Does level of Schooling moderate the relationship between morphological awareness and spelling?

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Abstract: Children's awareness of morphemes improves over the elementary school years, but its role in determining literacy skills, particularly those in spelling, is still an open question. To answer this question, 100 children in Grades 2 and 3 completed morphological and phonemic awareness tasks, spelling, as well as a control measure of general ability. The results showed that the relationship between morphological awareness and spelling is moderated by grade. The model with the control and explanatory variables explained 30% of the variability in spelling scores, and adding the interaction term showed a statistically significant contribution, indicating that grade moderates the contribution of morphological awareness, particularly that of inflectional morphology to spelling. Morphological awareness is a stronger predictor of spelling in Grade 3 than in Grade 2, even after controls were carried out. We discuss the implications of these findings for theory and practice.
Keywords: Spelling; Morphology; Morphological Awareness; Metalinguistic Awareness

ᴱˢᴾ ¿Modera la escuela la relación entre la conciencia morfológica y el deletreo?

Resumen: La conciencia que los niños tienen de los morfemas mejora a lo largo de los años que acuden a escuela primaria, pero su papel en la determinación de las destrezas de lectoescritoras, en particular las de ortografía, sigue siendo una cuestión abierta al debate. Para responder a esta cuentión, 100 niños de 2° y 3er curso completaron tareas de conciencia morfológica y conciencia fonémica, ortografía, así como una medida de control de la capacidad general. Los resultados mostraron que la relación entre la conciencia morfológica y la ortografía está moderada por el grado. El modelo con las variables de control y explicativas explicaba el 30,0% de la variabilidad en las puntuaciones de ortografía, y la introducción de la interacción mostró una contribución estadísticamente significativa, lo que indica que el grado que cursan los niños modera la contribución de la conciencia morfológica, en particular la de la morfología flexiva, a la ortografía. La conciencia morfológica es un predictor más fuerte de la ortografía en el Grado 3 que en el Grado 2, incluso después de realizar controles. Se discuten las implicaciones de estos resultados para a nivel tanto teórico como aplicado.
Palabras clave: Conciencia morfológica; Conciencia metalingüística; Morfología; Ortografía.

Summary: Introduction. The Development of Morphological Awareness and Its Relationship with Spelling. Method. Participants. Instruments. Procedures. Data Analysis. Results. Inflectional Analogy. Derivational Analogy. Morphological Association. Decomposition. Discussion. References.

Introduction

The alphabetic principle is that the spelling of a word reflects the mappings between sounds and letters. Thus, this correspondence between sound and letters is central to spelling development (e.g., Bourassa & Treiman,2001). However, alphabetic orthographies differ in how directly sound-letter mapping occurs. For instance, in the English writing system, many words have more than one plausible spelling (e.g. '*night*' and '*nite*'). English is well known as an "opaque" orthography. Other languages as Spanish have very straightforward sound to letter correspondence rules and are called "transparent". There has been evidence that even in transparent orthographies such as Spanish morphological awareness plays a role in reading and spelling (Jaichenco et al. 2013; Suárez-Coalla et al., 2017).

Still, there are languages such as Portuguese, the language in focus here, that are in the middle of the spectrum of orthographic transparency (Seymour et al., 2003). Portuguese is a language with simple syllabic structure like Spanish, but it presents ambiguities in the spelling of many words. There are sources of regularities in which we can draw to choose the correct spelling of ambiguous words. One of these is morphological regularities. Morphemes are known for having spelling stability (Chomsky & Halle, 1968). These can help children to appropriately choose the spelling of the words.

Morphemes are the smallest linguistic units that carry meaning. They are fundamental units in the construction of new words. Analyzing words in terms of their morphemes provides important information for accessing their meanings and spellings (Manolitsis et al., 2019; Turaça & Mota, 2022). For example, in Portuguese language the word "laranjeira" is spelled with "j" because of the base morpheme "laranja." The ability to manipulate and reflect on morphemes–morphological awareness–is associated with good spelling performance (Casalis et al., 2011; Enderby et al., 2021; Guimarães & Mota, 2018; Görgen et al., 2021; Nagy et al., 2006; Nunes et al., 1997). A child who knows that "laranja" and "laranjeira" belong to the same "family" is more likely to spell "laranjeira" with "j" rather than "g" (Mota & Silva, 2007). Here we examine this relationship in Portuguese-speaking children, including whether the magnitude of this relation across the mid-elementary school years.

