Variations in reading and spelling acquisition in Portuguese, French and Spanish: A cross-linguistic comparison

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Abstract

This study undertakes a cross-linguistic comparison of reading and spelling acquisition in French, Portuguese and Spanish languages. It aims to examine several explanatory factors for the well-documented effect of language on the speed of reading and spelling development: differences in orthographic depth and complexity of syllabic structures. A longitudinal study was carried out with first graders in the three languages and with a common assessment procedure. Children were tested in October, February and May on letter knowledge, familiar word and simple pseudoword reading and spelling. Results show that all children were accurate in reading and spelling at the end of the first school year. Differences between languages are highlighted when rate of acquisition and linguistic variables such as lexicality, items length, or complexity of grapheme-phoneme correspondences and of the syllabic structure are considered. These differences will be discussed in the light of the explanatory factors mentioned.

The present paper compares the early development of reading and spelling in three Romance languages, namely French, Portuguese and Spanish. Most cross-linguistic studies show a variation in the speed of acquisition of these abilities (Wimmer & Goswami, 1994; Frith, Wimmer, & Landerl, 1998;

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Goswami, Gombert, & Barrera, 1998; Defior, Martos, & Cary, 2002; Goswami, 2002; Alegria, Marin, Carrillo, & Mousty, 2003; Seymour, Aro, & Erskine, 2003), which could be related to differences in orthographic depth. As Alegria et al. (2003), we consider that a shallow orthography is a system that faithfully reflects the surface phonology. Most of the letters, including morphological and syntactical markers, are pronounced in a shallow orthography. By contrast, a deep orthography simultaneously represents the language at the phonological, morphological and syntactical levels, and the morphological and syntactical markers are not systematically pronounced. For example, in French, the morphology is systematically represented even if it is not always overtly pronounced (e.g., the plural “ils marchent”, they walk, and the singular “il marche”, he walks, are pronounced similarly). The deeper the writing system, the slower will be the acquisition of the reading and spelling processes (e.g., Ziegler & Goswami, 2005, 2006).

The effect of orthographic depth has been largely documented in the literature. Seymour et al. (2003) reported results of a large study comparing English with a wide range of European languages. Thirteen countries participated in this study. Regarding letter knowledge, all groups reached a performance of 89% or better, late in their first primary school year. Only Scottish children were delayed in the speed of letter identification, likely because of their immaturity. Indeed, Scottish children start formal learning at an earlier age (5 years) than any of the other language groups. The ability to read familiar words and simple pseudowords was mastered more slowly in French, Portuguese and Danish than in any of the other European orthographies such as Spanish, but it was really delayed in English. Differences in orthographic depth between languages seem to explain variations in the ability to read both words and pseudowords. Seymour et al. (2003) also showed that syllabic complexity (complex closed syllable languages vs. simple open syllable languages) exerts a selective effect on the development of the decoding process.

Studies focusing on reading and spelling acquisition in Romance languages (Goswami et al., 1998; Defior et al., 2002; Alegria et al., 2003; Seymour et al., 2003) point to the same conclusion: the more inconsistent the mapping between spelling and sound (considering both directions feedforward consistency and feedfback consistency), the slower is the acquisition of reading and spelling abilities. For example, Goswami et al. (1998) compared reading acquisition in English, French and Spanish. They showed that beginning readers were faster reading pseudowords when these had the same rimes as familiar words. This effect was larger in English, intermediate in French and smallest in Spanish. French children showed higher pseudoword reading performances than English children did, but lower performances than the Spanish children did. These results could be explained by the fact that the Spanish children rely on efficient phonological processing based on grapheme-phoneme correspondences, while the English children, and to lesser extent the French children, rely on larger reading units such as rimes. This conclusion must be taken with caution, as the density of rime neighbors was not controlled in the material. Nevertheless, this paper highlights the fact that learning to read inconsistent orthographies is not only delayed in comparison with learning to read consistent orthographies, but might also rely on qualitatively different processes. In a later study, Goswami, Ziegler, Dalton, & Schneider (2001) showed that English readers rely on larger grain sizes and more lexical phonology than German readers. Also, Goswami et al. (2003) showed that English readers use more flexible coding strategies than German readers who rely exclusively on small-grain size decoding. Similarly, differences in the preferred grain size of processing units have even been shown for skilled readers (Ziegler, Perry, Jacobs, & Braun, 2001).

Defior et al. (2002) took up the challenge to highlight differences in the development of reading acquisition in Portuguese and Spanish, two orthographies that are shallower than English. Children were given three reading tasks: numeral reading, number word reading and pseudoword reading. Pseudowords were created by exchanging onset and rime of the number words. Spanish children read number words and pseudowords faster and better than did Portuguese children in grades 1 and 2. No differences were found in numeral reading time. The fact that grapheme-phoneme correspondences are more consistent in Spanish than in Portuguese is a plausible interpretation of this pattern of results. Thus, both the COST study and Defior et al.'s (2002) showed that reading acquisition is more difficult for Portuguese than for Spanish, and therefore that the transparency of the orthography has a positive effect on the rate of reading development.

The importance of orthographic depth was also apparent in Alegria et al.'s (2003) spelling study. They studied the acquisition of the same contextual phoneme-grapheme correspondences during second grade, in Spanish and French. For example, the phoneme /g/ followed by the letters "e" or "i" is systematically spelled "gu" in both languages as in the words "guerra" in Spanish and "guerre" in French. In Spanish, these graphonemes[1] are present in a mainly regular orthographic system, while in French they are present in a less regular orthographic system. The results showed that these contextual phoneme-grapheme correspondences were acquired earlier in Spanish than in French. This suggests that the same phoneme-grapheme correspondences are mastered earlier in the context of a shallow orthography than in the context of a deep orthography.

The spelling of inconsistent graphonemes, i.e. phonemes that admit several transcriptions, was also studied. A frequency effect for words including inconsistent graphonemes was observed earlier in Spanish than in French, indicating that the acquisition of orthographic representations occurred earlier in the shallower Spanish orthography. Thus, Alegria et al. (2003) showed that

[1] The term graphoneme refers to the relationship between phoneme and grapheme.

the general inconsistency of the orthographic system is responsible for slowing down spelling achievement.

