

## Phonological Awareness and Assessment of Associated Factors: Case Design

Yanire Suárez Pilo

<sup>1</sup>*Doctorate in psychology, Universidad de Extremadura, España.*

*\*Corresponding author: Yanire Suárez Pilo*

**ABSTRACT:** In the present study, an investigation is carried out on the skills of Phonological Awareness in three students enrolled in the of Primary Education stage, diagnosed with phonological dyslexia and / or with difficulties in reading due to deficit in phonological awareness. The main objective is to apply an intervention program to improve the phonological skills of the participants who come from different socio-family and school environments. A transversal design was used, with evaluation of the Phonological Consciousness. In addition, the socioeconomic, family and school environment of each of the participants will be evaluated. The intervention consists of a program to improve phonological knowledge that enhances the most disturbed aspects in children with alterations in phonological awareness. The measurement instruments used were the PECO and the PROLEC-R, applied before and after the intervention. Regarding the socio-family and school environment, semi-structured interviews were designed to qualitatively know relevant aspects of these. After data analysis, it is possible to affirm that the program has been effective, with a clear improvement in the reading performance of the simple participants. Regarding the analyzed environments, it is concluded that the socio-family environment is the one that most affects the reading performance of children.

**Keywords** - Cognitive process, dyslexia, family environment, intervention and reading.

### I. INTRODUCTION

It is important to study the Phonological Consciousness as it is one of the necessary processes for reading, and reading is a fundamental process not only for good academic performance but for the global development of the human being. Hence the importance of researching about reading and the underlying cognitive processes altered in it. If we refer to the data, reading problems have a prevalence of around 20% in the population, which, as the Madrid Association with Dyslexia says in 2014, one in five Spaniards has reading difficulties.

As already mentioned, Sánchez (1988), in agreement with numerous specialists, affirms that reading and writing are the most important skills that children must develop during the first years at schools. These skills are essential tools for learning, for acquiring new knowledge, as well as for building new thoughts. Viero (2003) highlights reading as a basic and indispensable instrumental activity for people to carry out learning through the written format.

Being the Phonological Consciousness the object of study, in its beginnings, the study of this course with 3 great controversies. The first of these refers to whether phonological consciousness is a metalinguistic ability without a specific biological system for its acquisition (it is therefore a skill learned by cultural influence) or if it is the same biological system that is responsible for learning speech. The second major controversy has been about causality, relationship or interaction between phonological consciousness and reading learning. There are numerous studies that have found cause, relationship, and interaction. Evidence indicates that there are several levels (Signorini, 1998). Numerous studies (Castles and Coltheart, 2004; Fowler, Brady and Shankweiler, 1991; Lonigan, Burgess, Anthony and Barker, 1998) have found that Phonological Consciousness predicts reading performance, therefore, that it is a necessary condition for correct reading learning. However, there are also other investigations that have shown the existence of a correlation between the two (Alegría, 2006; Brady and Shankweiler, 1991; Defior 1994), in addition, other research have found the existence of

interaction between phonological consciousness and reading learning (Wise, Pae, Wolfe, Sevcik, Morris, Lovett and Wolf, 2008; Ehri, Nunes, Willows, Schuster, Yaghouh Zadeh and Shanahan, 2001). Thus, it is from these findings that we begin to study the subtypes of Phonological Consciousness. For example, Defior (1996) distinguishes up to 15 different processes of phonological consciousness, ranging from recognizing which word is longer, to inverting syllables or inventing writing. Other research (Hoiem, Lundberg, Stanovich and Bjaalid, 1995) found 3 factors: a phoneme factor, a syllable factor and a rhythm factor; the one that had the greatest weight was the phoneme factor. Other authors (Carrillo, 1994) group two main components: sensitivity to phonological similarities (rhymes) and segmental consciousness. The first is prior to the learning of reading, the second is concomitant. There would thus be two forms of consciousness: holistic (the children have it before learning to read) and analytical (they acquire it with learning to read). According to Morais, Alegria y Content (1987) segmental consciousness would have two components: descentration and analytical thinking.

In relation to the neurobiological substrate, Etchepareborda and Habib (2001), in their review, provide numerous findings on the neurological bases of dyslexia, such as some cortical malformations such as ectopias in frontal regions and in areas of language, mainly of the left hemisphere, dysplasia in cortical regions, microgiria or micropoligiria in the left temporal cortex, absence of asymmetry in the temporal plane, absence of asymmetry in the parietal operculum, lack of asymmetry of the lower frontal rotation or interhemispherical deficit. They also highlight that in the brains of people with dyslexia there is less neural substrate in areas involved in language processing and less activation (less blood supply) in those areas, for example, The lower activation in the previous temporal region shows a greater activity of the posterior area, which suggests the overexertion they make in reading "visual" and not so "auditory".

Regarding the capacity to improve phonological consciousness, many investigations (Valenzuela, Ruiz y Ríos, 2011; Favila y Seda, 2010; Cuadro y Trías, 2008; Defior, 2008; Herrera, Defior and Lorenzo, 2007) have successfully implemented interventions to facilitate the acquisition of phonological skills, thus improving reading learning.

