



# Effects of early reading and writing intervention on Spanish school children

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**Título:** Intervención temprana de la lectura y la escritura en estudiantes españoles.

**Resumen:** El objetivo de este trabajo es analizar el rendimiento en lectura y escritura en estudiantes españoles, tras su intervención desde edades tempranas. La finalidad de la intervención es priorizar y sistematizar la instrucción en principio alfabético, conciencia fonológica, fluidez lectoescritora, vocabulario y comprensión textual. La muestra está formada por 126 sujetos, distribuidos en grupo instruido ( $n=62$ ) y grupo no instruido ( $n=64$ ), pertenecientes a zonas socioculturales medias, con inteligencia normal y sin déficits físicos, psíquicos y/o sensoriales. Los sujetos son evaluados desde 2º curso de Educación Infantil (cuatro años) hasta 1º curso de Educación Primaria (seis años). El diseño es longitudinal con medidas repetidas (cuatro evaluaciones), tres fases de intervención y dos variables de estudio (Rendimiento en Lectura y Rendimiento en Escritura) y dos grupos de sujetos. Se realizan análisis estadísticos descriptivos y análisis de varianza de medidas repetidas. Los resultados obtenidos indican mejores puntuaciones en lectura y escritura a lo largo de todas las evaluaciones y un avance significativamente mayor en el grupo instruido. Estos resultados demuestran la eficacia de una intervención temprana del lenguaje escrito a través de la instrucción sistemática en conciencia fonológica, principio alfabético, fluidez lectoescritora, vocabulario y comprensión textual.

**Palabras clave:** Intervención temprana. Estudio longitudinal. Lectura. Escritura.

**Abstract:** The aim of this paper is to analyse the reading and writing achievement of Spanish school children following an intervention conducted at an early age. The purpose of the intervention is to prioritise and systematise instruction in the alphabetic principles, phonological awareness, reading fluency, vocabulary, and text comprehension. The sample consists of 126 subjects, distributed between an instructed group ( $n=62$ ) and an uninstructed group ( $n=64$ ). All the subjects were from average socio-cultural areas, with normal intelligence and with no physical, mental, and/or sensory deficits. Subjects were evaluated from the second year of Early Years Education (4 years of age) up to the first year of Primary Education (six years of age). The design was longitudinal with repeated measurements (four assessments), three intervention phases, two study variables (reading achievement and writing achievement), and two groups of subjects. Descriptive statistical analysis and repeated measures analyses of variance were performed. The results obtained indicate higher scores in reading and writing throughout all the assessments and significantly greater progress in the instructed group. These results demonstrate the effectiveness of early intervention in written language through systematic instruction in phonological awareness, the alphabetic principles, reading fluency, vocabulary, and text comprehension.

**Keywords:** Early intervention. Longitudinal study. Reading. Writing.

## Introduction

Written language is a basic skill taught at school as soon as children enter compulsory education on account of its particular social, educational, and cognitive relevance. Reading and writing are classed as functional learning, the foundation onto which lifelong knowledge and education are built (OECD, 2019; Ollero, 2005). They are also privileged strategies to promote learning and cognitive development (Marchesi, 2005; Ministry of Education, 2020) and constitute fundamental criteria in the quality of education. In addition, the teaching-learning of written language is a topic of great interest and debate in the scientific community, on account of the different stances regarding when and how to start the process.

As for when to begin teaching reading, different studies put forward alternative views. On the one hand, some studies argue that children should begin learning to read and write once they have attained a certain psychological maturity that makes such learning possible, and that it makes sense for them to begin learning from the age of six (Condemarin et al., 1985; Revuelta & Guillen, 1987). Along these lines, in Spain, the teaching of reading and writing begins in Early Years Education (at the age of five) and is compulsory when children begin Primary Education (six years of age). However,

other theoretical perspectives advocate early intervention in the teaching of written language, from the age of three and four, and advise increasing exposure to reading to prevent future learning difficulties (Brand & Dalton, 2012; Brown et al., 2012; Dunphy, 2012; Elliott & Olliff, 2009; Fuchs et al., 2019; Swartz et al., 2003; Vadasy & Sanders, 2008; Wright et al. 2008). Some such interventions are carried out in other countries, through different programmes such as Success For All (SFA) and California Early Learning Literacy (CELL), beginning with written language teaching from the age of three to four. These studies find improvements in literacy and also in other areas of achievement such as mathematics, as well as a decrease in the number of children at risk of school failure (Cheung & Slavin, 2016; Quint et al., 2015; Swartz et al., 2003). In our context, some early literacy psycho-educational programmes have also been implemented in Spanish, albeit only a few, which have been shown to favour reading and writing learning in Early Childhood Education and, subsequently, in the first cycle of Primary Education (González et al., 2015; Gutiérrez et al., 2015; Gutiérrez & Díez, 2017; Porta, 2021; Rosemberg & Stein, 2016). In some of these studies, the duration of the intervention is limited (one or two school terms), the definition of activities and the proposed programme are not precise, and the sample is not representative.

