

Longitudinal study on learning to read in early ages¹

Estudio longitudinal sobre el aprendizaje lector en las primeras edades

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Raúl Gutiérrez-Fresneda
Antonio Díez Mediavilla

Universidad de Alicante

Elena Jiménez-Pérez

Universidad de Málaga

Abstract

Learning to read begins in the early ages and is an essential tool for school success. Oral language, phonological processing skills, naming speed and alphabetic knowledge are now considered important precursors of learning to read in early ages, since they have a high correlation with the decoding processes and the strategies of understanding in the initial learning of written language, however, it has not been established when its development commences. The purpose of this study was to analyse the moment in which different reading precursor abilities present greater incidence in learning to read in early ages in order to clarify the best period to start teaching. A longitudinal quasi-experimental study was carried out on 432 children from 5 to 7 years of age. Data analysis was performed using a mixed ANOVA of repeated measures, which included three factors: assessment (6 measures), group and sex. The results show an improvement in the participants in all variables analysed from the first year of intervention that is maintained during the following two years. The effects of the program support the development of teaching models that integrate these variables for the improvement of learning to read, reason why it is suggested it is included in the curricular objectives in early ages.

Keywords: spoken language, reading, written language, reading aloud, functional reading.

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Resumen

El aprendizaje de la lectura se inicia en las primeras edades y constituye una herramienta imprescindible para el éxito escolar. El lenguaje oral, las habilidades de procesamiento fonológico, la velocidad de denominación y el conocimiento alfabético son considerados en la actualidad precursores importantes del aprendizaje de la lectura en las primeras edades ya que presentan una alta correlación con los procesos de decodificación y con las estrategias de comprensión en el aprendizaje inicial del lenguaje escrito, sin embargo, no se ha establecido cuando se ha iniciado su desarrollo. El propósito de este estudio fue analizar el momento en el que distintas habilidades precursoras de la lectura presentan mayor incidencia en el aprendizaje lector en las primeras edades con la finalidad de clarificar el periodo más idóneo para iniciar su enseñanza. Se llevó a cabo un estudio cuasiexperimental de corte longitudinal donde se observa la evolución de 432 niños desde los 5 hasta los 7 años de edad. El análisis de datos se efectuó mediante un ANOVA mixto de medidas repetidas en el que se incluyeron tres factores: evaluación (6 medidas), grupo y sexo. Los resultados muestran una mejora de los participantes en todas las variables analizadas desde el primer año de intervención que se mantiene durante los dos años siguientes. Los efectos del programa apoyan el desarrollo de modelos de enseñanza que integren estas variables para la mejora del aprendizaje de la lectura, por lo que se sugiere su inclusión en los objetivos curriculares de las primeras edades.

Palabras clave: lenguaje hablado, lectura, lenguaje escrito, lectura en voz alta, lectura funcional.

Introduction

Throughout the last years, many studies have been carried out in order to identify the skills that most favour the acquisition of reading, however, there is currently no agreement on when the best period for beginning to teach this linguistic ability starts, (Sellés, Martínez and Vidal-Abarca, 2012) when it constitutes one of the most frequent issues between educators and children's parents.

Traditionally two opposing ideological currents have been proposed regarding the most appropriate moment for beginning to read. On the one hand, we find the authors who consider it necessary for the students to acquire the necessary maturity to start their learning since it requires the joint work of the retina and the brain for the capture of the images and the subsequent processing of the meaning of the words (Mialaret,

1979; Inizan, 1981), while on the other hand, there are researchers who defend earlier teaching by stimulating the factors that favour learning to read (Gutiérrez and Díez, 2015, Bravo, 2016).

The studies carried out in recent years on the reading process has allowed the variables that are most involved in the acquisition of reading to be identified, finding that oral language, phonological knowledge, alphabetic knowledge and naming speed are among the most relevant in the process (González, López, Vilar and Rodríguez, 2013, Gutiérrez, 2016),) being of equal importance in the development of reading competence the fact that from the earliest ages students already use inferences and are able to construct a mental representation of verbal texts, regardless of the control of their decoding ability (Gutiérrez-Braojos, Rodríguez and Salmerón-Vílchez, 2014), so it is especially important to develop oral language from early ages.

The control of spoken language is determinant in the acquisition of written language since when children learn to speak they develop a semantic network that allows them to integrate ideas and thoughts into a social context of knowledge, as well as creating the basic structure for the establishment of the relationships with the written code (Dickinson, 2011, Bravo, 2016).

By means of the progressive development of the linguistic capacity one becomes aware of the units that configure the language through the control of the elements that compose it: phonological, morph syntactic, semantic and pragmatic, which are the ones that allow the individual to develop his / her communicative capacity and acquire the skills to gradually separate the sentence structure from its meaning. This shift in attention from the content to the form of oral language allows the individual to acquire the skills to understand the relationships between oral and written language (Defior and Serrano, 2011; Gutiérrez and Díez, 2015). These skills are known as phonological skills and are encompassed within a general term known as phonological awareness.