The influence of the environment is something that has also been taken into account in the learning of reading and, in particular, in the development of phonological consciousness. For example, Frith (1977) assumes that the environment can have a transversal effect that influences both the genetic and the cognitive-behavioral, so some interactions between environment and genetics can have detrimental effects on the brain and affect reading performance. In the same vein, Simos, Breier, Fletcher, Foorman, Castillo and Papanicolaou (2002) also maintain that the environment indirectly influences the reading performance by means of the image that the child has on his/her own performance, as well as attitudes towards it. In general, most studies (Senchal and Cornell, 1993; Bus, Van Ijzendoorn and Pellegrini, 1995; Foy and Mann, 2003; Molfese, Modgin and Molfese, 2003) agree that reading at home improves children's reading performance. A surprising fact, related to the environment, is the educational level of one of the progenitors, specifically the mother, has been verified (Aram and Levin, 2001; Rauh, Parker, Garfinkel, Perry and Andrews, 2003; Jiménez and Rodríguez, 2008) the lower the mother's educational level the worse reading performance. Evan, Shaw and Bell (2000) have found that when parents focus their teaching at home on general activities for reading they manage to increase the vocabulary of the children but when they focus on teaching activities of letter and sound, improve both vocabulary and phonological consciousness.

## II. RESEARCH METHOD

The present work has employed an unique case study design. It is a design of N=3 in which three participants who present a specific problem in different socio-family, educational and economic contexts are studied. In this study, the response variable or dependent variable is measured in two phases A-B: pre-treatment (A) and post-treatment (B).

### 2.1 Research participants

The sampling of this investigation has been a non-probabilistic, deliberate/intentional sampling, the participants have been selected according to the fulfillment of a series of requirements to participate in this investigation.

The inclusion criteria used are:

1. To accept the informed consent of the parents or legal guardians of the child.
2. The participant must have started reading learning.
3. The participant must be more than 5 years old.
4. The participant must present evidence of problems in phonological consciousness and/or have a diagnosis of phonological development dyslexia.

There are also exclusion criteria:

1. To Suffer from a disorder of comorbid neurodevelopment due to dyslexia of phonological development.

2. To Suffer from cognitive impairment.
3. To Suffer from severe and incapacitating physical illness. After the selection of the sample, the study selected 3 participants with the following characteristics.

#### *Participant 1*

An 8-year-old boy that is in 3rd grade of primary, having repeated the 2nd grade. Schooling in a CEIP located in rural area of the province of Badajoz. It is a centre that always adapts to the needs of students, academics and family, leading to continuous improvement. The socio-economic level of this town where the school is located is medium.

Regarding the psycho-pedagogical report of the student, it presents problems in reading, and more specifically when reading through the phonological route. The child goes 3 hours a week, 45 minutes each session, to support with the Hearing and Language professional, support that is offered outside their ordinary classroom along with another student who has similar problems.

The socio-familial environment is very favorable; the child lives with his parents and little sister. It is a very structured family, made up of a father and a mother with dependent children. What stands out most about this environment is the concern for the parents in the school performance of the child, continuously looking for solutions, collaborating and participating in what is necessary in the education of their child. The emotional climate is very positive. In socio-economic terms, it is considered a family with a medium-high socio-economic environment, taking into account the level of income and the purchasing power of the family.

#### *Participant 2*

A 7-year-old girl that is studying 2nd Primary. Schooling in a CEIP located in the city of Badajoz. This center does not have the necessary facilities to take care of all the students enrolled in the center. As for the location of the centre, most of the students come from low-middle socio-cultural environments (poor neighborhoods and vulnerable areas).

The psycho-pedagogical report highlights that this is a girl with a rather impaired reading performance, currently being evaluated, and it has been almost assured that the girl has dyslexia. It presents great problems in reading, and more specifically in reading through the phonological route. The girl attends 3 hours a week, 45 minutes each session, to support with the professional of Hearing and Language, support that is offered to him outside of his ordinary classroom, sometimes in shared spaces with other professionals or students, for not having classroom.

The socio-family environment indicates that the girl is in a good family environment, the relationships between parents and participant are good but the time dedicated, for work reasons, to the girl is not enough. In socio-economic aspects, it is considered a family with a medium-low socio-economic environment, according to its income level and family purchasing power.

#### *Participant 3*

An 11-year-old male, enrolled in 5th Primary School in a School of Primary Education in Badajoz. Both the environment and the school itself have a medium-high socio-economic level.

Regarding the psycho-pedagogical report of the student, it is noted that the reading delay presented by this participant is harming his school performance, affects all the areas worked. This student also presents problems in reading, especially of unknown words. The child goes 3 hours a week, 45 minutes each session, to support with the Hearing and Language professional, support that is offered outside of their ordinary classroom, in a space aimed at that area. They usually receive individual support, although sometimes they make couples or small groups with other students with similar problems.

The socio-family environment is not entirely favorable. It belongs to an unstructured family, with separated parents. He has an older brother who acts as a referent and his grandmother who acts as a maternal figure. With the father has little relationship and with the mother, due to work and other unspecified topics, spends little time, practically living with the grandmother. However, there is some concern on the part of the mother, and as a solution to her school performance, she attends every afternoon, for 1 hour and a half, to private lessons, to work in all areas, especially in those that present greater difficulty. In socio-economic terms, a family with an average socio-economic environment is considered, bearing in mind that the only source of income comes from the mother's self-employment.

