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Reading Acquisition in Monolingual Spanish-Speaking First Grade Children

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Author's contribution

The author CLE solely performed this research.

Research Article

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ABSTRACT

The first aim of the current study was to identify the relative contribution of several theoretically relevant skills in accounting for variance in both word reading and reading comprehension in a normal sample of one-hundred Spanish-speaking children in first grade (average age of 6 years and 10 months; 47 boys; 53 girls). In hierarchical regression analyses, we showed that there is dissociation between the skills that account for variance in word reading, and those that account for variance in reading comprehension. Significant variance in reading comprehension depends on measures of word identification-decoding, rapid naming, and vocabulary. By contrast, word reading ability was best explained by measures of phonological awareness and vocabulary. The second aim was to explore the double-deficit hypothesis. Four groups were formed on the basis of their performance in rapid naming and phonological awareness. The double-deficit subgroup (slow naming speed and low phonological awareness) showed marked difficulties in a range of reading tasks, including reading comprehension. The phonological awareness deficit subgroup showed weaker word decoding skills than did the naming-speed deficit and the no-deficit subgroups. Fewer differences were shown between the naming-speed deficit and the no-deficit subgroups. Implications for early literacy learning and for diagnosis and intervention are discussed.

Keywords: Reading; Spanish; comprehension; RAN; phonological awareness; vocabulary; literacy; first grade.

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1. INTRODUCTION

Learning to read is one of the most important academic challenges that children face during the first school years. Reading involves a variety of processes that lead from visual letter identification to comprehension of content and context of the written word. Word identification has a central place in the acquisition of reading skill and reading comprehension is the ultimate goal of reading. Therefore, understanding the development of word identification and reading comprehension constitutes a major focus of reading research and might have significant theoretical and practical implications for literacy learning and for diagnosis and intervention for children with reading disabilities.

1.1 Determinants of Word Reading

There is general agreement among researchers that phonological processing, that is, the ability to use information about the sound elements of language in processing written and oral language, is a strong predictor of individual differences in word recognition performance at the very early stages of learning to read. In English (a phonetically complex language) phonological skills appear to be the most salient predictor of word reading ability before the child enters primary school. Evidence for this assertion has been accumulating in the past three decades of research (Bradley and Bryant, 1985; Kirby and Parrila, 1999; Goswami and Bryant, 1990; Lyon, 1995; Manis et al., 1983; Perfetti, 1992; Rvachew and Savage, 2006; Shankweiler and Liberman, 1972; Wagner and Torgesen, 1987), for a review see Adams, 1990. The predictive power of PA to the early phase of formal reading instruction has also been detected in transparent languages, including Spanish (Anthony et al., 2006; Casillas and Goikoetxea, 2007; Lipka and Siegel, 2007).

Rapid naming (RN), defined as how quickly children can name lists of highly familiar visual stimuli (i.e. letters, objects), has also been shown to correlate with reading ability (Cirino et al., 2005; Compton et al., 2001; Savage and Frederickson, 2005; Wile and Borowsky, 2004). It has been assumed that rapid naming is more important for the development of word-decoding speed than for the development of word-decoding accuracy (Bowers and Swanson, 1991; Torgesen et al., 1997; Wolf and Bowers, 1999). In addition, especially in highly consistent orthographies such as Spanish, Finnish, or German, relative strong predictive associations have been observed between word reading and naming speed (Escribano, 2010; Holopainen, Ahonen and Lyytinen, 2001; Wimmer and Mayringer, 2002).

PA and RN have been extensively proven to be related to lexical processes (Badian, 2005; Wolf et al., 2002), but their relationships to comprehension have not been thoroughly investigated. The question is whether PA and RN -so important in children's word-level processing- have direct effects in reading comprehension or are there different predictors of comprehension besides PA and RN?

1.2 Determinants of Reading Comprehension

Reading comprehension is a complex skill that draws on many coordinated component processes and resources. Recognizing that no single component can fully explain reading comprehension, most researchers acknowledge the critical role of word identification in reading ability (LaBerge and Samuels, 1974; Perfetti, 2007; Stanovich, 2000).

LaBerge and Samuels (1974) perspective maintains that deficient word recognition skills is the primary reason for reading difficulties; poor comprehension can be expected to result from deficiencies in automatic word recognition, at least in the early stages of reading. This perspective on reading problems reflects the variety of evidence that difficulties in accuracy and speed of word recognition are common place among poor readers of all ages.