In summary, a review of the studies that compared the languages concerned in the present paper supports the conclusion that Portuguese and French languages may be differentiated from Spanish with respect to the rate at which basic literacy is acquired. In order to identify the linguistic factors that could affect reading and spelling acquisition, the common linguistic characteristics of the Spanish, Portuguese and French languages as well as their specificities, are described in the next section.

Number of vowels

The number of vowels varies in these three languages. While oral Spanish has 5 vowels, oral Portuguese contains 14 vowels and oral French includes 15 vowels (Delattre, 1965). Therefore, the difficulty of reading and spelling is expected to be equivalent in French and Portuguese, and less pronounced in Spanish.

Degree of bi-directional consistency between orthography and phonology

The notion of consistency in reading refers to the variability of the phonological codes that can be assigned to a particular orthographic unit. In Spanish, Portuguese and French, Grapheme-to-Phoneme Correspondences, GPCs, are quite predictable. Nevertheless, GPCs are more consistent in Spanish than in Portuguese or French. Statistical descriptions of the mapping between phonology and orthography exist for French (Véronis, 1986; Ziegler, Jacobs & Stone, 1996; Peereman & Content, 1999) and Portuguese (Borgwaldt, Hellwig, & De Groot, 2002), but are not available in Spanish.

While Spanish readers are confronted with graphemes having a clear and precise phonemic translation, more inconsistencies are present in French and Portuguese. For example, the grapheme ‘e’ in French is pronounced in various ways as in ‘fe̲me̲lle̲’ (female) → /fəm∑l/, ‘fe̲mme̲’ (woman) → /fəm/; in Portuguese, ‘o’ is pronounced /o/ as in ‘boca’ (mouth), /o/ as in ‘toca’ (burrow) and /u/ as in ‘bonito’ (beautiful). Therefore, given the consistency of Spanish orthography, reading performances in this language should be higher than in Portuguese (see Defior et al., 2002) and in French.

In the three languages, there is an asymmetry between GPCs and PGCs. This asymmetry is more important in Portuguese and French than in Spanish. One of the few, but fairly common, inconsistency in Spanish is that the phoneme /b/ can be spelled “v” or “b” or “w”. In Portuguese, the intervocalic sound /z/ is represented by “s” as in "casa" (/kaza/; house) or by “z” as in "azar" (/azar/; bad luck). In French, the asymmetry between GPCs and PGCs is larger than in Spanish and Portuguese: there are alternative spellings for a large number of phonemes. For example, the phoneme /o/ may be spelled “au, o, eau, ô, ot, aux, eaux”, etc; the phoneme /f/ may be spelled “f, ff and ph”. The only objective data we can mention for the three languages is that there are 24 phonemes for 30 graphemes in Spanish (Defior & Serrano, 2005), 35 phonemes for 67 graphemes in Portuguese (Gomes, 2001), and 35 phonemes for 130 graphemes in French (Catach, 1980). The relation of number of phonemes for number of graphemes is 1:1.4 in Spanish, 1:1.9 in Portuguese and 1:3.7 in French. Consequently, the acquisition of PGCs (an index of the phonological procedure in spelling) should be occurring earlier in Spanish, somewhat later in Portuguese, and last in French.

Vocalic reduction in spoken language

The question we will address here is whether the phonological characteristics of oral language introduce variations in the developmental course of reading. Vocalic reduction does not occur in Spanish and in French, but is quite prevalent in Portuguese. Linguists agree to consider vocalic suppression, and not vocalic reduction, for the French language. This vocalic suppression concerns only the median /ə/ and most of the time in adverbs ending in "-ement". For example ‘samedi ’ (Saturday) is pronounced /samdi/ and not /samədi/; 'principalement' (mainly) is pronounced /pr∑sipalmã/ and not /pr∑sipaləmã/. In Portuguese, vocalic reduction affects all vowels included in unstressed syllables. For example, in fluent speech “sábado” (Saturday) is often pronounced /sabd(e)/.

Study design

This study was a part of a larger project coordinated by P.H.K. Seymour, aimed at comparing the early development of cognitive processes involved in reading and spelling acquisition in a variety of European orthographies. The project included languages from shallow to deep regarding the orthographic depth continuum, such as Finnish, Greek, Spanish, Portuguese and French (languages with simple syllabic structure); Norwegian, Icelandic, Swedish and English (languages with complex syllabic structure) (Seymour et al., 2003).

The theoretical framework underlying this study was the dual foundation model developed by Seymour (1997, 1999). In the present study, we were interested at comparing the rate of development of the foundation level. Given the large number of concerned languages in Seymour’s project, a methodological option was to require very basic similarities between materials in different languages. Therefore, the presented materials were highly familiar and simple. The complexity effect (comparing simple with complex words) was chosen as a psycholinguistic marker of basic cognitive processes underlying word reading and spelling; simple words, with consistent and dominant GPCs, can be read by relying solely on either sublexical/alphabetic or lexical/sight-reading processes, whereas complex words require the mastery of orthographic principles. The length effect was selected as an index of the phonological procedure, especially in the case of pseudoword reading and spelling.

The literature has largely documented the fact that reading speed seems to be a more sensitive measure than accuracy to highlight variations in reading acquisition across languages (Wimmer, 1993; de Jong & van der Leij, 2003; Sprenger-Charolles, 2004; Ziegler, Perry, Ma-Wyatt, Ladner, & Körne, 2003; Ziegler & Goswami, 2005). Therefore, in the present study, both accuracy and reaction times will be presented and analyzed.

Method

Participants

The sample included eighteen Spanish-speaking children (9 girls and 9 boys) with a mean age of 6 years and 1 month; nineteen Portuguese-speaking children (10 girls and 9 boys) with a mean age of 6 years and 3 months, and seventeen French-speaking children (8 girls and 9 boys) with a mean age of 6 years and 5 months. In the three countries, children enter the first primary school in the calendar year of their sixth birthday. Children in the three language samples were comparable in terms of sociodemographic and socioeconomic background. Only native speakers in French, Portuguese and Spanish were selected, respectively. Moreover, all participants were selected from schools with middle socioeconomic status located in urban areas. All children were learning to read with a mixed approach: teaching of letter-sound and grapheme-phoneme correspondences in a semantic context of interest for the child. A description of the sample is presented in Table 1.

Children were examined three times along the first primary school year: the first test point (TP1) was in October, the second one (TP2) was in February-March and the third one (TP3) was in May-June. Assessments made in each language, considering the components of foundation literacy identified by Seymour and Evans (1999), included (1) letter knowledge with naming and spelling tasks, (2) very familiar word identification, (3) word spelling, (4) decoding of simple pseudowords and (5) pseudoword spelling.