Some research has considered the teaching of reading and writing based on the development of basic prerequisites such as visual perception, psychomotor skills, laterality and/or body schema (Condemarin et al., 1985; Molina, 2000;

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Revuelta & Guillén, 1987) for optimal development. However, other studies focus more on the promotion of linguistic and metalinguistic skills in order to achieve adequate reading and writing achievement (Cervetti & Hiebert, 2015; Duncan, et al., 2013; Ford et al., 2013; Johnson & Tweedie, 2010; Mahony et al. 2000; Parsons & Gallagher, 2016; Roberts, 2005; Schaadt et al., 2013; Vadasy & Sanders, 2012; Van Weerdenburg et al., 2009; White, 2011). In this context, the National Reading Panel (NRP, 2000) report noted the main scientific findings on optimising the early literacy learning process and what the educational implications for instructional methods would be. The report established five main pillars in reading instruction: the alphabetic principle, phonemic awareness, reading fluency, vocabulary, and text comprehension. Some of these studies also emphasise the importance of prioritising the teaching of written language through the systematisation of different modes of reading and writing (guided, shared, independent), increasing exposure to reading and writing as a way to improve the instruction and learning of curricular contents (Cervetti & Hiebert, 2015; Swartz et al. 2003; Vadasy & Sanders, 2012). With regard to the Spanish language, some longitudinal studies have also been carried out which, through instruction only in phonological awareness and rapid automatic naming, have shown how reading and writing improve at an early age. Other programmes focus on isolated components, such as phonological awareness, oral language development, morphological awareness, vocabulary, or are only analysed in reading or writing (González et al., 2015; González et al., 2017; Rosemberg & Stein, 2016; Rueda & Lopez, 2016).

In accordance with the findings of most of this research, the aim of this paper is to analyse the reading and writing achievement of Spanish school children following an intervention conducted at an early age. The purpose of the intervention is to prioritise and systematise instruction in the alphabetic principle, phonological awareness, reading fluency, vocabulary, and text comprehension from Early Years Education (four years of age) up to the beginning of Primary Education (six years of age). Children in the instructed group are expected to attain a higher level of reading and writing achievement than those in the uninstructed group.

## Method

### Design

In accordance with the aim of this research, we followed a longitudinal repeated measures design (four assessments), encompassing different phases of intervention (three periods), two study variables (reading achievement and writing achievement) and two groups of subjects (instructed and uninstructed). One group received early intervention in reading and writing and the other did not. All the children were evaluated over the course of three school years (four to six years of age).

### Participants

Participating schools was selected by means of stratified random sampling of the city of Malaga (Spain), according to the literacy level of the area (low, medium, and high).

Out of a total of twelve state primary schools located in an average socio-cultural area of Malaga city (Spain), according to the census of schools published by Andalusia's Regional Department for Education, five schools took part in this research. In this area, 30 per cent of the population is below the average illiteracy rate (González et al., 2012). Of the five participating schools, early instruction was given in six classrooms within three of these schools, making up the Instructed Group (IG). In four classrooms of the other two schools, instruction was carried out in accordance with the formal curriculum, making up the Uninstructed Group (UG).

The sample consisted of a total of 126 Spanish children, distributed between the uninstructed group ( $n = 62$ ) and in the instructed group ( $n = 64$ ). The UG was made up of 35 girls and 27 boys. The IG was made up of 35 girls and 29 boys. The subjects began the study during the second year of Early Years Education, aged four years and one month ( $M = 4.1$  and  $SD = 0.4$ ) and completed it at the end of the first year of Primary Education, aged six years and eight months ( $M = 6.8$  and  $SD = 0.5$ ).

All the subjects were Spanish speaking, with no physical, mental, or sensory deficits, and did not belong to the group of specific Educational Support Needs, according to the reports compiled by the psychologists and the information gathered by the teachers at each school. Subjects had a normal IQ estimated by means of the WISC-III test (Wechsler, 1998), with no significant differences found between the IG and the UG ( $F_{1, 124} = 1.97; p < .001$ ).

