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## Effects of an Intervention Programme on the Phonological Awareness of Spanish Children at Risk of Developing

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**Abstract:** The majority of research on the relationship between phonological awareness and written language focuses on demonstrating the influence of the former on the latter. However, the aim of this study is to analyse the effects of an Early Years written language programme on phonological awareness. The sample comprises 56 Spanish children aged 5-7 who are at risk of developing learning disabilities. A mixed design was used, with four assessments and three intervention stages, two study variables (syllable and phoneme awareness) and two groups (instructed and uninstructed). The results show that instructed groups achieved better scores for phonological awareness in all the assessments. The findings corroborate the short and medium-term efficacy of systemic and structured intervention in reading and writing with regard to the acquisition of phonological awareness among young Spanish children at risk of developing learning disabilities.

**Keywords:** *Syllable awareness, phoneme awareness, reading, writing.*

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### Introduction

The research conducted over the last three or so decades with regard to the study of language awareness has defined metalinguistic awareness as the capacity to reflect on the structural features of spoken language and learn to manipulate them (Tunmer et al., 1988). Metalinguistic awareness refers to an awareness of the different linguistic units that make up a language. Hence, phonological awareness, or phonological knowledge, pertains to conscious representations of the phonological properties or constituent elements of speech, and has been defined as the capacity to become aware of the structure of language sounds (Wagner & Torgesen, 1994). In other words, it is the ability to recognise that a spoken word comprises a sequence of individual sounds and to become linguistically aware of the properties of speech.

Different levels of phonological awareness are defined, depending on the different linguistic units considered. Most research in this regard draws a distinction between syllable awareness, phoneme and/or phonetic awareness (segmental awareness) and intrasyllable awareness (Morais et al., 1987; Tunmer et al., 1988). The first is based on the syllable to operate with spoken words, constituting the basis for the perception and production of speech, and favours conscious segmentation particularly within more transparent orthographical systems. The next two are based on acoustic and articulatory traits of linguistic units, and on representations of phonological units in the mental lexicon, respectively. And the last one is based on onset-rhyme, intermediate units between the syllable and the phoneme. These levels of phonological knowledge entail different degrees of difficulty for children, leading to different modes of acquisition, depending on the linguistic units considered, the characteristics of the language, the position they occupy in the words, and reading and/or writing experience. Hence, syllable knowledge is easier than onset-rhythm, which in turn is easier than phoneme knowledge in alphabetical languages. Onset-rhythm and phoneme knowledge are easier in more transparent languages (Spanish, Italian) than in more opaque ones (English, German). The end units of words are easier to identify for pre-school children, and the initial units of words are easier to identify for children who have already learned to read and write (Goikotxea, 2005; Mann & Winner, 2002; Share, 2008; Share & Blum, 2005; Tolchinsky et al., 2012).

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Regarding the relationship between phonological awareness and the acquisition of reading and writing, different hypotheses have been developed in recent decades (Morais et al., 1987). One of the most widely analysed hypotheses regarding normative and non-normative children argues that phonological awareness leads to reading and writing success, considering this a strong predictor in languages of different consistency (Aguilar-Villagran et al., 2010; Caravolas et al., 2013; Georgiou et al., 2008; Gonzalez-Valenzuela et al., 2016; Landerl et al., 2012; Li et al., 2012; Silven et al., 2007; Suarez-Coalla et al., 2013; Tolchinsky et al., 2012; Vaessen & Blomert, 2013; Van Otterloo & Van, 2009; Xue et al., 2013). Some authors show that this predictive relationship depends on the characteristics of the language, the frequency of words, syllables and morphemes, and the levels of phonological knowledge considered. Hence, for some authors, in alphabetical languages, onset-rhyme intra-syllabic segmentation is not a good predictor of reading and/or writing, whereas syllabic and phonemic segmentation are (Defior et al., 2002; Gonzalez-Valenzuela et al., 2016; Muter & Snowling, 1998; Nation & Hulme, 1997). Along these lines, it has been found that when a group of normative children and/or children with dyslexia are given specific instruction to develop their phonological segmentation skills, the results in reading and writing improve significantly. Accordingly, they argue that phonological awareness favours the acquisition of these skills in languages of different consistency (Gonzalez et al., 2011, 2012; Lorusso et al., 2011; Lundberg et al., 1988; Muter & Snowling, 1998; Sofie & Riccio, 2002; Van Otterloo & Van, 2009; Welsch, 2007).