Table I: Characteristics of the Spanish, Portuguese, and French speaking children.

		Age (TP1)		Raven matrices	
	N	*Mean*	*SD*	*Mean*	*SD*
Spanish	18	6;1	3.7	22.1	4.01
Portuguese	19	6;3	3.8	19.23	4.72
French	17	6;5	4.3	25.17	5.73

Note. N, Number of participants*; SD,* standard deviation.

Materials

Each test point included upper and lower case letter knowledge, simple word reading, complex word reading, monosyllabic and bisyllabic pseudoword reading. Moreover, TP2 included letter spelling, simple and complex word spelling, monosyllabic and bisyllabic pseudoword spelling. Material used for each language is presented in Appendix I and II.

Letter knowledge. Two separate lists, one printed in upper case and the other in lower case, included all the letters of the alphabet in each language.

Familiar word lists. Selected words were very familiar for first primary school children. These words were sampled from the reading materials used in the early stage of primary schooling in each language. Half of the items were content words (nouns and adjectives), the other half, function words (prepositions, conjunctions and articles).

Both simple and complex words were presented to each child. Simple words were based on standard letter-sound correspondences that link one letter with one phoneme, while complex words included multi-letter grapheme-phoneme correspondences and contextual influences. The most frequent complexities were chosen in each language. Consequently, the selected complexities were specific to each language. In Spanish, for example, complexities were mainly digraphs and the silent letter "h". In French, complexities include the presence of a diacritic, silent letters at the end of words, and contextual rules like "gu" before "e" pronounced /g/. In Portuguese, complexities include digraphs and contextual rules analogous to the ones in French.

In Spanish, Portuguese and French, multisyllabic words are fairly common as compared to monosyllabic words. Monosyllabic words represent 2% of all words in a Spanish database (Justicia, 1995), 2% in a Portuguese one (Gomes & Castro, 2003) and 13% in a French one (Brulex; Content, Mousty & Radeau, 1990). Bisyllabic words are the most frequent among multisyllabic words, 27% in Spanish, 15% in Portuguese, and 42% in French (same sources). For this reason, bisyllabic words were used in this study.

Pseudoword lists. The acquisition of the alphabetic principle was examined with a task of pseudoword reading. Two lists of eight pseudowords were proposed to each child. One list included short, CV items, and the other long, CV-CV items. The pseudowords were built by sampling dominant and consistent 1-to-1 letter sound correspondences in each language.

Psychometric data were collected at TP3: a standardised measure of reading development and the Raven coloured progressive matrices. As at the time of testing there was no standardised reading test in Portugal, Portuguese children were selected by their teachers as being of average ability. The standardised reading test used in Spanish was Prolec (Cuetos, Rodríguez, & Ruano, 1996), and in French, l'Alouette (Lefavrais, 1967). In Spanish, Prolec gives rise to measures in percentiles (mean of 74.21, standard deviation 27.30) for pseudoword reading and mean of 61.71, standard deviation 24.39 for reading comprehension). In French, l'Alouette gives rise to a reading age (mean of the sample: 7 years 2 months).

General procedure

For each language, children were allocated to one of four sets differing in the order of presentation of the tasks.

Letter identification as well as word and pseudoword reading were run on a portable computer using Cognitive Workshop software. Thus, the experimental software (computer, software, microphone) was identical across countries.

Each task was introduced by six practice items. The stimuli were displayed in isolation at the centre of a 12' LCD computer screen in a white, lower-case font (for the reading items) against a black background. After a 1000 millisecond warning signal (*) followed by a 1000 millisecond delay, the stimulus was presented on the screen for up to 10 seconds. Participants were required to identify each item as quickly and as accurately as possible.

All responses of each child were recorded on-line on a digital sound file, and correct responses and reaction times (RT) were computed. Correct responses and errors were also scored on-line during the experiment and then checked off-line using the digital sound file. For each response of each participant, RTs were automatically calculated from the onset of the stimulus until the onset of the response. Only RTs of correct responses were used to calculate RT means. Each RT was checked off-line using the digital sound file.

In TP2, a spelling session separated from the reading one was run. Items were presented orally in isolation and children were asked to write them down in a sheet of paper prepared for that purpose. No particular instruction was given to the child regarding the use of upper or lower case letters. For assessment of letter knowledge, letter names were dictated. Simple words, complex words and pseudowords were dictated in separate task. Spelling task presentation was counterbalance in the session.

Results

Reading and spelling results are presented for each task (letter knowledge, familiar words, pseudowords).

Letter identification. Results for letter identification on both correct responses and reaction times as a function of Language and Test point (TP) are presented in Table 2.

Analyses of variance (ANOVA) on both correct responses and reaction times were conducted with Language (Spanish, Portuguese, French) and Test Point (TP1, TP2, TP3) as main factors.

The statistical analyses showed a marginally significant main effect of Language for accuracy, $F(2, 51) = 2.55$, $p=.08$, partial $\eta^2=0.09$, and statistically significant for RTs, $F(2, 51) = 7.6$; $p<.001$, partial $\eta^2=0.23$. Spanish-speaking children showed the tendency to have a more accurate performance than French- and Portuguese-speaking children in letter identification. The performance was clearly higher in Spanish-speaking children regarding RTs; they were faster to identify letters than the Portuguese- and French-speaking children who did not differ significantly from each other. A main effect of Test point was obtained both in accuracy, $F(2, 102) = 189.57$; $p<.0001$, partial $\eta^2=0.78$, and RTs, $F(2, 51) = 7.21$; $p<.01$, $\eta^2=0.12$ as improvements were observed between each test point. There was a significant interaction between Language and Test Point in accuracy, $F(4, 102) = 5.83$; $p<.001$, partial $\eta^2=0.19$, indicating that the Language effect was only significant at the beginning of the school year (TP1). No statistically significant interactions were found in RTs analysis.

Letter writing. Mean percentages of correct responses for letter writing at TP2 are presented in Table 2. An ANOVA was carried out with Language as factor. The main effect of Language, $F(2, 67) = 7.08$; $p<.01$, partial $\eta^2=0.18$, showed that the Portuguese-speaking children were better able to write letters than the Spanish-speaking and French-speaking children (95%, 87% and 80%, respectively).

