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Differences in reading acquisition development in two shallow orthographies: Portuguese and Spanish

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ABSTRACT
The present study examines the role of the relative transparency of Portuguese and Spanish orthographies in schoolchildren's word recognition procedures. Both Portuguese and Spanish may be considered as transparent orthographies. However, mappings at the grapheme–phoneme level are more consistent in Spanish than in Portuguese. Four groups of Portuguese and Spanish children from grades 1, 2, 3, and 4, who had been taught to read using a phonics-based approach, were given a Portuguese and a Spanish version of three different continuous reading tasks: numeral reading, number word reading, and pseudoword reading. Reading time per item was measured and errors noted. Improvement in reading time was observed in both orthographies from grades 1 to 4. There were no errors in numeral recognition and few children made errors in reading the number words. In pseudoword reading, the Spanish children were faster and made fewer errors than the Portuguese children. Errors in pseudoword reading were scored as phonological when leading to the production of another pseudoword and as lexical when involving refusals and/or the production of a real word. Portuguese children made more phonological errors than the Spanish group, and there was no difference in the number of lexical errors. The results are discussed in terms of the role played by the differing orthographic transparency of Spanish and Portuguese in young readers' word recognition procedures.

Cognitive models of reading development mainly emerged from the study of reading in a deep orthography like English (Coltheart, 1985; Frith, 1985; Seymour, 1986). Until a few years ago, it was assumed that the word recognition procedures occurred across all alphabetic systems, regardless of their orthographic consistency. However, a set of recent studies comparing reading acquisition in different alphabetic systems pointed out that factors such as the level of orthographic transparency of the alphabetic rendition of the language and even

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the characteristics of the spoken language may influence the processes of word recognition.

From a cross-linguistic perspective, two main lines of research can be distinguished. One line focuses upon the analysis of the differences between logographic and phonographic orthographies (Ho & Bryant, 1997; Huang & Hanley, 1995; Mann, 1986). The other line deals with the comparison between shallow versus deep alphabetic orthographies. Alphabetic orthographies differ in the complexity of their grapheme–phoneme correspondence rules (GPCRs). In shallow or transparent orthographies (i.e., Italian, German, Serbo-Croatian, Spanish, and, to a certain extent, Portuguese) the GPCRs are highly consistent, whereas in deep or nontransparent orthographies they are quite inconsistent and unpredictable. The latter feature many words whose spelling does not convey their pronunciation clearly and have numerous exceptions and many irregular words (English being the extreme case). Studies carried out in orthographies as different in their degree of transparency as Italian, German, English, French, Greek, and Brazilian Portuguese have evidenced important differences in children's reading strategies (Cossu, 1999; Frith, Wimmer, & Landerl, 1998; Harris & Giannouli, 1999; Pinheiro, 1995; Porpodas, 1991; Sprenger-Charolles & Bonnet, 1996; Wimmer & Goswami, 1994; Wimmer & Hummer, 1990).

Wimmer and Hummer (1990) found that German beginning readers appear to rely mainly on an alphabetic strategy and display little evidence of the use of logographic strategies. Their errors in word reading are mostly pseudowords, which indicates that German beginning readers use the sublexical route and move into reading by assembling pronunciations through the use of GPCRs. The acquisition of the French orthography seems to proceed in a similar way, even though French is considered to be a deep orthography (though to a lesser extent than English). In fact, as shown by Sprenger-Charolles and Bonnet (1996), French first graders with only 4 months of reading tuition do not appear to use a logographic reading strategy. At variance with the previous results, Seymour and Elder (1986) and Stuart and Coltheart (1988) found that reading errors made by English beginning readers involved reading one word for another, which evidences the use of a lexical–logographic reading strategy. Studies comparing reading acquisition in German and English (Frith et al., 1998; Wimmer & Goswami, 1994) showed that 7-year-old German children read better, faster, and with fewer errors than 9-year-old English children. Moreover, the performance of German 7-year-olds in pseudoword reading correlates highly with their reading of familiar words whereas the same correlation is nonsignificant among English children of the corresponding age. This means that, although German children use the same procedure (a phonological, sublexical, or indirect one) to read both types of materials, English children use a visual, lexical, or direct procedure to read words and a phonological, indirect procedure to read pseudowords. A similar pattern of results was obtained when reading acquisition in English was compared to reading acquisition in other shallow orthographies such as German, Italian, and Spanish (Cossu, Gugliotta, & Marshall, 1995; Goswami, Gombert, & Barrera, 1998; Thorstad, 1991). These studies also showed that more complex orthographic systems are more difficult to acquire and they entail the use of different reading strategies.

