

Efficacy of an evidence-based literacy intervention for Spanish speaking struggling readers from vulnerable socio-economic status

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Abstract

Introduction. Past research supports the efficacy of evidence-based literacy interventions for English-speaking struggling readers, but it remains unknown if similar results can be achieved in Spanish.

Methods. We assessed the impact of a 15-hour long evidence-based literacy intervention for Spanish speaking struggling readers attending grade 1 and 2 in primary schools of vulnerable socio-economic status (SES) in Uruguay. Struggling readers were randomly assigned to a supplementary intervention ($n = 68$) in addition to business-as-usual classroom instruction or control group ($n = 57$) and compared to an additional group of typically developing readers ($n = 69$) on pre-post measures of phonological awareness, spelling, reading fluency and comprehension.

Results. Although all participants showed significant improvements with respect to pre-post-test trajectories, struggling readers in the intervention group only achieved higher growth levels as compared to the control group on rhyme identification and partially for comprehension skills.

Discussion and conclusions. Findings from this study underline the need to consider contrasts between the writing systems of Spanish and English, as well as cognitive profiles of children from vulnerable SES in Latin-America when applying evidence-based practices to design intervention programs for struggling readers from low SES in Spanish speaking countries.

Keywords: early literacy, intervention, phonological awareness, evidence-based practices, low socio-economic status

Resumen

Introducción. Las investigaciones apoyan la eficacia de las intervenciones en alfabetización basadas en la evidencia para estudiantes angloparlantes con riesgo lector, pero no queda claro si resultados similares se pueden conseguir con alumnos hispanoparlantes.

Método. Investigamos el impacto de una intervención en alfabetización basada en la evidencia con una duración de 15 horas, en niños con riesgo lector de 1° y 2° año de escuela de niveles socioeconómicos (NSE) vulnerables en Uruguay, con español como lengua materna. Los estudiantes con riesgo lector fueron asignados aleatoriamente a una intervención ($n = 68$) suplementaria a la instrucción usual de aula o a un grupo de control ($n = 57$) y se compararon con otro grupo de desarrollo lector típico ($n = 69$) en medidas pre-post-test en conciencia fonológica, escritura, fluidez y comprensión

Resultados. Aunque todos los participantes mostraron mejoras significativas en relación a su trayectoria pre-post-test, los niños con riesgo lector que participaron de la intervención experimental solamente mostraron mayores niveles de crecimiento que el grupo control en la habilidad para identificar rimas y parcialmente en comprensión lectora.

Discusión y conclusiones. Los hallazgos de este estudio reflejan la necesidad de tomar en cuenta los contrastes entre los sistemas de escritura del español y el inglés, así como el perfil cognitivo de niños de NSE vulnerables en Latinoamérica a la hora de aplicar prácticas basadas en la evidencia al diseño de programas de intervención para niños con riesgo lector de niveles socioeconómicos vulnerables en países de habla hispana.

Palabras Clave: alfabetización temprana, intervención, conciencia fonológica, prácticas-basadas-en-la-evidencia, nivel socioeconómico bajo

Introduction

Educators and researchers commonly agree that the field of literacy education needs to combine theoretical knowledge and evidence-based interventions. However, available resources predominantly come from research conducted with English-speaking participants. Therefore, it remains unclear if evidence-based interventions derived from this body of work are able to achieve a similar impact in other languages (Escamilla, Loera, Ruiz & Rodríguez, 1998; Mathes, Pollard-Durodola, Cárdenas-Hagan, Linan-Thompson & Vaughn, 2007; Share, 2008).

In transparent orthographies, such as Spanish, the majority of words can be read through one-to-one mappings between graphemes and phonemes. In contrast, in deeper orthographies, grapheme-phoneme conversion rules are not always easily predictable and allow for more than one grapheme-phoneme mapping depending on the word (Kohnen, Colenbrander, Krajenbrink & Nickels, 2015). Several crosslinguistic studies have addressed these differences (Caravolas et al., 2012; Moll et al., 2014) and concluded that it is likely that the impact of literacy interventions with English-speaking populations is different in non-English-speaking populations. Furthermore, they highlight that this might have important practical implications for the design and implementation of literacy interventions in languages other than English (Escamilla et al., 1998; Mathes et al., 2007).

Findings from meta-analysis on the impact of phonological awareness instruction brought forward by Ehri, Nunes, Willows, Yaghoub-Zadeh and Shanahan (2001) may serve as an example to illustrate the above-mentioned issue. The authors found significantly higher impact values in English as compared to more superficial orthographies for several literacy measures: phonological awareness (English: $d = 0.99$; other languages: $d = 0.65$), reading (English: $d = .63$; other languages: $d = .36$) and spelling (English: $d = 0.95$; other languages: $d = 0.51$). However, Ehri et al. (2001) included languages with varying degrees of grapheme-phoneme-correspondence consistency such as Norwegian, Finnish, Swedish, Danish, Spanish, Hebrew, Dutch and German within the group of non-English languages. It is therefore possible that an investigation of the efficacy of a literacy intervention in one of these non-English languages, such as Spanish (Defior, Jiménez-Fernández, Calet & Serrano, 2015), might show even larger crosslinguistic differences than reported by Ehri et al. (2001).