Table II. Mean percentage of correct responses, mean reaction time (ms) for Letter Identification, LI, at TP1 (October), TP2 (February-March) and TP3 (May-June) and Letter Writing, LW, at TP2, in Spanish, Portuguese and French. Standard deviations in parentheses.

		Spanish			Portuguese			French		
		TP1	TP2	TP3	TP1	TP2	TP3	TP1	TP2	TP3
LI	*Accuracy*	53.29 (26.45)	86.33 (9.81)	89.82 (10.03)	52.98 (26.39)	79.31 (19.21)	92.77 (7.17)	31.29 (25.91)	81.84 (9.26)	88.65 (5.24)
	Reaction times	1469 (524)	1062 (197)	1042 (227)	—	1410 (363)	1208 (276)	—	1271 (304)	1186 (273)
LW	*Accuracy*	–	87 (12.55)	—	—	95 (8.63)	—	—	80 (12.25)	—

Familiar word reading. Mean percentages of correct responses and reaction times for simple and complex word reading are provided in Table 3 as a function of Language and TP. The large number of errors at TP1 precludes statistical analyses of reaction times for this test point. As a consequence, only RT data from TP2 and TP3 will be presented. Results show than Spanish-speaking children were able to read simple and, to a lesser extent, complex words at the very beginning of the school year, when the Portuguese-speaking and French-speaking children presented floor results.

For Spanish speakers, the size of the complexity effect remained low across the school year, compared to the two other groups of children. The fast reaction times of the Spanish-speaking children are really impressive compared to the slowness of the Portuguese-speaking and French-speaking children.

Table III. Mean percentage of correct responses, mean reaction time (ms) for simple, S, and complex,C, word reading in Spanish, Portuguese and French at TP1 (October), TP2 (February-March) and TP3 (May-June). Standard deviations in parentheses.

		Spanish			Portuguese			French		
		TP1	TP2	TP3	TP1	TP2	TP3	TP1	TP2	TP3
S	*Accuracy*	29.17 (41.35)	65.97 (36.08)	84.03 (30.56)	0.68 (2.98)	59.37 (31.62)	84.42 (13.62)	2.94 (12.13)	42.65 (30.32)	79.41 (25.36)
	Reaction times	—	1123 (217	1038 (261)	—	3132 (1601)	2762 (1794)	—	2955 (1019)	2273 (1099)
C	*Accuracy*	16.04 (24.07)	53.92 (30.85)	81.44 (22.35)	0.32 (1.38)	29.47 (32.54)	74.37 (26.75)	2.94 (12.13)	27.94 (28.48)	78.68 (23.70)
	Reaction times	—	1206 (174)	1116 (192)	—	3172 (980)	2758 (1464)	—	3798 (1190)	2371 (1038)

Analyses of variance on both correct responses and reaction times were conducted with Language, Test Point and Complexity (Simple vs. Complex words) as main factors. The ANOVAs showed a strong effect of Language on both accuracy, $F(2, 51)= 4.17$; $p < .02$, partial $\eta^2=0.14$, and RTs, $F(2, 51)= 21.14$; $p < .0001$, partial $\eta^2=0.88$. A better score was exhibited by the Spanish-speaking children (55%) compared to the French- (39%) and the Portuguese-speaking children (41%), who did not differ significantly from each other. The Spanish-speaking children were also faster to faster to read aloud (1096 ms) than the French-speaking children (2766 ms) while the Portuguese-speaking children were the slowest (2956 ms).

A main effect of TP was found for accuracy, $F(2, 51)= 182.4$; $p < .02$, partial $\eta^2=0.78$, and for RTs, $F(1, 51) = 14.75$; $p < .001$, partial $\eta^2=0.22$, showing that gains were observed across the school year. A significant interaction between Test point and Language was found in RT, $F(2, 51) = 4.5$; $p < .01$, partial $\eta^2=0.15$, indicating that these improvements varied according to the group of children. Progresses were less substantial for Spanish-speaking than for Portuguese- and French-speaking children, who did not differ significantly. As Spanish-speaking children displayed some abilities to read words at the very beginning of the school year with low RTs in the middle of the school year, their opportunities to make improvements were lower than for Portuguese and French speakers.

A significant effect of Complexity was also obtained on both accuracy, $F(1, 51)= 35.88$; $p < .0001$, partial $\eta^2=0.41$ and RTs, $F(1, 51)= 5.9$; $p < .01$, partial $\eta^2=0.11$, with an advantage of the simple words (49% and 2176 ms) over the complex ones (40% and 2369 ms). The interaction TP x Complexity was statistically significant on correct responses, $F(2, 102)= 8.88$; $p < .0001$, partial $\eta^2=0.14$, showing that the size of the Complexity effect varied across the school year, but only on accuracy.

Regarding RTs, the interaction Language x Complexity was marginally significant $F(2, 51)= 3.17$; $p = .05$, partial $\eta^2=0.11$; this means that the Complexity effect was not of the same importance across languages: French--speaking children displayed a larger Complexity effect (473 ms.) compared to the Spanish-speaking (85 ms.) and to the Portuguese (18 ms.), who did not show the Complexity effect in RTs.

The significant triple interaction Language x Test Point x Complexity on accuracy $F(4, 102)= 2.67$; $p < .03$, partial $\eta^2=0.095$, indicates that the interaction Complexity x Test Point was only significant for Portuguese--speaking, $F(2, 36)= 12.39$; $p < .0001$, partial $\eta^2=0.14$ and French-speaking children, $F(2, 32)= 4.18$; $p < .02$, partial $\eta^2=0.11$. For both languages, the Complexity effect was statistically significant only at TP2 ($p<.001$ and $p<.04$). That is, the Complexity effect was more important at TP2 (effect of 30% and 15%, respectively) compared to TP3 (effect of 10% and 0.8%, respectively) and TP1 (effect of 0.37% in the Portuguese-speaking group and no effect in the French-speaking group). For Spanish-speaking children, the Complexity effect was present throughout the school year but in equivalent proportions.

Familiar word spelling. Mean percentages of correct responses for simple and complex word spelling in each language at TP2 (February-March) are shown in Table 4. An ANOVA including two factors, Language and Complexity, was carried out. The main effect of Language was significant, $F(2, 51) = 23.5$; $p < .0001$, partial $\eta^2=0.12$, with the highest performance for the Spanish-speaking children (75%), the intermediate one for the Portuguese--speaking children (55%) and the lowest one for the French-speaking children (37%).