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This body of results reveals that a decoding procedure using assembled pronunciations is achieved earlier and more efficiently in shallow orthographies than in deep ones and, moreover, that learning to read in the former does not necessarily imply that the child should go through a phase of logographic reading (Wimmer & Hummer, 1990).

The studies just presented deal with the comparison between shallow versus deep, or opaque, orthographies. However, it would also be interesting to compare schoolchildren's reading procedures in shallow orthographies that differ in their degree of orthographic consistency. The present study attempts to address this question by examining reading development in Spanish and in Portuguese. Both orthographies can be considered shallow, but GPCRs are more consistent in Spanish than in Portuguese. As far as reading is concerned, Spanish is a clear example of a shallow orthographic system. Each grapheme has a clear and precise phonemic translation. The GPCRs allow readers to determine the phoneme corresponding to each specific grapheme without ambiguity, and thus reading is controlled by a set of consistent rules. There are simple GPCRs concerning the five vowels (*a, e, i, o, u*) and 19 consonants (*b, d, f, ch, j, k, l, ll, m, n, ñ, p, rr, qu, s, t, v, w, z*). Each of these maps to a single phoneme. There is also one silent letter (*h*). There are some contextual GPCRs to establish the pronunciation of graphemes that may map to two or more phonemes (*c, g, r, x, y*), but these conversions are totally predictable and stable, depending on the grapheme that follows and/or their position in the word. For instance, the grapheme *c* is read /k/ when followed by the graphemes *a, o,* or *u,* as in *casa* (house) but it is read /θ/ when followed by *e* or *i* as in *cena* (supper). The grapheme *g* is read /g/ when followed by the graphemes *a, o,* or *u* as in *gato* (cat) but it is read /x/ when followed by *e* or *i* as in *gitano* (gypsy). The grapheme *r* is read /r/ when it is not located in initial position as in *cara* (face), but it is read /R/ when located at the beginning of the word or following the letters *n, l,* or *s* as in *rosa* (rose) or *Israel* (Israel). The grapheme *y* takes the vowel value /i/ when isolated or located at the end of the word, as in *rey* (king), but it takes the consonant value /j/ in the rest of the cases, as in *yema* (yoke). The grapheme *x* is read /s/ when located at the beginning of the word, as in *xilófono* (xylophone), but it is read /ks/ in the remainder of cases, as in *taxi* (taxi). However, it is worth pointing out that there are few Spanish words containing the grapheme *x* and even fewer containing it in initial position.

Although less transparent than Spanish, Portuguese orthography is, particularly when reading is considered, relatively shallow, given its predictable grapheme–phoneme mappings and the stable contextual rules establishing grapheme–phoneme conversions (Girolami-Boulinier & Pinto, 1994; Rebelo & Delgado-Martins, 1978; Viana, Andrade, Oliveira, & Trancoso, 1991. For similar considerations regarding Brazilian Portuguese, see also Pinheiro, 1995, and Rego, 1999). The Portuguese spelling system has 25 consonants (*b, c, ç, ch, d, f, g, gu, h, j, l, lh, m, n, nh, p, qu, r, rr, s, ss, t, v, x, z*). The consonant *h* is always silent or part of the phonologically stable digraphs *ch, lh,* and *nh*. As it is the case in a large variety of orthographies, contextual rules establish the pronunciation of a certain number of consonants. In Portuguese orthography, stable contextual GPCR establish the pronunciation of 10 consonants (*c, g, gu,*

