

# PLAYFUL ACTIVITIES FOR THE DEVELOPMENT OF ORAL AND WRITTEN LANGUAGE FOR CHILDREN AND ADOLESCENTS WITH DOWN SYNDROME<sup>1</sup>

## ATIVIDADES LÚDICAS PARA O DESENVOLVIMENTO DA LINGUAGEM ORAL E ESCRITA PARA CRIANÇAS E ADOLESCENTES COM SÍNDROME DE DOWN<sup>2</sup>

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**ABSTRACT:** This paper aimed to investigate the results produced by a language workshop focused on the stimulation of phonological skills and the understanding of the alphabetic system, with a group composed of five children and adolescents with Down syndrome, aged between 9 to 12 years and 11 months. The work was developed by an interdisciplinary team, with a 90-minute duration, once a week, during one year, and was carried out in the therapeutic playroom of a university hospital in the Southeast Region of the country. The methodology was that of collective case studies and the research was composed of a pre-test, intervention, and post-test application. The instruments used evaluated the reading of isolated words; phonological awareness; sequential auditory memory, the ability to repeat real words and non-words. Statistical Package for the Social Sciences - SPSS, version 23.0, was used for the data analysis with the Student t test. The results show statistical significance for phonological awareness skills of rhyme, syllabic manipulation and transposition, segmentation, synthesis, manipulation and phonemic transposition; phonological work memory measured by the repetition of non-dissyllable words, and readings of isolated high-frequency trisyllable words. It was concluded that the systematic stimulation of cognitive-linguistic abilities, especially the phonological ones, was able to favor the learning of the reading and writing of children and adolescents with Down syndrome.

**KEYWORDS:** Special Education. Down syndrome. Literacy. Speech-Language Pathology. Occupational therapy.

**RESUMO:** Este artigo teve como objetivo investigar os resultados produzidos por uma oficina de linguagem, com foco no estímulo das habilidades fonológicas, e a compreensão do sistema alfabético, com um grupo composto por cinco crianças e adolescentes com síndrome de Down, com idades entre 9 e 12 anos e 11 meses. O trabalho foi desenvolvido por equipe interdisciplinar, com duração de 90 minutos, uma vez por semana, por um ano, e realizado na brinquedoteca terapêutica de um hospital universitário da Região Sudeste do país. A metodologia foi a de estudos de casos coletivos, e a pesquisa contou com a aplicação de pré-teste, intervenção e pós-teste. Os instrumentos utilizados avaliaram a leitura de palavras isoladas; a consciência fonológica; a memória sequencial auditiva, a habilidade de repetição de palavras reais e de não palavras. Para a análise dos dados, foi utilizado o software *Statistical Package for the Social Sciences* – SPSS, versão 23.0, com o teste de t Student. Os resultados mostram significância estatística para as habilidades de consciência fonológica de rima, manipulação e transposição silábica, segmentação, síntese, manipulação e transposição fonêmica; memória de trabalho fonológica medida pela repetição de não palavras dissílabas e leituras de palavras isoladas trissílabas de alta frequência. Concluiu-se que a estimulação sistemática de habilidades cognitivo-linguísticas, especialmente as fonológicas, foi capaz de favorecer a aprendizagem da leitura e escrita de crianças e adolescentes com síndrome de Down.

**PALAVRAS-CHAVE:** Educação Especial. Síndrome de Down. Alfabetização. Fonoaudiologia. Terapia ocupacional.

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## 1 INTRODUCTION

Schooling in Brazil has been providing more opportunities for access and permanence, and the enrollment of people with disabilities grows every year, adding, in the 2016 Educational Census, 796,486 students with specific needs included in regular schools (Instituto Nacional de Estudos e Pesquisas Educacionais [INEP], 2017). However, the quality of their education is still far below world standards. Data from the last evaluation of the Program for International Student Assessment (PISA), held in 2015, placed Brazil in the 63rd position, in a total of 70 countries involved. 23,141 students from 841 schools participated in this evaluation, representing 73% of the country's 15-year-old students. The results showed a high percentage of students below the level of proficiency established by the Organization for Economic Cooperation and Development (OECD), as necessary for the student to fully exercise his/her citizenship in the areas of Science (56.6%), Reading (50.99) and Mathematics (70.25%) (INEP, 2016).

In order to corroborate this information, data from the *Indicador de Alfabetismo Funcional* (INAF) – Functional Literacy Indicator –, from 2016, show that a significant percentage of students who are in Brazilian schools, in the initial grades of Elementary School, are illiterate (30%) or in the stage of rudimentary literacy (37%), totaling 67% of functional illiterate students, and in the final grades of Elementary School, 10% of illiterates and 32% with rudimentary literacy, totaling 42% of people with insufficient knowledge to perform simple tasks involving reading and writing of words and phrases after more than 6 years of Elementary School education (Ação Educativa & Instituto Paulo Montenegro, 2016).