Two kinds of morphemes —are inflectional and derivational (in addition to compounds)— have been focus of research in different orthographies (Casalis & Louis-Armstrong, 2000; Deacon & Bryant, 2005; Mota et al, 2013). Inflectional morphemes modify words in terms of gender, number, and verb tense, whereas derivational morphemes form an open system, with no clear rules governing the formation of new words. Typically, they affect words' semantics by introducing new concepts or nuances of meaning, and often result in category change–for example, transforming a verb into a noun ('to teach' → 'teacher') or an adjective into an adverb ('happy' → 'happily'). Word meaning is affected because derivational morphemes can create words with new meanings (e.g., "govern" → "government"), producing category change (or word class shift) that happens when the derived form belongs to a different grammatical category than the base (e.g., verb → noun, adjective → adverb).

In contrast, inflectional morphology follows well-defined rules for word formation. Inflectional processes tend to follow systematic and predictable rules–such as regular patterns of verb conjugation or plural formation–which are more transparent and frequent in the input children receive, making it easier for them to acquire. Evidence suggests that inflectional morphology is acquired earlier than derivational morphology in various languages (Casalis & Louis-Armstrong, 2000; Deacon & Bryant, 2005), including Portuguese (Mota et al, 2013). This may be due to the fact that those inflections are more stable and predictable. For example, in the future tense, verbs in Portuguese use the nasal sound spelled as "ão," whereas in the past tense, the nasal sound is spelled as "am." This pattern is consistent whenever these verb tenses are used. In the case of derived words, they appear later in children's vocabularies, and exposure to them increases over the years (Anglin, 1993). The fact that derivational forms emerge later and belong to an open system with no clear formation rules may explain why children master them later in development.

Although researchers have examined the development of morphological awareness throughout elementary school and have demonstrated its importance in supporting spelling development (e.g., Casalis et al., 2011; Deacon et al., 2009; for reviews see Deacon et al., 2008; Deacon & Sparks, 2015), the nature of this relationship remains uncertain. One open question lies in whether effects of morphological awareness on spelling remain stable over time, as predicted by statistical learning theories, or increase in their contribution, as predicted by phonologically focused theories (Ehri, 2013; for review see Deacon & Sparks, 2015).

In this study, we aim to clarify the nature of the relationship between morphological awareness and spelling. We investigate the effect of grade level on the relationship between morphological awareness and spelling in children in Grades 2 and 3. In examining these relations, we analyze separately the ability to process derivational and inflectional morphology because of developmental differences in their emergence. We also capture effects of another metalinguistic skill important for reading–that of phonological awareness. Its effects in both English and more phonologically transparent orthographies, such as Portuguese, are well-established.

The Development of Morphological Awareness and Its Relationship with Spelling

Morphological awareness appears to improve over the school years, but not always in a linear pattern. Despite its relationship to reading and spelling in Portuguese (Freitas Jr. et al., 2018; Oliveira et al., 2020) is it still necessary to establish how this ability develops if we want to inform instruction. Mota et al. (2011) conducted a study with Portuguese-speaking children in Grades 1, 2 and 3, assessing their ability to reflect on

morphemes using two judgment tasks. First-grade children performed worse than second- and third-grade children, who, in turn, did not differ from each other. These results suggest that there is a shift in morpheme understanding between first and second grade in Portuguese. The authors also administered a word analogy task, in which children had to decide which word completed a pair based on a morphological relationship between an initial pair. For example: "If I say *'meia'-'meias'*, ('sock'-'socks') you say *'casa'-?'*" ('house'-'houses') period The results of this task differed from those of the judgment task. First- and second-grade children did not differ in performance, but third-grade children outperformed first graders. The difference in explicit morphological reflection required by each task may explain these developmental differences. The analogy task requires producing a response, whereas in the judgment task, all stimuli are present, and the child only needs to evaluate whether the response is correct or incorrect. These findings suggest that morphological awareness develops over time, with children deepening their understanding around third grade. Children in Grade 2 appear to be in an intermediate stage, responding to more implicit morphological questions but struggling with more explicit ones.