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m, n, qu, r, s, x, z) that may map to two or more phonemes, according to their position in the word or to the letters that precede or follow them. For example, *c* and *g* map to the stops /k/ and /g/, respectively, when followed by the oral vowels /a/, /ɑ/, /o/, /ɔ/, and /u/ and by the nasals /ɑ̃/, /õ/, /ũ/, but they map to the fricatives /s/ and /ʒ/, respectively, when followed by the oral vowels /ɛ/, /e/, /ə/, and /i/, as well as by the nasals /ẽ/ and /ĩ/; the orthographic sequences *gu* and *qu* may be read as the stops /g/ and /k/, respectively, with *u* silent, as in /gɛRɑ/ *guerra* (war) and /kɛtə/ *quente* (hot, warm), but may however also be read as the corresponding stops *plus* a semivowel /w/, as in /lĩngwɑ/ *língua* (language, tung) and /kwɑ̃dru/ *quando* (when). Contextual rules also specify that *m* and *n* might be read as /m/ and /n/, respectively, or may have the function of nasalating the preceding vowel, as in /põtə/ *ponte* (bridge); and *r* may map to the phoneme /R/ if it appears at the beginning of a word, or to the phoneme /r/ if it appears in its medial and/or final position.

Portuguese phonology also has a greater number of vowels than Spanish phonology. Differently from Spanish, in Portuguese there are five nasal vowels (/ɑ̃/, /ẽ/, /ĩ/, /õ/, /ũ/) and nine oral vowels (/a/, /ɑ/, /e/, /ɛ/, /ə/, /i/, /o/, /ɔ/, /u/). This makes for a big dissimilarity between the two orthographies and the reduced transparency of Portuguese orthography when compared to Spanish orthography. As a consequence, grapheme–phoneme correspondences are not one to one. There are instances where the identical vowel may map to different phonemes. For example, *o* may map to the phonemes /o/, /ɔ/, or /u/ as in /bokɑ/ *boca* (mouth), /tɔkɑ/ *toca* (burrow), and /bunitu/ *bonito* (beautiful), and *e* may map to the phonemes /ɑ/, /e/, /ɛ/, /ə/, /ẽ/, or /i/, as in /tɑʎɑ/ *telha* (tile), /temu/ *temo* (I fear), /tɛlɑ/ *tela* (canvas, tissue), /tẽmpu/ *tempo* (time, weather), /tələfɔnə/ *telefone* (telephone), and /tiar/ *tear* (loom). On the other hand, there are instances where different vowels may map to the same phoneme. For example, the underlined vowels in the words *mes<u>a</u>* /mezɑ/ (table) and *t<u>e</u>lha* /tɑʎɑ/ (tile) both map into the phoneme /ɑ/. The degree of asymmetry and the complexity of GPCR is thus greater in Portuguese orthography than in Spanish orthography.

The outlined differences between the two orthographies take us to the point we wanted to make. That is, to what extent do these variations in the degree of consistency of GPCRs between the two orthographies entail differences in reading acquisition procedures? If the already exposed asymmetry between the two orthographic systems has any influence in reading acquisition processes, it would represent another instance of the role of orthographic characteristics in reading development. Accordingly, the aim of the present study is to compare reading processes of Portuguese and Spanish school graders. We used the same procedure, tasks, and materials (numerals, number words, and pseudowords) that Wimmer and Goswami used in their 1994 study comparing reading processes of Austrian and English children. Given the outlined differences in shallowness between Spanish and Portuguese, we expected to find differences in reading time and number of errors across the two orthographies. Our hypothesis was that the greater predictability of Spanish orthography would facilitate reading acquisition, and thus we expected the Spanish group to read pseudowords more quickly and with fewer errors than the Portuguese group. The reading of

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overlearned words, as is the case of number words, was expected to be comparable across the two orthographies. We were also interested in error type because, particularly in the first years of reading acquisition, error type may reflect the level of orthographic consistency and reveal differences in reading style.

