 ( $SD = 0.2$ ;  $.047$  and  $p = .045$ ).

The most demanding suffix for the 2<sup>nd</sup> grade was “-idade” in the stimulus “Naturalidade” (naturalness; 93.3%), while for the 4<sup>th</sup> grade it was the suffix “-mento” in the stimulus “Pagamento” (payment; 96.7%). In the analysis of the less demanding suffixes, the highest percentage of correct answers in the 2<sup>nd</sup> grade was 96.7% — for the stimuli “Finalidade” (goal), “Pagamento” (payment), and “Valentia,” while the 4<sup>th</sup> grade presented the maximum score in the stimuli “Finalidade” (goal), “Naturalidade” (naturalness), “Movimento” (movement), “Alegria” (happiness), and “Valentia” (bravery).

The spelling of correct words and the suffix were analysed for the spelling by dictation task. The 2<sup>nd</sup> grade scored an average of 10.3 ( $SD = 2.0$ ) for the spelling of words and the 4<sup>th</sup> grade scored an average of 11.0 ( $SD = 1.5682$  and  $p = .098$ ). Regarding the spelling of the suffix, the 2<sup>nd</sup> grade obtained an average of 5.9 ( $SD = 0.4$ ) and the 4<sup>th</sup> grade obtained an average of 5.9 ( $SD = 0.3$ ;  $.344$  and  $p = .732$ ). In sum, there were no significant differences between the two groups.

Neither group had any difficulty in the spelling of the suffixes; however, the 2<sup>nd</sup> grade had more trouble with “-ia” in the stimulus “Melhoria” (improvement), with a score of 93.3%, and the 4<sup>th</sup> grade scored 93.3% for “-mento” in the stimulus “Levantamento” (survey).

In the spelling test, there was a significant difference in the performance between the 2<sup>nd</sup> grade ( $M = 20.0$ ;  $SD = 3.4$ ) and the 4<sup>th</sup> grade ( $M = 22.1$ ;  $SD = 2.6$ ), with  $.699$  and  $p = .009$ . The accuracy of the 24-word reading of list B and list C was analysed according to the level of complexity. For List B, the 2<sup>nd</sup> grade achieved an average score of 18.5 ( $SD = 2.6$ ) and the 4<sup>th</sup> grade achieved an average of 20.6 ( $SD = 2.0$ ), with  $.369$  and  $p = .001$ . For the reading of simple words,  $p = .006$ ; words with an intermediate complexity,  $p = .027$ ; and complex words,  $p = .043$ . The most complex word in terms of reading accuracy was “Chazinho” (small cup of tea) for both years, with a percentage of correct answers of 20.0% and 40.0%, respectively. Conversely, the most accessible words for the 2<sup>nd</sup> grade were “Mota” (motorcycle) and “Vime” (wicker); maximum scores were achieved. For the 4<sup>th</sup> grade, the maximum score was obtained for “Duna” (Dune), “Mota” (motorcycle), “Dezena” (ten), and “Macaco” (monkey).

For list C, the 2<sup>nd</sup> grade obtained an average score of 18.6 ( $SD = 3.4$ ) and the 4<sup>th</sup> grade an average of 21.2 ( $SD = 1.9$ ) (.705 and  $p < .001$ ). For the reading of simple words,  $p = .002$ ; words with an intermediate complexity,  $p = .006$ ; and complex words,  $p = .021$ .

For List C, the word with the lowest accuracy was “Cegamente” (blindly) for both grades (30.0% and 50.0%, respectively). The least demanding words for the 2<sup>nd</sup> grade were “Capa” (cloak), “Lupa” (magnifying glass), and “Pico” (peak); the maximum score was achieved. The most accessible words for the 4<sup>th</sup> grade were “Lupa” (magnifying glass), “Pico” (peak), “Batata” (potato), “Cavalo” (horse), “Panela” (pan), “Barriga” (stomach), “Pirata” (pirate), and “Gelatina” (gelatin); the maximum score was achieved. There was a significant difference in the accuracy of the reading between the 2<sup>nd</sup> grade ( $M = 37.2$ ;  $SD = 5.5$ ) and the 4<sup>th</sup> grade ( $M = 41.8$ ;  $SD = 3.5$ ), with  $-3.858$  and  $p < .001$ .