#### 2.2 Research Instrument

Phonological consciousness was evaluated through the application of two psychometric tests: Evaluation Test of Phonological Knowledge or P.E.C.O (Ramos and Cuadrado, 2005) and the Evaluation Battery of Reading Processes-revised or PROLEC-R (Cuetos, Rodríguez, Ruano and Arribas, 2007). This second test was used for the evaluation of the phonological route since the three participants presented evidence (in some cases, diagnosis) that they presented difficulties in reading, and more specifically in the phonological route, and yet, after the implementation of the CCEE, these difficulties were not precisely identified.

#### A. Evaluation of phonological awareness

*A. I. P. E. C. O.:* It is composed of 30 items. It consists of several activities:

1. Syllable identification: 5 exercises, each of which presents 5 drawings between which it is necessary to identify which of them contains the syllable indicated.
2. Identification of phonemes: 5 exercises, each of which presents 5 drawings between which it must be identified which of them contains the phoneme indicated.
3. Addition of syllables: 5 exercises, in which the evaluator places on the table a white token (with a syllable), and then, slightly separated, places a red token (with another syllable), in the order of the reading. The student must express what word has been formed.
4. Addition of phonemes: 5 exercises, in which the evaluator places on the table a white token (with a syllable or a phoneme), and then, slightly separated, places a red token (with another syllable or a phoneme), in the order of reading. The student must express what word has been formed.
5. Omission of syllables: 5 exercises, in each of them contain a drawing, the student is asked to think about the name of the drawing and then to say his name without pronouncing the syllable indicated to him. Example: "casa" without syllable /ca/: child should say /sa/.
6. Omission of phonemes: 5 exercises, in each of them contains a drawing, the student is asked to think about the name of the drawing and then to say his name without pronouncing the phoneme indicated to him. Example: "foca" without the /ffff/sound: child should say /oca/. The maximum score that can be obtained in this test is 30, scoring "1" by correct answer and "0" by incorrect answer. The reliability, estimated through the Cronbach alpha coefficient is 0.866.

#### A. 2. PROLEC-R:

Composed of 9 tasks designed to evaluate reading processes at all levels, from the most basic processes to the most complex processes involved in reading. Being the object of study only the processes of identification and lexical processes, it has been limited to the realization of the activities that enter into those processes, eliminating from the process of evaluation the syntactic and semantic processes. Therefore, the part used PROLEC-R is explained below.

Tasks are:

1. Identification of letters:
  - Name or sound of letters: there are 23 letters (3 training) that must be named with their corresponding sound.
  - Equal-Different: There are 20 pairs of words and pseudo-words that can be the same or different.
2. Lexical Processes:
  - Word reading: 40 words are presented, 20 are highly frequent words and the rest are infrequent. The task is to read these words.
  - Reading pseudo-words: 40 pseudo-words are presented that must be read.

The reliability of PROLEC-R was calculated in several ways. Medium-high reliability was found in some tests (Cronbach's alpha from 48 to 79). The PROLEC-R measures two variables: number of hits and time of completion of the task. Cuetos, Rodríguez, Ruano and Arribas (2007) calculated descriptive statistics for the two variables of each test according to the course.

#### B. Evaluation of socio-faily, economic and school environments

For the analysis of aspects related to the socio-economic and economic environments of the participants, semi-structured interviews were designed:

##### *B.1. Semi-structured interview for students*

Designed to know the reading habits of children. It is divided into 2 parts. The first contains 15 dichotomous answer questions, affirmative/negative answer. It refers to the enjoyment of reading, the importance of reading, the disposition of books, reading habits etc. Then it is presented in that same part, four questions, to which it is added a further answer option, "sometimes", and these are issues related to reading compression. Then, there are 11 questions, of polyotomic answers, where several alternative answers are offered to better fit each respondent. These questions deal, above all, with the interest in reading, inquiring about what motivates the reader, about the number of books he/she read last year, etc. Finally, there are open questions about reading habits.

In the second part, questions with free answers are presented. The variables discussed in this second part of the interview are: relationship with parents and self-esteem (in the family and school environment).

##### *B.2. Semi-structured interviews for teachers*

###### B.2. a. Semi-structured interview for teachers

It consists of 12 open-ended questions about the methodology or strategies they use to address reading difficulties.

More specifically, it asks about knowledge about reading difficulties and phonological consciousness, their influence on the educational development of their students, strategies to identify alterations in the reading of their students, an assessment about the participant, expectations about this, and what diagnosis it would give.

#### B.2. b. Interview about reading difficulties knowledges

Brief survey that inquires about the methodology, pedagogical strategies, etc. that teachers use in terms of reading. It consists of 15 questions with affirmative/negative answers, polytopic, with various alternatives to choose from, and other open questions. Asks about: the time spent reading in class, the view on the importance of reading in the classroom, the perception of self on its ability to teach reading, methodology and materials used to encourage reading in class; opinion on the importance of the school library, and assessment of the importance of training courses on reading difficulties.