Table IV. Mean percentage of correct responses for simple and complex word spelling in Spanish, Portuguese and French at TP2 (February-March). Standard deviations in parentheses.

	Spanish	Portuguese	French
Simple words	90.69 (12.7)	83.36 (14.36)	58.75 (17.62)
Complex words	60.9 (23.5)	26.27 (25.34)	14.38 (12.86)

A main effect of Complexity was found F(1, 51)= 173.50, $p < .0001$, partial η^2=0.39; simple words were better spelled than complex words (77% vs. 33%), $p < .0001$. The significant interaction Language x Complexity, F(2, 51)= 12.12; $p < .0001$, partial η^2=0.08, indicates that the Spanish-speaking children presented the lowest complexity effect while this effect was equivalent for Portuguese-speaking and French-speaking ($p > .05$). Note that Spanish-speaking children presented a high ability to spell complex words (60%) compared to the Portuguese- and French-speaking children (26% and 14%, respectively).

Pseudoword reading. Mean percentages of correct responses and mean RTs for the reading of CV and CV-CV pseudowords are given in Table 5. As for word reading, the large number of errors at TP1 precludes statistical analyses of reaction times for this test point, and only RT data from TP2 and TP3 will be presented. Results show that the Spanish-speaking children successfully read 37% of pseudowords at the very beginning of the school year, while the Portuguese- and French-speaking children had nearly floor performance. The Spanish-speaking children were also reading much faster than the other two groups of children. For CV pseudowords, they reached ceiling results earlier (i.e. at TP2) in the school year compared to the Portuguese- and French-speaking children. The effect of length was present in each language group.

Table V. Mean percentage of correct responses, mean reaction time (ms) for CV and CVCV pseudoword reading in Spanish, Portuguese and French at TP1 (October), TP2 (February-March) and TP3 (May-June). Standard deviations in parentheses.

		Spanish			Portuguese			French		
		TP1	TP2	TP3	TP1	TP2	TP3	TP1	TP2	TP3
CV	*Accuracy*	37,96 (38,26)	96,76 (7,08)	91,67 (23,74)	1,74 (5,92)	47,32 (32,24)	73,21 (25,42)	8,82 (25,08)	65,69 (31,72)	97,06 (5,05)
	Reaction times	---	1106 (215)	1009 (217)	---	2465 (676)	2347 (1067)	---	2186 (808)	1368 (651)
CV - CV	*Accuracy*	12,96 (27,15)	52,78 (38,88)	81,48 (24,18)	0,42 (1,84)	43,47 (31,13)	59,21 (29,01)	5,88 (17,62)	53,43 (30,34)	91,67 (7,22)
	Reaction times	---	1371 (360)	1271 (298)	---	3044 (960)	2703 (1159)	---	3774 (1344)	2026 (1111)

Analyses of variance on both correct responses and reaction times were conducted with Language, Test Point, and Length (short and long) as main factors. The results showed a significant main effect of Language on both accuracy, F(2, 51)= 11.36; $p < .0001$, partial η^2=0.31 and RTs, F(2, 51)= 21.71; $p < .0001$, partial η^2=0.46. The Spanish-speaking children presented a higher overall performance (62%) compared to the French-speaking children

(53%), who showed a higher performance than Portuguese-speaking children (37%). The Spanish-speaking children had faster RTs (1189 ms.) compared to the Portuguese-speaking (2639 ms.) and French-speaking children (2338 ms.) who did not differ significantly from each other.

There was a significant main effect of Test point on both accuracy, $F(2, 102)= 197.9$; $p<.0001$, partial $\eta^2=0.8$ and on RTs, $F(1, 51)= 37.12$; $p < .0001$, partial $\eta^2=0.41$, indicating that improvements occurred throughout the school year (11% at TP1, 59% and 2324 ms at TP2, 82% and 1787 ms at TP3). This main effect interacted with Language, $F(4, 102)= 2.78$; $p < .03$, partial $\eta^2=0.1$ for accuracy, and $F(2, 51)= 17.09$; $p < .0001$, partial $\eta^2=0.40$, for RTs. Regarding accuracy, gains were most evident for the Portuguese- and French--speaking children, who reached equivalent results. The interaction was mainly due to the fact that, at the beginning of the school year, the Spanish--speaking children could already read some pseudowords (37% correct) whereas the result for the Portuguese- and French-speaking children´s performances was at floor. Note that all three groups of children reached ceiling at the end of the first primary school year. Regarding RTs, posthoc analysis for the interaction Language x TP showed that the main effect of TP was only found in French-speaking group indicating that the rate of progress was largest for French-, than for Portuguese- and for Spanish-speaking children. However, it is still important to highlight that, at TP2, the Spanish--speaking children reacted twice as fast as the two other groups of children and that the Portuguese-speaking and French-speaking children displayed equivalent RTs.

A strong effect of Length was obtained on both accuracy, $F(1, 51)= 57.9$, $p < .0001$, partial $\eta^2=0.53$, and RTs, $F(1, 51)= 112.98$; $p < .0001$, partial $\eta^2=0.69$. Monosyllabic pseudowords (57% and 1746 ms) were read easier and faster than bisyllabic pseudowords (44% and 2364 ms). Moreover, there was a significant Length x Language interaction both on accuracy, $F(2, 51)= 14.45$; $p < .0001$, partial $\eta^2=0.36$, and RTs, $F(2, 51)= 19.26$; $p < .0001$, partial $\eta^2=0.43$ suggesting that there were significant differences in the size of the length effect between groups of readers of different languages. Regarding accuracy, the interaction was due to a markedly more important Length effect for Spanish-speaking children than for Portuguese-speaking and French--speaking children, who did not differ from each other. The triple interaction between Language, Test Point and Length, $F(4, 102)= 3.95$; $p < .005$, partial $\eta^2=0.12$, indicates that the Length x Language interaction was only significant at TP1 and TP2. Regarding RTs, the Length x Language interaction was due to a markedly smaller Length effect in Spanish than in Portuguese and French-speaking children, who did not differ from each other. The interaction between Length, Language and Test Point, $F(2, 51)= 5.73$; $p < .01$, partial $\eta^2=0.18$, in RTs indicates that the Length x Language interaction was only observed at TP2. At TP3 indeed, French-speaking children presented lower

RTs, particularly for bisyllabic pseudowords which markedly reduced their Length effect.