Further evidence for the importance of word recognition in reading comprehension comes from observations of children identified with reading disabilities. There is considerable evidence that children with reading comprehension problems often have difficulty with aspects of word identification (Adams, 1990; Hoover and Gough, 1990; Stanovich, 2000; Vellutino and Scanlon, 1991).

Being able to identify words in their printed form is necessary for reading but, of course, it is not sufficient. The relationship between word recognition and reading comprehension has been well documented in research; however, the nature of this relationship remains unclear.

Currently, researchers usually distinguish between different aspects of an individual's word knowledge. According to the Lexical Quality Hypothesis (LQH) (Perfetti, 2007) the quality of word representations has consequences for reading skill, including comprehension. High lexical quality includes the word's form (orthography and phonology) and flexible representations of meaning, that is, semantic representations forming associative networks, allowing for rapid and reliable meaning retrieval. This hypothesis entails both semantic and phonological components, and also includes fluency as a dimension of word knowledge.

On a similar vein, considering that the capacity to read with comprehension may largely depend on a dimension concerning word meaning, Tannenbaum et al. (2006) distinguish between size of the mental lexicon (breadth) and richness of knowledge an individual possesses about the words that are known (depth). They also include fluency as a dimension of word knowledge.

In sum, the literature on reading processes in English proposes several critical predictors of reading comprehension performance at the lexical level: word identification (orthography and phonology), vocabulary knowledge or semantic skills (breadth and depth) and fluency or automaticity of accessing word meanings.

In fact, positive correlations between word-processing measures of various kinds and reading comprehension assessments are well established in both children (Perfetti, 1985) and adults (Haenggi and Perfetti, 1994).

Besides, the range of the correlations between word identification and reading comprehension varies depending on several factors, such as test format and age of the participants (Tannenbaum et al., 2006). The present study examined the Woodcock-Muñoz Language Survey-Revised: Passage Comprehension Subtest, Spanish version (2005). Since the participants are just finishing first grade, reading comprehension is still at a relatively early stage of development. At these early phases of learning to read, reading comprehension is expected to be strongly related to decoding (Catts et al., 2005; Shankweiler et al., 1999).

The relation between decoding and reading comprehension might change as a beginning reader gains experience. As reading skill advances, comprehension is expected to be less dependent on decoding and more strongly related to other cognitive skills (Hoover and

Tunmer, 1993; Nation, 2005; Protopapas et al., 2007; Catts et al., 2005; Storch and Whitehurst, 2002).

Most studies on monolingual Spanish-speaking children have focused on PA and accurate word recognition (Casillas and Goicoetxea, 2007; Defior, 1996; Jiménez and Ortiz, 2000), while few studies have examined the contribution of lexical and sub-lexical processes to the prediction of reading comprehension. The first aim of this study was to determine which factors are related to reading comprehension and word identification in first grade Spanish-speaking children. We focused on children just after they typically begin to read in Spanish. According to previous research in the Spanish language, we expect to find PA to be strongly related to word identification (Casillas and Goicoetxea, 2007) and word identification, vocabulary and RN to comprehending connected text (López-Escribano and Katzir, 2008; López-Escribano and Beltrán, 2009).

1.3 Identifying Discrepant Readers. The Double Deficit Hypothesis

Wolf and Bowers (1999) have proposed an alternative conceptualization of reading disabilities, the Double-Deficit Hypothesis (DDH) which integrates research on phonology and naming-speed. This alternative model suggests that naming-speed is a second independent source of reading failure. These authors propose that phonology and naming-speed can contribute, both uniquely and in combination, to reading disabilities.

According to the DDH, readers can be classified in four major subtypes: no-deficit (ND): intact phonological awareness skills, intact naming speed; single phonological deficit; (PD): poor phonological awareness, intact naming speed; single naming deficit; (ND): naming-speed deficits; intact phonological awareness skills; and double deficit (DD): combined phonological and naming-speed deficit. Double-deficit children have more severe reading difficulties than do children with either deficit alone (Kirby et al., 2003; Wolf et al., 2000).

Studies testing the DDH reported that phonology contributes greater variance to word attack and decoding skills (Bowers et al., 1999; Bowers, 2001; Manis et al., 2000), whereas naming-speed is directly related to variation in rapid recognition of visually presented linguistic stimuli, which, in turn, impedes fluency.