It is clear that the schooling has been facing failure in the functional literacy process of its students, and the causes of this breakdown involve many variables. One of them is the lack of psycholinguistic and linguistic knowledge of teachers involved in literacy (Luz, 2009).

Learning to read is a milestone in people's lives. It opens the doors to citizenship, allowing for new learning, and even better possibilities of employment. However, this is not a simple process, and it also implies numerous skills. For the acquisition of our alphabetic system, several skills are required, such as: fine motor coordination, phonological awareness, visuospatial perception, oral language (Fonseca, 1995; Pamplona, 1997; Capovilla & Capovilla, 2000; Mousinho, 2003; Santamaria, Leitão, & Assencio-Ferreira, 2004; Duinmeijer, De Jong, & Scheper, 2012).

For subjects with Down syndrome, learning to read is no different, it brings a number of benefits, but it is also a great challenge. Children with Down syndrome present hypotonia in both body and phonoarticulatory organs, which can generate postural instability and inaccuracy in writing movements; difficulty in hearing perception, which leads on to a late development of phonological awareness; delay in the development of oral language, mainly due to problems with operational memory, which make it difficult to internalize new concepts; and the engram of the target sounds of the mother tongue. Therefore, it is assumed that these children present difficulties in acquiring and appropriating the alphabetic system (Pacheco & Oliveira, 2011).

Previous studies have shown that, for all children, the development of phonological awareness and oral language skills, especially with regard to a broadly expressive, organized and semantic-lexical phonological system, provides successful literacy (McCartney, 2006; Dadalto

& Goldfeld, 2009). The results of research confirm that the same occurs in subjects with Down syndrome, and there is a significant positive association between the phonological awareness abilities, the writing hypotheses and the phonological work memory in a Brazilian population of children with Down syndrome (Lavra-Pinto & Lamprecht, 2010). Corroborating these relations, Lavra-Pinto, Segabinazi and Hübner (2014) emphasized general cognitive ability, expressive and receptive language skills, and phonological awareness as predictors of reading abilities in Down syndrome. And even more specifically about phonological awareness, Lamprecht (1999, 2004) considers that the development of phonological abilities occurs spontaneously between 4 and 6 years of age.

On the other hand, research showed that the training of phonological awareness on individuals with Down syndrome, at least in English language, was not as relevant as a process to favor the learning of written language, especially at a phonemic level (Mishra & Stainthorp, 2007).

Redress proposals in the school - stimulation of the phoneme-grapheme transposition in an alphabetic system of reading and writing learning, with activities at the phonemic, syllabic and supraphonic levels (Capellini et al., 2010) - in workshops, including language activities in general, and specifically phonological awareness, have proved to be efficient as a means of promoting reading in groups with different difficulties (Sás, Coser, Villa, Aguiar, & Almeida, 2012).

Promoting the evolution of these skills through toys means creating a zone of proximal development, since the child will act according to social rules that go beyond his/her age and usual behavior (Vygotsky, 1991). The imaginary situation present in the play develops abstract thinking, and this is possible because it is based on the child's life experience. Since language is the privileged function on the meaning and understanding of what children live in their daily lives, play becomes a fertile field for the experimentation of their daily learning and, in a pleasant way, makes integrating them into their knowledge possible.

Spaces of stimulation and learning of reading and writing go beyond the school, because, when the intervention occurs with children and adolescents with Down syndrome, it may be necessary to make adaptations that reduce the complexity of the task or that minimize the motor requirement, or to include resources that expand the therapeutic and pedagogical scope of the activity.

The main objective of this paper is to compare the evolution, before and after the interdisciplinary stimulation, of the phonological abilities and the understanding of the alphabetical system in children and adolescents with Down syndrome. The present proposal is justified by the few scientific evidences on the favoring of the cognitive-linguistic abilities of this group, especially in Brazil. The central question that moves this research is therefore whether the systematic stimulation of cognitive-linguistic abilities, especially the phonological ones, is able to favor the learning of reading and writing in subjects with Down syndrome.

## 2 METHOD

It is proposed a collective case study, that is, an instrumental study extended to several cases. The subjects present in this study the common characteristic of having Down syndrome and difficulties in the process of learning the written language. This option is based

on a more in-depth analysis, which favors a better understanding of the phenomenon, and can be seen as a movement towards a generalization (Stake, 2000; Alves-Mazotti, 2006). The project was approved by the Research Ethics Committee under the number CAAE: 47339615.5.0000.5264.