### Instruments

Reading achievement (RA) was evaluated by means of the Reading Achievement test (González & Delgado, 2006) which consists of two tests: Reading Accuracy Achievement (RAA) and Reading Comprehension Achievement (RCA). The RAA test evaluates the reading accuracy of 28 letters (consonants and vowels), 16 syllables with different linguistic structures (CV, VC, CVC, CCV, CCVC), 16 words of different length and frequency (one syllable and three syllable words, both familiar and rare), 8 pseudowords of different lengths (two-syllable and three-syllable), 6 sentences and 6 texts of different length and linguistic complexity. The maximum score is the number of correct answers given. The factor validity of the test shows a one-dimensional structure and a saturation index greater than .33, with an explained variability of 43.75 % and a sampling adequacy index of .85, respectively. As for reliability, item analysis indicates that all homogeneity ratios are greater than .30 and internal consistency is .92 (González & Delgado, 2006). The RCA test evaluates the comprehension of 14 words, 6 sentences, and 6

texts. The maximum score is the total number of correct answers given. The factorial validity of the test shows a one-dimensional structure and a saturation index greater than .33, with an explained variability of 47.85 % and a sampling adequacy index of .85, respectively. As for reliability, item analysis indicates that all homogeneity ratios are greater than .30 and internal consistency is .96 (González & Delgado, 2006).

Writing Achievement (WA) was evaluated by means of the Writing Achievement test (González & Delgado, 2006) which consists of two tests: Copying Accuracy Achievement (CAA) and Dictation Accuracy Achievement (DAA). The CAA test evaluates writing accuracy by copying 8 geometric figures of different graphic complexity, 7 letters (3 vowels and 4 consonants), 8 words (two and three syllable words of different linguistic structures), and 2 phrases. The maximum score is the number of correct answers given. The construct validity of the test shows a one-dimensional structure and a saturation index greater than .37, with an explained variability of 51.15 % and a sampling adequacy index of .83, respectively. As for reliability, item analysis indicates that all homogeneity ratios are greater than .30 and internal consistency is .94 (González & Delgado, 2006). The DAA test evaluates written accuracy in the dictation of 8 letters (2 vowels and 6 consonants), 8 words (one and three syllable words of different linguistic structures), 8 pseudowords (two and three syllable words of different linguistic structures), 4 sentences and 3 texts of different linguistic length and difficulty. The maximum score is the number of correct answers given. The factorial validity of the test shows a one-dimensional structure and a saturation index greater than .37, with an explained variability of 48.65 % and a sampling adequacy index of .86, respectively. As for reliability, item analysis indicates that all homogeneity ratios are greater than .30 and internal consistency is .95 (González & Delgado, 2006).

## Procedure

The corresponding permission was requested from the Research Ethics Committee of the Universidad de Málaga (CEUMA) in order to initiate data collection and implement the intervention. Permission was obtained after the headteachers of the participating schools signed the respective informed consent.

Assessments were conducted individually with each pupil during school hours by Psychology graduates. The first assessment (pre-test) was carried out at the start of the school year (September), when the children were in the second year of Early Years Education, both in the IG and the UG. The other three assessments (post-tests) were also carried out in both groups, following the application of the different intervention periods, in June of the following school years, when the children were in the second and third years of Early

Years Education and the first year of Primary Education, respectively. The evaluation phases (pre-test and post-test) assessed reading and writing achievement. The intervention phases were carried out between October and May of the three corresponding school years, when the children were in the second and third years of Early Years Education and the first year of Primary Education, respectively.

The UG received instruction in reading and writing in accordance with the official curriculum targets for Early Years and Primary Education, established by Andalusia's Regional Department for Education, established in Decree 105 and Decree 107 (Ministry of Education, 1992a, b) for Early Years and Primary Education, respectively. This instruction was delivered by teachers in each of the ordinary classrooms to which the pupils belonged and during school hours. The contents developed in Early Years Education were related to an approximation to written language, through the reading and writing of some letters and words (production and use of graphic symbology, identification of some frequent written words, comprehension and use of images). Written language (grapheme-phoneme correspondence, reading short texts, understanding short texts, direction and sense of writing, linearity, word distribution and tracing) was not systematically taught until the first year of Primary Education. The contents were delivered through the promotion of basic skills such as the body schema, laterality, psychomotricity, and visuospatial perception, both in Early Years and Primary Education. The instruction received in reading and writing in this group did not have a fixed daily duration, as it was not prioritised or approached systematically, and the time spent on it was based on the promotion of reading and writing skills and activities described above in both stages.

The IG received instruction in reading and writing, in a prioritised and systematic way, from the second year of Early Years Education (four years of age), through the teaching of different basic components: the alphabetic principle (phonological discrimination and grapheme-phoneme correspondence), phonological awareness (syllable and phoneme awareness), reading fluency (accuracy and speed in reading and writing syllables, words, phrases and texts), vocabulary (categorisation of concepts and identification of lexical families, and identification and distinction of the value of words in different types of sentences) and comprehension (reading comprehension and written expression). Table 1 presents the contents developed according to the instructional component and year of programme development. The activities were sequenced by school year and term, according to developmental criteria, from lower to higher cognitive complexity, and all instructional components were developed together in each session.