Another hypothesis that relates phonological knowledge with reading and writing posits the influence of reading and writing on the acquisition of phonological awareness. From this perspective, the acquisition of phonological awareness largely depends on reading and writing experience; in other words, phonological abilities would improve as a consequence of alphabetical instruction (Burgess & Lonigan, 1998; Foulon, 2005; Mann & Wimmer, 2002). Along these lines, some studies maintain that reading instruction among normative child speakers of different languages favours phonemic segmentation, even more than syllable segmentation (Seymour & Evans, 1994). However, other studies indicate that the influence of reading and writing on phonological knowledge also depends on the linguistic characteristics and units considered. Hence, segmental awareness does not develop before a child learns the alphabetical code, as shown by tasks performed that test for omission, counting, and reversal, and it also depends on the level of the linguistic units represented in the orthography of each language (Hulme et al., 2002). In this respect, Spanish children who have already started learning to read and write find phoneme knowledge tasks easier than pre-reading children, whereas the latter find tasks involving syllabic and intra-syllabic knowledge easier (Tolchinsky & Teberosky, 1998). Children without difficulties can learn certain components of phonological awareness such as rhyme, alliteration, syllabic and intra-syllabic awareness before they are taught to read and write. However, they fully acquire other skills such as phoneme awareness once they have already learned the written code (Perez & Gonzalez, 2004; Wimmer et al., 1991). Therefore, experience in reading and writing would also favour the acquisition of certain levels of phonological awareness, and some more than others, according to the characteristics of the language and the linguistic units considered (Tolchinsky & Teberosky, 1998). It should be noted that, although there are studies in Spanish and in other less consistent languages that demonstrate the influence of reading and writing on the acquisition of phonological awareness, they have largely been conducted with normative children, and less frequently with children who display learning disabilities, in comparison with the studies carried out in relation to the previous hypothesis.

## Methodology

### *Research Goal*

Given the controversy surrounding the relationship between written language and phonological awareness, and the fact that far fewer studies analyse the influence of reading and writing on phonological awareness among non-normative children, the aim of this study, in line with previous research conducted by the authors, is to analyse the effects of the systematic and structured application of a reading and writing intervention programme on the syllable and phoneme awareness of young Spanish children who display a risk of developing learning disabilities, over the course of three school years. The initial expectation is that the scores achieved for syllable awareness (SA) and phoneme awareness (PA) among children who take part in the intervention programme between the ages of five (Reception/Pre-Kindergarten) and seven (Year 2/1<sup>st</sup> Grade) will be higher than those of the group that do not take part in the programme, which runs over the course of three school years. The results could shed further light on the relationship between phonological awareness and written language.

### *Sample and Data Collection*

The sample is made up of two groups of pupils who are at risk of developing learning disabilities, enrolled at five of the 12 schools operating in an intermediate sociocultural area in terms of illiteracy levels (30% of the population is below the illiteracy average; Gonzalez et al., 2011, 2012). The schools were chosen by means of random stratified sampling based on the census of all state-run schools published by Andalusia's Regional Department of Education (2013). Three of the schools were included in the instructed group (IG) and two were included in the Uninstructed Group (UG). The instructed group was made up of pupils enrolled at schools that had agreed to take part in the intervention programme. The uninstructed group (UG) was made up of children enrolled at schools in the same area that did not receive an invitation to take part in the programme, and which followed the official curriculum (Chaves Gonzalez & Pascual Acosta,

1992a, 1992b).