Furnes and Samuelson (2010) showed that phonological awareness only significantly contributed in explaining reading outcomes in grade 1 of primary school in Swedish and Norwegian students, while in English it was still a powerful predictor up to grade 2 of primary school. In contrast, Tafa y Manolitsis (2008) found no significant contribution of phonological awareness skills to discriminate average and at-risk readers in Greek. It is also possible that different orthographies rely on different types of phonological awareness subskills. While rhyming abilities play an important role in predominantly opaque orthographies, smaller phonological units, such as syllables and phonemes seem to be more important in Spanish (Goodwin, Agosto & Calderón, 2015).

Overall, the evidence-base for the efficacy of literacy interventions in Spanish, to date, shows mixed results. Studies conducted in the United States of America with native Spanish-speaking participants reveal a positive impact of literacy interventions adapted from existing English intervention programs, such as “Reading Recovery” (Escamilla et al., 1998). In a similar way, Mathes et al. (2007) completed parallel studies in Spanish and English and concluded that the Spanish version of the intervention “Lectura Proactiva” was just as successful as the English version.

The few reports of studies conducted in Spanish-speaking countries on the efficacy of literacy interventions mostly focus on improving the quality of general classroom instruction by implementing teacher professional development programs. For instance, the program “Un buen comienzo” achieved an overall improvement of literacy instruction but showed no significant differences between treatment and control group. To explain this result, Yoshikawa et al. (2015) provided additional information based on classroom observations that revealed that teachers in the treatment group devoted only 15 minutes more than teachers in the control group to literacy activities. They therefore speculated that this low dose of literacy activities could be the reason why they found no treatment-specific effect.

In a different study, Pallante and Kim (2013) implemented a one-year long literacy intervention entitled Collaborative Language and Literacy Instruction Project (CLLIP) to improve regular classroom instruction in Chile and found a significant impact in preschool students, but not in grade 1 primary school students that participated in the intervention. In addition, preschool students from low socio-economic status (SES) showed a slower growth curve than their peers from high SES. Strasser, Rolla and Romero-Contreras (2016) suggested

that SES could be a decisive factor to reach a better understanding of the differences observed between the efficacy of Spanish and English literacy interventions. It is likely that children categorized as low SES participants in Latin-American studies have more severe linguistic deficits than children included in the same SES category in studies conducted in English-speaking countries.

Building on this work, the present study aimed to examine the efficacy of a literacy intervention for Spanish-speaking children from low SES in Uruguay that supplemented the business-as-usual classroom instruction they were receiving. We were interested in investigating to what extent a literacy intervention that was designed based on evidence-based principles derived from research with English-speaking populations would be able to improve the literacy outcomes of children from low SES living in a Spanish speaking country. The objectives of this study were: (1) to assess the progress made by the participants of our literacy intervention through pre-post-tests in phonological awareness, spelling, reading fluency and reading comprehension and also (2) to investigate to what extent this progress could be attributed specifically to our intervention program and show better outcomes than business-as-usual classroom instruction.

Methods

Participants

Grade 1 and 2 primary school students ($n = 483$) from six private schools of low SES in Montevideo, Uruguay participated in this study. Schools were defined as being of low SES, because (a) they were located in neighbourhoods that are classified as being of low SES according to the National Institute of Statistics of Uruguay (INE, 2012) and (b) the maximum monthly payment expected by parents was of max. US\$ 20 (UCU, 2012). All children were native Spanish speakers with no exposure to other languages with the exception of occasional English input through television or music. They were first assessed through a letter and word reading task. Children with a performance below the 25th percentile were randomly allocated to an experimental group ($n = 68$) that participated in our literacy intervention or to a control group ($n = 57$). Children that reached a performance between the 40th and 60th percentile were assigned to a third group ($n = 69$).

Instruments

Letter and word Identification of the Bateria III Woodcock-Muñoz (Muñoz-Sandoval, Woodcock, McGrew & Mather, 2005a). Internal consistency is reported to be $r = 0.95$ based on a sample of Spanish-speaking people in the United States of America, Spain and different Latin American countries (Schrank, McGrew, Ruef, Alvarado, Muñoz-Sandoval & Woodcock, 2005). Unfortunately, there are no Uruguayan norms available for this task.

Matrices (Raven, 1993). We used this measure to assess non-verbal reasoning skills. Internal consistency of this instrument is $\alpha = .84$ based on a sample of children in Chile (Jara Quezada y Troncoso San Martín, 2014). Unfortunately, no Uruguayan norms are available for this task.

Oral comprehension. For this purpose we used the oral comprehension subtest of the Bateria III Woodcock-Muñoz Test (Muñoz-Sandoval et al., 2005a). Internal consistency is reported to be $r = .93$ (Schrank et al., 2005).

Phonological awareness. We used the subtest *Sound discrimination* of the Bateria III, Woodcock-Muñoz (Muñoz-Sandoval et al., 2005a) to collect this measure. The subtest includes tasks to measure: rhyming, omission, substitution and inversion of phonemes. Its internal consistency is $r = .94$ (Schrank et al., 2005).

Word spelling. For this purpose, we used the subtest *Orthography* of the Bateria III Woodcock-Muñoz Test (Muñoz-Sandoval et al., 2005a). Internal consistency is reported to be $r = .93$ (Schrank et al., 2005).

Reading fluency. For this measure we administered the Test of Reading Efficacy - TECLE (Cuadro, Costa, Trías & Ponce de León, 2009). The task consists of 64 items with a test-retest reliability of $r = .88$ based on local norms derived from a sample of primary school children in Uruguay. This task was only completed by children in grade 2, as it is not considered to be an appropriate tool to assess grade 1 students that are just starting to learn to read.