Studies that analyse the predictive relationship of phonological skills in reading acquisition in pre reading children have shown that students who have a good level of phonological awareness learn to read more easily than those who have lower levels (Defior, 2008; González, Cuetos, Vilar and Uceira, 2015). It has also been shown that a greater degree of phonological awareness benefits those students who present reading difficulties (Defior, 2008, Gutiérrez, 2016).

Together with phonological awareness another skill that is receiving increasing attention for its influence in acquiring reading is fast and automated denomination. It has been found that dyslexic children with reading difficulties are slower than their peers in this type of task (Wolf, 1991; Wolf and Bowers, 2000). It has also been acknowledged that children with low denomination speeds are more likely to develop reading difficulties (Kirby, Pfeiffer and Parrila, 2003).

Alphabetic knowledge has also been investigated as an important component of the early literacy process, showing that it is a highly relevant factor in learning to read (Diuk and Ferroni, 2012) and facilitates the development of phonological skills in establishing a causal relationship between the knowledge of the name of the letters and the learning of their sounds (De Jong and Van der Leij, 1999).

As can be seen, the studies carried out to date show that oral language, phonological awareness, naming speed and alphabetic knowledge are important variables in learning to read (González, López, Vilar and Rodríguez, 2013, González, Cuetos, Vilar and Uceira, 2015, Gutiérrez, 2016), so knowing the age at which their development is most beneficial is a contribution of great interest to professionals working in the educational field.

In this regard, the objective of the present study is to analyse whether stimulation from pre-school levels of those which have been considered the main precursors of learning to read: oral language, phonological awareness, naming speed and alphabetic knowledge improve acquisition of this linguistic ability and thus determine the most suitable period to commence teaching.

Method

Participants

The study involved 432 subjects who attended the third year of pre-school education. For the selection of the sample, eight state and semi private schools located in middle socio-cultural areas of the province of Alicante were randomly chosen, forming two groups: those who would voluntarily apply the intervention program (experimental group) and those who would not apply the program (control group). The assignment of the

different levels of treatment of the centres was performed randomly before evaluating the students, leaving two state schools and two semi private schools in the experimental group, as well as in the control group. In each study group, subjects who spoke Spanish were chosen who did not present physical, psychic or sensorial alterations and with a normal intellectual level. Regarding the distribution of participants, the experimental group consisted of 220 students ($M = 5$ years and 3 months, $DT = 4.37$), of whom 47.7% were boys and 52.3% were girls. On the other hand, the control group was formed by 212 students ($M = 5$ years and 4 months, $DT = 3.64$), 47.1% were boys and 52.9% were girls. All participants were enrolled in the school they attended from the beginning of the second cycle of pre school education. The contingency analysis (Pearson's chi-square) between condition and sex did not show statistically significant differences ($X^2 = 0.63$, $p > .05$).

Instruments

In order to evaluate the dependent variables under study, four evaluation instruments with psychometric guarantees of reliability and validity were used.

- *Navarre-revised oral test (PLON-R)* (Aguinaga, Armentia, Fraile, Olangua and Uriz, 2005). It is a standardized test that allows the evaluation the different components of the language: form (phonology, morphology and syntax), content (semantics) and use (pragmatic). The direct scores of each dimension are transformed into typical scores organized into three categories: 'retardation', 'needs improvement' and 'normal' for each age. The test also allows us to obtain a total score on language development. This test has a Cronbach coefficient of reliability of 0.80.
- *Test for the Evaluation of Phonological Knowledge (PECO)* (Ramos and Cuadrado, 2006). This test evaluates the levels of phonological knowledge (syllabic and phonemic), each of which is composed of three distinct tasks: identification, addition and omission. This test includes three subtests with syllables and phonemes (activities of identification, addition and omission), with a total of 30 items (15 syllables and 15 phonemes). The maximum score that can be

obtained is 30, one point for each correct answer and zero for each error. The reliability, measured through Cronbach's alpha coefficient, is .80.

- *Speed of naming. The Rapid Automatized Naming Test (RAN)* (Wolf and Denckla, 2003). The RAN test is an individual application test. The objective of the task is to name 200 stimuli as fast as possible, grouped into four subtests: digits, letters, colours and drawings. The RAN task records the time it takes to name the stimuli of each card and the number of errors made when naming them. With these two data an efficiency index is performed for each of the 4 types of subtests presented, according to the procedure used by Compton (2003), which converts the scores into digits per second, letters per second, colours per second and drawings per second. This test has a Cronbach coefficient of reliability of 0.80.
- *Assessment of the reading processes.* For the evaluation of reading, four subtest of the PROLEC-R test were used (Cuetos, Rodríguez, Ruano and Arribas, 2007). The tests of the name or sound of the letters, reading of words and reading of pseudo words were used that allow the evaluation of the lexical processes and the subtest of grammatical structures and understanding of sentences that evaluate the semantic processes. The total score in each of these five tests is obtained by assigning a point to each correct answer, in addition in the first two the time invested in each subtest is taken into account. This test has a Cronbach coefficient of reliability of 0.79.