**Table 1**  
*Sequencing of activities by early instruction components in reading and writing.*

	1st year	2nd year	3rd year
Phonological knowledge	<ul style="list-style-type: none"> <li>Counting syllables in words with the letters they have worked on</li> <li>Identifying syllables in any position with the letters they have worked on</li> <li>Identifying rhymes</li> <li>Identifying phonemes in any position in words</li> <li>Identifying the vowel structure of words with the letters they have worked on</li> </ul>	<ul style="list-style-type: none"> <li>Counting syllables in words with the letters they have worked on</li> <li>Identifying syllables in any word position</li> <li>Identifying rhymes</li> <li>Adding syllables</li> <li>Missing syllables out</li> <li>Linking words by the final syllable</li> <li>Identifying phonemes in any position in words</li> <li>Identifying the vowel structure of words</li> <li>Counting phonemes in words</li> <li>Adding phonemes to words</li> <li>Missing phonemes out of words</li> </ul>	<ul style="list-style-type: none"> <li>Identifying and making rhymes</li> <li>Adding syllables</li> <li>Missing syllables out</li> <li>Linking words by the final syllable</li> <li>Replacing syllables</li> <li>Adding phonemes</li> <li>Missing out phonemes</li> <li>Linking words by the final phoneme</li> <li>Spelling one, two, and three-syllable words, forwards, backwards, and mixed</li> <li>Replacing phonemes</li> <li>Guessing the spelling of one and two-syllable words, forwards and backwards.</li> </ul>
The alphabetic principle	<ul style="list-style-type: none"> <li>Articulating and discriminating phonemes of the letters explained</li> <li>Reading, copying, and dictating vowels</li> <li>Reading, copying, and dictating consonants p, m, n, ñ, l, s, t, j, d, b/v, c/z</li> </ul>	<ul style="list-style-type: none"> <li>Articulating and discriminating phonemes of the letters explained</li> <li>Reading, copying, and dictating vowels</li> <li>Reading, copying, and dictating consonants r, f, h, ch, k, c/q, g, x, w</li> </ul>	<ul style="list-style-type: none"> <li>Articulating and discriminating phonemes of the letters explained</li> <li>Reading, copying, and dictating all uppercase and lowercase letters</li> </ul>
Reading and writing fluency	<ul style="list-style-type: none"> <li>Reading, copying, and dictating CV syllables with these letters</li> <li>Reading, copying, and dictating two-syllable words with those letters</li> <li>Reading, copying, and dictating short sentences (2-3 words) with those words</li> <li>Reading, copying, and dictating a short story (2 stories)</li> <li>Spacing, organisation and directionality on paper</li> </ul>	<ul style="list-style-type: none"> <li>Reading, copying, and dictating VC syllables with s, l, n, r, j, z, m, p, b, d, t, c, g, f</li> <li>Reading, copying, and dictating syllables pr/pl, br/bl, tr, dr, cr/cl, fr/fl, gl/gr</li> <li>Reading, copying, and dictating familiar short words (two and three syllable words)</li> <li>Reading, copying, and dictating short, unfamiliar words (two and three syllable words)</li> <li>Reading, copying, and dictating phrases (2-3, 4- 6 and 6- 8 words)</li> <li>Reading short stories (6 stories)</li> <li>Spacing, organisation and directionality on paper</li> </ul>	<ul style="list-style-type: none"> <li>Reading, copying, and dictating all syllables</li> <li>Reading, copying, and dictating short and long words, familiar and unfamiliar</li> <li>Reading, copying, and dictating short sentences (6, 8 and 10 words)</li> <li>Reading short stories (12 stories)</li> <li>Pauses and intonation</li> <li>Text dictation (3/4, 4/5 and 5/6 sentences)</li> <li>Use of capital letters for proper nouns and at the start of a sentence</li> <li>Use of punctuation marks (full stop, question mark, exclamation mark)</li> <li>Use of m before p/b</li> <li>Spacing, organisation and directionality on paper</li> </ul>
Vocabulary	<ul style="list-style-type: none"> <li>Defining drawings (people, objects, actions...)</li> <li>Choosing the term that defines a drawing (people, objects, actions...)</li> <li>Drawing-word association</li> <li>Classifying drawings of different lexical categories (animals, clothes, toys...)</li> <li>Ordering 2/3 drawings to construct a story and explain it</li> <li>Ordering 2/3 words to construct a phrase with the words they have worked on</li> <li>Completing sentences (2/3 words) with alternatives</li> </ul>	<ul style="list-style-type: none"> <li>Defining drawings (people, objects, actions)</li> <li>Defining words orally</li> <li>Drawing-word association</li> <li>Drawing-word association and definition</li> <li>Word-definition association</li> <li>Classifying drawings by semantic category</li> <li>Counting words in a spoken and written phrase</li> <li>Ordering drawings to construct an oral story</li> <li>Completing sentences with drawings</li> <li>Ordering 3- 5 words to construct a phrase</li> <li>Completing sentences with and without support words</li> </ul>	<ul style="list-style-type: none"> <li>Categorising and classifying concepts</li> <li>Identifying absurd content</li> <li>Finding synonyms and antonyms</li> <li>Creating and completing word searches with definitions</li> <li>Solving crossword puzzles</li> <li>Completing sentences</li> <li>Ordering words and constructing phrases</li> <li>Ordering phrases and constructing a text</li> <li>Gender (masculine/feminine) and number (singular/plural) agreement</li> </ul>