#### B.3. Semi-structured interview for parents

Designed to know both the reading habits at home (with 7 open-ended questions), and the family climate (10 open-ended questions). This survey is divided into three parts: with regard to the economic level of the household, referring to your child (related to school performance and reading habits at home and with respect to family relationships (in order to know the emotional climate in which the participant develops).

#### 2.3 Procedure

A quasi-experimental single-case design with pre- post treatment measures was used. The procedure of this study has been organized in three phases:

**1<sup>st</sup> phase. The Contact with participants, evaluation (pretest) and intervention planning:** For the search of participants, the researcher visited numerous centers from different socio-cultural environments. Meetings were arranged with the management team of each centre to set out the objectives and procedure of the investigation. Once the management team of each centre has agreed to carry out the intervention with the participants, the explicit authorization of participation and informed consent of the parents of the minors, as well as the confidentiality document, A first contact with the child is requested, in which the objectives of the study were explained and a series of questions were made to know some relevant data about the child and his environment (semi-structured interview for participants).

A first individualized 30-45 minute session was then scheduled for an initial assessment (PECO) and a second session for the PROLEC-R test.

#### Programme development

In the preparation of the programme, the activities presented in the evaluation tests used were taken into account, on the basis of which the same type of activities were proposed, as well as others that worked on the same aspects but with different exercises. Each of the sessions of the program has a time dedicated to a little more activity, playful, where participants know that playing can also be learned, and also to capture more their attention. The program consists of 10 sessions in which we work: syllables, phonemes, words, inverted and locked syllables and pseudo-words. Activities and sessions present tasks in ascending order of complexity.

**2<sup>nd</sup> phase. Implementation of the intervention program and other evaluations:** Aimed at the implementation of the program Semi-structured interviews were also designed to monitor all the areas in which the child is developing. Thus, interviews were conducted in the socio-family environment (parents) and school environment (tutor).

**3<sup>rd</sup> phase. Evaluation (postest) and data collection:** Aimed at the final evaluation. The same measuring instruments (PECO and PROLEC-R), space and time were used as in pretest.

### III. DATA ANALYSIS AND RESULTS

In order to know if there is any change between pretest and postest, descriptive analyses were made with the scores obtained in the tests applied. For the comparison between Pretest and Postest, both from the CCEE and the PROLE-C, the formula of "percentage of change" ( $\text{Post-Pre/Pre} * 100$ ) is applied, allowing to know what percentage has changed from one evaluation to another with an intervention.

Participant 1

**Table 1. Percentage of Pre-post Change in the CCEE. Participant (1)**

Name of the test	VARIABLE	Pretest	postest	% OF CHANGE
1. Syllable identification	PRECISION	3	5	66,6 %
2. Phonemes identification	PRECISION	4	5	25 %
3. Addition of syllables	PRECISION	3	4	33 %
4. Addition of phonemes	PRECISION	5	5	0 %
5. Omission of syllables	PRECISION	3	5	66,6 %
6. Omission of phonemes	PRECISION	0	3	0 % = 1

Positive changes are observed between pretest and posttest, their scores have increased in all tests. In the case of the test "omission of phonemes", a percentage of null change is shown (0%), because when performing the calculation the formula forces to make a division between 0. To solve the problem of the formula of the Percentage of Change, we could theoretically replace, the score of 0 for the next smallest integer number that is 1, and the Percentage Change for such a test would be the highest. The highest percentage of change is given in the tests "syllable identification", "omission of syllable" and "omission of phoneme", that is, activities that try to form pseudo-words.

**Table 2. Percent Pre-post Change in PROLEC-R. Participant (1)**

Name of the test	VARIABLE	PRETEST	POSTEST	% OF CHANGE
Name or sound of the letter	TIME (Sec.)	31,07	17,05	- 45,12%
	PRECISION(successes)	15	18	20 %
Equal or different	TIME (Sec.)	120,07	99	17,55 %
	PRECISION (successes)	15	17	13,33 %
Words reading	TIME (Sec.)	120,03	90	- 25,02 %
	PRECISION (successes)	32	35	9,37%
Pseudo-words reading	TIME (Sec.)	121	84	- 30,58 %
	PRECISION (successes)	19	35	84, 21 %

In the time variable the participant (1) has obtained a percentage of negative and high change, that is, it has improved the time, being greater in the test "name or sound of the letter". In the precision variable the percentage of change has been positive; highlighting the activity "reading pseudo-words" with a higher percentage, that is, the number of hits has increased by 84.21%.

**Table 3. Core indices PROLEC-R participant (1)**

PROLEC -R	Name/ sound letter		equal/different		Words reading		Pseudo-words reading	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
<b>CORE INDICES</b>	48 MD	106 N	12 MD	17 N	27 MD	39 MD	16 SD	42 N

\* PRECISION: SD (Severe difficulty); MD (Mild difficulty); ? (Doubt); N (Normal)

\* TIME: VS (Very slow); S (Slow); N (Normal)

The core indices indicate quantitative improvement in all tasks. Qualitative data also show a change in the scale indicating that the participant's reading performance has improved. In all activities, after the intervention, the participant (1) moves to a normal category, with the exception of "word reading" which is still mild difficult.