To make up the participating groups, initially, based on a full assessment certified by the school psychologist, native Spanish-speakers were chosen from the participating schools who did not present any physical, mental, or sensory deficits, and who had a normal intellectual level, estimated according to the Weschler Intelligence Test for Children WISC-III (Weschler, 1998). The results of the TERA Academic Performance Assessment (Rivas et al., 2010) used by teachers to evaluate academic performance were also taken into account, along with the results obtained in the Reading and Writing Performance Assessment (Gonzalez et al., 2011) and the Navarra Oral Language Assessment (Aguinaga et al., 1989), for the evaluation of reading/writing performance, and oral language, respectively. These tests were administered individually by the authors. Of all the subjects selected, only pupils who scored below the 20<sup>th</sup> percentile in these tests were considered. The 20<sup>th</sup> percentile was chosen because it is one of the criteria used in different studies to diagnose these pupils (Fletcher et al., 2004; Gonzalez et al., 2011, 2012; Welsch, 2007). The children selected are characterised as being at risk of developing learning disabilities, since they are early years and primary education pupils and have not yet firmly established their instrumental learning, although they did show signs of potentially developing such disabilities, in accordance with the criteria signalled earlier.

The total sample of pupils deemed to be at risk of developing learning disabilities, therefore, encompassed a total of 56 children, distributed between the IG and UG. They came from an intermediate sociocultural background, were native speakers of Spanish, presented no physical, mental or sensory deficits, and displayed a normal intellectual level, although they all presented a low level of academic performance, reading/writing, and oral language. The IG was made up of 14 boys and 17 girls at risk of developing learning disabilities, enrolled at school in Reception/Pre-Kindergarten, aged five ( $M = 5.30$  and  $SD = 0.50$ ) up to Year 2/1<sup>st</sup> Grade, aged seven ( $M = 7.30$  and  $SD = 0.50$ ). The UG was made up of 14 boys and 11 girls at risk of developing learning disabilities, enrolled at school in Reception/Pre-Kindergarten, aged five ( $M = 5.60$  and  $SD = 0.50$ ) up to Year 2/1<sup>st</sup> Grade, aged seven ( $M = 7.60$  and  $SD = 0.50$ ). The sample was the same one used by the authors in other studies conducted for other purposes (Gonzalez et al., 2011, 2012).

### Instruments

To evaluate the variables studied – syllable awareness and phoneme awareness – the PSEFA-R was used, comprising 65 items with dichotomic response options, distributed between two subscales that measure syllable awareness and phoneme awareness, with 6 (35 items) and 5 (30 items) tests, respectively (Gonzalez, 2001).

The sub-tests used to assess syllable awareness evaluated the children's capacity to manipulate and operate orally with the syllables contained in words, and they were as follows: *identification of syllables* (identify in pairs of words a certain syllable that might be at the beginning, in the middle or at the end of the word); *syllable counting* (counting the number of syllables in each word, which might be two or three, with direct or blended syllables); *adding syllables* (finding out which syllable is missing from a two or three-syllable words in order to form another word. This syllable might be at the beginning, in the middle or at the end of the word), *omission of syllables* (finding out which syllable must be removed from a two or three-syllable word to form another word. This syllable could be at the end or in the middle of a word); *substitution of syllables* (changing a syllable located in different positions of two or three-syllable words in order to form another word); and, *rhyming* (identifying drawings of words with the same ending). The number of items included in each of these tests is 8, 6, 6, 6, 4, and 6, respectively.

The sub-tests used to assess phoneme awareness evaluate the children's capacity to manipulate and operate orally with the phonemes of words, and they are as follows: *identification of phonemes* (identifying in pairs of words a certain phoneme that can be found in different positions within the word); *counting phonemes* (counting the number of phonemes contained within two and three syllable words); *adding phonemes* (finding out which phoneme is missing from a two or three-syllable word in order to form a different word); *omitting phonemes* (finding out which phoneme needs to be removed from two or three-syllable words in order to form a different word); and, *substituting phonemes* (changing phonemes in different positions of two and three-syllable words in order to form a different word). The number of items that make up each of these tests is 8, 6, 6, 6, and 4, respectively.