## 2.1 SAMPLE

The sample consisted of children and adolescents who met the following inclusion criteria: to have Down syndrome; to be at school age; to be between 9 years and 12 years and 11 months old; to have normal audiometric evaluation; to be assisted at the Therapeutic Playroom of a university hospital in the Southeast Region of Brazil; to have participated in the entire process from the pre-test to the post-test, and whose parents signed the Informed Consent Form.

Children and adolescents with Down syndrome who presented associated problems such as visual impairment (blindness), hearing loss that could interfere with phonological comprehension, from audiometric evaluation, motor deficiency (paresis) and autism spectrum disorder, were excluded.

Thus, five children participated in the present study:

- M.E.- Child with Down syndrome, female, 9 years old, attending a private school in the junior year of Elementary School. Expressive language compatible with schooling. She attended Speech Therapy, Psychopedagogy and Occupational Therapy once a week. She was raised by maternal grandparents. She presented effective verbal communication and a spirit of leadership. She was able to visually identify the letters of the alphabet and write her own name. Initially, she was challenged and, although she knew how to do most of the activities, she would lose interest in them quickly.
- G.S. - Child with Down syndrome, female, 10 years old, attending a private school in the 3rd grade class of Elementary School. She was able to communicate verbally and be understood, albeit with the presence of phonetic-phonological alterations. She presented visual alteration characterized by horizontal nystagmus and intermittent convergent deviation, besides astigmatism and hypermetropia, the latter corrected with the use of glasses. Still, she would make body adjustments (getting closer and turning her head) so she could see better. She had a somewhat slower pace of learning and very immature behavior for her age, and therefore she needed more mediation from therapists to keep focused. The school had never done a differentiated work and, therefore, she showed a great lack of basic concepts, even from the Early Childhood Education (name of animals, objects, geometric shapes). The writing of her own name was in process.
- K.S. - Child with Down syndrome, female, 12 years old, attending a private school in a class of the 3rd year of Elementary School. Communication greatly impaired, because of the unsystematic phonological exchanges in several phonemes, that made her speech almost unintelligible. To make herself understood, she used gestures. In addition to the diagnosis of Down Syndrome, she presented a diagnosis of Anxiety Disorder and Oppositional Defiant Disorder, in psychiatric treatment and with the use of medication.

In the beginning, she would attack therapists and classmates by pinching, kicking and even face slaps intentionally and without any apparent cause. With time and bonding, inappropriate behaviors changed (mild aggressions, forced vomiting, and escaping from the room) and only occurred as a way to divert attention from the proposed activities. However, after a conversation, she resumed her activities. She found it very difficult to identify and recognize sounds and letters, and the speech exchanges did not favor her. She did not identify letters, numbers, and could not write her name down without support. The school had never made curricular adaptations and, according to the family, their activities were always different from the themes worked in the classroom.

- P.F. - Child with Down syndrome, male, 10 years old, attending a public school in the 4th grade class of Elementary School. Effective verbal communication, but with a nasal pattern. He demonstrated many resistance behaviors: he refused to sit on his chair, pick up his pencil, and made use of inappropriate vocabulary. Extremely affectionate and cheerful, but very dispersed, he always wanted to divert the focus from the activity; thus, he used these behaviors at inopportune moments as a way to divert attention from the proposal. He identified few letters and numbers and could not write his name down without support. He presented an important difficulty of fine motor coordination, with his writing being very light and irregular.
- N.M. - Child with Down syndrome, male, 9 years old, attending a municipal school, and was included in the class of 2nd year of Elementary School, without mediator support. He was accompanied in the Specialized Educational Service twice a week, for an hour, in extra hours to his schooling. He was attending Speech Therapy, Psychopedagogy and Psychology, once a week; swimming classes twice a week; and judo three times a week. He had started Occupational Therapy care once a week, three months before the start of the research project. Introspective child. His oral language made it possible for everyone to understand. He was not literate, identified letters and numbers, and, in reading, made inferences about words by considering the initial letter. He quantified and made sum and subtraction calculations of numbers up to 10. He was able to write his own name and short words, when spelled.

## 2.2 PROCEDURE

The study was developed in the Therapeutic Playroom of a Federal University Hospital in the Southeast Region of Brazil.

### 2.2.1 INTERVENTIONS – STIMULATION WORKSHOPS

The material used in the workshops was developed using the books of the *Coleção Estrelinha*, author Sônia Junqueira, Ática publisher (Junqueira, 2007). The collection is dedicated to children in the literacy phase, and from there, the techniques of phonological remediation were applied. The workshops were carried out by professionals in the areas of Speech Therapy, Occupational Therapy and Pedagogy, who worked together, and divided as follows: 1) 30 minutes for playing activities: reading or retelling the guiding story (books from the *Coleção Estrelinha*), plays or games adapted to stimulate phonological awareness, from

previously defined vocabulary; 2) 30 minutes for graphic activities: written production, using means of clipping and collage, writing or adapted activities; 3) 15 minutes of free activities: psychomotor games, popular games like songs, aiming at the stimulation of rhymes, role playing or other games of the collection of the playroom; and 4) 15 minutes for the delivery of graphic activities to be performed at home, and guidance to families so that they could continue the stimulation process.