The second research question was: “*Is there an association between morphological awareness and reading and spelling?*”. The data were correlated using Pearson’s test (see Table 4, Appendix).

The morphological awareness tasks that had the greatest impact correlating with List B reading were: the derived word analogy task ( $r = 0.545$ ;  $p < .001$ ) and the pseudoword interpretation task ( $r = 0.511$ ;  $p < .001$ ), showing a moderate and significant correlation.

A low but significant correlation was observed between all measures of morphological awareness and the reading of List C: morphosemantic decision task: affix ( $r = 0.300$ ;  $p < .020$ ); morphosemantic decision task: stem ( $r = 0.436$ ;  $p < .001$ ); derived word analogy task ( $r = 0.371$ ;  $p = .003$ ); pseudoword interpretation task ( $r = 0.452$ ;  $p < .001$ ); and the judgement of word relations task ( $r = 0.339$ ;  $p = .008$ ). As for the *thematic elicitation spelling*, there was a positive but moderate and significant correlation in the morphosemantic decision (stem) task ( $r = 0.569$ ;  $p < .001$ ). In relation to spelling by dictation, there was a low positive correlation but significant between four measures of morphological awareness and spelling by dictation, namely the morphosemantic decision (stem) task ( $r = 0.398$ ;  $p = .002$ ); the derived word analogy task ( $r = 0.388$ ;  $p = .002$ ); the pseudoword interpretation task ( $r = 0.322$ ;  $p = .012$ ); and the judgement of word relations task ( $r = 0.303$ ;  $p = .018$ ).

In answer to the question, there was a strong and significant positive correlation between the morphological awareness tests and reading ( $r = 0.651$ ;  $p < .001$ ) and a moderate and significant positive correlation between the morphological awareness and spelling tests ( $r = 0.539$ ;  $p < .001$ ).

The third research question was: “*Are there differences in the impact of morphological awareness and reading and spelling amongst 2<sup>nd</sup> and 4<sup>th</sup>-graders?*”. For this, measurements were crossed through Pearson’s test. Since the total sample consisted of 60 children, it was appropriate to separate the results according to the groups. The data presented are only those of positive and significant correlations. The remaining results are shown in the Appendix, Table 5 and Table 6).

For the 2<sup>nd</sup> grade, the data showed a low but significant correlation between three morphological awareness measurements and the reading of List B, namely the morphosemantic decision (stem) task ( $r = 0.420$ ;  $p = .021$ ); the derived word analogy task ( $r = 0.481$ ;  $p = .007$ ); and the pseudoword interpretation task ( $r = 0.390$ ;  $p = .033$ ). Compared to the 4<sup>th</sup> grade, there was a low but significant positive correlation between two measures of morphological awareness

and the reading of List B, namely the morphosemantic decision (affix) task ( $r = 0.379$ ;  $p = .039$ ) and the derived word analogy task ( $r = 0.378$ ;  $p = .039$ ). There was also a moderate and significant correlation between the pseudoword interpretation task and reading ( $r = 0.560$ ;  $p = .001$ ).

Then, in the 2<sup>nd</sup> grade, a low to moderate correlation was observed between two measures of morphological awareness, associated with the reading of List C, particularly in the morphosemantic decision (stem) task ( $r = 0.437$ ;  $p = .016$ ) and in the derived word analogy task ( $r = 0.509$ ;  $p = .004$ ). Compared to the 4<sup>th</sup> grade, there was a low positive correlation between a measure of morphological awareness and the reading of List C, namely the morphosemantic decision (stem) task ( $r = 0.392$ ;  $p = .032$ ). There was also a moderate positive correlation between the morphosemantic decision (affix) task and the reading of List C ( $r = 0.507$ ;  $p = .004$ ) and a strong positive correlation between the pseudoword interpretation task and List C ( $r = 0.672$ ;  $p < .001$ ).