The PSEFA-R test displays a one-dimensional structure and a saturation index greater than 0.35, with explained variability of 48.25% and a sampling adequacy index of 0.88. The homogeneity indices of all the items is greater than 0.43 and internal consistency is 0.94 (Gonzalez, 2001).

### Procedure

A mixed design was used (between-groups, within-groups) with repeat measures (four measurements) and three intervention stages (three periods), two study variables (syllable awareness and phoneme awareness) and two groups of students (Instructed Groups, IG, and Uninstructed Groups, UG).

Having requested express parental permission and obtained signed informed consent forms, as well as permission from the University's Ethics Committee, the assessments were carried out individually with each child. During these

assessments, the authors did not know which group each child had been assigned to. The first assessment (pre-test) was conducted in September, when the children were starting in Reception/Pre-Kindergarten. The other three assessments (post-tests) were conducted in June, following the application of the reading and writing intervention programmes over the course of three school years. The intervention programmes ran from October to May over three school years, when the children were in Reception/Pre-Kindergarten, Year 1/Kindergarten, and Year 2/1<sup>st</sup> Grade), respectively.

The UG received the standard syllabus for reading and writing, in accordance with the official curriculum for the areas of Communication and Language, and Spanish Language, set by Andalusia's Regional Department of Education and Culture (Chaves Gonzalez & Pascual Acosta, 1992a, 1992b), for the different school years. In Reception or Pre-Kindergarten (five years of age), reading and writing were approached through reading and writing recognition tasks of just a few high frequency words (Chaves Gonzalez & Pascual Acosta, 1992a, 1992b). In Primary Education (six and seven years of age), written language was taught through the reading of school texts and by writing short texts (Chaves Gonzalez & Pascual Acosta, 1992a, 1992b). The amount of time spent every day on reading and writing tasks was variable and not systematic over each of the school years. Teachers who taught these contents in their regular classrooms did not receive any type of information or prior preparation about the teaching of reading or writing.

The IG received specific instruction about reading and writing through an intervention programme tailored to the different school years. In Reception/Pre-Kindergarten (five years of age) and in Primary Education (6 and 7), the contents of the intervention programme were sequenced in all the school years in accordance with developmental criteria, from lesser to greater cognitive complexity, and they were taught in conjunction by means of an interrelated approach (Gonzalez et al., 2011, 2012). In Reception/Pre-Kindergarten, reading and writing skills were developed through reading/writing recognition tasks, reading comprehension, and written composition. Reading/writing recognition was developed through activities designed to work on phoneme articulation, discrimination and knowledge of all graphemes and phonemes in the alphabet, reading, copying and dictation of letters, words, and text. Reading comprehension and written composition were developed through activities involving identifying and organising ideas, categorising contents, identifying and distinguishing the value of words in different types of sentences, composing messages and short texts, and metacognition of their own reading comprehension and written composition. The intervention programme was applied by teachers in their regular classrooms by means of a systematic and structured approach. Approximately twenty weeks were allocated to the programme over each school year. The teachers worked with the programme on a daily basis, dedicating two and a half hours to it every day. The authors provided the teachers with training in how to apply and develop the programme. This training was delivered before and during the programme. Before the programme was initiated, the teachers attended seminars and workshops at which the authors explained and reviewed the instruction procedures, through role-playing and feedback given to the teachers. During the application of the programme itself, weekly monitoring sessions were held, through direct observation in the classrooms and individual or group interviews with them, in order to analyse their experiences, tackle any difficulties they had encountered, and comment on and evaluate the achievements made. This procedure was used to control the validity and reliability of the teachers' interventions.