Pseudoword spelling. Mean percentages of correct responses for pseudoword spelling at TP2 are given in Table 6. There was a significant main effect of Language, $F(2, 51) = 2.31$; $p < .01$, partial $\eta^2=0.16$, due to the lower spelling performance obtained by the French-speaking children (69%) compared to Portuguese- and to Spanish-speaking children (89% and 81%, respectively) who did not differ significantly ($p > 1$). The Length effect was also significant, $F(1, 51)= 15.39$; $p < .0001$, partial $\eta^2=0.4$ indicating that monosyllabic pseudowords (87%) were easier to spell than bisyllabic pseudowords (71%). A significant Length x Language interaction was obtained, $F(2, 51)= 2.53$; $p < .01$, partial $\eta^2=0.15$ showing that the Length effect was much larger for Spanish-speaking (38%) than for Portuguese--speaking and French-speaking children (9%).

Table VI: Mean percentages of correct responses for pseudoword spelling in Spanish, Portuguese and French at TP2 (February-March). Standard deviations in parentheses.

	Spanish	Portuguese	French
CV pseudowords	100 (0)	95.46 (9.87)	73.75 (26.25)
CV-CV pseudowords	63.88 (32.51)	86.36 (21.45)	65.00 (33.83)

Discussion

The aim of the present paper was to compare the early development of reading and spelling abilities in three Romance languages, namely Spanish, Portuguese and French. Most of the research on reading development comes out from English-speaking countries (Share, 2008). However, there is accumulating evidence that learning to read in English is harder than learning to read other European orthographies (Seymour et al., 2003). This observation has lead to the emergence of cross-linguistic studies. Most of these studies show a large variability in reading and spelling acquisition through languages and converge to the conclusion that the more inconsistent the mapping between spelling and sound (considering both directions), the slower will be reading and spelling acquisition. A longitudinal approach was adopted here: children were first examined from the very beginning of learning to read and spell and then throughout the first primary school year.

In the present study, an attempt was made to examine the involvement of different explanatory factors of linguistic nature in three languages of common origins, namely Spanish, Portuguese and French. Two factors have been of particular interest, i.e. the number of vowels and the degree of bi--directional consistency between orthography and phonology. In order to investigate serial processes underlying the phonological procedure, the effect of complexity in word reading and spelling and the effect of length in pseudoword reading and spelling were investigated.

Letter knowledge

We observed that Spanish-speaking children were faster at letter identification than French and Portuguese-speaking children at the beginning of the school year. The precocity of Spanish-speaking and French-speaking children in letter identification suggests that these children are well prepared in kindergarten. Given the high consistency of the Spanish orthography, teachers are sensitive to the importance of the development of phonological abilities before starting to read and spell. Consequently, these abilities are largely trained in kindergarten and also at home. French-speaking children also knew half of the letters at the beginning of the school year. This may be explained by the fact that children attending the last year of the kindergarten in Belgium generally are exposed to meta-phonological games (syllable counting, rime detection) and learn to read and write some very frequent words as their first name, 'maman', 'papa', the days of the week. In contrast, letter knowledge is not explicitly trained in most Portuguese kindergartens. Thus, typically, children start primary school without any previous systematic knowledge of letters (maybe just their name initials, or so). They learn fast, however, since at TP2 they are at the same level as their French and Spanish peers, that is already 80%, and they even obtain better results in letter writing.

Familiar word reading and spelling

The Spanish-speaking children presented a higher overall word reading performance compared to the Portuguese-speaking and French-speaking children. They were also faster than the other two groups of children, while Portuguese-speaking children were particularly slow. Spanish-speaking children started to read simple words early in the school year, while French--speaking and Portuguese-speaking children's performance was at floor level at this testing point. This is striking given the fact that Spanish-speaking and French-speaking children had similar letter knowledge at the beginning of the first grade (for similar data, see Alegria et al., 2003). This fast acquisition by Spanish-speaking children is likely a consequence of the high feedback consistency of the writing system being taught.

Moreover, children from the three languages read simple words better than complex words. The complexity effect was not significant for Portuguese and French-speaking children at the beginning of the school year, as they could not read neither simple nor complex words. The large advantage for simple words appeared at TP2, and remained until TP3. In contrast, the complexity effect was present across Spanish-speaking children throughout all the school year. Indeed, Spanish-speaking children read complex words with 13% accuracy as early as in TP1. Note, however, that the complexities in Spanish were part of very familiar words. They were digraphs and h, which are taught in the school. This could reduce their complex value. This result suggests that Spanish-speaking children make far less decoding errors than Portuguese--speaking or French-speaking children.

Familiar word spelling results confirmed that Spanish-speaking children surpassed Portuguese-speaking and French-speaking children, confirming previous results (Goswami et al., 1998; Defior et al., 2002; Seymour et al., 2003). It is interesting to note that French-speaking children presented more difficulties to spell words compared to Portuguese-speaking children and Spanish-speaking children, even when these words only contained "one sound-one letter correspondences". It is likely that French-speaking children are delayed in memorizing the spelling of words by the high degree of inconsistency of the French orthography. The effect of complexity was present in all three languages but was lower for Spanish-speaking children. Again, this could be explained by the fact that Spanish orthography does not offer many complexities, and that the words containing complex graphemes have been easily memorized at the middle of the first school year.

Pseudowords reading and spelling: the acquisition of the alphabetic principle

Spanish-speaking children displayed a higher level of pseudoword reading performance than Portuguese-speaking and French-speaking, which did not differ significantly from each other. Spanish-speaking children were also faster than Portuguese and French-speaking children, who presented very high reaction times. The Spanish-speaking children reached ceiling results earlier in the school year (i.e. at TP2) compared to the Portuguese-speaking and French-speaking children. It is important to note that all three groups of children reached ceiling at the end of the first primary school year. Therefore, the foundation skills seem to be well mastered at the end of the first primary school year by children learning to read and spell in Romance languages.

The length effect allowed us to investigate to what extent phonological decoding processes operate in a serial manner. The assumption is that the greater the length effect, the more children rely on serial decoding strategies (Weekes, 1997; Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001). The length effect was present in each language group. The effect of length on accuracy was strong in Spanish-speaking children, but the effect on reaction times was lower in this language than for Portuguese and French-speaking children. As the reaction time was particularly short in Spanish children at for CV pseudowords, only a small increase in CV-CV pseudowords could be expected.