In terms of spelling, it was found that in the 2<sup>nd</sup> grade there was a low but significant correlation between the morphosemantic decision (stem) task and the thematic elicitation spelling ( $r = 0.450$ ;  $p = .013$ ) subtests. In comparison, the 4<sup>th</sup> grade presented more significant values in the thematic elicitation spelling test in the morphosemantic decision (affix) task ( $r = 0.541$ ;  $p = .002$ ) and the morphosemantic decision (stem) task ( $r = 0.591$ ;  $p = .001$ ), being a moderate and significant positive correlation. Furthermore, it was observed correlation between two measures of morphological awareness and spelling with the use of dictation, in particular the morphosemantic decision (affix) task ( $r = 0.421$ ;  $p = .020$ ) and the pseudoword interpretation task ( $r = 0.446$ ;  $p = .014$ ).

On the one hand, in response to the research question, in the 2<sup>nd</sup> grade, there was a low but significant correlation between morphological awareness and reading ( $r = 0.474$ ;  $p = 0.008$ ) and a positive but not significant correlation in the case of spelling ( $r = 0.326$ ;  $p = .079$ ). On the other hand, in the 4<sup>th</sup> grade group there was a strong and significant correlation between morphological awareness and reading ( $r = 0.724$ ;  $p < .001$ ), as well as between morphological and spelling ( $r = 0.659$ ;  $p < .001$ ).

As the main objective of the present study was to examine the relationship between morphological awareness and reading and spelling in primary school, the first question was — “Are there differences in knowledge of morphological awareness between 2<sup>nd</sup>- and 4<sup>th</sup>-graders?”. The results showed that there were significant differences. This result confirms the conclusions of authors who have argued for the existence of discrepancies in knowledge in this area of metalanguage as children progress through their schooling (Gomes et al., 2016; Mota, 2009). Gomes (2014) found that the task with the highest percentage of correct answers was the morphosemantic decision subtest. This was followed by the morphosemantic association task, then the derived word analogy task, and, finally, the interpretation of pseudowords task. The present study matches these results. It should be recalled that it divided more carefully the morphosemantic, stem, and affix decision subtests than Gomes (2014) did.

On the one hand, there were significant differences in the four tests of morphological awareness, namely in the morphosemantic decision (stem) task; the derived word analogy task; the pseudoword interpretation task; and the judgement of word relations task. On the other hand, the morphosemantic-fixed decision subtest did not reveal a significant difference

between the two groups. The results show that there are differences in the knowledge of morphological awareness between the 2<sup>nd</sup> and 4<sup>th</sup> grades. They therefore reinforce the findings of previous studies (Guimarães et al., 2014). Casalis and Louis-Alexander (2000), for example, showed how 2<sup>nd</sup> graders develop this knowledge in French primary schools.

The results for the second question — “Is there an association between morphological awareness and reading and spelling?” — showed that morphological awareness and reading have a strong and significant positive correlation and a moderate and significant positive correlation in the case of spelling. These results corroborate the existence of a correlation between morphological awareness and reading and spelling that has been reported by several authors (Desrochers et al., 2018; Silva & Martins-Reis, 2017).

There was a positive and significant correlation between the two reading tests (Lists B and C) in each of the morphological awareness tests. This was in keeping with the literature (Gomes, 2014). The correlation between the children’s performance in these two domains reinforced Maluf’s et al. (2006) assertion that reading knowledge evolves alongside metalinguistic performance. Other studies have indicated that morphological awareness plays an important role in the development of this ability (Castles et al., 2018; Guimarães & Mota, 2016).

There was a positive and significant correlation between the morphosemantic awareness tests and the spelling test (thematic elicitation and dictation). However, there are no studies that evaluate this test individually and corroborate this result, though several support the results herein, that is, that morphological awareness has a positive impact on the acquisition of spelling, more precisely on the recognition and interpretation of new morphemes (Gomes, 2014; Pires, 2010).