Previous research investigating the DDH subtype classification of readers in Spanish developmental dyslexia found that the DD subtype showed more difficulties with reading than the single-deficit subtypes (Escribano, 2007; Jiménez et al., 2008). In addition, Jiménez et al. (2008) reported that the presence of a single-deficit in naming-speed affected measures of fluency. Escibano's (2007) study results suggested a pattern in which naming-speed difficulties in the DD subtype primarily affected reading speed and orthographic recognition. These studies on the DDH in Spanish compared samples with a great variability of ability, age and origin: children between 7 and 12 years old, recruited from different sources. The present study examines the DDH with a more homogeneous sample than the studies cited before. Participants in the present study were first graders, 6 to 8 years old, attending public schools, with a similar socioeconomic status.

Consequently, a second aim of the present study was to identify discrepant readers according to the DDH in a sample of first graders. We compared the no-deficit, single-deficit, and double-deficit subgroups of readers identified by the DDH, in order to (a) retest key predictions of the DDH in Spanish, (b) report how numerous are these discrepant readers in a group of 100 Spanish first graders, (c) describe their characteristics with regard to abilities

relevant to reading, and to (d) compare our results on the DDH in Spanish with the results of previous studies in English

2. METHODS

2.1 Participants

Data for this study was collected from 100 first grade students from two public elementary schools located in Madrid (Spain): one in a suburb and the other in a rural area. Families in these communities were predominantly lower-middle class to middle-class. All participants were native Spanish children. The children were representative of the full range of reading abilities, with normal hearing and no history of significant emotional or neurological disorders. Furthermore, no child had been diagnosed, in the school, with autism or mental retardation. Table 1 shows the numbers of girls and boys and their mean age. The sample contained 53 girls and 47 boys, ranging in age from 6 years and 3 months to 8 years and 3 months, with a mean age of 6 years and 10 months (Table 1). Only students with written parental permission were allowed to participate.

Table 1. Demographic Characteristics of Studies Group (N = 100)

Age (months)		Age Range (months)		Gender	
M	SD	Min.	Max.	Female	Male
82.46	4.08	75	99	53	47

2.2 General Procedures

All participants were tested individually at the end of first grade in a quiet room in the children's respective schools, by Spaniards trained graduate students, in one session that lasted about 45 minutes each. Each session was recorded for further analysis.

2.3 Instruments

Rapid Automatized Naming (RAN) – Letters. This measure was selected from the RAN/RAS test (Wolf and Denckla, 2005). The task consists of 5 letters each arrayed on a page; each repeated in random order 10 times. The page has 50 letters. Participants were initially asked to provide the name of each letter in order to assess familiarity with the presented stimuli. Following this, participants were presented with a page containing the matrix of letters and asked to name each item from left to right as quickly as possible. Total time and accuracy were recorded. Test-retest reliability reported from norms for RAN-Letters (RAN-L) .90. Total time in seconds is reported.

2.4 Phonological Awareness

The 'Evaluación de la Conciencia Fonológica' (Phonological Awareness Assessment) (Matute et al., 2006) was selected to assess phonological awareness. Two tasks were selected from the test: sound blending and sound deletion. The sound blending task required participants to listen carefully to a word in small parts, and then put these parts together to make a whole word. Three sample items were used to demonstrate the blending procedure, and feedback was given only for those items. There were 16 test items which involved

blending of syllables (e.g., me-ta [goal], ma-dre [mother]). The sound deletion task required participants to say a word pronounced by the experimenter and then say it again after deleting a phoneme specified by the experimenter. Three sample items were used to demonstrate the deletion procedure, and feedback was given only for those items. There were 20 test items. The items that were deleted included single initial phoneme (e.g., /c/ from col [cabbage]), single final phonemes (e.g., /n/ from fin [end]), and middle single phonemes (e.g., /r/ from verde [green]) Test-retest reliability reported from norms for blending .89 and for deletion .76. Direct scores are reported.

Several standardized sub-tests (Woodcock-Muñoz Language Survey-Revised, 2005) were administered to assess word reading, reading comprehension, and vocabulary:

2.5 Word Reading Task

The WMLSR-I (Woodcock-Muñoz Language Survey-Revised: Identificación de Letras y Palabras [Letter-Word Identification] Subtest) was selected to assess word reading. This test requires the participant to read letters and words fluently. WMLSR-I reports a median reliability of .97 in the age 5 to 19 ranges.