#### *Analyzing of Data*

Given the objective of this study and the characteristics of the research design, one-way repeated measures analysis of variance was carried out in order to analyse inter-subject and intra-subject differences regarding the variables studied, having first verified the parametric assumptions of sphericity and homoscedasticity of the variances using the Mauchly and Levene tests, respectively. Subsequently, intra-group and inter-group mean comparisons were conducted using Student's *t* test and univariate analysis of variance, respectively. Data analysis was performed using the statistical programme SPSS 20.

### **Results**

#### *Results obtained for syllable awareness*

First, the parametric assumptions (sphericity and homoscedasticity of variances) have been tested using different statistics. Sphericity was analysed using the Mauchly test, rejecting this assumption ( $\chi^2 = 13.005$  and  $p < 0.05$ ) and correcting it with the Huynh-Feldt Epsilon ( $\epsilon = 0.896$ ). The homogeneity of variances between groups has also been tested, using the Levene statistic, checking compliance ( $F 1, 36 = 7.232$  and  $p = 0.011$ ;  $F 1, 36 = 0.129$  and  $p = 0.721$ ;  $F 1, 36 = 2.592$  and  $p = 0.116$ ; and  $F 1.36 = 7.964$  and  $p = 0.008$ , for each evaluation, respectively).

The mean scores obtained for syllable awareness improved progressively at the second, third, and fourth assessments compared to the initial (pre-test) assessment, in the IG ( $ME = 7.84$  and  $SD = 4.14$ ;  $ME = 15.23$  and  $SD = 5.39$ ;  $ME = 23.61$  and  $SD = 6.82$ ;  $ME = 26.94$  and  $SD = 7.73$ ; respectively) and in the UG ( $ME = 6.00$  and  $SD = 1.53$ ;  $ME = 6.14$  and  $SD = 4.67$ ;  $ME = 7.43$  and  $SD = 5.25$ ;  $ME = 9.14$  and  $SD = 4.84$ ; respectively). However, the scores obtained by children in the IG were higher than those in the UG in all the assessments (Figure 1).

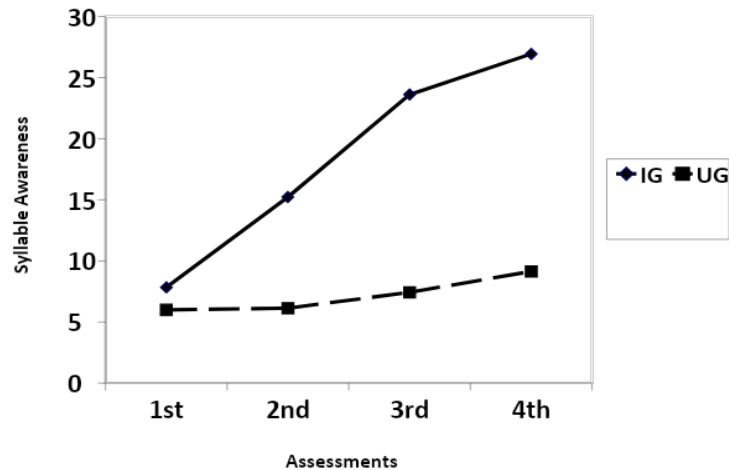


Figure 1. Average scores for syllable awareness per assessment, in each group

To analyse whether these differences are significant, a repeated measures analysis of variance was applied. With regard to the inter-subject factor, the results indicate the existence of significant differences between the groups, with  $F(1, 54) = 41.44$  and  $p = .00$ , with high statistical power ( $\beta = 1$ ) and a medium effect size ( $\eta^2 = .53$ ). Table 2 sets out the comparisons between the mean values of the groups. The results indicate that the differences found between the IG and the UG in the first assessment are not statistically significant. However, the differences found between the groups are statistically significant in the second, third and fourth assessments, with the IG obtaining higher scores. Furthermore, the differences found between the groups increase over the years as the programme is applied.

With regard to the intra-subject factor, the results indicate significant differences between the four assessments ( $F[2.13, 76.70] = 24.07$  and  $p = .00$ ), with high statistical power ( $\beta = 1$ ) and a medium effect size ( $\eta^2 = .40$ ). Table 3 shows the significant differences between the IG in all the assessments, except for the third and fourth assessments. In the UG, on the other hand, no significant differences were found between any of the assessments.