The results suggest that children who have greater knowledge of morphological awareness perform better in reading and spelling (Meaux et al., 2020; Silva & Martins-Reis, 2017). Moreover, they also reinforce the idea that such knowledge contributes to subsequent success in reading and spelling (Law & Ghesquière, 2017). little is known regarding MA’s early development. Aim The aim of this study is to better understand MA at different stages of development and its association with Phonological Awareness (PA The results point to the need to encourage metalanguage at the morphological level as a learning facilitating strategy (Gomes et al., 2016; Villalva, 2021).

In the case of the third research question — “Are there differences in the impact of morphological awareness on reading and spelling amongst 2<sup>nd</sup>- and 4<sup>th</sup>-graders?” —, for the 2<sup>nd</sup> grade, there was a positive and significant correlation between three measures of morphological awareness and the reading of List B and C. These findings were in keeping with the literature (Gomes, 2014; Machado, 2011). By contrast, a slight negative correlation was observed between the morphosemantic decision (fixed) task and the reading of List C. These findings contrasted with previous studies. However, scholars have usually considered morphosemantic decision-making as a whole rather than in subtests, which was the case herein (Gomes, 2014).

It was possible to verify a positive and significant correlation between a measure of morphological awareness and thematic elicitation, namely in the morphosemantic decision test. When relating the measures of morphological awareness and spelling by dictation, no positive or

significant correlation was observed. Based on the results, it was found that it is not possible to prove that there is a relationship between morphological awareness and spelling in the 2<sup>nd</sup> grade.

In the 4<sup>th</sup> grade group, a positive and significant correlation between three measures of morphological awareness and the reading List B and List C. The results were in agreement with what was expected, taking into account the previous literature (Guimarães et al., 2014).

Positive and significant correlations were found between measures of morphological awareness and spelling. The data obtained were in keeping with another Portuguese study (Gomes, 2014). Various studies have mentioned the importance of morphological awareness in spelling in the context of other languages (Gaiolas, 2016; Meaux et al., 2020; Saiegh-Haddad & Taha, 2017).

In the 2<sup>nd</sup> grade, there was a low correlation between morphological awareness and spelling. Several studies have shown that the effects of morphological awareness on the acquisition of spelling in the initial years of schooling are lower than those of later years (Guimarães et al., 2014; Villalva, 2021). The results of the present study are in keeping with these findings. In other words, there is a lower impact of this area of metalanguage on spelling than on reading. In languages such as English, it has been verified that morphological awareness supports the visual recognition of words, which is important in the acquisition of reading and spelling (Desrochers et al., 2018). Furthermore, some English speaking researchers have long noticed that English spellings are limited by morphology and argued that morphology should play a more important role in literacy instruction (Bowers & Bowers, 2017). The present study's findings are in keeping with some papers in which evidence of a positive correlation between the variables with advancement in schooling is observed (Guimarães et al., 2014). The results, however, are different from those of Vinagre et al. (2022). What is more, the tests use different formats — particularly the morphological awareness tests, the reading (Lists B and C), and spelling tests — and different types of evaluation. Sample sizes also explain some discrepancies in the findings. In the present case, there were significant differences in the knowledge of morphological awareness and the correlation between morphological awareness and reading and spelling; in the aforementioned paper, significant differences were identified in some of the morphological awareness tests, and a correlation between morphological awareness and reading and spelling was in evidence. In other languages, several studies claim that morphological awareness has a significant impact on literacy. In the English language, Bowers & Bowers (2017) claim that learning morphology had a significant impact on literacy. Furthermore, it is not only in the English language that this impact is observed, as there are also studies that observe the added value of morphological awareness in reading and spelling (Álvarez, 2018; Gumiel-Molina & Pérez-Jiménez, 2022);

Although the present study's results confirmed the findings of other scholars, it was limited by the difficulty in finding papers that have used current Portuguese data. Future researchers could undertake studies involving greater numbers of participants and a wider range of control variables. A programme to stimulate morphological awareness stimulation could be developed and a longitudinal study conducted thereafter.