2.6 Reading Comprehension Task

The WMLSR-C (Woodcock-Muñoz Language Survey-Revised: Comprensión de Textos [Passage comprehension] Subtest) was selected to assess reading comprehension. Passage comprehension measures how well a subject understands written discourse as it is being read. This test requires the participant to read short passages (usually two or three lines) and identify a keyword missing from the passages. WMLSR-C reports a median reliability of .82 in the age 5 to 19 ranges.

2.7 Vocabulary

The WMLSR-V (Woodcock-Muñoz Language Survey-Revised: *Vocabulario sobre dibujos* [Picture Vocabulary] Subtest) was selected to assess vocabulary. Picture vocabulary measures aspects of oral language, including language development and lexical knowledge. The task requires the participant to identify pictured objects and is an expressive semantic task at the single-word level.

3. RESULTS

3.1 Descriptive Statistics

Table 2 presents means and standard deviations of the variables. A closer examination of the task scores indicate that participants varied considerably in reading ability. However, the mean standard scores for the WMLSR sub-tests are above the population mean of the test, especially the mean for the WMLSR-I subtest is quite high for this group of students ($M = 162$).

Table 2. Performance on reading and cognitive measures by the sample

Test	M	SD	Range
RAN-Letters	37.42	9.42	22-74
Sound Blending (16)	14.10	3.12	5-16
Sound Deletion (20)	17.00	4.35	3-20
Letter-Word Identification (WMLSR-I)	162.12	8.80	123-182
Passage Comprehension (WMLSR-C)	111.97	8.33	88-133
Vocabulary (WMLSR-V)	112.25	9.74	74-131

*Note. RAN-Letters (in seconds)
Sound Blending and Sound Deletion (maximum raw score in parentheses)*

All the Spanish WMLS-R tests are adaptations of the parallel tests in English. The norms of the WMLS-R test were obtained using a technology known as the Rasch model. This technology was used to facilitate equating Spanish data to the English norms [for further explanation see Alvarado et al., (2005)]. This finding is not surprising in a language with a highly transparent orthography. According to cross-linguistic studies, reading acquisition takes place differently depending on the orthographic system (Aro, 2006; Seymour et al., 2003). For example, it was found that phonological decoding skills are mastered earlier in a more consistent orthography like German (Frith et al., 1998). It was also found that children learning in more opaque orthographies, like English, present higher error rates and less fluency in reading than children learning in transparent orthographies after one year of teaching (Seymour et al., 2003 for a review).

3.2 Correlations among the Variables

Pearson correlations among the reading measures are shown in Table 3. Inspection of the correlation matrix reveals moderate correlations among all variables. All the correlations are significant with $p < .05$.

Table 3. Correlations among measures

Variable	1	2	3	4	5	6
1. RAN-Letters	--					
2. Sound Blending	-.21*	--				
3. Sound Deletion	-.22*	.60**	--			
4. Letter-Word Identification (WMLSR-I)	-.21*	.37**	.42**	--		
5. Passage Comprehension (WMLSR-C)	-.39**	.30**	.28**	.45**	--	
6. Vocabulary (WMLSR-V)	-.20*	.27**	.17	.30**	.41**	--

*Key: * $p < .05$ ** $p < .01$.*

These results show that skill in word identification is closely associated with the phonologically decoding process that is tapped by the phonological awareness measures. However, reading comprehension was more closely associated with differences in word reading accuracy, vocabulary and RAN-Letters skills.

3.3 Regression Analyses

Table 4 presents results from hierarchical regression analyses with Sound Blending, Sound Deletion, RAN-Letters and Vocabulary as dependent variables and Word Identification as

the independent variable. All variables were entered simultaneously. Despite being significantly correlated with word reading, neither Sound Blending nor RAN-Letters accounted for the significant unique variance in the regression analyses reported. These results suggest that Sound Deletion and Vocabulary are significant predictors of Word Identification.

Table 4. Prediction of word identification: multiple regression results

Step	Variable	R	R ²	F
			Change	Change
1	Sound Deletion	.42	.18	21.30**
2	Vocabulary	.50	.05	14.45**
Excluded	Sound Blending RAN-Letters			

Key: * $p < .05$ ** $p < .01$

Table 5 presents results from hierarchical regression analyses with Word Identification, Sound Blending, Sound Deletion, RAN-Letters and Vocabulary as dependent variables and Reading Comprehension as the independent variable. All variables were entered simultaneously. Despite being significantly correlated with reading comprehension, PA measures did not account for the significant unique variance in the regression analyses reported. These results suggest that Word Identification, Vocabulary, and RAN-Letters are significant predictors of reading comprehension.