Finally, regarding the results obtained for the 'assessment-group' interaction factor, significant differences ( $F [2.13, 76.70] = 13.06$  and  $p = .00$ ) were observed between the groups in the different assessments. This results offered high statistical power ( $\beta = 1$ ) and a small effect size ( $\eta^2 = .26$ ).

Table 1. Differences in syllable and phoneme awareness between groups at each assessment

Assessment	M IG	M UG	M (IG- UG)	F	p
<b>SA</b>					
1	7.84	6.00	1.84	1.15	.25
2	15.23	6.14	9.08	4.11	.00
3	23.61	7.43	16.18	5.87	.00
4	26.94	9.14	17.79	5.80	.00
<b>PA</b>					
1	1.77	1.29	0.49	0.84	.40
2	6.10	1.00	5.10	3.19	.00
3	17.35	3.14	14.21	4.41	.00
4	21.19	4.43	16.76	4.81	.00

Note: IG=Instructed Group, UG= Uninstructed Group

#### Results obtained for phoneme awareness

First, the parametric assumptions (sphericity and homocedasticity of the variances) have been tested using different statistics. Sphericity was analysed using the Mauchly test, rejecting this assumption ( $\chi^2 = 34,384$  and  $p < 0.001$ ) and correcting it with the Huynh-Feldt Epsilon ( $\epsilon = 0.759$ ). The homogeneity of variances between groups has also been tested, using the Levene statistic, checking compliance ( $F 1, 36 = 2,331$  and  $p = 0.136$ ;  $F 1, 36 = 3,433$  and  $p = 0.072$ ;  $F 1, 36 = 10,776$  and  $p = 0.002$ ; and  $F 1, 36 = 14.239$  and  $p = 0.001$ , for each evaluation, respectively).

As shown in Figure 2, the mean scores obtained in PA show an increase at the second, third and fourth assessments compared to the initial (pre-test) assessment, in the IG ( $ME = 1.77$  and  $SD = 1.45$ ;  $ME = 6.10$  and  $SD = 4.12$ ;  $ME = 17.35$  and  $SD = 8.30$ ;  $ME = 21.19$  and  $SD = 9.04$ ; respectively) and the UG ( $ME = 1.29$  and  $SD = 0.95$ ;  $ME = 1.00$  and  $SD = 1.53$ ;  $ME =$

3.14 and  $SD = 3.24$ ;  $ME = 4.43$  and  $SD = 2.44$ ; respectively). However, the IG achieved higher scores than the UG in all the assessments.