Nunes et al. (1997) obtained similar results in a study of word spelling in English. The authors investigated elementary school children's knowledge of the role morphemes play in spelling. They found that children can use their morphological knowledge in writing from first grade, but this knowledge continues to develop throughout schooling. Around second grade, however, the authors identified an intermediate stage in the application of morphological knowledge. A study using the same technique was conducted with Brazilian Portuguese speakers by Mota (1996), who obtained similar results. In English, the study leveraged the fact that the past tense morpheme "ed" sounds like "t," "d," or "id" depending on the word but is always spelled as "ed" because it is a verb inflection. For example, in the words "helped," "wept," and "except," all three end in the same /pt/ sound, but "helped" is spelled with "ed" because it is a regular verb. Children at the intermediate stage often wrote irregular verbs with "ed" more frequently than control words (e.g., spelling "wept" as "weped"), showing that they first learned the rule of adding -*ed* before learning exceptions.

In study with Portuguese speakers, Mota (1996) asked children to write words with ambiguous ending spellings 'ão' e 'am', such as the verbs "*saberão,*" (future tense of to know) "*souberam,*" (past tense of the verb to know) and the noun "*sabão*" (soup). In Portuguese, these endings nasal sounds create confusion for children, because even though there are slight differences in stress they sound the same. It was expected that children would generalize the use of "am" more frequently for future tense verbs than for nouns, as they would recognize that "am" is part of a verb morpheme. This is exactly what happened. The generalization of "am" was more common in the future tense than in control words, increasing in the first two years of elementary school and declining in later grades as children learned the correct spellings.

Similarly Berninger et al. (2009) examined growth curves in the development of both morphological awareness and phonological awareness (the ability to reflect on speech sounds). They found improvements in metalinguistic skills during early elementary school but with different trajectories: phonological awareness continued growing until third grade before stabilizing, whereas morphological awareness continued to improve in later grades.

Theories of reading and spelling acquisition propose that children initially learn orthographic knowledge by understanding letter-sound correspondences (Ehri, 2005; Frith, 1985). At this stage, phonological awareness plays a crucial role in supporting children's writing. A child who can reflect on speech sounds is better equipped to select the correct letters to represent those sounds. Thus, in early grades, phonological awareness is expected to have a greater impact on writing than morphological awareness, because phonological decoding is the main skill being acquired. As children develop their understanding of letter-sound correspondences, they begin to recognize that words do not always follow strict phoneme-grapheme rules. At this point, morphology may become important in supporting children's spelling. Phonological awareness may give way to morphological awareness in spelling acquisition, as many words with complex orthography follow morphological rules.

This pattern has emerged in some cases, but not all. Recent evidence suggests that morpheme processing facilitates writing in children and becomes more proficient in adults. Children aged 8 to 12 and adults demonstrated sensitivity to morphemes in writing, with this sensitivity increasing in adults (Breadmore et al., 2023). These findings conflict with some other studies, which have shown relatively stable contributions of morphological awareness to reading tasks, both in the early (e.g., Deacon, 2012) and middle to upper elementary school years (e.g., Roman et al., 2009). As such, this is an important question for empirical study, given its theoretical implications.

Further, understanding these relations develop in Portuguese is essential. We need models that reflect the reality of our language and culture to develop truly effective educational strategies. Portuguese is also a particularly strong test of these relations given that it is a relatively transparent orthography, although there are some morphological regularities in spelling.

Method

Participants

The study sample consisted of 100 children from the 2nd and 3rd grades of elementary school (M = 102 months; SD = 9.8 months), with 50 boys and 50 girls from a municipal school in the city of Macaé. The selection of the school was based on convenience criteria. The inclusion criteria for the children in the study were

the absence of developmental disorders and the signing of the Informed Consent Form by their guardians. This form complied with the norms of the Research Ethics Committee of the University of the first author.