Regarding pseudowords spelling, the French-speaking children compared to the Spanish-speaking and the Portuguese-speaking children obtained a lower performance. These results parallel those obtained for word spelling, and indicate that French-speaking children are delayed in the mastery of simple phoneme-to-grapheme correspondences. It should be highlighted that French-speaking children are delayed in spelling, while they performed equivalently to Portuguese-speaking children in reading. Spanish-speaking children again displayed a large length effect, Portuguese-speaking children displayed an intermediate one, and French-speaking children displayed a non--significant length effect. Both the high percentage of correct responses for CV pseudowords and the lower performance for CV-CV pseudowords in Spanish children could be explained by the strong emphasis in CV structure since the beginning of literacy instruction.

Conclusions

This study confirms that there are variations in the speed of reading and spelling acquisition in Spanish, French and Portuguese. These variations could be due to different linguistic factors. One of these factors, largely documented in the literature, is the degree of orthographic transparency. But when we are facing with languages that are relatively predictable at the level of grapheme--phoneme correspondences, another factor emerges, namely the number of vowels included in languages. This linguistic factor should be considered regarding the speed of reading acquisition.

The vocalic reduction only present in Portuguese seems to be another linguistic factor to be taken into account when considering reading and spelling acquisition. As mentioned before, in this language, vowels in unstressed syllables may be drastically reduced, such that in fluent speech only stressed vowels are perceptually salient amidst an apparent sequence of consonants only. Therefore, this factor would particularly affect the Portuguese results. In fact, Sucena, Genard, Serrano, Castro, Alegria, Leybaert, Mousty & Defior (2003) showed that before learning to read, French children largely exceeded Portuguese children in a task of explicit syllabic awareness, but both groups of children displayed similar difficulties in rime and phonemic awareness tasks. It is possible that the phonological characteristics of spoken Portuguese have an impact on the recovery speed of familiar phonological representations. This suggests that the development of the phonological lexicon, and from there the development of phonological awareness, may require more time to be firmly established, which in turn would affect the developmental course of reading. This interpretation is also supported by the reading results of familiar simple words, which were particularly slow in the group of Portuguese children. As soon as the reading materials were more complex or unfamiliar, differences between the Portuguese-speaking and French-speaking children disappeared.

The dual foundation model developed by Seymour (1997, 1999), predicted that the lexical/sight-reading (also called logographic in this model) and sublexical/alphabetic foundations are formed in a beginning phase of reading, responding to formal instruction. While the lexical/sight-reading skills were assessed by the identification of very familiar words, reading and spelling of simple pseudowords assessed the sublexical/alphabetic abilities. As all children examined in the present study were instructed in a mixed method of reading in which letters and sounds are taught at the same time in a context that makes sense to the child, the dual foundation model expects a parallel development of the two foundations. We can mention here the fact that progress along the first primary school year was observed both for word and pseudoword reading. Moreover, at the end of the school year, most of the children reached high levels of performance irrespective of the material to be read.

The dual foundation model also hypothesised that both the lexical/sight--reading and the sublexical/alphabetic foundations are dependent on the prior establishment of letter-sound knowledge. In that sense, letter-sound knowledge is a good predictor of further abilities to read familiar words and simple pseudowords in the middle of the school year ($r = .74$ and $r = .57$, respectively, across the three groups of children). These results indicate that the lexical and sublexical processes are both dependent on letter-sound knowledge.

To conclude, the abilities involved in foundation level literacy are mastered at the end of the first primary school year by children learning to read in the three Romance languages studied. These children are well prepared to reinforce these abilities in the second year of primary school, as well as to move towards the establishment of a more abstract representation of the spelling system.

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References

Alegria, J., Marin, J., Carrillo, S., & Mousty, P. (2003) Les premiers pas dans l'acquisition de l'orthographe en function du caractère profound ou superficial du système alphabétique: comparaison entre le français et l'espagnol. In M.N. Romdhane, J.-E. Gombert & M. Belajouza (Eds), *L'apprentissage de la lecture: Perspectives comparatives* (pp 51-67). Rennes: Presses Universitaires de Rennes.

Borgwaldt, S. R., Hellwig, F. M., & De Groot, A. M. B. (2005) Onset entropy matters – letter-to-phoneme mappings in seven languages, *Reading and Writing 18*, 211-229.

Catach, N. (1980) *L´orthographe française*. Paris: Nathan.

Coltheart, M., Rastle, K., Perry, C., Langdon, R., & Ziegler, J. (2001) DRC: a dual route cascade model of visual word recognition and reading aloud, *Psychological Review,* **108,** 204-256.

Content, A., Mousty, P., & Radeau, M. (1990) Brulex: Une base de données lexicales informatisée pour le français écrit et parlé, *L'Année Psychologique*, **90,** 551-566.

Cuetos, F., Rodríguez, B., & Ruano, E. (1996) *PROLEC: Batería de evaluación de los procesos lectores de los niños de Educación Primaria*. Madrid: TEA.

Defior, S., Martos, F., & Cary, L. (2002) Differences in reading acquisition development in two shallow orthographies: Portuguese and Spanish, *Applied Psycholinguistic,* **23,** 135-148.

Defior, S., & Serrano, F. (2005) La habilidad de escritura: palabras y composición escrita. In F. Justicia, E. Fernández de Haro, & M.C. Pichardo (Coords.), *Enciclopedia de Psicología de la Educación.* Archidona: Aljibe.

De Jong, P.F., & van der Leij, A. (2003) Developmental changes in the manifestation of a phonological deficit in dyslexic children learning to read a regular orthography, *Journal of Educational Psychology,* **95,** 22-40.

Delattre, P. (1965) *Comparing the phonetic features of English, French, German and Spanish.* Heidelberg: Jurnius Gross Verlag.

Frith, U., Wimmer, H., & Landerl, K. (1998) Differences in phonological recoding in German- and English- speaking children, *Scientific Studies of Reading,* **2(1),** 31-54.

Gomes, I. (2001) *Ler e escrever em Português Europeu (Vols. 1-2)*. Unpublished doctoral dissertation, Universidade do Porto – Faculdade de Psicologia e Ciências da Educação, Porto.

Gomes, I., & Castro, S. L. (2003). Porlex, a lexical database in European Portuguese, *Psychologica,* **32,** 91-108.