**Table 4. Secondary indices. PROLEC-R participant (1)**

PROLEC -R		Name/ sound letter		same/different		Word reading		Pseudo-word reading	
		PRE	POST	PRE	POST	PRE	POST	PRE	POST
<b>SECONDARY INDICES</b>	PRECISION	15 MD	18 ?	15 ?	17 N	32 SD	35 MD	19 SD	35 N
	TIME	31,07 N	17,05 N	120,7 S	99 N	120,03 VS	90 S	121 S	84 N

Precision: it presents a better performance in all the tasks, going from category. After the intervention, the participant (1) is, in all the tests, within the normal, except for the "word reading".

Speed: as can be seen, the time invested in the tests is much less after the intervention, highlighting the improvement of the time in the reading of pseudo-words.

Finally, of the semi-structured interviews designed to know data about the environments highlights:

- Participant (1): demotivation by reading, does not like this task but strives to improve, accepting the accomplishment of tasks for it and the creation of reading habits in the family environment.

- Teachers: use of appropriate strategies to enhance the improvement of the reading performance of their student. Shows interest in the student.

- Parents: very favorable social and family environment. Parents are very concerned about the child's difficulties and constantly look for solutions (they go to specialists, they create reading habits, etc). Parents spend a lot of time with the child and often practice many educational activities in their free time. It has a medium-high socio-economic level.

Participant 2

**Table 5. Percentage of Pre-post Exchange in the PECO. Participant (2)**

NAME OF THE TEST	VARIABLE	Pretest	postest	% OF CHANGE
<i>1. syllables identification</i>	PRECISION	5	5	0%
<i>2. Phonemes identification</i>	PRECISION	4	5	25%
<i>3. Addition of syllables</i>	PRECISION	3	4	33.3%
<i>4. Addition of phonemes</i>	PRECISION	3	3	0 %
<i>5. Omission of syllable</i>	PRECISION	2	4	100%
<i>6. Omission of phonemes</i>	PRECISION	1	3	200%

In participant (2) also demonstrates improvement in their reading performance. Increasing scores in most CEEC activities. Except for the "addition of phonemes" test. The most prominent percentage of change is in the "Omission of syllables" and "omission of phonemes" test.

**Table 6. Percentage of pre-post change in PROLEC-R. Participant (2)**

NAME OF THE TEST	VARIABLE	PRETEST	POSTEST	% OF CHANGE
<b>Name or sound of letter</b>	TIME (Sec.)	27,01	19,50	-27,8 %
	PRECISION(Successes)	17	19	11,7 %
<b>Equal or different</b>	TIME (Sec.)	110	68	-45,45 %
	PRECISIÓN (Successes)	13	17	30,76 %
<b>Words reading</b>	TIME (Sec.)	109	87	-20,18 %
	PRECISION (Successes)	35	38	8,5 %
<b>Pseudo-words reading</b>	TIME (Sec.)	121	95	- 21,4 %
	PRECISION (Successes)	32	38	18,75 %

Regarding the time variable, the time in the reading "equal or different" stands out with a -45.45%. The activity in which the least improvement has been detected is in the "Word Reading", with a -20.18%, however, the participant (2) went from doing the "Word Reading" of 109 seconds of duration to 87 seconds. In the "Pseudo-words Reading" he gets one of the lowest percentages with respect to time 21.4%, although the change between pretest and posttest is relevant. With regard to the accuracy, it is observed that an improvement has been given after the intervention. The tests in which it has improved the most are in "Equal or different" with 30.76% and the "Pseudo-words Reading" with 18.75%.

**Table 7. Core indices PROLEC-R participant (2)**

PROLEC –R	Name/sound letter		equal/different		Word reading		Pseudo-word reading	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
<b>CORE INDICES</b>	63	97	12	25	32	44	26	40

In the activity "Name of the letter" is, in both moments within the Normality, although the scores change (Pretest=63 Postest=97). Regarding the activity "Equal or Different" a considerable change is observed, going from a Mild Difficulty to a Normal Score (Pretest=12 // Postest=25). In the task "Word Reading" the Participant (2) is, before and after the intervention, within the same category, because it presents a Mild Difficulty when reading words, however there is improvement in scores (Pretest=32// Postest=44). Finally, "Pseudo-words Reading" there is change both between the scores and in the categories. When reading unknown words he gets a score of 26 on the Pretest and 40 on the Postest, from Mild to Normal Difficulty.

**Table 8. Secondary indices PROLEC-R participant (2)**

PROLEC -R		Name/sound letter		Equal/different		Word reading		Pseudo-word reading	
		PRE	POST	PRE	POST	PRE	POST	PRE	POST
SECONDARY INDICES	PRECISION	17 ?	19 N	13 MD	17 N	35 MD	38 N	32 ?	38 N
	TIME	27,01 N	19,50 N	110 N	68 N	109 VS	87 S	121 S	95 N

Precision: it can be observed that the participant (2) goes to a better category after the intervention, being within the normal in all the tests.