Design and Procedure

According to the objectives of the study, the learning process of reading was compared in two groups of students from the beginning of the third level of pre school education (5 years of age) until the end of the second year of Primary Education, one receiving instruction on those considered to be the main precursors of reader learning and another that follows the curricular program established in the official regulations. Our hypothesis is that students participating in the intervention program will improve their level of reading to a greater extent than their peers. For this, a quasi-experimental and longitudinal design was established, with pre-test-post-tests (six measurements) and phases of intervention (three

periods) with an experimental group (to which the intervention program was applied) and a control group (which follows the official curriculum established in the curriculum of the second cycle of pre school education and Primary Education of the Valencian Community). For the analysis of the data the statistical program SPSS Statistics 20.0 was used. At first, descriptive statistics were obtained with the purpose of analysing the mean scores and standard deviations of the subjects in each of the measured variables. Subsequently, the main analyses of the study were carried out through a mixed ANOVA of repeated measurements $6 \times (2 \times 2)$. The factors that were included in the model were the period of each evaluation (pre-test-post-test: E1, E2, E3, E4, E5, E6), the group (experimental-control) and sex (boy-girl). The relevant F statistics were obtained according to the fulfilment of the sphericity assumption calculated through the Mauchly (1940) test. Likewise, Bonferroni post hoc tests were performed to determine the levels of variables that were significant. On the other hand, a unifactorial ANOVA of repeated measures was carried out to obtain intra-group data, both in the experimental group and in the control group, including, as a factor, the evaluations carried out (E1, E2, E3, E4, E5, E6). Finally, we estimated the size of the effect (index d) proposed by Cohen (1988) that allows quantifying the magnitude of the differences found between groups over time. Low effects ($.20 \leq d \leq .49$), moderate ($.50 \leq d \leq .79$) and high ($d \geq .80$) were established.

The procedure carried out was developed in different periods of evaluation and intervention. There were six evaluation phases, at the beginning and at the end of each school level (third year of pre school education, first and second years of Primary Education).

The evaluations were always carried out with the same tests and each subject was assessed individually blindly, during class time and in a classroom equipped for this purpose, these evaluations were carried out by education professionals (teachers specialized in hearing and language and psych pedagogues) previously trained by the person in charge of the study with several students who did not participate in the investigation, which facilitated the homogeneity in the data collection. The study respected the ethical values required in research with human beings (informed consent, right to information, protection of personal data, guarantees of confidentiality, non-discrimination, gratuity and having the possibility of abandoning the program in any of its phases).

Intervention program

In the intervention phase, the subjects of the control group were taught in the way which is established in the official curricular objectives elaborated by the Ministry of Education and Culture (Decree 38/2008 and 108/2014 of the second cycle of pre school education and Primary Education respectively) of the Valencian Community. The contents of pre school education focus on the approximation to written language along with the development of oral language and in Primary Education to the systematic development of reading through the control of the elemental linguistic units of our code through the development of lexical, semantic and morph syntactic. On the other hand, the subjects of the experimental group were assigned the intervention program designed, which consists of 60 sessions of 45 minutes for each of the courses, focused on the development of those that are currently considered the main precursors of learning to read: oral language, phonological knowledge, naming speed and alphabetic knowledge (González, López, Vilar and Rodríguez, 2013; González, Cuetos, Vilar and Uceira, 2015; Gutiérrez and Díez, which were carried out in a combined manner and together with the contents of the nine didactic units (with a duration of three weeks each) during which they were studied in each of the three levels of school, progressively in the degree of complexity and following the order established in Table 1. At the beginning of each new unit the previous contents were reviewed and new ones were added until the control of all those outlined in said table was acquired

For the development of oral language, activities aimed at the exercise of the different components of oral language were carried out: form, content and use. The phonological, morphological and syntactic component (form) was worked through onomatopoeic exercises, constructing sentences through a series of images, invention of story titles and joint creation of small narrative texts. Semantic development (content) aimed at enhancing the lexical scope was exercised through tasks of recognition of elements in pictures, photographs and drawings, elaboration of lists of objects by semantic fields, identification of intrusive words in sentences and searches of synonyms and antonyms. The communicative capacity (use) was developed through tasks of expression of opinions, ideas, feelings and personal experiences, explanation of daily events, communicative situations of role playing and group exhibitions around certain centres of interest.