METHOD

Participants

A total of 214 children (120 Spanish, 94 Portuguese) took part in the study. The number of boys and girls was approximately the same. The sample comprised four subgroups of children in school grades 1–4. The Spanish and Portuguese children attended public schools in urban settings. The social and economic background of the families was homogeneous. They were mainly middle-class families of a medium-high cultural level, and the parents' jobs were very diverse. There were no cases of parents who were illiterate, bilingual, or immigrants or whose mother tongue was not the language of the study. No other aspects that might affect the interest of the children in learning and/or reading were detected, either. The educational contexts of both countries are perfectly comparable at this level of education due to their geographical and cultural proximity. In fact, written language starts to be systematically taught at the age of 6 in both countries. This point also marks the beginning of compulsory primary education. To make the sample even more homogeneous, children who were taking the course for the second year were discarded, as well as any children who, according to the teacher, had any learning difficulties or did not meet the regular educational standards for that grade. The two linguistic groups had been taught to read using a phonics-based approach, in which teachers focus on teaching the rules of correspondence between graphemes and phonemes.

Reading tasks

The children were given a Portuguese and a Spanish version of the three continuous reading tasks devised by Wimmer and Goswami (1994): numeral reading, number word reading and pseudoword reading (see Appendix). Pseudowords were created by exchanging the onset and the rime of the number words. For example, the Portuguese number word *sete* (seven) would become the pseudoword *dete,* whereas the corresponding Spanish number word *siete* (seven) would become the pseudoword *diete*. In each orthography the nine items of each material type (numerals, number words, and pseudowords) were randomly combined into two lists of 18 items, so that each of the nine items appeared twice in each list. The only restriction was that items never appeared in their ordinal sequence. To create a situation as similar as possible to a real reading situation, words and pseudowords were printed from left to right, separated only by spaces, in three different lines and in lower-case characters. Numerals were printed according to the same rules and in such a way that their location on the sheet corresponded to the first letter of the words and/or pseudowords.

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Procedure

The testing took place during the third term of the school year. Each child was tested individually in a single experimental session. Children were informed that the experiment was not aimed at evaluating their schoolwork. They were then requested to read the different lists as fast and accurately as possible. Three practice lists of six items, including numerals, number words, and pseudowords, were presented in order to make the children familiar with the tasks. These training lists were presented in the same order in which the child would receive the experimental tasks. Overall reading time per list was measured and errors were noted. Given the fact that the task was easy, the subjects' answers were recorded without any difficulties. However, in order to obtain homogeneous results, the answers of subjects with a greater variability than two typical deviations above the mean were ruled out. Pseudoword pronunciation was scored according to a very tolerant criterion, particularly in the case of Portuguese grapheme–phoneme correspondences. In other words, pseudoword pronunciation was considered to be correct whenever a given grapheme was pronounced similarly to a plausible corresponding phoneme in the language.

In order to disclose the possibility that, in each orthography and across school grades, word recognition might be carried out according to different strategies (an indirect phonological strategy versus a direct lexical one), errors in pseudoword reading were classified as follows: (a) phonological, when involving deletion, substitution, or other inversion of consonants and/or vowels but leading to the production of another pseudoword; and (b) lexical, when involving lexicalizations of the stimuli.

RESULTS

Reading time

A three-way analysis of variance carried out on the mean reading time per item, in which orthography (Portuguese, Spanish), school grade (grades 1, 2, 3, and 4), and reading list (numerals, number words and pseudowords) were the main factors, showed significant effects for the three main factors and all possible interactions (see Table 1).

The significant effect of orthography, $F(1, 206) = 26.62$, $p < .000$, is related to the fact that, as a whole, the Portuguese children were slower than Spanish children. The significant interaction of Orthography × Reading List, $F(2, 412) = 18.15$, $p < .000$, is because the Spanish children read number words and pseudowords faster than the Portuguese children. However, no differences were found in numeral reading time.

Improvement in reading time was observed between grades 1 and 4. In all grades and in both orthographies, pseudowords were read slower than number words and numerals. Post hoc analysis through the least significant difference test carried out on number word and pseudoword reading time showed significant differences in reading time between grades 1 and 2, on the one hand, and between both of grades compared to grades 3 and 4, on the other hand. In both

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Table 1. *Means* (*standard deviation*) *of reading time in the three different reading lists according to grade and orthography*