	1st year	2nd year	3rd year
Reading comprehension	<ul style="list-style-type: none"> <li>• Understanding words and phrases read with those letters: Oral questions</li> <li>• Short story comprehension with words and phrases they have worked on: oral questions about explicit main ideas in the text</li> </ul>	<ul style="list-style-type: none"> <li>• Reading comprehension of familiar and unfamiliar short words: Oral questions</li> <li>• Reading comprehension of phrases (3 to 8 words): Oral questions</li> <li>• Reading comprehension of short stories: Oral questions on explicit main ideas in the text</li> <li>• Guided written expression with simple drawings (written description)</li> <li>• Non-guided written expression with drawings (written description)</li> </ul>	<ul style="list-style-type: none"> <li>• Reading comprehension of infrequent words: Oral questions</li> <li>• Comprehension of phrases (8 to 10 words): Oral questions</li> <li>• Comprehension of texts: Oral questions about explicit and implicit ideas in texts, Written questions about explicit and implicit main ideas in texts, Asking about the text according to the title, Oral summary of what was read, Orally changing the end of a story</li> <li>• Self-regulation of reading comprehension (self-questioning, rereading)</li> <li>• Guided written expression with drawings</li> <li>• Guided written expression with given words and/or phrases</li> <li>• Spontaneous written expression with organisation of ideas: describe an object or person</li> <li>• Spontaneous written expression with organisation of ideas: describe an event or occurrence</li> <li>• Written expression of a group story</li> <li>• Self-regulation of writing (self-correction and correction)</li> </ul>

The IG intervention was performed in the classroom over approximately twenty weeks in each school year, every day, for two and a half hours each day. The children worked on the same sequence of contents every day in the classroom during this time. Firstly, for about an hour, they carried out activities related to the alphabetic principle and phonological awareness. Later, for about an hour and a half, they carried out tasks covering reading fluency, vocabulary, comprehension, and textual expression. The activities were carried out individually and/or in small groups (four to six children), through the different areas of the curriculum, in order to systematise and diversify what was being learned and to encourage awareness and a fondness for reading and writing in a playful and fun way. Most of these activities were carried out using pencil-paper exercises with attractive drawings and through cooperative games. Storybooks were used covering topics from everyday life that promoted education in social values, close to the children's vocabulary. They drew on what the children were reading and writing. Dialogues and discussions were held with questions and answers, so that the children would reflect and think about what they had to do and what they had done in each of the activities carried out.

The intervention programme with the IG was also implemented by teachers in the children's regular classrooms. Prior to the implementation of the programme, teachers were informed and instructed on the objective of the programme, and trial runs were conducted on how to carry out the activities planned, through workshops. During the intervention, periodic follow-ups were also carried out through

direct observation in the classrooms about their interventions. In addition, weekly interviews were conducted, individually and/or as a group, in order to analyse their experiences, resolve any difficulties encountered, and comment on and evaluate the achievements obtained. Teachers attended fortnightly progress seminars and received feedback on achievements and the difficulties raised. This controlled the validity and reliability of teacher interventions.

### Statistical analysis

For the purposes of data analysis, the descriptive statistics for RA and WA were calculated, and a GLM Repeated Measures Analysis of Variance (Ato & Vallejo, 2015; Cohen, 1992) was performed.

Homoscedasticity was confirmed using the Levene test, and the assumption of sphericity was verified using the Mauchly test. The different hypotheses referring to the inter-subject factor, intra-subject factor, and the assessment-group interaction factor were compared to verify the effect of the intervention. Information on the effect size is also provided, considered small, medium, or large,  $r = .10$ ,  $r = .30$ ,  $r = .50$ , respectively, according to Cohen's standards (1992).

Finally, post-hoc tests were performed using the Bonferroni correction, based on Student's  $t$  distribution, which shows the specific differences between assessments in each group and the specific differences between groups in each assessment. This method controls the error rate by dividing the significance level ( $\alpha$ ) by the number of comparisons ( $k$ )

performed. Each comparison is evaluated using a significance level  $\alpha_c = \alpha/k$  (Ato & Vallejo, 2015).