Instruments

Morphological Awareness Task - Word Analogy (Nunes et al., 1997)

The adapted version for Portuguese by Mota et al. (2014) was used. This task consists of asking the child to produce a morphologically complex word based on a target word, applying the same derivational or inflectional relationship as a previously given pair, such as "stone - stonemason"; "milk - ?". There are eight derivational morphology items and eight inflectional morphology items. For the analogy tasks (i.e., derivational and inflectional morphology) the instruction was as follows: a pair of related words was presented, followed by a second pair where the child had to complete the missing word. In the Phoneme Subtraction task, a practice session with five items was conducted. The instruction given was: "I will say some words and remove the initial sound; you will tell me what remains. For example: The word 'pants' without the /p/ sound, how would it be?" After five training words, the task began with no further feedback given. For this sample, the reliability coefficient was α = .64 for derivational morphology and α = .69 for inflectional morphology, which were analyzed separately. One point was awarded for each correct item.

Morphological Association

This task consists of 10 items. The child must decide whether a word is derived from another. For example, "may" derives from "mayonnaise"? Five items are derived words, and five are not (simple words). The target words have the same initial sound as the test words or control words (e.g., "stone" (pedra) and "stonemason" (pedreiro); "chic" (chique) and "pigsty" (chiqueiro). The child must recognize whether the word is morphologically complex, as well as whether it is related to the provided word. Two pairs of words were presented during training the first with words from the same family and the second with words not from the same family. During the task, the child had to indicate whether the words presented belonged to the same family. Scoring criteria assign one point for each correct answer and zero for each incorrect answer, with a maximum score of 10 points. Cronbach's alpha for this task was .63.

Morphology - Decomposition Adapted from Carlisle (2000)

This 10-item task requires the child to transform an affixed word into its base word. For example, the child is given the word "farmer" in the context of a sentence and must complete a sentence with its base form, such as: "The farmer is in the field. The fields are being plowed in the _____." Two examples were given to the child. The children were asked to complete a sentence with the one appropriate word. All target affixes were derivational morphemes. One point is awarded for each correctly produced word. The alpha coefficient for this task was .55.

Word Spelling Assessment - TDE Writing (Stein, 1994)

This subtest includes a list of 24 words dictated by the examiner, followed by a sentence. The following instruction is given: "I will dictate a word and then read a sentence containing the dictated word, and I will say the word again; only then may you write it." The child writes each word in a numbered list. One point is given for each correctly written word and for correctly writing at least the first name. The total score is 35 points.

Phonological Awareness (Rosner & Simon, 1971)

We measured phonological awareness with the phoneme subtraction task. In this task, a word is orally presented word (e.g., /KaRta/) and the participant needs to mentally subtract a specific sound (e.g., /K/) and say the remaining sound (e.g., /aRta/). After five practice items, nine test items are presented. One point is awarded for each correct response. The internal consistency analysis of this task (Cronbach's alpha) for the study sample was .90.

Verbal and Non-Verbal Intelligence Ability - Wechsler Intelligence Scale for Children - WISC-IV (Wechsler, 2013)

Two subtests from the scale were administered: Verbal Intelligence Subtest (Lexical Domain) - Vocabulary Subtest and Non-Verbal Intelligence Subtest - Block Design. In the verbal measure, a series of words is orally presented, and the child must define them orally. In Block Design, two-dimensional geometric patterns made with cubes or printed patterns that the child must reproduce using two-colored cubes. Weighted scores were computed for statistical analyses. The test was scored according to the WISC-IV manual.

Procedures

Authorization to conduct the study was obtained from parents/caregivers and school administration. After approval by the Research Ethics Committee (approval number omitted for blind review) and the signing of the Informed Consent Form, data collection began. Tasks were administered individually in four sessions of approximately 50 minutes by the researcher. The tasks were conducted in the school's reading room, during the child's regular morning or afternoon school period.

In the first session, the following tasks were administered: Block Design and Vocabulary. In the second session, the word analogy awareness tasks (derivational morphology, inflectional morphology) and phoneme subtraction were given. In the third session, the Morphological Association and Morphological Decomposition tasks were administered. Finally, the word spelling subtest of the TDE (dictation) was conducted.

The Block Design, Vocabulary, and TDE Writing tasks followed the manual's instructions. However, the TDE Word Spelling task was administered collectively.

Data Analysis

To test the hypothesis that grade level moderates the relationship between morphological awareness and spelling, a hierarchical multiple regression model was conducted for measure of morphological awareness (i.e., inflectional analogy, derivational analogy, decomposition, and association).

Control variables were entered in individual blocks, beginning with Block Design, followed by Vocabulary and Phoneme Subtraction. After entering the control variable blocks, one morphological awareness task was added as an explanatory variable in each model. Next, grade level was added as a moderating variable. Finally, an interaction term between grade level and the specific type of morphological awareness was included.