Phonological awareness was worked on using different tasks of syllabic awareness and phonemic awareness through ludic proposals drawn from materials *Avanza* (Espejo, Gutiérrez, Llambés and Vallejo, 2008) and *Avanzados* (Espejo, Gutiérrez, Llambés and Vallejo, 2015) through activities of: identification, comparison, classification, substitution and omission of syllables and phonemes.

The speed of denomination was exercised through templates of different images: objects, numbers, colours and letters that were presented on the digital whiteboard to be evoked with agility by the students both individually, in a small group, and collectively.

Alphabetical knowledge focused on the teaching of the name of the letters through mixed methods of phonetic basis using different words of the students' environment, such as names of classmates, vocabulary of everyday environment, titles and characters of classic children's stories,... From the stories that were read together through the technique of dialogic reading (Gutiérrez, 2016) various activities were presented, which are detailed below.

All these contents were sequenced according to evolutionary criteria, from lowest to highest complexity (Table 1).

TABLE I. Contents of the intervention program

3º Educación Infantil	1º Educación Primaria	2º Educación Primaria
<ul style="list-style-type: none"> • Activities of attention and auditory discrimination through the repetition of corporal, musical and onomatopoeic sounds. • Orthopaedic motor exercises: breathing, lingual, labial and palatal praxis. • Discrimination and evocation of worked phonemes grouped by perceptual and auditory similarity. • Repetition of onomatopoeia and words with the phonemes worked. • Articulation of words with phonemes worked in different positions (initial, medial and final). • Playing "I spy". • Activities of evocation of opposites with simple words and sentences. • Formation of sentences with the words given. • Complete incomplete sentences. • Development of ocular agility through the quick search of non-linguistic elements. • Development of eye agility through the quick naming of everyday objects. • Development of eye agility through rapid colour naming. • Development of ocular agility through the rapid naming of numbers. • Identify rhymes. • Orally compose two-syllable words from direct and inverse syllables. • Orally recompile tri-syllable words from mixed syllables. • Isolate direct syllables in initial and final position in words. • Skip the final and initial syllable in different words. • Recompose monosyllable and bi-syllabic words from their phonemic components. • Isolate vowel sounds in initial and final position in words. • Omit vowel and consonant phonemes in final position in direct syllables. • Add consonant phonemes to form other words. • Replace one initial phoneme with another to create new words. • Sort images to build simple sentences. • Sort drawings to make a story. • Shared reading of children's stories. • Formulation of open questions from the joint reading of narrative stories. • Reading of words constructed from the manipulation of moving letters. • Reading sentences with iconic elements. 	<ul style="list-style-type: none"> • Denomination of words through drawings and images. • Articulation of logotomas of increasing difficulty. • Emission of pairs of words of auditory similarity. • Word-chaining games by syllables and phonemes. • Elaboration of words from a given syllable or phoneme. • Search for opposites of words and sentences. • Arranging words to form sentences. • Expand the number of words of titles and statements. • Concordance of words and sentences. • Description of sheets in an orderly manner. • Memorization and evocation of riddles and poetry. • Association for semantic fields. • Development of ocular agility through the rapid search of letters. • Quick description of school objects. • Fast naming of primary colours. • Development of ocular agility through the search and rapid naming of monosyllabic words. • Count syllables of polysyllables and monosyllables. • Comprising bi-syllabic and tri-syllable words from locked syllables. • Recompose multi-syllable words from direct and inverse syllables. • Isolate mixed syllables in the final and initial position of the words. • Isolate locked-up syllables in words. • Skip the final, initial and medial syllable in different words. • Isolate consonant sounds that occupy initial and final position. • Change one final phoneme by another giving rise to different words. • Replace initial phonemes to form new words. • Phoneme count in monosyllable, semi-syllable and tri-syllable words. • Sort images to build sentences and short stories. • Shared reading of stories and children's stories. • Reading of words elaborated from the manipulation of moving letters. • Reading sentences individually and collectively 	<ul style="list-style-type: none"> • Construct sentences from a series of given words. • Elaboration of answers to open questions. • Grammar association. • Invent titles to short narrative texts. • Summarize short stories and everyday events. • Reduce and expand the number of words from different given sentences. • Transform affirmative sentences into negative and interrogative sentences. • Rituals, riddles, poems and riddles. • Description of stories through ordered cartoons. • Inventing simple stories from illustrations. • Development of ocular agility through the rapid naming of numbers. • Development of ocular agility through the search and rapid naming of linguistic elements: direct syllables. • Development of ocular agility through the search and quick naming of linguistic elements: direct, inverse, and mixed syllables. • Development of eye agility through the search and rapid naming of words. • Add, omit and substitute phonemes in words to elaborate new ones. • Spell words in direct and inverse order. • Form numerous words from a series of given letters. • Search for synonyms and antonyms. • Identify absurdities in sentences. • Elaboration of new sentences from others built improperly. • Crossword puzzle resolution. • Transform affirmative sentences into interrogatives and negatives. • Reading of poetry, riddles and tongue twisters. • Expand short sentences. • Reduce paragraphs to simple sentences. • Invent titles in short narrative stories. • Create alternative endings for children's stories. • Shared reading of stories and children's stories. • Reading of small texts individually and collectively. • Response to literal and inferential questions about narrative stories