Reading comprehension. We used the subtest of reading comprehension of the Bateria III Woodcock-Muñoz (Muñoz-Sandoval et al., 2005a), which has an internal consistency of $r = .91$ (Schrank et al., 2005).

Multicomponent Literacy Intervention Program (in Spanish - Programa de Intervención en Alfabetización Multicomponencial - PIAM). The literacy intervention was designed by the first and second author of this report based on a systematic literature review on evidence-based literacy interventions (Balbi, von Hagen, Cuadrado & Ruiz, 2018). Overall the duration of the intervention was 15 hours distributed in 20 sessions of 45 minutes each. For ten weeks we completed two interventions sessions per week with small groups of four children in a quiet room outside of the regular classroom. We recruited ten advanced psychology and educational psychology BSc students to function as tutors and deliver the intervention. All of them had successfully completed three BSc courses on literacy assessment and intervention instructed by the first and second author of this report. In addition, they participated in a training session on evidence-based literacy practices designed specifically for this study by the first and second author of this report. Every tutor also received a written manual with the objectives, general structure, implementation steps, techniques and timeline for each of the sessions of the intervention program.

Design of PIAM. We opted for a multicomponent design focused on the following five principal components: phonological awareness, phonics, fluency, vocabulary and comprehension (National Reading Panel, 2000). These five components were systematically trained through the implementation of evidence-based techniques. In Table 1 we present the structure of the program and describe further details in the following sections.

Table 1. Design of the intervention program PIAM with to sample sessions

Components	Session A	Session B	Time
Comprehension	Listening to the story	Climbing the mountain	8 minutes
	Interacting with the text	Crystal clear and detective questions	
Vocabulary	New words	Definition and use of new words	8 minutes
Phonological awareness	Rhymes	Omission, substitution and inversion of phonemes	8 minutes
Phonics	GPCR: cards with graphemes, syllables and words to use in reading and spelling tasks		8 minutes
Fluency	Guided reading	Reading theatre	8 minutes
	Repeated reading		
Self-regulation	Castle metaphor		5 minutes

Note. GPCR. Grapheme-phoneme conversion rules.

We chose storybooks to be at the centre of our intervention program. Therefore, the first and second author of this report carefully selected ten books with attractive and motivating stories and interesting themes that were appropriate for the age of our participants. The tutors read the storybooks out loud and presented them in their authentic format to participants.

Every week the program started with the presentation of a new storybook to create a climate of pleasure for reading. Next, the technique “Interacting with the text” (Hansen & Pearson, 1983) was implemented to enable communicative interactions by encouraging children to express their opinions, activate previous knowledge related to the text and establish inferences. For phonological awareness and phonics, we used explicit instruction techniques by Sánchez, Rueda and Orrantia (1989). The tutor verbalized each step of the process and modelled it for the children. Immediately after this, one child was invited to try it out for him- or herself, while the tutor provided explicit feedback at each step of the process. The characters of the storybooks appeared in each task to maintain children’s motivation. For instance, a rabbit jumped from one phoneme of the word to the next or a light failed to work correctly and switched off every time a phoneme was omitted.

To train fluency, we used guided and repeated reading techniques (National Reading Panel, 2000). We transcribed the most exciting scenes of each storybook in a simplified, but semantically accurate version in activity booklets each child received. Then we asked children to read each fragment several times. They read it all together simulating a choir, representing different characters and alternating roles, as well as expressing different types of emotions and prosodic features. To stimulate vocabulary skills, we followed suggestions by Beck, McKeown and Kucan (2013). For example, we selected keywords of each story and proposed activities to define words, use them in a sentence, as well as play games to identify synonyms and antonyms.

In relation to comprehension, we mainly used the metaphor of climbing a mountain (Clarke, Truelove, Hulme and Snowling, 2014). The base of the mountain simulated the start of the story and as children climbed up, they were asked to retell the conflict of the story. Finally, while climbing down again they would narrate the ending of the story. We also used the technique “Crystal clear and detective questions” (Jiménez-Fernández, Serrano and Defior, 2014). The tutor asked a question that was pre-determined in the intervention manual and children had to identify if the information they needed to respond was “crystal clear like water” or if they needed to pretend to be “detectives and search for evidence” to respond. Finally, each

session ended with a self-regulation activity that aimed to enable children to reflect on the progress and difficulties they were experiencing during their learning trajectory. We used the technique by Emmer et al. (2007) of representing a castle in which children were encouraged to colour one brick for each of the goals they had reached.

Procedure

The first author of this report was contacted by two foundations interested in improving literacy skills of primary school students in low SES neighbourhoods. In coherence with the requirement of the Ethics Committee of the Universidad Católica del Uruguay we asked parents of the participants of this study to complete written consent forms. Figure 1 provides further details on the procedure followed by this study.