Table 5. Prediction of passage comprehension: multiple regression results

Step	Variable	R	R ²	F
			Change	change
1	Letter-Word Identification (WMLSR-I)	.45	.20	24.92**
2	RAN-Letters	.54	.09	20.26**
3	Vocabulary (WMLSR-V)	.60	.06	17.80**
Excluded	Sound Blending Sound Deletion			

Key: * $p < .05$ ** $p < .01$

3.4 Comparison of Single- and Double-Deficit Subgroups

Consistent with analyses reported by Bowers et al. (1999), Manis et al. (2000) and Wolf and Bowers (1999), children were classified into four subgroups based on their performance on letter naming and Sound Deletion. A 25th-percentile cutoff score was used to form a naming-speed deficit (NSD) subgroup ($n = 20$), a phonemic awareness deficit (PD) subgroup ($n = 11$), a double-deficit (DD) subgroup ($n = 4$) and a no-deficit (ND) subgroup ($n = 65$). It is worthwhile to point out that the children in these subgroups varied considerably in reading ability and that there were only a few very poor readers in this sample as the results of the Woodcock Word Identification test showed (See means scores presented in Table 2 and Table 6). These subgroups are arbitrary subdivisions of participants varying along a continuum of Sound Deletion and RAN-Letters and are useful for illustrating what happens when children score low on one or more of these two theoretically important dimensions of reading.

Table 6. Means and standard deviations for naming-speed deficit, phonological deficit, double-deficit, and no-deficit subgroups

Variable	Group								Significance test
	ND ^a		NSD ^b		PD ^c		DD ^d		
	M	SD	M	SD	M	SD	M	SD	
RAN-Letters	33.5	5.2	48.7	7.1	33.5	4.7	57.7	11.9	F(3,99) = 51.99, p <.001 (ND = PD) < NSD < DD
Sound Blending (16)	14.8	2.1	15.2	1.9	10.4	3.7	6.0	1.3	F(3,99) = 30.42, p<.001 (ND = NSD) <PD <DD
Sound Deletion (20)	18.6	2.5	18.2	2.3	9.1	2.2	6.7	2.7	F(3, 99) = 74.21, p <.001 (ND = NSD) < PD =DD
Letter-Word Identification (WMLSR-I)	163.6	7.2	163.7	8.5	153.9	11.6	151.7	8.5	F(3, 99) = 7.00, p <.001 (ND = NSD) < PD =DD
Passage Comprehension (WMLSR-C)	113.9	7.0	109.7	7.7	109.9	10.4	97,2	8.42	F(3, 99) = 7.21, p < .001 (ND = NSD = PD) < DD
Vocabulary (WMLSR-V)	113.8	8.1	110.1	11.4	108.3	13.5	108.7	11.4	no significant differences

Note. 25th percentile cutoff for deficit groups. ND = no deficit; NSD = naming-speed deficit; PD = phonological deficit; DD = double deficit
^an = 65. ^bn = 20. ^cn = 11. ^dn = 4.

Analyses of variance (ANOVAs) were used to compare the four subgroups on each of the measures. The means, standard deviations, F values, and significant levels for the univariate ANOVA for each variable are shown in Table 6. The F values for overall subgroup differences were highly significant for every variable except for vocabulary. All of the performed ANOVAs showed significant differences among groups except for the ANOVA for Vocabulary.

The pattern of subgroup differences across tasks was assessed via the Tukey post hoc test with alpha set at .05 for each variable. The DDH received some confirmation from the comparison of the DD and PD subgroups to the other groups. The single phonological deficit PD subgroup scored significantly lower than the ND and NSD subgroups on the word reading task and the DD subgroup was generally the lowest performing subgroup across tasks. The DD subgroup differed significantly from the other subgroups in all the measures but vocabulary, where not statistically significant differences were found among groups. This finding supports the hypothesis that children with both naming-speed and phonological awareness difficulties are likely to have lower reading skills. The single naming deficit NSD subgroup scored low on RAN-Letters, but was closely comparable to the ND subgroup in all the measures.

4. CONCLUSION

The first aim of the present study was to determine which factors are related to word identification and reading comprehension for first grade Spanish-speaking children. All the children in the sample were studied with measures of PA, RN, Vocabulary, Word Identification, and Reading Comprehension. As previously stated, these data were used to explore concurrent relationships and to estimate, by means of regression analyses, the independence and additivity of these measures as predictors of word reading and reading comprehension.