Results

Table 2 shows the descriptive statistics of the variables oral language, phonological awareness, naming speed and reading processes, including mean scores and standard deviations of the experimental group and the control group in the six evaluation periods. As can be seen, the same table includes the F statistics obtained from the mixed ANOVA of repeated measurements in the evaluation factor, group and the evaluation-group interaction. On the other hand, Table 3 shows the typical measures and deviations of each of the analysed variables, according to the sex of the participants. Likewise, the F-statistics of the factors sex, evaluation-sex, and group-sex are included in the table. The longitudinal study data obtained using the mixed ANOVA of repeated measures 6 X 2 X 2 and the intra-group ANOVA performed with each variable are set out below.

Oral language

The mixed ANOVA of repeated measures indicated a significant main effect of the evaluation factor ($F(1,63) = 48.32, p < .001$) as the participants improved the results over the three years of intervention. Within the experimental group, intra-group ANOVA indicates a main effect of the evaluation factor ($F(1,34) = 53.62, p < .001$). Post-hoc tests indicate significant differences from E1 to E2 ($p < .001$), from E3 to E4 ($p < .001$) and from E5 to E6 ($p < .01$). No significant differences were found from E2 to E3 ($p < .068$) and from E4 to E5 ($p < .078$). In the control group, there was also a main effect of the evaluation periods ($F(1,34) = 14.37, p < .001$), in this case post hoc tests indicated significant differences from E1 to E2 ($p < .01$), From E3 to E4 ($p < .001$) and from E5 to E6 ($p < .01$). The overall change in T1 to T6 scores was significant in the experimental group ($p < .001$) and in the control group ($p < .001$). We also found a main effect of the group factor ($F(1,63) = 12.54, p < .01$), which shows differences between the experimental and control groups over time, with the experimental group obtaining higher scores. In addition, significant interaction effects were found between the evaluation-group factors ($F(1,63) = 9.83, p < .01$), which, together with Bonferroni's post hoc test, indicate significant differences in favour of the experimental group in E2, E4 and E6. The magnitude of the differences between the groups from

E1 to E6 was moderate as indicated by the effect size estimator ($d = 0.64$). As for sex, there were no effects on this factor ($F(1,63) = 6.43, p = .062$). There was also no effect of group sex interaction ($F(1,63) = 5.58, p = .064$). The comparison * group * gender comparison was not significant ($F(1,63) = 4.23, p = .137$).

Phonological awareness

In this variable, the mixed ANOVA analysis showed the existence of main effects of the evaluation factor ($F(1,63) = 83.41, p < .001$). Intragroup analysis also indicates a major effect of this factor in the experimental group ($F(1,34) = 28.14, p < .001$), with significant differences from E1 to E2 ($p < .001$), from E3 to E4 ($p < .001$) and from E5 to E6 ($p < .001$). There were no differences from E2 to E3 ($p = .123$) nor from E4 to E5 ($p = 1.42$). In the control group there was also an evaluation effect ($F(1,34) = 6.37, p < .01$) with significant differences from E3 to E4 ($p < .01$) and from E5 to E6 ($p < .01$). The overall change from E1 to E6 was significant in both groups at a level $p < .001$. As for the group factor, the analysis indicates a main effect ($F(1,63) = 63.84, p < .001$). Participants in both groups improved their phonological awareness scores, although the subjects in the experimental group scored higher, as an interaction effect was obtained * group evaluation ($F(1,63) = 24.63, p < .001$). The post hoc tests evidenced the existence of significant differences in favour of the experimental group in E2, E4 and E6. The effect size when comparing the groups was moderate ($d = 0.68$). As for sex, there were no effects on this factor ($F(1,63) = 7.51, p = .052$). There was also no effect of group sex*interaction ($F(1,63) = 6.52, p = .061$). The comparison*group*sex ratio was not significant ($F(1,63) = 3.56, p = .241$).