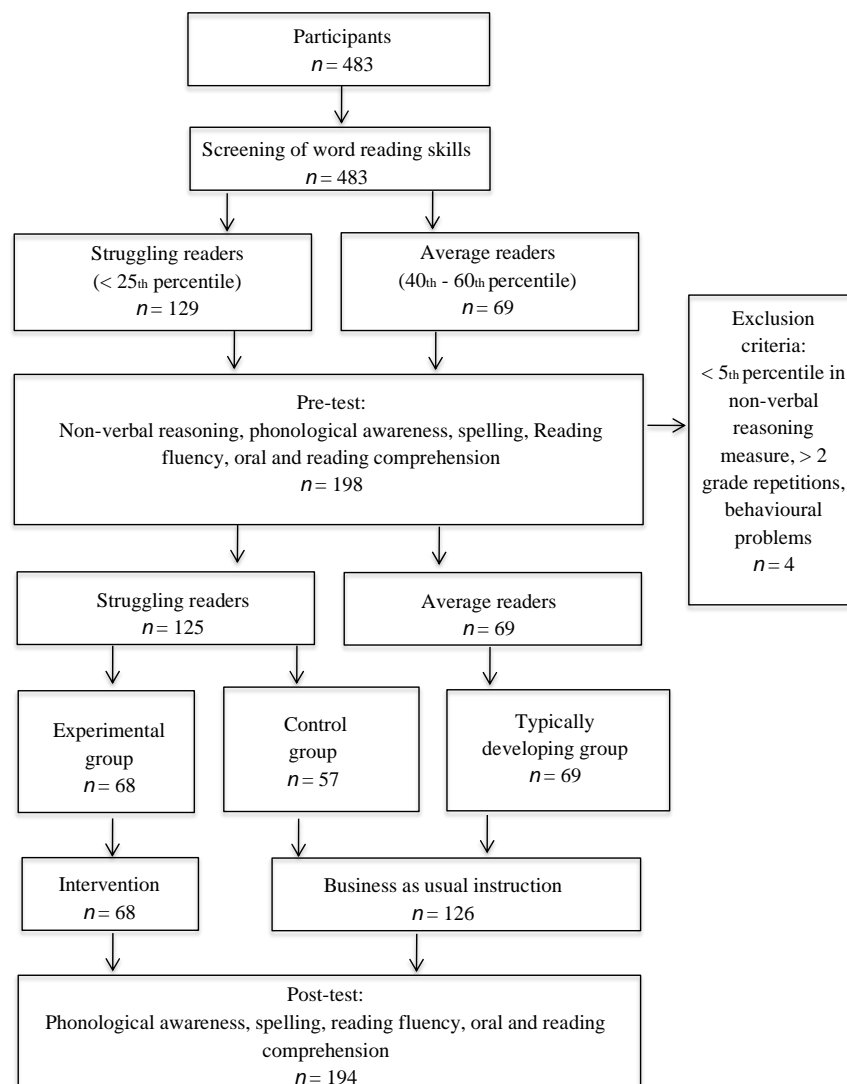


Figure 1. Flow diagram of the assessment and intervention procedure

First, we administered a word reading screening test to all students in grade 1 and 2 of primary school to identify struggling and typically developing readers. Next, we randomly assigned struggling readers to the experimental group ($n = 68$) that received our intervention program and the control group ($n = 57$). Typically developing readers were allocated to a third group ($n = 69$).

Results from analyses of variance (ANOVA) confirmed that there was no significant difference between the three groups with respect to age, nonverbal reasoning and oral comprehension skills. As expected, based on our selection criteria, the experimental and control group showed significantly lower word reading skills as compared to the typically developing reader group, $F(2, 194) = 37.65, p < .001$. We observed the same pattern with respect to phonological awareness, spelling, reading fluency and reading comprehension. In Table 2 we detail these results.

Table 2. *Pre-test and control measure performance per participant group*

Measure	EG ($n = 68$)	CG ($n = 57$)	TDG ($n = 69$)	F	p	Post-hoc Bonferroni
Age	6.98 (0.06)	7.11 (0.09)	6.98 (0.06)	0.05	0.62	-
Nonverbal reasoning	18.73 (4.47)	18.12 (4.53)	19.77 (4.93)	2.06	0.62	-
Oral comprehension	14.45 (3.65)	14.81 (4.03)	15.61 (4.27)	1.53	0.94	-
Word reading	12.11 (7.18)	12.21 (7.17)	24.29 (12.40)	37.65	< .01**	EG < TDG CG < TDG
Phonological awareness	7.11 (4.95)	7.46 (5.30)	9.10 (7.26)	6.42	< .01**	EG < TDG CG < TDG
Spelling	13.56 (7.50)	15.28 (8.14)	18.83 (7.86)	8.62	< .001***	EG < TDG CG < TDG
Reading fluency	4.10 (1.98)	4.31 (2.52)	11.11 (4.21)	47.18	< .001***	EG < TDG CG < TDG
Reading comprehension	6.25 (2.68)	7.77 (3.75)	12.53 (5.40)	38.63	< .001***	EG < TDG CG < TDG

Note. EG = experimental group; CG = control group; TDG = typically developing reader group; we report all values in raw scores with the exception of the variable age which is reported in years; standard deviations are reported in parentheses. * $p < .05$, two-tailed; ** $p < .01$, two-tailed; *** $p < .001$, two-tailed.

Only the experimental group attended the supplementary literacy intervention on top of regular classroom instruction, while the control and typically developing group remained in their regular classrooms and only received “business-as-usual” instruction as provided by their teachers. Once the intervention was completed, we collected post-test measures on

phonological awareness, word spelling, reading fluency and reading comprehension for the three participant groups. None of the participants dropped out of the study and attendance was above 95% in all assessment and intervention sessions.

Results

As a first step, we computed repeated measures ANOVAs comparing pre- and post-test performance for phonological awareness, spelling, reading fluency and reading comprehension to assess the progress made by each participant group. Table 3 details the results and reveals a significant pre-post-test improvement with moderate effect sizes (Cohen, 1988) for all three participant groups on all four dependent variables.