Goswami, U. (2002) Phonology, reading development and dyslexia: A cross-linguistic perspective, *Annals of Dyslexia,* **52,** 1-23.

Goswami, U., Gombert, J.E., & de Barrera, L.F. (1998) Children's orthographic representations and linguistic transparency: Nonsense word reading in English, French and Spanish, *Applied Psycholinguistics,* **19,** 19-52.

Goswami, U., Ziegler, J. C., Dalton, L., & Schneider, W. (2001) Pseudohomophone effects and phonological recoding procedures in reading development in English and German, *Journal of Memory & Language,* **45**(4), 648-664.

Goswami, U., Ziegler, J. C., Dalton, L., & Schneider, W. (2003) Nonword reading across orthographies: How flexible is the choice of reading units?, *Applied Psycholinguistics,* **24**, 235-247.

Justicia, F. (1995) *El desarrollo del vocabulario: Diccionario de frecuencias*. Granada: Universidad de Granada.

Lefavrais, P. (1967) *Manuel du test de l'alouette*. Paris: Editions du Centre de Psychologie Appliquée.

Peereman, R., & Content, A. (1999) LexOP: A lexical database with Orthography--Phonology statistics for French monosyllabic words, *Behavior Research Methods, Instruments, & Computers,* **31,** 376-379.

Seymour, P. H. K. (1997).Foundations of orthographic development. In C. Perfetti, L. Rieben & M. Fayol (Eds.), *Learning to Spell. Research, theory, and practice across languages* (pp. 319-338). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Seymour, P. H. K. (1999) Cognitive arquitecture of early reading. In I. Lundberg, F.E. Tonnessen, & I. Austad (Eds.), *Dyslexia: advances in theory and practice* (pp.59--74). Dordrecht: Kluwer Academic Publishers.

Seymour, P. H. K., Aro, M., & Erskine, J. M. (2003). Foundation literacy acquisition in European orthographies, *British Journal of Psychology,* **94,** 143-174.

Seymour, P. H. K., & Evans, H. M. (1999) Foundation level dyslexias: Assessment and treatment, *Journal of Learning Disabilities*, **32,** 394-405.

Share, D. L. (2008). On the anglocentricities of current reading research and practice: The perils of overreliance on an "outlier" orthography, *Psychological Bulletin,* **134**(4), 584-615.

Sprenger-Charolles, L. (2004). Linguistic processes in reading and spelling: The case of alphabetic writing systems: English, French, German and Spanish. In T. Nunes & P. Bryant (Eds.), *Handbook of children's literacy* (pp. 43-65). Dordrecht: Kluwer Academic Publishers.

Sucena, A., Génard, N., Serrano, F., Castro, S. L., Alegria, J., Leybaert, J., Mousty, P., & Defior, S. (2003) Phonological awareness development: A cross-linguistic comparison between Portuguese, Belgian and Spanish first graders [Abstract]. In *Proceedings of the XIIIth meeting of the European Society for Cognitive Psychology* (p. 502). Granada: ESCOP.

Véronis, J. (1986) Etude quantitative sur le système graphique et phono-graphique du français, *Cahiers de Psychologie Cognitive*, *6,* 501-531.

Weekes, B. S. (1997) Differential effects of number of letters on word and nonword latency, *Quarterly Journal of Experimental Psychology,* **50A,** 439-456.

Wimmer, H. (1993) Characteristics of developmental dyslexia in a regular writing system, *Applied Psycholinguistics,* **14,** 1-33.

Wimmer, H., & Goswami, U. (1994) The influence of orthographic consistency on reading development: Word recognition in English and German children, *Cognition,* **51,** 91-103.

Ziegler, J., & Goswami, U. (2005) Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory, *Psychological Bulletin,* **131(1),** 3–29.

Ziegler, J. C., & Goswami, U. (2006) Becoming literate in different languages: similar problems, different solutions, *Developmental Science,* **9**(5), 429-436.

Ziegler, J. C., Jacobs, A. M., & Stone, G. O. (1996) Statistical analysis of the bidirectional inconsistency of spelling and sound in French, *Behavior Research Methods, Instruments & Computers,* **28**(4), 504-515.

Ziegler, J. C., Perry, C., Jacobs, A. M., & Braun, M. (2001) Identical words are read differently in different languages, *Psychological Science*, **12**(5), 379-384.

Ziegler, J. C., Perry, C., Ma-Wyatt, A., Ladner, D., & Körne, G.S. (2003) Developmental dyslexia in different languages: language specific or universal?, *Journal of Experimental Child Psychology,* **86,** 169-193.

Appendix I: Word stimuli (reading and spelling tasks).

Spanish		Portuguese		French	
Simple	Complex	Simple	Complex	Simple	Complex
mesa	perro	bago	milho	mari	colère
papá	silla	bola	vinha	navire	café
masa	hombre	copo	serra	midi	noël
mano	techo	cuco	tique	pirate	barque
pelo	noche	neve	quilo	malgré	voici
dedo	calle	fada	pinta	parmi	jusque
pato	choque	gato	mundo	ici	comment
luna	gorro	luva	campo	cela	durant
nada	hacia	lado	rente		tissu
sino	hasta	modo	donde		carotte
tanto	aunque	tudo	junto		amour
desde	conque	viva	porque		aurore
antes	porque	logo	porém		selon
mismo	ahí	nada	tanto		sinon
menos	allá	dela	disso		après
lejos	allí	cujo	minha		aussi
	marrón		vento		
	cerro		pomba		
	grillo		vaso		
	chicle		casa		
	flecha		face		
	plancha		cego		
	leche		zero		
	guerra		bege		
	aquí		nenhum		
	mucho		quando		
	quizá		caso		
	alguien		para		
	hola		cima		
	dentro		longe		
	mientras		fora		
	detrás		ora		

Appendix II: Pseudoword stimuli (reading and spelling tasks).

Spanish		Portuguese		French	
CV	CV-CV	CV	CV-CV	CV	CV-CV
du	begu	ba	buva	na	nita
li	deno	ga	duta	ru	muro
fo	zoje	jo	fepo	da	silu
ma	rado	fo	live	no	baru
lu	pifu	le	piba	ja	vina
ba	mose	ne	rafo	ti	jotu
ñi	fazu	go	telo	mu	dari
po	same	za	vope	bi	funi

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