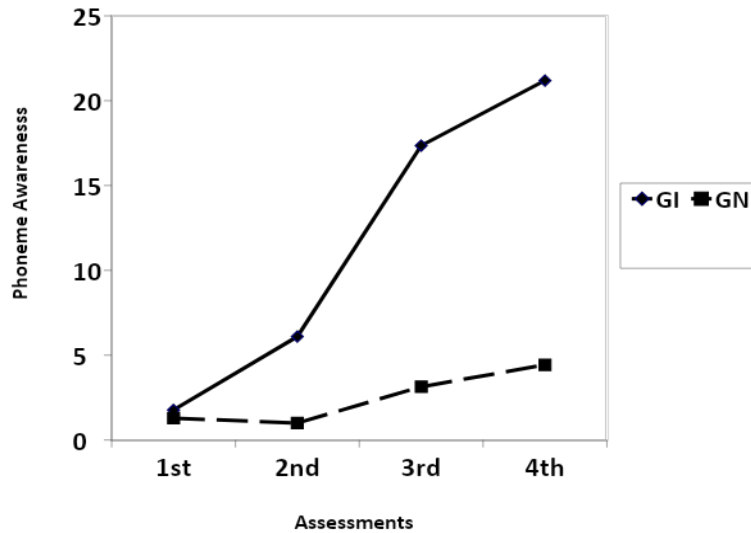


Figure 2. Average scores for phoneme awareness per assessment, in each group

To analyse whether these differences are significant, repeated measures analysis of variance was carried out. The results for the inter-subject factor indicate the existence of significant differences between the groups, with  $F(1, 54) = 27.43$  and  $p = .00$ , high statistical power ( $\beta = 0.99$ ) and a medium size effect ( $\eta^2 = .43$ ). Table 2 shows the comparisons between the mean values for the two groups. The results indicate that the differences found between the IG and the UG in the first assessment are not statistically significant. In contrast, the differences observed between the groups in the second, third, and fourth assessments are statistically significant, with the IG achieving higher scores. Furthermore, the differences found between the groups become greater over the years during which the programme is applied.

The results for the intra-subject factor show significant differences between the four assessments ( $F[2.23, 80.42] = 26.16$  and  $p = .00$ ), with high statistical power ( $\beta = 1$ ) and a medium effect size ( $\eta^2 = .42$ ). Table 3 shows that the IG displayed significant differences between all the assessments. In contrast, the results achieved by the children in the UG were not statistically significant in any of the assessments.

Finally, the results obtained for the ‘assessment-group’ interaction factor revealed significant differences ( $F[2.23, 80.42] = 13.29$  and  $p = .00$ ) between the groups in the different assessments. These findings offered high statistical power ( $\beta = 0.99$ ) and a small effect size ( $\eta^2 = .27$ ).

Table 2. Comparisons between assessments in each group for syllable and phoneme awareness

Group	Assessment (I)	Assessment (J)	M (I-J)	t	p
<b>SA</b>					
Instructed	1	2	-7.39	-7.86	.00
		3	-15.77	-11.89	.00
		4	-19.10	-11.83	.00
	2	3	-8.39	-7.57	.00
		4	-11.71	-8.19	.00
3	4	-3.32	-2.51	.02	
Uninstructed	1	2	-0.14	-0.09	.93
		3	-1.43	-0.82	.44
	2	4	-3.14	-2.18	.72
		3	-1.29	-0.96	.37
		4	-3.00	-2.07	.08
3	4	-1.71	-1.21	.27	



have been instructed with regard to phonological knowledge and discrimination of other higher language units (syllables and words). In alphabetical languages such as Spanish, letter names foster an awareness that words are made up of phonemes, and this promotes and improves reading and writing recognition of words.

### Conclusion

These results also contribute in some measure, together with previous findings about the predictive nature of phonological awareness in reading and writing, to the argument that the relationship between phonological awareness and written language (reading and writing) in alphabetical languages is in fact a two-way relationship, not only among normative children but also in pre-school age children (Burgess & Lonigan, 1998; Morais et al, 1987; Share, 2008; Wagner & Torgesen, 1994; Wimmer et al., 1991). The findings presented here also support the results of other authors who argue that phonological knowledge, and more specifically phoneme knowledge, could be classed as a reading sub-skill and not as a universal and emerging linguistic ability (Share, 2008).

### Limitations and Suggestions

The results obtained should be considered with caution due to the size of the sample and the fact that the gains in SA and PA between five and seven years in subjects at risk of learning disabilities do not ensure that they are maintained at later ages. It should be noted that the intention in future studies is to ascertain whether the effects of the intervention programme delivered to children with learning disabilities are maintained in the long term, and if these effects lead to an improvement in their disabilities, in older ages.

On the other hand, despite the contributions of the results obtained, it cannot be assured that the improvement in SA and PA can also be achieved with the consideration of other variables to which it is related and which have not been evaluated or treated in this study. So in future studies, it would also be useful to analyse whether improvement in phonological awareness is favoured by other factors, such as oral language or auditory memory in children with these characteristics at these ages, just as numerous studies have shown its importance in the improvement of reading and writing. These analyses could highlight the importance of the objective of this study and would help to clarify the relationships between variables in order to shed further light on these difficulties with a view to preventing and ameliorating them

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