Table 3. Pre-post-test measures

Experimental group Measure	Pre-test	Post-test	ANOVA		
	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>	<i>p</i>	η^2
PA	7.11 (4.95)	15.24 (6.59)	205.81	< .001***	0.71
Spelling	13.56 (7.47)	21.90 (6.13)	141.50	< .001***	0.68
Reading fluency ^a	4.10 (1.98)	8.79 (3.63)	55.42	< .001***	0.66
Reading comprehension	6.25 (2.66)	14.16 (6.4)	124.60	< .001***	0.68
Control group Measure	Pre-test	Post-test	ANOVA		
	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>	<i>p</i>	η^2
PA	7.46 (5.27)	12.35 (6.19)	48.57	< .001***	0.46
Spelling	15.28 (8.14)	21.58 (6.62)	66.42	< .001***	0.54
Reading fluency ^a	4.31 (2.52)	7.81 (3.33)	31.53	< .001***	0.56
Reading comprehension	7.77 (3.75)	13.09 (6.11)	105.82	< .001***	0.76
Typically developing group Measure	Pre-test	Post-test	ANOVA		
	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>	<i>p</i>	η^2
PA	9.10 (7.62)	17.74 (7.93)	205.81	< .001***	0.76
Spelling	18.83 (7.86)	26.46 (5.62)	217.39	< .001***	0.76
Reading fluency ^a	11.11 (4.22)	16.11 (4.69)	65.54	< .001***	0.71
Reading comprehension	12.53 (5.49)	20.14 (5.3)	208.81	< .001***	0.76

Note. PA = Phonological awareness; ^aResults for reading fluency are only based in data from grade 2 primary school students ($n = 83$); * $p < .05$, two-tailed; ** $p < .01$, two-tailed; *** $p < .001$, two-tailed.

Our second analysis aimed to explore if the experimental group of struggling readers showed intervention-specific improvements, as compared to the control and typically developing reader group. Therefore, we conducted analyses of co-variance (ANCOVAs) with

phonological awareness, spelling, reading fluency and comprehension as dependent variables and pre-test scores on these same variables as co-variates. For phonological awareness, results revealed a significant difference between the post-test scores achieved by all three participant groups, $F(2, 181) = 10.3, p < .001, \eta^2 = .101$. Post hoc Bonferroni analyses confirmed that the experimental group of struggling readers ($M = 15.24; SD = 6.59$) showed significantly higher post-test scores than the control group ($M = 12.35; SD = 6.19$), $p < .001$. Furthermore, only the control but not the experimental group continued to show a significantly lower performance than the typically developing reader group on this measure, $p < .001$.

A more detailed follow up analysis on the specific phonological awareness subskills (rhyming, phoneme omission, substitution and inversion) that we assessed indicated significant differences across participant groups on these four dependent variables. Post-hoc Bonferroni analyses revealed that the experimental group achieved significantly higher scores than the control group in the subskill of identifying rhymes, but not in omitting, substituting and inverting phonemes. Both the experimental and the control group progressed significantly less with respect to their phoneme omission, substitution and inversion skills as compared to the typically developing reader group. Results are presented in Table 4.

Table 4. *Pre-post-test measures for phonological awareness subskills*

Measure	Pre-test			Post-test			ANCOVA		
	EG	CG	TDG	EG	CG	TDG	<i>F</i>	<i>p</i>	Bonferroni
Rhyming	2.96	3.12	4.26	6.43	4.39	5.87	13.4	<	CG < EG
	(1.67)	(1.78)	(2.24)	(2.49)	(2.07)	(2.34)	2	.001***	CG < TDG
Phoneme omission	1.56	1.63	1.63	2.81	2.81	4.29	9.67	<	EG < TDG
	(1.50)	(1.65)	(1.65)	(1.85)	(1.85)	(1.95)		.001***	CG < TDG
Phoneme substitution	0.91	0.98	1.70	2.34	1.95	3.45	6.71	<	EG < TDG
	(0.94)	(0.99)	(1.67)	(1.80)	(1.43)	(2.67)		.001***	CG < TDG
Phoneme inversion	1.44	1.72	2.24	3.43	3.32	5.19	6.48	<	EG < TDG
	(1.60)	(1.73)	(2.41)	(2.59)	(2.56)	(2.42)		.001***	CG < TDG

Note. EG = experimental group; CG = control group; TDG = typically developing reader group; * $p < .05$, two-tailed; ** $p < .01$, two-tailed; *** $p < .001$, two-tailed.

In relation to the dependent variable spelling, we also found significant differences across participant groups, $F(2, 193) = 10.85, p < .001, \eta^2 = .107$. More specifically, the

experimental ($M = 21.90$; $SD = 6.13$) and the control group ($M = 21.58$; $SD = 6.68$) continued to perform below the typically developing reader group ($M = 26.97$; $SD = 4.93$), according to Bonferroni post-hoc tests. We did not find evidence of any differences between the experimental and control group for this measure.

For the dependent variable reading fluency our analyses are only based on data from grade 2 primary school students ($n = 83$). Once again, we found significant differences across participant groups for this measure, $F(2, 79) = 6.36$, $p < .01$, $\eta^2 = .139$. The group of typically developing readers ($M = 16.11$; $SD = 4.69$) reached significantly higher scores than the control ($M = 7.81$; $SD = 3.33$) and experimental group ($M = 8.79$; $SD = 3.63$), $p = .032$ and $p = .002$, respectively, according to Bonferroni post-hoc analyses.