To facilitate interpretation, these variables were centered. Model diagnostics included visual inspection of residuals, Cook's Distance, Durbin-Watson Autocorrelation Test, and VIF. The models were compared using ΔR^2 to assess the explanatory power of each hierarchical level. Interaction effects were identified when the inclusion of the interaction term improved the model's explanatory power. Interaction interpretation was conducted through graphical regression analysis for each grade level. Analyses were performed using the R programming language (R Core Team, 2018) and the JMV package (Selker et al., 2018).

Results

Table 1 presents descriptive statistics for measures of morphological awareness, phonological awareness, vocabulary, Block Design, and Word Spelling TDE. It also includes reliability values for each measure. In general, the grammatical morphology tasks demonstrated adequate consistency, except for the morphological decision task, which had an alpha of 0.44.

Table 1. Descriptive Statistics and Reliability of Tasks

Descriptive Statistics and Reliability of Administered Tasks	Scores Min-Max	Score total	M	SD	Cronbach Alpha
Derivational Analogy	1-8	8	5.4	1.9	.64
Inflectional Analogy	0-8	8	6.5	1.8	.69
Morphological Association	4-10	10	8	1.86	.63
Decomposition	1-10	10	8.6	1.56	.55
Phonological Awareness	0-10	10	9	2.2	.90
Word Spelling – TDE	2-35	35	20.5	7.08	.95
Vocabulary/WISC IV (standard score)	3-16	19	9.14	3.7	.89
Block Design/ WISC IV (standard score)	3-16	19	9.8	3.5	.86

Note. TDE = Teste de Desempenho Escolar (School Achievement Test)

Pearson correlations assessed associations between metalinguistic tasks, vocabulary, and Block Design. The correlation results showed weak but significant and positive correlations between Word Spelling TDE and all tasks, except for the morphological decomposition task. Based on the preliminary data analysis, we proceeded to investigate the main hypotheses of this study: Does morphological awareness contribute to word spelling in Brazilian Portuguese even after controlling for vocabulary, non-verbal ability, and phonological awareness? Additionally, we asked whether the contribution of morphological awareness (MA) interact with the school grade level. Our hypothesis was that as school progress so the contribution of MA. Thus, it is expected that the contribution of MA will be greater for third-year students than for second-year students.

Table 2. Pearson Correlations

	Block Design	Vocabulary	MD	MA	IA	DA
TDE Spelling	.23*	.31**	.18	.30**	.33**	.25*
Block Design		.21*	.11	.32**	.09	.10
Vocabulary			.15	.16	.17	.08
Morphological Decomposition				.16	.24*	.34**
Morphological association					.21*	.30**
Inflectional Analogy						.50**

Note. TDE = School Achievement Test, DM= Morphological Decomposition,
MA= Morphological Association, IA= Inflectional Analogy, DA= Derivational Analogy.