			Reading times		
Grade	Orthography	*N*	Numeral	Number words	Pseudowords
1	Spanish	30	0.70 (0.12)	1.40 (0.62)	1.71 (0.51)
1	Portuguese	15	0.75 (0.18)	1.90 (1.22)	2.75 (1.27)
2	Spanish	30	0.49 (0.08)	0.53 (0.11)	0.94 (0.23)
2	Portuguese	24	0.63 (0.15)	0.76 (0.24)	1.30 (0.53)
3	Spanish	30	0.48 (0.09)	0.53 (0.13)	0.93 (0.28)
3	Portuguese	18	0.55 (0.11)	0.63 (0.12)	1.02 (0.20)
4	Spanish	30	0.48 (0.10)	0.50 (0.13)	0.87 (0.21)
4	Portuguese	37	0.49 (0.13)	0.56 (0.22)	0.94 (0.35)
Total		214	0.56 (0.15)	0.78 (0.59)	1.21 (0.69)

orthographies, the children read faster as they grow older, and they are faster at reading numerals than at reading number words and pseudowords.

As can be seen in Figure 1, the pattern of results in number word and pseudoword reading time is quite similar in the two orthographies. The only difference is the longer time needed by Portuguese first and second graders to read pseudowords and number words. This similarity in the pattern of results seems to show that children from both orthographies use the same strategy to read both types of lists but the greater complexity of Portuguese GPCRs constitutes an extra burden for Portuguese beginning readers.

Reading errors

A three-way analysis of variance taking orthography, school grade, and error number per reading list as the main factors showed significant effects for the main factors and a significant second-order interaction, $F(6, 412) = 7.83$, $p < .000$.

No errors were made in numeral reading, and only very few children made some errors in number word reading (error range = 1–2). In fact, no significant differences were found across school grades or orthographies for numeral reading and number word reading.

Figure 2 presents the mean number of errors in pseudoword reading according to orthography and school grade. In general, the number of errors in pseudoword reading decreases as school grade increases. However, the pattern of errors is not equivalent in each orthography. Whereas the performance of the Portuguese children improves significantly from grade 1 to grade 3, the pattern of errors of the Spanish children is different. They make fewer errors than the Portuguese children in first grade, but their error rate is stable from second grade on. Although Portuguese children made more errors than Spanish children, post hoc analysis evidenced that these differences were only significant when the comparison involved grades 1 and 2, $F(3, 206) = 3.19$, $p < .02$.

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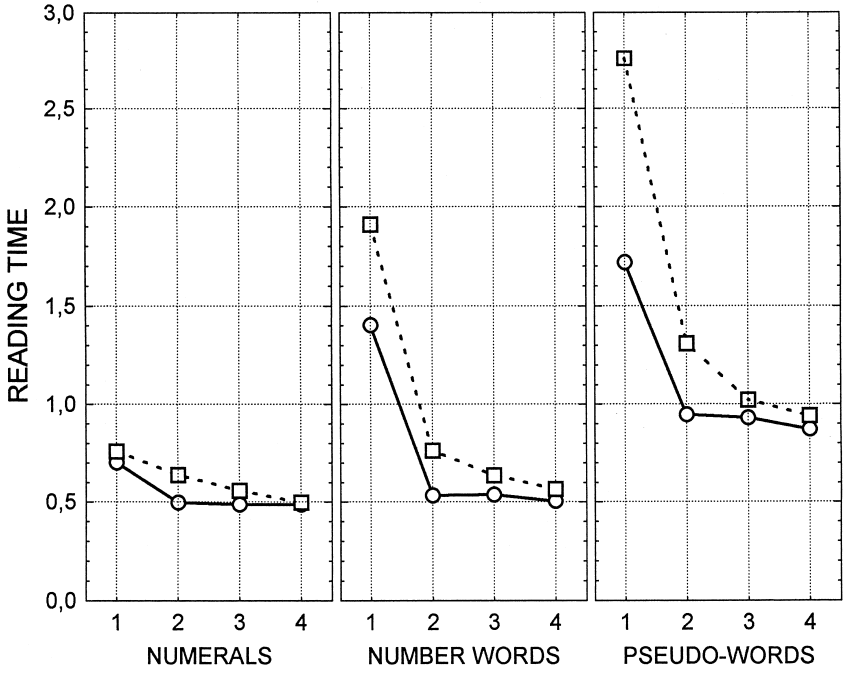


Figure 1. The mean reading time as a function of grade, reading list, and orthography for (○) Spanish and (□) Portuguese.