The correlation matrix revealed moderate correlations among all the measures, indicating that although the dimensions of PA, RAN, Word Identification, Vocabulary and Reading Comprehension are distinguishable from one another, they are related skills. These relationships make sense if we assume that reading comprehension is stimulated by experience with words and by reading itself, which strengthens the orthographic and phonological connections to the semantic networks.

Regression analyses indicated that Sound Deletion and Vocabulary account for significant amounts of unique variance in Word Identification.

As previous research in Spanish language suggests, phonological awareness causally influences the development of word decoding especially during the early phase of formal reading instruction (Anthony et al., 2011; Casillas and Goikoetxea, 2007; Herrera and Defior, 2005; Jiménez and Ortiz, 2001). Consequently, phonological processes should be developed and stimulated during the kindergarten years.

Nevertheless, the results of the present study showed that differences in reading comprehension during the first grade in Spanish are largely determined by variations in the skills that enable a reader to identify automatically the individual words of the text, including word identification, meaning (Vocabulary), and measures related with fluency or rate (RAN-Letters). As theories of reading development in English (e.g., Ehri, 1992; Seymour, 2008),

previous Spanish research on reading comprehension suggests that comprehension rely more on orthographic ability or whole-word reading recognition than on phonological recoding (Elosua et al. 2012; López-Escribano et al. in review) Consequently, considering that the capacity to read with comprehension may largely depend on a dimension concerning whole-word recognition including vocabulary and fluency as dimensions of word knowledge, training during the early phases of formal reading, as we discuss later, might included these componential skills of reading.

Taken together, these results support the view of a developmental progression from phonological processing skills to word identification and further to passage comprehension, as previous existing research in English suggested (Bradley and Bryant, 1985; Manis et al., 1993; Parrila et al., 2004; Share, 1995; Stanovich, 1992).

Nevertheless, as pointed out before, the importance of word identification in comprehension varies depending on several factors, such as test format and age (Tannenbaum et al., 2006).

The present study examined the Woodcock reading comprehension sub-test, reaching the conclusion that this specific test is influenced in our sample by decoding skills. Other studies in English have also found that the WJPC test is highly correlated with decoding skills (Keenan et al. 2008) suggesting that the reason might be the short passages of the test. Moreover, reading comprehension may be largely based on decoding skills in first grade. Probably our participants' initial stage of decoding ability, performance in this specific comprehension test was more dependent on decoding skills. Other studies have concluded that there is more influence from decoding skills for younger and less skilled readers (Keenan, et al., 2008; Catts et al., 2005; Kirby, 2006).

Therefore, the results of this study may not be generalized to later grades or to children with reading difficulties because, in both cases, word reading accuracy might be a less important variable to reading comprehension in the Spanish language. This is due to the fact that children learning to read in Spanish have reached ceiling in decoding at the end of first grade, as the results of the present study show. After this point word decoding does not discriminate between good and poor readers in the Spanish orthography.

This study conducted analyses within the context of a consistent language (Spanish) and adds to previous findings on word reading and reading comprehension in a different orthography, studying the performance in different reading tasks of a group of first grade students with the whole range of variation in reading skills. In addition, the present study applied several sub-tests of the Woodcock-Muñoz Language Survey-Revised (2005), which had not been tested before within this population. Our findings suggested that these test norms are not well suited to our population (see means scores of these sub-tests in Table 2).

The second aim of the present study was to explore the double-deficit hypothesis in the described sample. Congruent with the findings of previous studies in Spanish on the DDH (Escribano, 2007; Jiménez et al., 2008), where the DD group showed marked difficulties in a range of reading tasks, we found that the DD was more impaired in accurately naming words than the other sub-groups. In addition, the DD sub-group performed worse in the reading comprehension task than the other sub-groups. The presence of a deficit in PA in the PD subgroup affected the word identification measure.

These findings are broadly consistent with the DDH (Wolf and Bowers, 1999; Wolf et al., 2000). The fact that DD poor readers have difficulties in a range of reading tasks is

particularly alarming; their very low start may hinder them from keeping up with the pace of the increasing demands of regular classroom instruction. Their lower level in several literacy skills indicates that these children are in need of extra support. Based on longitudinal research findings (Deeney et al., 2001), these children could be identified early on by the presence of unexplained problems in naming speed. The present study suggests the importance of incorporating naming speed as a measure of assessment for initial readers to treat and prevent future reading difficulties.