Naming speed

The mixed ANOVA of repeated measures indicated a significant main effect of the evaluation factor ($F(1,63) = 35.24, p < .001$) indicating that the participants improved their results throughout the intervention. Within the experimental group, intra-group ANOVA indicates a main effect of the evaluation factor ($F(1,34) = 47.21, p < .001$). Post-hoc tests indicate

significant differences from E1 to E2 ($p < .001$), from E3 to E4 ($p < .001$) and from E5 to E6 ($p < .01$). No significant differences were found from E2 to E3 ($p < .052$) or from E4 to E5 ($p < .061$). In the control group, there was also a main effect of the evaluation periods ($F(1.34) = 15.41$, $p < .001$), in this case post hoc tests indicated significant differences from E1 to E2 ($p < .05$), From E3 to E4 ($p < .001$) and from E5 to E6 ($p < .01$). The overall change in T1 to T6 scores was significant in the experimental group ($p < .001$) and in the control group ($p < .001$). We also found a main effect of the group factor ($F(1.63) = 16.43$, $p < .01$), which shows differences between the experimental and control groups over time, with the experimental group obtaining higher scores. In addition, significant interaction effects were found between the evaluation-group factors ($F(1.63) = 12.84$, $p < .01$), which, together with Bonferroni's post hoc test, indicate significant differences in favour of the experimental group in E2, E4 and E6. The magnitude of the differences between the groups E1 to E6 was moderate as indicated by the effect size estimator ($d = 0.57$). As for sex, there were no effects on this factor ($F(1.63) = 14.21$, $p = .053$). There was also no effect of group sex * interaction ($F(1.63) = 11.14$, $p = .061$). The comparison * group * sex comparison was not significant ($F(1.63) = 3.53$, $p = .326$).

Reading processes

In this variable, the mixed ANOVA showed the existence of main effects in the evaluation factor ($F(1.63) = 63.78$, $p < .001$), which indicates that the participants improved their results during the three years of intervention. Within the experimental group, intra-group ANOVA indicates a main effect of the evaluation factor ($F(1.34) = 57.23$, $p < .001$). Post-hoc tests indicated significant differences from E1 to E2 ($p < .001$), from E3 to E4 ($p < .001$) and from E5 to E6 ($p < .001$). No significant differences were found from E2 to E3 ($p < .423$) and from E4 to E5 ($p < .146$). In the control group, there was also a main effect of the evaluation periods ($F(1.34) = 26.51$, $p < .001$), in this case post hoc tests indicated significant differences from E1 to E2 ($p < .05$), From E3 to E4 ($p < .01$) and from E5 to E6 ($p < .001$). The overall change in T1 to T6 scores was significant in the experimental group ($p < .001$) and in the control group ($p < .001$). We also found a main effect of the group factor ($F(1.63) = 68.42$, $p < .001$), which shows differences between the experimental and control groups over time, with the experimental group obtaining higher scores. In addition, significant interaction effects were found between the evaluation-group factors ($F(1.63) = 12.84$, $p < .01$), which, together with Bonferroni's post hoc test, indicate significant differences in favour of the experimental group in E2, E4 and E6. The magnitude of the differences between the groups E1 to E6 was moderate as indicated by the effect size estimator ($d = 0.57$). As for sex, there were no effects on this factor ($F(1.63) = 14.21$, $p = .053$). There was also no effect of group sex * interaction ($F(1.63) = 11.14$, $p = .061$). The comparison * group * sex comparison was not significant ($F(1.63) = 3.53$, $p = .326$).

.001), which showed differences between the experimental and control groups over time, with the experimental group obtaining higher scores. In addition, significant interaction effects were found between the evaluation factors * group ($F(1,63) = 47.52, p < .001$), which, together with Bonferroni's post hoc test, indicates significant differences in favour of the group Experimental in E2, E4 and E6. The magnitude of the differences between the groups from E1 to E6 was high according to the effect size estimator ($d = 0.83$). As for sex, there were no effects on this factor ($F(1,63) = 5.04, p = .072$). There was also no effect of group sex * interaction ($F(1,63) = 4.32, p = .053$). The comparison * group * gender comparison was not significant ($F(1,63) = 4.12, p = .421$).

TABLE 2. Descriptive statistics and mixed ANOVA of repeated measurements of comparisons evaluations and group

		Experimental		Control		Phase comparison F (1,63)		
		M	DT	M	DT	Evaluation	Group	Group* evaluation
Oral Language	E ₁	2.18	0.21	2.21	0.41			
	E ₂	2.65	0.34	2.37	0.26			
	E ₃	2.57	0.14	2.35	0.28	48.32***	12.54**	9.83**
	E ₄	2.84	0.26	2.61	0.52			
	E ₅	2.81	0.52	2.57	0.27			
	E ₆	2.94	0.34	2.72	0.36			
Phonological Awareness	E ₁	1.12	0.51	1.14	0.24			
	E ₂	1.56	0.35	1.20	0.41			
	E ₃	1.51	0.23	1.19	0.25	83.41***	63.84***	74.63***
	E ₄	1.86	0.42	1.35	0.46			
	E ₅	1.84	0.32	1.33	0.62			
	E ₆	1.97	0.16	1.49	0.58			
Denomination speed	E ₁	2.02	0.42	2.06	0.23			
	E ₂	2.31	0.67	2.14	0.57			
	E ₃	2.25	0.31	2.12	0.49	35.24***	16.43**	12.84**
	E ₄	2.56	0.49	2.43	0.32			
	E ₅	2.52	0.32	2.41	0.45			
	E ₆	2.78	0.45	2.57	0.37			
Reading processes	E ₁	1.10	0.52	1.14	0.32			
	E ₂	1.32	0.14	1.20	0.25			
	E ₃	1.28	0.35	1.16	0.57	63.78***	68.42***	47.52***
	E ₄	1.56	0.14	1.32	0.43			
	E ₅	1.55	0.21	1.30	0.35			
	E ₆	2.10	0.16	1.67	0.58			