Figure 3 presents the mean number of errors classified according to error type (phonological vs. lexical), according to school grade and orthography. A three-way analysis of variance with orthography, school grade, and error type as the main factors showed a significant effect of grade $F(3, 206) = 9.59$, $p < .000$, orthography, $F(1, 206)$, and a significant second-order interaction, $F(3, 206) = 2.76$, $p < .04$.

In general and in both orthographies, the number of phonological errors decreases as school grade increases. It should be noted, though, that the frequency of this error type among Spanish children was, except for the case of Spanish third graders, significantly lower than the number of errors made by Portuguese children. As for lexical errors, at the very beginning of reading acquisition, this error type is lower among Spanish than among Portuguese children. However, the difference disappears in second grade, to reappear again in fourth grade, in which Spanish children produce a higher number of lexical errors than the Portuguese children. The latter present a continuous decrease of this error type from grade 1 to grade 3 and an increase between grades 3 and 4 (see Figure 3). This increase in the number of lexical errors between grades 3 and 4 is also apparent among Spanish children, and may well reflect a change in reading strategies. In grade 3 the children from both orthographies may turn from an indirect, phonological strategy into a direct, lexical one. In fact, a qualitative analysis of this

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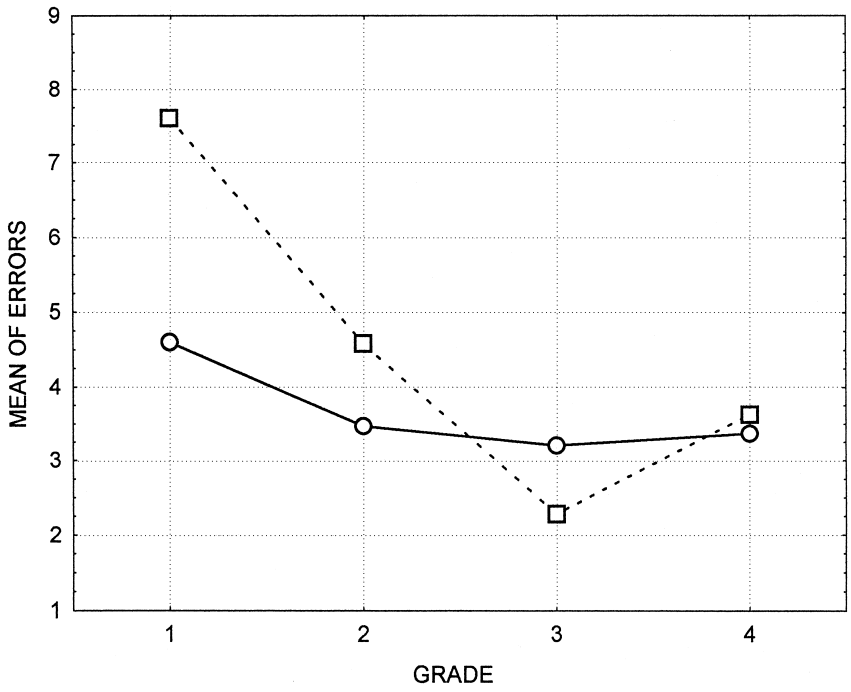


Figure 2. The mean number of errors in the pseudoword reading list as a function of grade and orthography for (○) Spanish and (□) Portuguese.

error type across the four grades showed that more than 90% of errors involved reading the pseudoword as the number word from which it had been derived.

It should be also considered that Spanish children made fewer phonological errors than the Portuguese children, whereas the number of lexical errors did not differ across orthographies.