Statistical analyses were carried out using the SPSS 28 (IBM, 2021) statistical software programme.

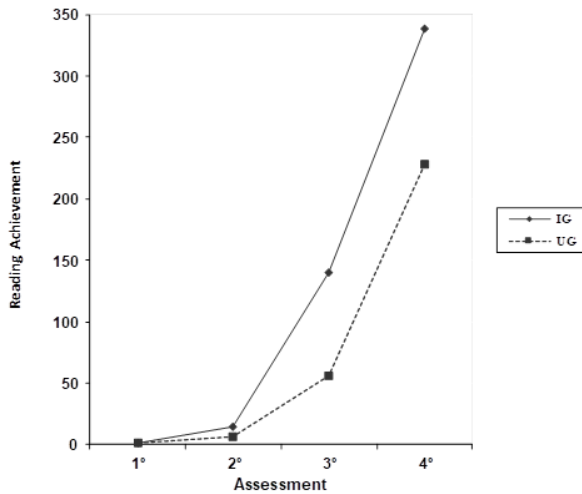
## Results

### Results in Reading Achievement

Table 2 presents the descriptive statistics for Reading Achievement among children in the IG and UG in all four assessments. There is an increase in mean scores in the second, third, and fourth assessments compared to the initial assessment, both in the IG ( $M = 1.54, SD = 2.42; M = 14.55, SD = 7.76; M = 140.55, SD = 127.99; M = 338.85, SD = 65.59$ , respectively) and the UG ( $M = 1.87, SD = 1.94; M = 6.44, SD = 4.88; M = 55.97, SD = 93.36; M = 227.81, SD = 107.78$ , respectively). However, the IG scores are higher than those reported by the UG from the second assessment onwards (Figure 1).

**Figure 1**

Average scores for Reading Achievement in both groups and in the various assessments.



To analyse whether these differences are significant, a repeated measures analysis of variance was performed. Previously, the assumption of homoscedasticity [ $F(1, 124) = 0.61, p = .43$ ] was verified along with the assumption of sphericity ( $\epsilon = .57$ ). The repeated measures analysis of variance shows that there are statistically significant differences between the IG and UG [ $F(1, 124) = 39.79, p < .001$ ], rejecting the null hypothesis for the inter-subject factor, which refers to the absence of differences between group means for RA. Of particular note within this factor is the strong adequacy of the hypothesis testing, obtaining excellent power ( $\beta=1$ ) and a medium effect size, with  $\eta^2 = 0.28$ . As shown in Table 2, the differences found between the IG and the UG are statistically significant in the second, third and fourth assessments in favour of the IG.

**Table 2**

Differences between average Reading and Writing Achievement of the two groups in each assessment.

Assessment	$\bar{X}$ IG (I)	$\bar{X}$ UG (J)	$\bar{X}$ (I-J)	Sign. <sup>a</sup>
RA				
1	1.54	1.87	-0.334	
2	14.55	6.44	8.117	*
3	140.55	55.97	84.531	*
4	338.85	227.81	111.039	*
WA				
1	7.39	4.47	2.923	
2	22.54	9.78	12.759	*
3	48.34	25.06	23.275	*
4	128.50	71.28	57.219	*

Note: RA= reading achievement; WA= writing achievement

<sup>a</sup> Adjustment for Multiple Comparisons: Bonferroni

(\*)  $p < .05$

The results also reject the null hypothesis for the intra-subject factor regarding the absence of significant differences between the various assessments, with significant differences found between the two groups throughout the different assessments. A significant change is shown over the four assessments [ $F(1, 124) = 308.94, p < .001$ ]. Once again, excellent power was found in the hypothesis ( $\beta=1$ ) in both groups and a large effect size of  $\eta^2 = .74$ . A significant interaction effect was found between assessment and group [ $F(1, 124) = 13.86, p < .001$ ], and thus the null hypothesis regarding the absence of significant differences between the IG and the UG in the various assessments is rejected. Optimal power is observed, with  $\beta = .99$ , and a small effect size ( $\eta^2 = .12$ ), as shown in Table 3. On the other hand, after examining post-hoc differences using the Bonferroni correction for interaction levels between each of the assessments in each of the groups, the results show that there are statistically significant differences between all assessments in the IG, with significant increases in scores over the periods of intervention. However, the UG only shows differences between the first and fourth assessments (at the ages of four and six), the second and fourth assessments (at the ages of four and six), such as the third and fourth assessments (at the ages of five and six) (Table 3).

**Table 3**

Post-hoc comparisons between assessments in each group for Reading and Writing achievement.