Note. *p < .05. **p < .01. ***p < .001.

TABLE 3. Descriptive statistics based on sex and mixed ANOVA of repeated measures of comparisons assessments, group and sex.

		Experimental		Control		Phase comparison		
		Boy	Girl	Boy	Girl	Sex	Evaluation*sex	Group*sex
		<i>M</i> (<i>DT</i>)	<i>M</i> (<i>DT</i>)	<i>M</i> (<i>DT</i>)	<i>M</i> (<i>DT</i>)	<i>F</i> (1,63)	<i>F</i> (1,63)	<i>F</i> (1,63)
Language Oral	E ₁	2.15 (0.23)	2.20 (0.32)	2.19 (0.31)	2.23 (0.42)			
	E ₂	2.60 (0.37)	2.70 (0.52)	2.31 (0.62)	2.45 (0.31)			
	E ₃	2.51 (0.21)	2.63 (0.35)	2.48 (0.46)	2.57 (0.52)			
	E ₄	2.78 (0.41)	2.80 (0.39)	2.50 (0.52)	2.68 (0.23)	6.43	7.53	5.58
	E ₅	2.83 (0.31)	2.82 (0.43)	2.58 (0.63)	2.57 (0.51)			
	E ₆	2.95 (0.25)	2.93 (0.65)	2.71 (0.14)	2.73 (0.16)			
Phonological Awareness	E ₁	1.10 (0.43)	1.14 (0.25)	1.13 (0.24)	1.15 (0.32)			
	E ₂	1.52 (0.21)	1.64 (0.46)	1.19 (0.36)	1.26 (0.51)			
	E ₃	1.48 (0.12)	1.54 (0.21)	1.17 (0.24)	1.21 (0.45)			
	E ₄	1.78 (0.42)	1.92 (0.27)	1.31 (0.31)	1.37 (0.41)	7.51	5.32	6.52
	E ₅	1.82 (0.38)	1.88 (0.45)	1.40 (0.62)	1.30 (0.36)			
	E ₆	2.03 (0.14)	1.94 (0.23)	1.55 (0.52)	1.62 (0.47)			
Denomination speed	E ₁	2.04 (0.34)	2.06 (0.25)	2.05 (0.47)	2.07 (0.31)			
	E ₂	2.33 (0.31)	2.29 (0.25)	2.16 (0.31)	2.12 (0.56)			
	E ₃	2.28 (0.27)	2.24 (0.42)	2.10 (0.54)	2.14 (0.26)			
	E ₄	2.51 (0.26)	2.59 (0.19)	2.45 (0.33)	2.41 (0.47)			
	E ₅	2.56 (0.48)	2.49 (0.57)	2.39 (0.64)	2.43 (0.21)	14.21	9.84	11.14
	E ₆	2.77 (0.36)	2.79 (0.26)	2.56 (0.39)	2.58 (0.52)			
Reading processes	E ₁	1.08 (0.32)	1.12 (0.64)	2.03 (0.31)	2.09 (0.54)			
	E ₂	1.29 (0.27)	1.38 (0.25)	1.19 (0.64)	1.21 (0.51)			
	E ₃	1.25 (0.23)	1.33 (0.62)	1.12 (0.71)	1.19 (0.62)			
	E ₄	1.50 (0.41)	1.52 (0.39)	1.29 (0.62)	1.34 (0.42)	5.04	8.52	4.32
	E ₅	1.63 (0.31)	1.59 (0.47)	1.31 (0.14)	1.29 (0.34)			
	E ₆	2.08 (0.23)	2.12 (0.45)	1.73 (0.67)	1.72 (0.43)			

Note. *p < .05, **p < .01, ***p < .001.

Discussion

The aim of this study was to analyse whether stimulation from pre-school levels, of what have been considered the main precursors of learning to read: oral language, phonological awareness, naming speed and alphabetic knowledge, can improve the acquisition of this linguistic ability and in this way can establish an optimal period for its development. The results obtained indicate significant differences in the group-evaluation interaction in favour of the group that received the intervention, with a considered effect in each one of the analysed variables, which shows the positive impact of the program.