Speed: the time spent on all tests has improved considerably after the intervention, dedicating fewer seconds in the second test (postest) being in the activities "equal/different" and "reading pseudo-words" in which it has improved the most.

Of the semi-structured interviews designed to know data about the environments is highlighted:

- Participant (2): demotivation by reading, does not like this task and does not strive to improve. At home she has no reading habits and she does not consider it important.

- Teachers: use of appropriate strategies to enhance the improvement of the reading performance of their student. Shows interest in the student. The school environment is not the most appropriate given the lack of facilities to cater for all pupils. The participant (2) receives specific support for reading in a common place exposed to continuous interruptions.

- Parents: normal socio-family environment. Parents are concerned about the girl's difficulties; however they do not spend much time with her, help her with her chores but do not create a reading habit at home. The girl spends too much time alone and the activities that they usually practice when they are in the family are not educational, they spend a lot of time in front of the television. Their socio-economic level is medium-low.

Participant 3

**Table 9. Percentage of Pre-post Exchange in the PECO. Participant (3)**

NAME OF THE TEST	VARIABLE	pretest	postest	% OF CHANGE
<i>1. Syllables identification</i>	PRECISION	5	5	0%
<i>2. Phonemes identification</i>	PRECISION	5	5	0%
<i>3. Addition of syllables</i>	PRECISION	4	5	25%
<i>4. Addition of phonemes</i>	PRECISION	4	5	25%
<i>5. Omission of syllables</i>	PRECISION	4	5	25%
<i>6. Omission of phonemes</i>	PRECISION	1	4	300%

The participant (3) did not present any difficulty in the activities of "Identification", being the percentage of change of 0%, since there has been neither an increase nor, on the contrary, a decrease after the intervention. In the "Addition" tests, the percentage is considerable, obtaining a 25% change. In the tasks of "omission" where the score increases the most with a 300% Percentage of Change in the test "Omission of phonemes".

**Table 10. Percentage of pre-post change in PROLEC-R. Participant (3)**

NAME OF THE TEST	VARIABLE (Secondary indices)	PRETEST	POSTEST	% OF CHANGE
Name or sound of the letter	TIME (Sec.)	21,03	15,05	-28,43 %
	PRECISION(successes)	18	19	5,55 %
Equal or different	TIME (Sec.)	79	60,08	-23,9 %
	PRECISION (successes)	15	16	6,66 %
Word reading	TIME (Sec.)	55	48	-12,72 %
	PRECISION (successes)	36	39	8,33 %
Pseudo-word reading	TIME (Sec.)	74	76	2,70 %
	PRECISION (successes)	32	40	25 %



Regarding time, gets the highest percentage in the test "Name or sound of the letter", It also highlights the "word reading". A percentage of positive change has been obtained with respect to time, so it is understood that not only has not improved but in that test, "Reading of Pseudo-words", has worsened. It has obtained 2.70% in the change, going from reading the pseudo-words in 74 seconds in the Pretest to reading them in 76 seconds. However, it is in this same test in which the precision stands out among the other activities, because it has improved considerably, getting to perform the perfect test, without any error, obtaining a 25% change, and going from 32 to 40 successes.

**Table 11. Core indices. PROLEC-R participant (3)**

PROLEC –R	Name/sound letter		Equal/different		Word reading		Pseudo-word reading	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
<b>CORE INDICES</b>	86	126	19	27	65	75	43	53

In the calculation of the core indices the participant (3) shows an improvement in their reading performance in all the tasks, highlighting the scores of the activity "name/sound letter". However, the change in scores in the other tests is relevant.

**Table 12. Secondary indices. PROLEC-R Participant (3)**

PROLEC –R		Name/sound letter		Equal/different		Word reading		Pseudo-word reading	
		PRE	POST	PRE	POST	PRE	POST	PRE	POST
<b>SECONDARY INDICES</b>	<b>PRECISION</b>	18 ?	19 ?	15 SD	16 MD	36 SD	39 ?	32 MD	40 N
	<b>TIME</b>	21,03 S	15,05 N	79 S	60,08 N	55 VS	48 S	74 S	76 S

**Precision:** It is observed that it is the participant that has improved least in both the core and secondary indices. However, the objective of improving reading performance after the intervention is met. After the application of the program, the participant (3) is doubtfully within normal conditions, except for the "equal/different" activity, which still presents a mild difficulty.

**Speed:** the time spent on the execution of tasks has also improved, but less than the other participants. It has been in the task "word reading" and "equal/different" where it has improved the most. In the "reading of pseudo-words" the time has increased by two seconds; however the number of errors is less, so in this study the number of hits is much more interesting than the time spent.

Of the semi-structured interviews designed to know data about the environments stands out:

- Participant (3): demotivation by reading, does not like this task but works hard to improve, in the school environment. He believes that reading is very important to relate properly, however at home he does not devote any time to it.

- Teachers: use of appropriate strategies to enhance the improvement of the reading performance of their student. Shows interest in the student. Very flattering school environment.

- Parents: socially disadvantaged family environment. Broken family with separated parents. He lives with the mother but because of the work the child spends most of the time with the maternal grandmother. They share very little time with the child. The mother is concerned about the child's difficulties; however the only solution taken has been to take the child to private classes, so that he can do his homework. Reading is not encouraged at home, there is no reading habit.