Finally, we observed significant differences across participant groups for the dependent variable reading comprehension, $F(2, 182) = 3.98$, $p < .05$, $\eta^2 = .048$. Post-hoc Bonferroni analyses indicated that the control group ($M = 13.09$; $SD = 6.11$) continued to score significantly below the typically developing reader group ($M = 20.14$; $SD = 5.3$), $p < .05$. In contrast, we found no evidence of a significant difference between the performance of the experimental group ($M = 13.68$; $SD = 6.4$) and the control group on one hand and the typically developing reader group on the other hand.

Discussion and conclusions

The present study aimed to investigate to what extent a literacy intervention designed based on evidence derived from research on English-speaking populations could also be successful in improving literacy skills of struggling readers from low SES in Spanish speaking countries. Although participants significantly progressed as revealed in post-test scores, our findings only supported an intervention-specific improvement for the experimental group in relation to children's rhyme identification and partially to their reading comprehension skills. These results are consistent with similar studies conducted in other Spanish speaking countries in Latin America (Pallante & Kim, 2013; Strasser et al., 2016; Yoshikawa et al., 2015) and contrast with findings from research with Spanish speaking participants in the United States of America (Escamilla et al., 1998; Mathes et al., 2007). We discuss four potential explanations for this contrast.

First, differences between Spanish and English orthographies impose different demands on the skills struggling readers need to learn. It remains unclear, for example, if training phonological awareness is as efficient to improve literacy skills in shallow orthographies, such as Spanish, as in English. Ehri et al. (2001) reported only small effect sizes for non-English languages. In a study with Swedish and Norwegian participants by Furnes and Samuelson (2010) phonological awareness was only a significant predictor of reading skills until grade 1 of primary school. Also, Tafa and Manolitsis (2008) concluded that phonological awareness did not contribute in distinguishing between at risk and average readers in Greek.

On one hand, this evidence indicates that higher intensity, as well as longer and more targeted activities in critical subskills such as phonemic awareness might be needed to impact literacy skills in Spanish speaking children. This could explain why the improvement we observed in our participants phonological awareness skills did not translate into treatment-specific improvements in other literacy skills. On the other hand, it is possible that different orthographies impose language specific demands on particular subskills that need to be taught to struggling readers. There is evidence to believe that in Spanish smaller phonological units, such as syllables and phonemes, instead of larger units, such as rhymes could play an important role (Goodwin et al., 2015). Instruction in rhyming abilities might, therefore, be irrelevant to improve literacy skills in Spanish speaking participants. In coherence with our findings, Guardia (2014) found no evidence of significant associations between the ability to rhyme and reading accuracy, speed and comprehension in grade 1 primary school children in Chile. Taking into consideration that rhyming abilities are assumed to be acquired at earlier developmental stages as compared to phonemic awareness skills, we could also attempt to interpret our results as evidence of an initiated, but still incomplete acquisition process that does not yet translate into significant improvements in phoneme manipulation skills. Perhaps the time dedicated to train phonological awareness in our intervention was not enough to achieve this impact.

Second, our decision to opt for the design of a multicomponent literacy intervention with a similar amount of time allocated to each component could have limited the impact of our intervention. There is evidence to suggest that reading fluency might require specific and sustained training in Spanish (Castejón, Gonzalez-Pumariega & Cuetos, 2015). Also, Gersten et al. (2008) suggest that it might be necessary to focus on a few central skills to achieve significant impact. They claim that it could be especially difficult for struggling readers to prioritize the most relevant skills if too many learning objectives are presented simultaneously.

In this way, the number of skills targeted by a literacy intervention can have important consequences on the time dedicated to train each individual skill. For instance, in this study we dedicated 8 minutes per session to train each of the five target components, overall adding up to a total of 2 hours and 40 minutes for each component across the complete intervention. This could not have been sufficient time to achieve significant improvements. Some of the literacy interventions conducted in Spanish that were able to achieve a positive impact are characterized by more intense training sessions. For example, Mathes et al. (2007) completed daily sessions of 50 minutes during 25 sessions.

A related reason to explain the limited impact we observed in our intervention might be related to the supplementary character of our intervention as compared to interventions that substitute business as usual instruction. Wanzek and Vaughn (2007) highlighted the need to consider practical limitations of the educational context when debating on the ideal duration of intervention programs. This aspect was especially important in this study, as it was conducted in authentic educational contexts. Guided by expectations of educational and social impact the need to efficiently administer limited resources were very important in this study. However, in future projects it might be preferable to plan for more intensive literacy interventions with a smaller sample of participants.

Third, it is possible that the low SES played an important role in limiting the impact we were able to achieve with our literacy intervention. We agree with Strasser et al. (2016) that the participants in our study might have had broader developmental and linguistic deficits than participants of low SES included in English-speaking countries. As Al Otaiba and Fuchs (2002) indicate students in minority contexts very often present associated difficulties and comorbid disorders.

Fourth, a potential treatment diffusion effect of the characteristics of our literacy intervention to regular classroom teachers could also be the reason for the limited impact of our intervention (Gunderson and Svartdal, 2010). This concept, originally described as treatment diffusion, is used to describe the situation when information about an intervention is leaked to regular classroom teachers. As mentioned before, our study was embedded in an authentic educational context with broad ambitions to improve children's literacy skills in the six participating primary schools and kindly funded by two foundations. Therefore, we encouraged teachers in regular classrooms to improve their literacy instruction strategies and invited them

to participate in a training day on evidence-based literacy instruction led by the first and second author of this report. As a consequence, teachers could have incorporated new evidence-based strategies that to some extent might have been similar to the ones used in our supplementary intervention. A similar case was reported by Duff, Hulme, Grainger, Hardwick, Miles and Snowling (2014) as all teachers and parents in their study were informed about the objectives of the study and therefore contaminated the control group.