Throughout the different evaluations carried out, it is verified that both the students in the control group and the experimental group have improved their reading level, although, in all the measurements made, the group that received the intervention program has reached higher scores, in addition, these have been maintained throughout the different periods of evaluation, which means that through the current curriculum students learn to read. However, this improvement can be even greater if systematic programs are implemented focused on the development of pre-reading skills. This finding is consistent with the results found in other studies (González, López, Vilar and Rodríguez, 2013, Gutiérrez and Díez, 2015).

Analysing the different variables that are part of the intervention program, we verified that the experimental group has improved significantly with respect to control in the development of oral language, which indicates that the implementation of oral interaction dynamics that attend the different linguistic components (phonological, morphological, syntactic, semantic and pragmatic) contribute significantly to improving communicative ability and access to learning to read, which would confirm the influence of oral language development on initial literacy, as has been indicated in previous works (Sepúlveda and Teberosky, 2011, Núñez and Santamaría, 2014). With regard to gender, it is observed that up to the end of the first year the development of oral language is higher in girls, although the differences are not significant, from then on it becomes equal.

In relation to phonological knowledge, the data collected indicate that the experimental group improved to a greater extent than their counterparts who followed the curricular program in the ability to handle

and become aware of units of spoken language. The contributions made by phonological awareness to reading access are that it provides tools for the segmentation of oral language into linguistic subunits, favours early spelling, as well as word recognition, which makes it possible to perform grapheme-phoneme. These data coincide with previous studies (Defior and Serrano, 2011; Bravo, 2016) in which the benefits of phonological awareness skills in learning to read are revealed. As for gender, as was the case in oral language, girls show higher levels (without these differences being significant) to that reached by boys until the end of the first course, at which point they become equal, a situation that coincides with the data of other previous studies (Gutiérrez and Díez, 2016).

Regarding the speed of naming, the students who participated in the intervention program also achieved superior results in the ability to identify and evoke effectively different elements both linguistic and non-linguistic. These data are in line with the conclusions recently presented by López-Escribano, Sánchez-Hípola, Suro and Leal (2014), based on a review of studies on the relationship between denomination velocity and reading acquisition, in which it reveals that the rapid designation of stimuli is a powerful indicator both to predict the subsequent acquisition of reading from the earliest ages and to discriminate between typical readers and others with difficulties.

As far as the contributions that phonological awareness and speed of denomination effect the process of acquisition of reading, apparently they are different, so whereas phonological processing would have more relation to reading accuracy, speed of denomination would present more influence on reading fluency (Suárez-Coalla, García de Castro and Cuetos, 2013, González, Cuetos, Vilar and Uceira, 2015). Hence the importance of including both components together in the educational programs in early ages.

With regards to alphabetical knowledge and the learning of the different processes involved in reading, the data obtained indicate that the intervention program contributed to the improvement in reading of both words and pseudo words, which shows that the students participating in the program increase phonological and spelling processing. This achievement in acquiring grapheme-phoneme correspondence rules can be determined by the development of phonological awareness skills, as well as by a greater capacity to quickly and accurately visualize and retrieve phonological representation of words.

As far as comprehension skills are concerned, the experimental group also performs better than its counterparts by increasing comprehension in both sentences and grammatical structures. This fact may be due to the lexical richness acquired through the intervention program, since vocabulary is one of the elements that most influence reading comprehension in early ages, as has been confirmed in a large number of longitudinal studies (National Reading Panel, 2000).

It should be noted that the improvements between the group that has participated in the intervention program compared to the one that has followed the official curriculum have been especially greater during the last level of pre-school education, in practically all the studied variables, indicating that this period is the most relevant for the development of pre-reading skills. These contributions highlight the desirability of being in these pre-school ages when the development of reading precursors is explicitly initiated, which coincides with the findings of other authors (Gutiérrez, 2016, Gutiérrez and Díez, 2016).

In summary, this study contributes to the facilitation of the processes involved in the acquisition of reading, allowing the orientation of the design and implementation of educational activities that affect the skills that have been identified as relevant in such learning. One of the contributions of this study is that the reading acquisition process established in current curricula can be improved by incorporating pre-reading skills into school norms to be developed in a systematic and structured way from the stages of pre-school education.

A limitation of this study and that which would be interesting to deal with in future studies is the consideration of certain variables that may also influence learning to read, such as the reading ambience in the family environment, shared reading practices at home, executive skills, lexical enrichment, attention, or working memory, which can also offer interesting contributions to the process of reading acquisition. It would also be advisable to follow the evolution of the reading process of the students participating in the program in higher courses in order to check if the effects of the program are maintained over time.

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Contact address: Raúl Gutiérrez Fresneda. Facultad de Educación, Universidad de Alicante. Carretera de San Vicente del Raspeig, s/n, 03690. Alicante. **E-mail:** raul.gutierrez@ua.es