#### 4 CONCLUSIONS

The principal aim of this study was to understand the relationship between morphological awareness with reading (fluency) and with writing, in children with typical development. The first objective was to understand if there were differences in the level of morphological awareness between children in the 2<sup>nd</sup> grade and the 4<sup>th</sup> grade. It was concluded that children in the 2<sup>nd</sup> grade obtained statistically lower averages compared to children in the 4<sup>th</sup> grade.

The second objective was to understand if there was an improvement between morphological awareness with reading (fluency) and with writing, in children attending the 2<sup>nd</sup> and 4<sup>th</sup> grades. Thus, the results showed that for children attending the 2<sup>nd</sup> grade there was a correlation between morphological awareness and reading. However, for children in the 4<sup>th</sup> grade there was a correlation between morphological knowledge and reading, as well as with writing.

The present study corroborates previous studies considering that is essential to invest in explicit instruction in this area, in order to allow children to use this morphological knowledge as a strategy for reading and writing.

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## APPENDIX – PEARSON CORRELATION COEFFICIENT IN BOTH GROUPS

**Table 4**

*Pearson correlation coefficient*

Subtest	Reading	Spelling
Morphosemantic decision task: affix	0.256*	0.201
Morphosemantic decision task: stem	0.546**	0.550**
Derived word analogy task	0.593**	0.458**
Derived word analogy task (Affixes)	0.606**	0.467**
Pseudoword interpretation task	0.495**	0.383**
Judgment of word relations task	0.427**	0.338**
Total Morphological awareness	0.651**	0.539**

Note: \* p ; \*\* p

**Table 5**

*Pearson correlation coefficient in the 2<sup>nd</sup> grade group (n= 30)*

Subtests	Reading		Spelling	
	Reading B list	Reading C list	Written by thematic elicitation	Written by dictation
Morphosemantic decision task: affix	0.066	-0.056	-0.154	-0.090
Morphosemantic decision task: affix (Prefixes)	0.029	-0.001	-0.179	0.124
Morphosemantic decision task: affix (Suffixes)	0.069	-0.077	-0.079	-0.216
Morphosemantic decision task: stem	0.420*	0.437*	0.450*	0.390
Morphosemantic decision task: stem (Prefixes)	0.212	0.339	0.341	0.415
Morphosemantic decision task: stem (Suffixes)	0.506**	0.356	0.378*	0.155
Derived word analogy task	0.481**	0.509**	0.345	0.343
Derived word analogy task (Affixes)	0.480**	0.512**	0.339	0.347
Pseudoword interpretation task	0.390*	0.162	0.207	0.124
Judgement of word relations task	0.349	0.311	0.087	0.217
Morphological awareness	0.474**		0.326	

Note: \* p 0.05; \*\* p0.01

**Table 6***Pearson correlation coefficient in the 4<sup>th</sup> grade group (n=30)*

Subtests	Reading		Spelling	
	Reading B list	Reading C list	Written by thematic elicitation	Written by dictation
Morphosemantic decision task: affix	0.379*	0.507**	0.541**	0.421*
Morphosemantic decision task: affix (Prefixes)	0.505**	0.544**	0.363*	0.325
Morphosemantic decision task: affix (Suffixes)	0.209	0.382*	0.578**	0.417*
Morphosemantic decision task: stem	0.309	0.392*	0.591**	0.270
Morphosemantic decision task: stem (Prefixes)	0.201	0.343	0.407*	0.137
Morphosemantic decision task: stem (Suffixes)	0.329	0.287	0.596**	0.343
Derived word analogy task	0.378*	0.288	0.215	0.322
Derived word analogy task (Affixes)	0.411*	0.341	0.241	0.350
Pseudoword interpretation task	0.560**	0.672**	0.387*	0.446*
Judgment of word relations task	0.257	0.347	0.455	0.336
Morphological awareness	0.724**		0.659**	

Note: \* p 0.05; \*\* p0.01