Group	(I) EV	(J) EV	$\bar{X}$ (I-J)	Sign <sup>a</sup>
RA				
IG	1	2	-13.014	*
		3	-138.959	*
		4	-337.311	*
	2	3	-125.946	*
		4	-324.297	*
		4	-198.351	*
UG	1	2	-4.563	
		3	-54.094	
		4	-225.937	*
2	3	-49.531		
	4	-221.375	*	
3	4	-171.844	*	

Group	(I) EV	(J) EV	$\bar{X}$ (I-J)	Sign <sup>a</sup>
<b>WA</b>				
IG	1	2	-15.149	*
		3	-40.946	*
	2	3	-25.797	*
		4	-105.959	*
	3	4	-80.162	*
		2	-5.313	*
UG	1	3	-20.594	*
		4	-66.812	*
	2	3	-15.281	*
		4	-61.500	*
	3	4	-46.219	*

Note: RA= reading achievement; WA= writing achievement

<sup>a</sup> Adjustment for Multiple Comparisons: Bonferroni

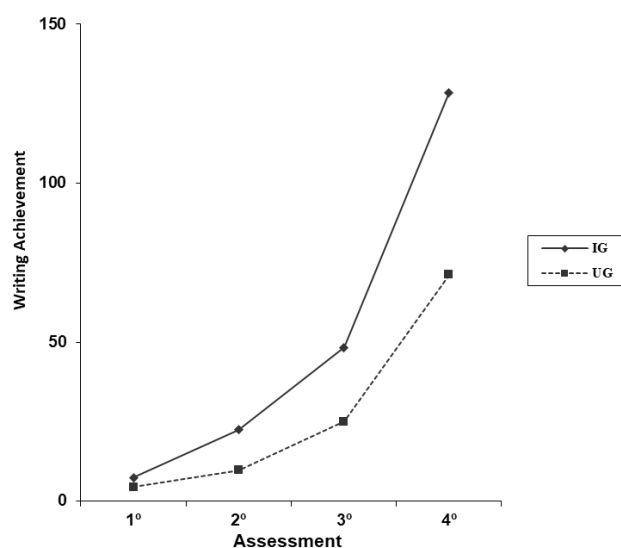
(\*)  $p < .05$

### Results obtained in Writing Achievement

Table 2 presents the descriptive statistics for Writing Achievement among children in the IG and UG in all four assessments. There is an increase in mean scores in the second, third, and fourth assessments compared to the initial assessment, both in the IG ( $M = 7.39$ ,  $SD = 5.80$ ;  $M = 22.54$ ,  $SD = 8.77$ ;  $M = 48.34$ ,  $SD = 20.02$ ;  $M = 128.50$ ,  $SD = 28.50$ , respectively) and the UG ( $M = 4.47$ ,  $SD = 4.98$ ;  $M = 9.78$ ,  $SD = 6.94$ ;  $M = 25.06$ ,  $SD = 14.17$ ;  $M = 71.28$ ,  $SD = 32.38$ , respectively). However, the IG scores are higher than those reported by the UG from the second assessment onwards (Figure 2).

Figure 2

Average scores for Writing Achievement in both groups and in the various assessments.



To ascertain whether these differences are significant, a repeated measures analysis of variance was performed. Previously, the assumption of homoskedasticity ( $[F(1, 124) = 1.95, p = .16]$ ) was verified along with the assumption of

sphericity ( $\epsilon = .55$ ). The repeated measures analysis of variance shows that there are statistically significant differences between the IG and the UG [ $F(1, 124) = 100.97, p < .001$ ], rejecting the null hypothesis for the inter-subject factor, regarding the absence of differences between group means for WA. Of particular note within this factor is the sound adequacy of the hypothesis testing, obtaining excellent power ( $\beta = 1$ ) and a large effect size,  $\eta^2 = .49$ . Table 2 shows the differences between the means between the two groups. The results indicate that the differences found between the IG and the UG are significant in the second, third, and fourth assessments in favour of the IG.

The results reject the null hypothesis for the intra-subject factor regarding the absence of significant differences between the various assessments. A significant change is shown over the four assessments [ $F(1, 124) = 46.10, p < .001$ ]. Once again, excellent power was found in the hypothesis testing ( $\beta = 1$ ) in both groups, along with a large effect size of  $\eta^2 = .49$ . A significant interaction effect was found between assessment and group [ $F(1, 124) = 46.10, p < .001$ ], and thus the null hypothesis regarding the absence of significant differences between the IG and the UG in the various assessments is rejected. Optimal power is observed, with  $\beta = 1$ , and a medium effect size ( $\eta^2 = .30$ ), as shown in Table 3. In other words, there are significant differences between the groups over the course of the different assessments. Furthermore, after examining post-hoc differences using the Bonferroni correction for interaction levels between each of the assessments in each of the groups, the results show that there are statistically significant differences between all assessments in the IG and in the UG.