#### IV. CONCLUSION

From the analysis of the data and the results obtained in this study, the conclusions obtained are collected:

1. The study participants presented problems in reading through the phonological route, because the test scores (PROLEC-R) revealed that they were below average.

2. Participants with a more disadvantaged socio-familial level had lower scores, so their reading performance was low, and therefore the improvement in this is not better. Participants with a better socio-family environment have performed better in the post-test.

3. The participant (1) has a more favorable social and family environment (structured family, parents who are very involved in the education of their children, create habits of study and reading, parents who spend a lot of time with their children, both to help him with his homework and to spend time with them, among others),

so your scores in the post and signs of improvement are higher than in the case of the participant (2) (structured family, parents not very concerned about the education of their children, do not create reading habits at home, are not very participatory with regard to the education of the girl child, among others), and much larger than that of the participant (3) (broken family, mother concerned about her child's education but delegating her duties to private teachers, does not create habits of study or reading, does not spend time with the child to do homework, and very little for leisure activities).

4. Considering that no intervention was made in this environment, it is considered and concluded that the socio-family environment does influence the reading performance of children.

5. The socio-economic level does not affect the reading performance of the participants. Socio-economic status is not a factor that necessarily influences the reading performance of our participants. Improving reading performance depends, among other factors, on the use of strategies that favor the pleasure of reading, sharing reading time with children, creating a habit dedicated to reading, and so on.

6. Educational level and profession if it affects the improvement of the reading performance of the participants.

7. Differences are observed between participants from different socio-family settings and with parents with different levels of study, with the result that the participant with parents with a higher level of education (participant 1) has better scores in the post-test.

8. The educational level of parents and their profession does influence the improvement of the reading performance of the participant (1), and therefore of the participants (2) and (3). However, it is not known what would happen if the parents of the latter participants carried out work functions that would allow them access to countless reading books, since the social and family environment of the latter would also have to be considered.

9. The school environment affects the reading performance of the participants. The impact depends on the physical and space characteristics, material and human (teaching) infrastructure of the school. These characteristics have influenced the development of the program, and the improvement of the reading performance, especially in the case of the participant (2) that the program had to develop in a common area (corridor) exposed to constant interruptions of other teachers and students. However, the school environment of the participant (1) and the participant (3) favored the development of the program and thus the improvement of reading performance.

10. With regard to the influence of professional characteristics (studies, specialization, age, educational experience, course, etc.), it can be concluded that they did not exercise any differentiation when working with students on reading problems, in this case, with our participants.

11. Concerning the working methods of the three teachers, they showed common and very relevant aspects when working with the reading problems with the students (motivation, constant training, concern for his/her pupil, joint participation with other specialists, interest in working with him/her and his or her family environment, implementation of appropriate strategies, etc). It is concluded that it does have a very positive impact on the reading performance of the participants, in this case.

12. The programme designed to improve phonological consciousness in the reading process has proved to be effective, as participants have improved their reading performance, and thus reading through the phonological channel.

13. It is concluded that the socio-family environment, which was the most influential factor.

## REFERENCES

- [1]. Sánchez, Emilio. "Aprender a leer y leer ara aprender: Características el escolar con pobre capacidad de comprensión." *Infancia y aprendizaje* 11.44 ,1988, 35-57.
- [2]. Vieiro, P. "Adquisición y aprendizaje de la lectoescritura: Bases y principales alteraciones." *Manual de desarrollo y alteraciones del lenguaje. Aspectos evolutivos y patología en el niño y el adulto*, 2003, 283-321.
- [3]. Signorini, Angela. "La conciencia fonológica y la lectura. Teoría e investigación acerca de una relación compleja." *Lectura y vida* 19.3, 1998, 15-22.
- [4]. Castles, Anne, and Max Coltheart. "Is there a causal link from phonological awareness to success in learning to read?." *Cognition* 91.1, 2004, 77-111. [https://doi.org/10.1016/S0010-0277\(03\)00164-1](https://doi.org/10.1016/S0010-0277(03)00164-1)
- [5]. Fowler, Anne E. "How early phonological development might set the stage for phoneme awareness." *Phonological processes in literacy: A tribute to Isabelle Y. Liberman* 106, 1991, 97-117.
- [6]. Lonigan, Christopher J., et al. "Development of phonological sensitivity in 2-to 5-year-old children." *Journal of educational psychology* 90.2, 1998, 294. <https://doi.org/10.1037/0022-0663.90.2.294>.
- [7]. Alegría, Jesús. "Por un enfoque psicolingüístico del aprendizaje de la lectura y sus dificultades." *Infancia y aprendizaje* 8.29 (1985): 79-94.
- [8]. Brady, Susan A. "The role of working memory in reading disability." *Phonological processes in literacy: A tribute to Isabelle Y. Liberman*, 1991, 129-151.
- [9]. Citoler, Sylvia Ana Defior. "La conciencia fonológica y la adquisición de la lectoescritura." *Infancia y Aprendizaje: Journal for the Study of Education and Development* 67, 1994, 91-114.