In summary, the present study aimed to examine the efficacy of an evidence-based literacy intervention for Spanish speaking struggling readers of low SES. One of the central questions that motivated this study was to investigate if an intervention based on evidence-based principles that are derived from research with English speaking participants could also be successful in improving literacy skills of Spanish speaking children. Although the children that participated in our intervention significantly improved their phonological awareness, spelling, fluency and comprehension skills, the evidence indicated that these results could only be interpreted as specific consequences of our intervention for rhyming and partially for reading comprehension skills. In line with past research, our findings point towards the need to consider contrasts between Spanish and English orthographies, as well as cognitive profiles of children with low SES in Latin America to explain inconsistent results in the impact achieved by literacy interventions in English and Spanish speaking countries.

References

- Al Otaiba, S., & Fuchs, D. (2002). Characteristics of children who are unresponsive to early literacy intervention. A review of the literature. *Remedial and Special Education, 23*(5), 300-316. doi: 10.1177/07419325020230050501
- Balbi, A., von Hagen, A., Cuadro, A. & Ruiz, C. (2018). Revisión sistemática sobre intervenciones en alfabetización temprana: implicancias para intervenir en español. *Revista Latinoamericana de Psicología 50*(1), 31-48.
- Beck, I. L., McKeown, M. G., & Kucan, L. (2013). *Bringing words to life: Robust vocabulary instruction*. New York: Guilford Press.
- Caravolas, M., Lervag, A., Mousikou, P., Efrim, C., Litavsky, M., Onochie-Quintanilla, E. et al. (2012). Common Patterns of Prediction of Literacy Development in Different

- Alphabetic Orthographies. *Psychological Science* 23(6), 678-686. doi: 10.1177/0956797611434536
- Castejón, L., González-Pumariega, S. y Cueto, F. (2015) *Development of word reading fluency along primary education: a six-year follow-up / El desarrollo de la fluidez en la lectura de palabras en educación primaria: un seguimiento longitudinal de seis años*, *Infancia y Aprendizaje*, 38:4, 842-871, DOI: 10.1080/02103702.2015.1076266
- Clarke, P.J., Truelove, E., Hulme, C. & Snowling, M.J. (2014). *Developing Reading Comprehension*. Chichester: Wiley-Blackwell.
- Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed.) New York: Academic Press.
- Defior, S., Jiménez-Fernández, G., Calet, N., & Serrano, F. (2015). Learning to read and write in Spanish: phonology in addition to which other processes?/Aprendiendo a leer y escribir en español: además de la fonología, ¿ qué otros procesos? *Estudios de Psicología*, 36(3), 571-591. doi: 10.1080/02109395.2015.1078552
- Duff, F. J., Hulme, C., Grainger, K., Hardwick, S. J., Miles, J. N., & Snowling, M. J. (2014). Reading and language intervention for children at risk of dyslexia: a randomised controlled trial. *Journal of Child Psychology and Psychiatry*, 55(11), 1234-1243. doi: 10.1111/jcpp.12257.
- Ehri, L. C., Nunes, S. R., Willows, D. M., Schuster, B. V., Yaghoub - Zadeh, Z., & Shanahan, T. (2001). Phonemic awareness instruction helps children learn to read: Evidence from the National Reading Panel's meta-analysis. *Reading research quarterly*, 36(3), 250-287. doi: 10.1598/RRQ.36.3.2.
- Emmer, A., Hofmann, B., & Matthes, G. (2007). *Elementares Training bei Kindern mit Lernschwierigkeiten: Test-und Trainingsverfahren*. [Elementary training for children with learning difficulties: test and training procedure]. Weinheim: Beltz.
- Escamilla, K., Loera, M., Ruiz, O., & Rodríguez, Y. (1998). An examination of sustaining effects in *Descubriendo la Lectura* programs. *Literacy, Teaching and Learning*, 3(2), 59.
- Furnes, B., & Samuelsson, S. (2010). Predicting reading and spelling difficulties in transparent and opaque orthographies: A comparison between Scandinavian and US/Australian children. *Dyslexia*, 16(2), 119-142. doi: 10.1002/dys.401