DISCUSSION

The main aim of this study was to examine the extent to which subtle variations in the degree of orthographic consistency of two shallow orthographies such as Spanish and Portuguese may entail differences in schoolchildren's reading acquisition procedures. The results met our assumption that these variations play a role in schoolchildren's reading strategies. There were considerable differences across orthographies in reading time, accuracy of decoding, and the pattern of errors produced, especially in grades 1 and 2. As for reading time, although the developmental pattern of results was similar in Spanish and Portuguese and no differences were found across orthographies in numeral reading time, the Spanish children read number words and pseudowords faster than the Portuguese children. Both the Portuguese and Spanish children improved

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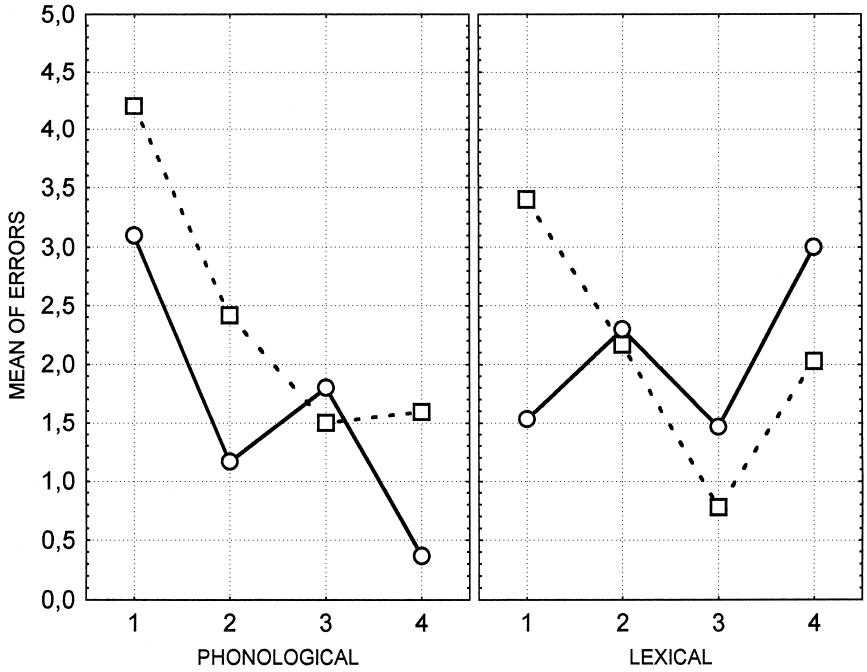


Figure 3. The mean number of errors in the pseudoword reading list as a function of grade, error type, and orthography for (○) Spanish and (□) Portuguese.

greatly in reading time from first to second grade. However, Spanish first and second graders read faster than their Portuguese counterparts. This difference vanished from third grade on. The major differences in reading time appeared among first graders. The delay in the temporal pattern displayed by the Portuguese children may be explained by the differences in orthographic consistency between Portuguese and Spanish. The higher predictability of GPCRs characterizing Spanish orthography allows children to reach an automatic control of reading at an earlier age. It is also important to point out that the Spanish and Portuguese schoolchildren differ in the time taken to achieve their highest level of reading speed. Whereas the Spanish children reach this level in grade 2 (no differences were found among the Spanish children from grade 2 to grade 4), the same performance level is only reached by the Portuguese children in grade 3.

A similar pattern of results emerges when errors in the pseudoword lists are considered. The Spanish first and second graders produced fewer errors than their Portuguese counterparts. In spite of this, the Portuguese children showed a greater improvement between grades 1 and 2. This can be seen in Figure 2, where the curve corresponding to the performance of Portuguese first and second graders drops more sharply than that of Spanish children from the corresponding school grades. Moreover, and also in line with what was observed for

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reading time, the Portuguese children stabilized their error level in grade 3, one year later than the Spanish children, whose error level stabilized in grade 2 (see Figure 2). These findings may well reflect the fact that Portuguese beginning readers, given that they have to cope with a less predictable orthographic system, have to face a more difficult task than Spanish beginning readers. Therefore, it takes them longer to acquire reading proficiency.

The reason for analyzing error type was that we admitted the possibility that, in each orthography and across school grades, word recognition might be carried out according to different procedures. No difference was found across orthographies in the number of lexical errors, but there was a great difference in the number of phonological ones. Regardless of the developmental pattern of reading acquisition, the number of phonological errors made by the Portuguese children was higher than that made by the Spanish children. Phonological errors reflect a failure in the use of the indirect procedure to access the mental lexicon. The greater complexity of Portuguese GPCR leads to the production of a higher number of errors of this type. This is also apparent when the developmental pattern of phonological errors is considered. Although across orthographies, the frequency of this error type decreases as age increases, the Portuguese children produced more phonological errors over the different grades than the Spanish children. As Figure 3 shows, even in fourth grade, when they are supposed to have attained skilled reading, there are still differences across orthographies. The Spanish fourth graders made practically no phonological errors (approximate mean = 0), whereas the number of phonological errors among Portuguese children remained constant between grades 3 and 4. The lowest mean error level of the latter is around 1.5, which is still significantly higher than the lowest mean error level attained by the Spanish children.