Inflectional Analogy The model with control and explanatory variables explained 30.0% of the variability in spelling scores with R^2 = .30; F(5, 94) = 8.07; p < .001. The model with the interaction term made a statistically significant contribution to explaining the variability in the spelling test scores, indicating that grade level moderates the contribution of inflectional analogy to writing. This type of morphological awareness is more important in predicting spelling performance among third-year students compared to second-year students, controlling for other variables, ΔR^2 = .035, p = .030, and β = -1.54, 95% CI [β_inf = -2.93 and β_sup = -0.15]. Figure 1 graphically presents this interaction.
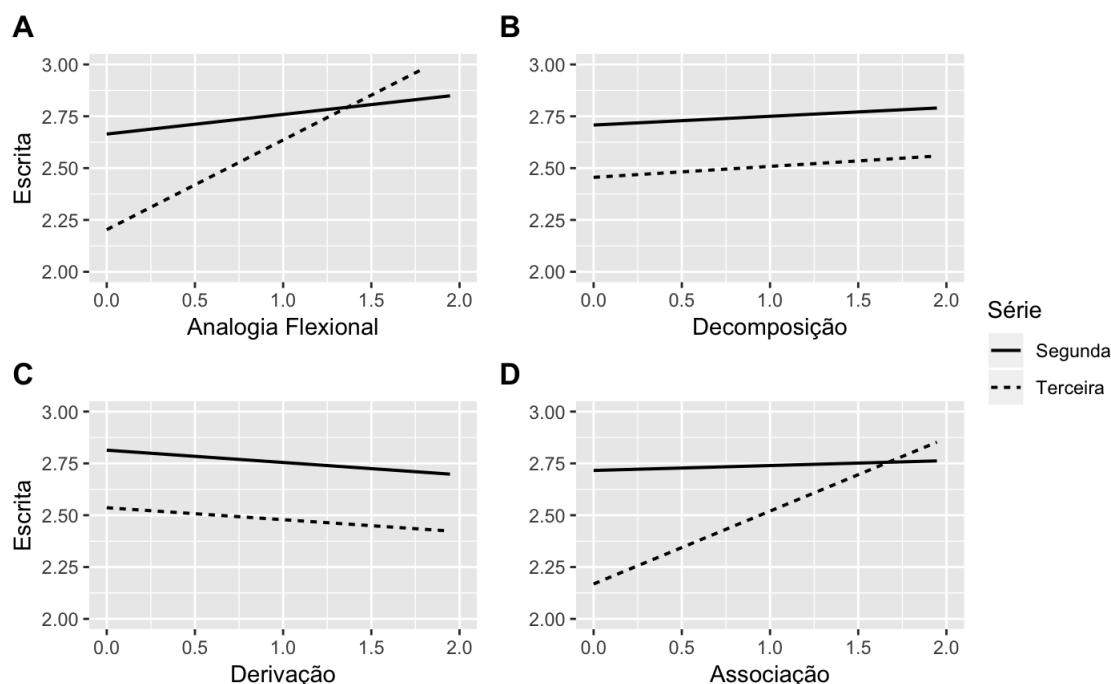

Figure1. Interactions between grade and morphological awareness as explanatory variables of spelling (n=100)

Note: Analogia Flexional: Inflexional Analogy; Decomposição: Decomposition;
Derivação: Derivational Analogy; Associação: Association

Derivational Analogy The model with control and explanatory variables explained 23.2% of the variability in writing scores with R^2 = .23; F(5, 94) = 5.68; p < .001. The model with the interaction term did not make a statistically significant contribution to explaining the variability in spelling test scores, indicating that grade level does not moderate the contribution of derivational decomposition ΔR^2 = <-0.001, p = .99. In Figure 1, the derivation graph presents the graphical model of this interaction.

Morphological Association The model with control and explanatory variables explained 27.0% of the variability in writing scores with R^2 = .27; F(5, 94) = 6.94; p < .001. The model with the interaction term made a statistically significant contribution to explaining the variability in spelling test scores, indicating that grade level moderates the contribution of association to spelling. This type of morphological awareness is more important in predicting spelling performance among third-year students compared to second-year students, controlling for other variables. ΔR^2 = .036, p = .030, and β = -1.94, 95% CI [β_inf = -2.85 and β_sup = -0.14]. Figure 1 presents the model of this interaction (Morphological Association graph).

Decomposition The model with control and explanatory variables explained 18.9% of the variability in writing scores with R^2 = .30; F(5, 94) = 5.64; p < .001. The model with the interaction term did not make a statistically significant contribution to explaining the variability in spelling test scores, indicating that grade level does not moderate the contribution of decomposition ΔR^2 = < .001, p = .95. Figure 1 (Decomposition graph) presents the graphical model of this interaction.

Discussion

This study aimed to investigate how the contribution of morphological awareness to spelling develops across two grades in elementary school in children learning to read in Brazilian Portuguese. The focus on the second and third years is due to these grades being when children consolidate their understanding of the alphabetic principle and begin to understand more complex aspects of Portuguese orthography (Mota, 1996). The hypothesis we proposed was that there would be a greater contribution of morphological awareness with grade level. This prediction aligns with Ehri's (2005) model, which predicts the transition from alphabetic spelling to more complex orthographic strategies. Alternatively, effects could remain stable as uncovered in some prior studies of reading (e.g., Deacon, 2012). In the present study, two of the four morphological awareness measures (Inflectional Analogy and Morphological Association) contributed more strongly to spelling in the third grade than in the second grade, with effects of the other two tasks (Derivational Analogy and Decomposition) remaining stable.