### Discussion and conclusions

In this study, the effects of prioritising systematic instruction in the alphabetic principle, phonological awareness, reading fluency, vocabulary, and text comprehension on reading and writing have been verified between the ages of four and six. We expected to find that children in the instructed group would attain a higher level of reading and writing achievement than those in the uninstructed group.

The results show, first of all, that the uninstructed group and the instructed group improved their reading and writing achievement between the ages of four and six, but the instructed group improved significantly more than the uninstructed group. Secondly, in the IG, there were differences between all ages in both reading and writing and in the UG differences were only seen between the age of six and the other ages. That is, the group that received the intervention shows a higher achievement in reading (accuracy and reading comprehension) and writing (accuracy in copying and dictation) than the group that received ordinary instruction. In addition, the progress of the instructed group is greater the longer the period of intervention received.

These results show the importance of early intervention

in written language in the short term to optimise the literacy process, in line with the findings of other authors in other languages and education systems (Dunphy, 2012; Elliott & Olliff, 2008; Ford et al. 2013; Fuchs et al., 2019; Johnson & Tweedie, 2010; NRP, 2000; Swartz et al., 2003; Vadasy & Sanders, 2012). We have seen how children who begin the literacy process earlier achieve better levels of reading and writing in early primary education, as demonstrated in the specific components examined in previous research (González & Delgado, 2007a,b).

The importance of structuring and systematising reading and writing and increasing exposure time to reading and writing should also be highlighted, as shown in other studies in other languages (Duncan et al., 2013; Ford et al., 2013; Johnson & Tweedie, 2010). Some of these studies have found that reading and writing experience favours achievement in written language especially when presented in a systematic and structured way.

Finally, we should highlight the importance of cognitive-linguistic variables to optimise the learning of reading and writing in very transparent languages such as Spanish, where there are very few grapheme-phoneme conversion rules, as well as in other less transparent languages such as English, where the correspondence between grapheme and phoneme is not as reciprocal (Babayigit & Stainthorp, 2011; Duncan et al., 2013; Jiménez et al. 2017; Schaadt et al., 2013; Vadasy & Sanders, 2008; Van Weerdenburg et al., 2009; White, 2011). The importance highlighted by some studies regarding the influence of factors such as phonological awareness or oral language, the alphabetic principle, vocabulary, fluidity, and comprehension in early literacy is also corroborated by applied research conducted through this study (González-Valenzuela et al., 2018; González-Valenzuela & Martín-Ruiz, 2020; Jiménez, 2019; Kelly et al., 2019; Lerner & Honigan, 2016; Sheahan, 2019; Teale et al., 2020). The reading and writing intervention carried out here is similar to programmes developed in other countries and other languages. There is a similarity with the SFA (Cheung & Slavin, 2016; Slavin, 1996) and CELL (Swartz et al., 2003) programmes in terms of phonological awareness and instruction, instruction in auditory discrimination with SFA, and instruction in grapheme-phoneme conversion, comprehension, and

spelling with CELL. Studies that implement the five components indicated by the National Reading Panel (NRP, 2000), which have also been used in this study, yield similar results for better reading and writing among pupils who have received instruction in these components (González-Valenzuela, 2017; González-Valenzuela & Martín-Ruiz, 2017, 2020; González-Valenzuela et al., 2018; Jiménez, 2019; Shaywitz & Shaywitz, 2020; Teale et al., 2020; Vesay & Gischlar, 2013; Walpole et al., 2010; Wasik, 2010).

In short, early intervention in written language through the systematic and structured promotion of reading and writing and cognitive-language skills proves to be effective in optimising the literacy process of schoolchildren, and it is difficult to estimate which of these issues are most or least relevant. It would have been interesting to compare the results obtained with a group of children who have not had any contact with the teaching of written language at these ages (four-six years old). However, this has not been possible because of the education legislation in place in Spain.

Finally, in future studies, it would be useful to analyse the benefits found with early intervention in longer-term reading and writing achievement in the same groups of pupils, in order to see whether these are maintained over time or whether the groups even out in terms of their level of reading and writing. In future research, the aim is to assess all subjects at the start of the second cycle of Primary Education (eight years of age), in order to find out whether there are still differences between them in terms of reading and writing achievement. Furthermore, it may also be important to analyse the effectiveness of the benefits found with this type of early intervention to analyse differences in outcomes found in normative groups with respect to groups at risk of learning disabilities, in line with the results found in other studies (Fletcher et al., 2019; Galuschka et al., 2020; González-Valenzuela & Martín-Ruiz, 2017; González-Valenzuela et al., 2018; Kelly et al., 2019; Lerner & Honigan, 2016; Sheahan, 2019).

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