- [10]. Wise, Justin C., et al. "Phonological awareness and rapid naming skills of children with reading disabilities and children with reading disabilities who are at risk for mathematics difficulties." *Learning Disabilities Research & Practice* 23.3, 2008, 125-136. <https://doi.org/10.1111/j.1540-5826.2008.00270.x>
- [11]. Defior, Sylvia. "Una clasificación de las tareas utilizadas en la evaluación de las habilidades fonológicas y algunas ideas para su mejora." *Infancia y aprendizaje* 19.73, 1996, 49-63.
- [12]. Høien, Torleiv, et al. "Components of phonological awareness." *Reading and writing* 7.2, 1995, 171-188. <https://doi.org/10.1007/BF01027184>.
- [13]. Carrillo, Marisol. "Development of phonological awareness and reading acquisition." *Reading and Writing* 6.3, 1994, 279-298. <https://doi.org/10.1007/BF01027086>.
- [14]. Morais, José, Jesús Alegría, and Alain Content. "The relationships between segmental analysis and alphabetic literacy: An interactive view." *Cahiers de psychologie cognitive* 7.5, 1987, 415-438.
- [15]. Etchepareborda, M. C., and Michel Habib. "Bases neurobiológicas de la conciencia fonológica: su compromiso en la dislexia." *Revista de neurología clínica* 2.1, 2001, 5-23.
- [16]. Valenzuela, María José González, Isaías Martín Ruiz, and Myriam Delgado Ríos. "Intervención temprana de la lectoescritura en sujetos con dificultades de aprendizaje." *Revista latinoamericana de Psicología* 43.1, 2011, 35-44.
- [17]. Favila, Alejandra, and Ileana Seda. "La conciencia fonológica en niños con retraso lector: efectos de una intervención." *Infancia y Aprendizaje* 33.3, 2010, 399-411.
- [18]. Cuadro, Ariel, and Daniel Trías. "Desarrollo de la conciencia fonémica: Evaluación de un programa de intervención." *Revista Argentina de Neuropsicología* 11, 2008, 1-8.
- [19]. Defior, Sylvia. "¿Cómo facilitar el aprendizaje inicial de la lectoescritura? Papel de las habilidades fonológicas." *Infancia y aprendizaje* 31.3, 2008, 333-345.
- [20]. Herrera, Lucía, Sylvia Defior, and Oswaldo Lorenzo. "Intervención educativa en conciencia fonológica en niños prelectores de lengua materna española y tamazight. Comparación de dos programas de entrenamiento." *Infancia y aprendizaje* 30.1, 2007, 39-54.
- [21]. Hulme, Charles, and Margaret J. Snowling, eds. *Dyslexia: Biology, cognition and intervention* (London: Whurr, 1997).
- [22]. Simos, Panagiotis G., et al. "Brain mechanisms for reading words and pseudowords: an integrated approach." *Cerebral Cortex* 12.3, 2002, 297-305. <https://doi.org/10.1093/cercor/12.3.297>.
- [23]. Senechal, Monique, and Edward H. Cornell. "Vocabulary acquisition through shared reading experiences." *Reading research quarterly*, 1993, 360-374.
- [24]. Bus, Adriana G., Marinus H. Van Ijzendoorn, and Anthony D. Pellegrini. "Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy." *Review of educational research* 65.1, 1995, 1-21. <https://doi.org/10.3102/00346543065001001>.
- [25]. Foy JG, Mann V. Home literacy environment and phonological awareness in preschool children: Differential effects for rhyme and phoneme awareness. *Applied Psycholinguistics*. 2003, 24:59-88.). <https://doi.org/10.1017/S0142716403000043>.
- [26]. Molfese, Victoria J., Arlene Modglin, and Dennis L. Molfese. "The role of environment in the development of reading skills: A longitudinal study of preschool and school-age measures." *Journal of learning disabilities* 36.1, 2003, 59-67. <https://doi.org/10.1177/00222194030360010701>.
- [27]. Aram, Dorit, and Iris Levin. "Mother-child joint writing in low SES: Sociocultural factors, maternal mediation, and emergent literacy." *Cognitive Development* 16.3, 2001, 831-852. [https://doi.org/10.1016/S0885-2014\(01\)00067-3](https://doi.org/10.1016/S0885-2014(01)00067-3).
- [28]. Rauh, Virginia A., et al. "Biological, social, and community influences on third- grade reading levels of minority Head Start children: A multilevel approach." *Journal of Community Psychology* 31.3, 2003, 255-278. <https://doi.org/10.1002/jcop.10049>
- [29]. Jiménez, Juan E., and Cristina Rodríguez. "Experiencia con el lenguaje impreso e indicadores socioculturales asociados a los diferentes subtipos disléxicos." *Psicothema* 20.3, 2008, 341-346. <https://doi.org/10.1007/BF01027184>.
- [30]. Evans, Mary Ann, Deborah Shaw, and Michelle Bell. "Home literacy activities and their influence on early literacy skills." *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale* 54.2, 2000, 65. <https://doi.org/10.1037/h0087330>.

**\*Corresponding author: Yanire Suárez Pilo**

<sup>1</sup>(Doctorate in psychology, Universidad de Extremadura, España)