This mixed set of findings align with evidence to date in the literature with English-speaking children (e.g., Deacon, 2012), and yet their emergence in a single study of the same children give us pause to reflect on whether the nature of the measures might lead to these differences in findings. It is not, however, immediately obvious that measurement dimensions are responsible for these differences. All four tasks have similar reliabilities in the .6 range. Intriguingly, two tasks show somewhat restricted range–morphological association and decomposition–and yet one shows increasing relations and the other stable. Similarly, there is both an inflectionally and a derivationally focused task (i.e., inflectional word analogy and morphological association, respectively) in the set of measures that show increasing associations with spelling. In our view, it is clear that additional studies are needed to disentangle factors that lead to these two patterns of findings, which emerges across different measures even within the same sample of children.

And yet across these differences in patterns of contribution, one finding remains clear: in Portuguese, as in English, morphological awareness is related to spelling. The cross-linguistic value of these findings are clear. Even in the face of substantive phonological regularity in the orthography, children's awareness of the morphological structure of words brings added value to their spelling. As such, despite differences in orthographic complexity between Portuguese and English, morphology plays an important role in the orthographic development of both languages.

A noteworthy finding in this study was that phonological awareness did not significantly contribute to spelling. One key possibility is that this measure did not adequately capture individual differences, with the mean performance at 9 out of 10 and a standard deviation of 2. Another interpretation is that by the second year, children had already consolidated grapheme-morpheme correspondence rules, and phonological awareness was no longer highly important for orthography. Further still, these findings might be influenced by differences in the orthographies. In English, orthographic irregularities cause children to take longer to consolidate letter-sound correspondences. For example, in a study comparing different orthographies, Seymour et al. (2003) found that children learning Portuguese consolidated the alphabetic principle earlier than those learning English. However, this hypothesis requires further investigation. Indeed, previous studies show that even in later elementary school years in Brazil with Portuguese speaking children, phonological awareness contributes significantly to spelling (Guimarães & Mota, 2018), though not in French (Casalic. Deacon & Pacton, 2011).

Despite these differences, the pattern of results suggests that differences in writing development across languages occur more as a function of time rather than qualitative changes in strategies. Thus, the results for Portuguese align with those found for English and support the models of Frith (1985) and Ehri (2005), which suggest that children begin writing with the alphabetic principle, moving toward more complex word writing in the orthographic phase. These strategies require different metalinguistic skills: initially, phonological awareness supports the alphabetic principle, and later, morphological awareness supports spelling. Indeed, we observed a greater contribution of morphological awareness with grade level.

Some limitations of this study must be considered. A follow-up study should test the hypotheses with a sample including additional grade levels, particularly the first year. This would allow for evaluating the relevance of the Brazilian findings against Ehri's (2005) proposed model. Another limitation may be related to the choice of study tasks. The Decomposition task did not show a significant correlation with spelling. One possibility is that the task was too easy for the children, as the mean correct response rate was 8.6 out of 10, with a standard deviation of 1.6. This task had also low reliability scores .55. This data may indicate a task bias rather than a finding that weakens the role of Morphological Awareness. The last limitation we address is the reliability of morphological awareness tasks that fell short of .70 cut point. This may be due to the relatively small sample size. Further studies should address this.

The educational implications of this study are clear. Knowledge of morphemes contributes to proficient spelling. The results showed that morphological awareness strengthens with schooling, suggesting that pedagogical practices should incorporate awareness of morphology and its relationship to orthography.

The results of the present study shed new light on the role of morphology in the acquisition of spelling in Portuguese. They show that, even with greater orthographic transparency than English, the contribution of morphological awareness to spelling increases over time. They suggest that, as children consolidate the rules of letter-sound correspondence, they begin to use more complex rules or larger orthographic units, such as morphemes, to write. In this way, the results align with the Models of Ehri (2005) and Frith (1985) regarding the development of spelling.

Authorship declaration: Dalva Silva Alves Santos: Article conceptualization; Data collection.
Silvia Guimarães: Article conceptualization.
Márcia Maria Peruzzi Elia da Mota: Article conceptualization; First draft writing; Methodology.
Leonardo Fernandes Martins: First draft writing; Statistics.
Hélène Deacon: Writing revision draft.

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