The predictability of Spanish orthography favors the nonproduction of phonological errors when children reach the expertise level, whereas the lower predictability of Portuguese orthography only allows for about 90% of correct grapheme–phoneme conversions. This may explain why the Portuguese schoolchildren continue to make phonological errors even when they are in fourth grade.

Lexical errors generally reflect a failure in the use of the direct route to access the mental lexicon. The reader addresses word representations without accomplishing an analysis of the orthographic segments of the printed word. Spanish first graders produced a low number of lexical errors. This may indicate that Spanish beginning readers make little use of a direct procedure starting from the onset of reading. Two other results are in line with this assertion: on the one hand, the number of lexical errors produced by the Spanish children increases with school grade, and, on the other hand, their pattern of lexical errors is the opposite of the pattern obtained for phonological ones. In other words, among the Spanish schoolchildren, the number of lexical errors grows with reading proficiency. Even though this fact may seem paradoxical, the explanation is that these children rarely use the direct route in first grade, as they find no need to. From first grade on there is a change in the reading strategy of Spanish children. This idea is reinforced by the low reading time recorded in fourth grade, reflecting the use of a direct reading strategy. Conversely, the pattern of errors of Portuguese first graders seems to indicate that, besides using an indirect strategy

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from the onset of reading, they also use a direct one; hence the greater number of lexical errors among Portuguese first graders than among Spanish first graders. This error type decreases between grades 1 and 3, and in grade 4 children attain a level of expert reading and a corresponding change in their reading strategy. This is the reason for the observed growth in the number of lexical errors produced by the Portuguese children. It is worth pointing out that this change in error pattern, which seems to reflect a change in reading strategy favoring the use of a direct strategy when a good level of reading skill is attained, occurs simultaneously in both orthographies (in third grade). Because both orthographies are shallow, children make a predominant use of the phonological route in the first stages of reading acquisition. When they become skilled and familiar enough with many of the words, they turn to a predominant use of the lexical or direct route.

In short, the present results suggest that subtle differences in the degree of predictability of GPCR in two shallow orthographies may influence, not only the timing of reading acquisition, but also the relative use that children make of the direct and the phonological routes in different phases of reading acquisition. The results cannot be interpreted by referring to the possible differences between the lists of number words and pseudowords in terms of their length, the type of phonemes, or the complexity of the structures involved in each orthography. This is supported by the fact that, as can be seen in the Appendix, both lists are extremely similar. Therefore, we are inclined to admit that it is more heuristic to consider orthographic systems as standing at different points of a continuum, depending on their level of consistency, than to classify them in terms of the shallow–deep dichotomy.

Finally, consideration must be given to the generalization of the results of this research. It is widely accepted that the reading of pseudowords is a good indicator of knowledge of the alphabetic code. Specialists in the field consider this task to be proof of the comprehension of the basic reading mechanisms (Frith et al., 1998; Goswami et al., 1998; Wimmer & Goswami, 1994). However, we are aware that the tasks we used are mainly related to word recognition skills. We must therefore be careful to keep in mind that there are other processes of a higher level that also play a role in reading skills.

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APPENDIX

Portuguese and Spanish number words and pseudowords

Number words		Pseudowords	
Portuguese	Spanish	Portuguese	Spanish
Dois (2)	Dos	Nois	Sos
Três (3)	Tres	Nês	Ces
Quatro (4)	Cuatro	Datro	Duatro
Cinco (5)	Cinco	Quinco	Ninco
Seis (6)	Seis	Treis	Ceis
Sete (7)	Siete	Dete	Diete
Nove (9)	Nueve	Sove	Dueve
Dez (10)	Diez	Cez	Siez
Doze (12)	Doce	Soze	Troce

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