The single naming deficit NSD subgroup scored low on RAN-Letters, but was closely comparable to the ND subgroup in all of the measures. However, some limitations of this study, on this respect, are worth mentioning. Our study did not include measures of reading speed and orthography knowledge. Therefore, we could not examine whether the RN deficit group might have differed from the ND and PD sub-groups in these measures.

Cross-linguistic studies on RAN would be informative regarding the relationship between RAN and reading in different languages. Using similar criteria described in the study by Manis et al., (2000) to create subgroups according to the DDH, we found in our group of 100 first graders, 59% of ND readers, 21% of NSD readers, 15% of PD readers, and 5% of DD readers. In English (Manis et al., 2000) found in a group of 85 second graders, 63% of ND readers, 10% of NSD readers, 16% of PD readers, and 10% of DD readers. This comparison suggests that the NS deficit is more frequent in Spanish than in English, and the DD deficit more frequent in English. As mentioned before, these subgroups are arbitrary subdivisions of participants varying along a continuum of Sound Deletion and letter naming (in Spanish) and Sound Deletion and digit naming (in English). However, such subgroups can be useful for (a) comparing the percentage of participants in each group in different orthographies, and (b) comparing what happens when participants score low on one or more of these two theoretically important dimensions of reading in both orthographies. In this respect, it is worthwhile to mention that the pattern of subgroup performance across tasks is very similar in English and in the present study in Spanish. In both studies, (1) the DD deficit subgroup was the lowest performing group across tasks; (2) the PD subgroup scored significantly lower than the ND subgroup on the phonologically related tasks not used to define the subgroup (Word Identification and Sound Blending); (3) the NSD subgroup was closely comparable to the ND subgroup; and (4) there were not significant differences in the vocabulary measure for the studied subgroups.

Nevertheless, the pattern of subgroup similarities and/or differences across tasks between English and Spanish speaking groups needs to be explored in a cross-linguistic study with homogeneous tasks, samples, and data analysis. In any case, similarities between the present results in reading acquisition and previous data in English suggest a similar reading pattern as a basic feature of reading across different languages using alphabetic scripts.

Finally, we discuss some implications for early literacy learning and for reading diagnosis and intervention: First, the relationships between PA, RAN, Word Identification, Vocabulary and Reading Comprehension abilities have not been studied extensively in Spanish and there remains insufficient understanding of its clinical uses among educators. It is our assessment that PA and RAN tasks can be best used by teachers and psychologist as part of a clinical assessment to identify risk for reading difficulties during Kindergarten and first grade. PA and RAN tasks require only modest training to administer and score and don't take extensive time to administer. Besides, there is evidence from multiple longitudinal studies, and from the results of the present study, as well, that both measures are robust early indicators of potential reading difficulties. And, second, a question that naturally follow

from the present study findings is, if we know possible predictors of word reading and reading comprehension, could reading education be improved to increase reading achievement? The highly consistent grapheme–phoneme correspondences of Spanish orthography, in combination with early reading instruction’s emphasis on the phonics teaching approach which is usually applied in Spanish schools, allow children to acquire the process of phonological word decoding. However, the question of how to improve reading fluency and comprehension is much more difficult. There are numerous programs designed to address phonological decoding skills, but few comprehensive programs that explicit address different levels of language: phonemes, words, sentences and texts with the goal of improving reading comprehension.

As the results of this study suggest, there is a need for multicomponential interventions of reading. In this sense we have developed a program called ProLin (Suro, Leal, Escribano, Santiuste and Zarabozo, in press.) ProLin is a compensatory program thought for children at risk of reading difficulties, although it could be used to support students in regular infant education classrooms. This program incorporates the best pedagogic foundations (multisensory, structured language approach and active and discovery learning) as well as a set of basic principles taken from linguistic, but probably the most important feature of the program is that jointly work with all elements of the language: phonemes, graphemes, words and texts (for a review of the program see Leal, Suro, Escribano, Santiuste and Zarabozo, 2011). Multicomponential programs in the English language are PHAST, RAVE-O, and Language!. Multicomponential intervention programs that target phonology as well as multiple levels of language show the greatest promise in improving reading achievement (Norton and Wolf, 2012),

COMPETING INTERESTS

Author has declared that no competing interests exist.

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