- Gersten, R., Compton, D., Connor, C. M., Dimino, J., Santoro, L., Linan-Thompson, S., & Tilly, W. D. (2008). *Assisting students struggling with reading: Response to Intervention and multi-tier intervention for reading in the primary grades. A practice guide* (NCEE 2009-4045). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, US Department of Education.
- Goodwin, A. P., August, D., & Calderon, M. (2015). Reading in Multiple Orthographies: Differences and Similarities in Reading in Spanish and English for English Learners. *Language Learning*, 65(3), 596-630. doi: 10.1111/lang.12127.
- Guardia, P. (2014). Is consonant rhyme important when learning to read in Spanish? ¿Es importante la rima consonante para aprender a leer en el español? *Estudios de Psicología*, 35(3), 567-583. doi: 10.1080/02109395.2014.965459
- Gundersen, K., & Svartdal, F. (2010). Diffusion of treatment interventions: exploration of 'secondary' treatment diffusion. *Psychology, Crime & Law*, 16(3), 233-249. doi: 10.1080/10683160802612924
- Hansen, J. & Pearson, P.D. (1983). An instructional study: Improving the inferential comprehension of fourth grade good and poor readers. *Journal of Educational Psychology*, 75, 821-829. doi: 10.1037/0022-0663.75.6.821
- INE (2012) Índice de Nivel Socioeconómico. [Index of Socio-economic Status]. Retrieved from <http://www.gruporadar.com.uy/01/wp-content/uploads/2012/04/Informe-Nuevo-INSE-2011.pdf>
- Jara Quezada, N. & Troncoso San Martín, J. (2014). *Validación Test de Matrices Progresivas de Raven Escala coloreada, en escolares de la ciudad de Chillán*. [Validation of the Test of Progressive Matrices - Coloured Scale in primary school students of Chillán]. Bachelor Thesis of Psychology. Universidad del Bío-Bío. Retrieved from <http://repositorio.ubiobio.cl/jspui/handle/123456789/204>.
- Jiménez-Fernández, G.; Serrano, F. & Defior, S. (2014). Elaboración de material audiovisual para la mejora de la docencia práctica de asignaturas relacionadas con el lenguaje escrito (PID 11-01) [Design of audiovisual materials to improve teaching of subjects related to written language (PID 11-01)]. In L. Jiménez del Barco Jaldo & M. C. García Garnica (coords.), *Innovación docente y buenas prácticas en la Universidad de Granada*, vol 3 [Teaching innovation and good practices at the University of Granada] (pp. 283-295). Granada: Editorial Universidad de Granada.

- Kohnen, S., Colenbrander, D., Krajenbrink, T., & Nickels, L. (2015). Assessment of lexical and non-lexical spelling in students in Grades 1–7. *Australian Journal of Learning Difficulties*, 20(1), 15-38.
- Mathes, P. G., Pollard-Durodola, S. D., Cárdenas-Hagan, E., Linan-Thompson, S., & Vaughn, S. (2007). Teaching struggling readers who are native Spanish speakers: what do we know? *Language, Speech, and Hearing Services in Schools*, 38(3), 260-271. doi: 10.1044/0161-1461(2007/027)
- Moll, K., Ramus, F., Bartling, J., Bruder, J., Kunze, S., Neuhoff, N. et al. (2014). Cognitive mechanisms underlying reading and spelling development in five European orthographies. *Learning and Instruction*, 29, 65-77. doi: 10.1016/j.learninstruc.2013.09.003
- Muñoz-Sandoval. A. F.; Woodcock, R.W.; McGrew, K.S. & Mather, N. (2005a). *Batería III Woodcock-Muñoz: Pruebas de habilidades cognitivas*. [Woodcock-Muñoz Battery III: Tests of cognitive abilities.]. Spring Lake Drive, Itasca: The Riverside Publishing Company.
- National Reading Panel (US), National Institute of Child Health, & Human Development (US). (2000). *Report of the national reading panel: Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction: Reports of the subgroups*. Retrieved from <https://www.nichd.nih.gov/publications/pubs/nrp/documents/report.pdf>
- Pallante, D. H., & Kim, Y. S. (2013). The effect of a multicomponent literacy instruction model on literacy growth for kindergartners and first-grade students in Chile. *International Journal of Psychology*, 48(5), 747-761. doi: 10.1080/00207594.2012.719628.
- Raven, J.C. (1993). *Test de Matrices Progresivas. Cuaderno de Matrices, Escala Coloreada. Series A, Ab y B*. [Test of Progressive Matrices - Coloured Scale. Series A, Ab and B]. Buenos Aires: Paidós.
- Sánchez, E., Rueda, M. I., & Orrantia, J. (1989). Estrategias de intervención para la reeducación de niños con dificultades en el aprendizaje de la lectura y de la escritura. [Intervention strategies for training children with Reading and writing difficulties]. *Comunicación, lenguaje y educación*, 1(3-4), 101-111.
- Schrank, F. A., McGrew, K. S., Ruef, M. L., Alvarado, C. G., Muñoz-Sandoval, A. F., & Woodcock, R. W. (2005). *Overview and technical supplement (Batería III Woodcock-*

- Muñoz Assessment Service Bulletin No. 1). Rolling Meadows, IL: Riverside Publishing.
- 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. doi: 10.1037/0033-2909.134.4.584.
- Strasser, K., Rolla, A., & Romero-Contreras, S. (2016). School Readiness Research in Latin America: Findings and Challenges. *New directions for child and adolescent development*, 2016, 152, 31-44. doi: 10.1002/cad.20160.
- Tafa, E., & Manolitsis, G. (2008). A longitudinal literacy profile of Greek precocious readers. *Reading Research Quarterly*, 43(2), 165-185. doi: 10.1598/RRQ.43.2.4
- UCU (2012). *Database of private primary schools fees in Montevideo, Uruguay*. Unpublished. Montevideo: Universidad Católica del Uruguay.
- Wanzek, J., & Vaughn, S. (2007). Research-based implications from extensive early reading interventions. *School Psychology Review*, 36(4), 541.
- Yoshikawa, H., Leyva, D., Snow, C. E., Treviño, E., Barata, M., Weiland, C., ... & Arbour, M. C. (2015). Experimental impacts of a teacher professional development program in Chile on preschool classroom quality and child outcomes. *Developmental psychology*, 51(3), 309. doi: 10.1037/a0038785

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