The workshops were organized with the group of children and adolescents, while evaluations were applied individually.

### 2.2.2 EVALUATION INSTRUMENTS

The same evaluation instruments were applied in the pre-test and in the post-test. The evaluations were carried out individually, in two one-hour sessions, in a playful context. On the first day of evaluation, the following instruments were used: Reading of isolated words (Capovilla & Capovilla, 2000) and Test of phonological awareness (Capovilla & Capovilla, 2000). On the second day of evaluation, the following instruments were used: Auditory Sequential Memory subtest of the Illinois test of Psycholinguistic Abilities (ITPA) (Bogossian & Santos, 1977); Real word repetition test (Lavra-Pinto & Lamprechet, 2010); Non-word repetition test (Kessler, 1997). The detailed description of each instrument will be given below:

- Reading of isolated words (Capovilla & Capovilla, 2000): The list consists of 12 regular words, 12 irregular words and 12 pseudowords, totaling 36 stimuli, which vary according to the frequency of occurrence in the Portuguese language according to the list of frequency of occurrence of words exposed to children in the pre-school and early grades (Pinheiro, 1994). The list is balanced according to the type of word (regular, with rules and irregular). The child is asked to read each word, which must be presented in large, legible letters and, for that sample, in an isolated mode.
- Phonological Awareness Test (Capovilla & Capovilla, 2000): The Phonological Awareness Test (PAT) assesses children's ability to manipulate speech sounds. The test is composed of ten subtests, each consisting of two training items and four test items. The test is performed orally. The subtests are: Syllabic Synthesis, Phonemic Synthesis, Rhyme, Alliteration, Syllable Segmentation, Phonemic Segmentation, Syllabic Manipulation, Phonemic Manipulation, Syllabic Transposition and Phonemic Transposition. In this study, only those tests that evaluated syllable awareness were used. This choice was based on the fact that most authors consider that phonemic activities are developed after literacy (Mousinho & Correa, 2009; Cielo, 2002), and also because at the time of the evaluation the present sample had not started that process. The results of the tests were analyzed through the percentage of correct answers. The subtests used were: syllabic synthesis, rhyme, alliteration, syllabic segmentation and syllabic transposition.
- Auditory Sequential Memory subtest of the Illinois Test of Psycholinguistic Abilities (ITPA) (Bogossian & Santos, 1977): The test, which evaluates phonological work memory, consists of 21 sequences of numbers to be repeated, when presented by the evaluator orally, and two repetition attempts may be made. They are two sequences of



two digits, three of three, four of four, five of five, five of six, five of seven and four of eight.

- Repetition test of real words (Lavra-Pinto & Lamprechet, 2010): The instrument consists of 14 sequences of disyllabic and trissyllabic words, containing a total of 46 words. The sequences were presented verbally, and the child was asked to repeat the memorized words. The total score was the number of words repeated correctly during the evaluation. The number of correct sequences repeated was also a measure of phonological work memory.
- Repetition test of non-words (Kessler, 1997): Along with the objective of evaluating phonological work memory, now with even more pure stimuli at this level, the test consists of the repetition of 30 items, with the syllabic and phonological structure according to the Portuguese consonant-vowel language standards. These items are separated into 6 groups, according to the variation of the number of syllables, from 1 to 6, with 5 words for each. The child was asked to repeat the word immediately after the orally given model. The attempt was considered incorrect when the child could not reproduce the item. The results were arranged as a percentage of correct answers.

For the characterization of the children, data from the hospital records were considered, such as: name; age; gender; schooling; assistance provided during the research period; oral and reading skills, writing skills and mathematics. The evolution of the children was made based on the analysis of those records, updated throughout the year in which the data were collected.

### 2.2.3 DATA ANALYSIS

A spreadsheet was created for data storage using the Microsoft Excel® 2013 program. The data were entered by two people, with double entry, for further verification of inconsistencies. In the occurrence of divergences, the researcher resumed the data for the accomplishment of the pertinent corrections.

For the analysis, the database was imported into the Statistical Package for the Social Sciences (SPSS) software, version 23.0. The answers given before and after the stimulation workshops were compared, in order to measure the level of evolution of the children. For this, the Student t-Test for paired samples was used. This test made it possible to compare two paired samples with the same subjects at two different times. Thus, with the test, it was possible to verify the existence of differences between the means of the sample, before and after the workshop. The significance level of 95%,  $p \leq 0.05$  and  $p \leq 0.01$ , was considered for this study.

## 3 RESULTS

The children participated in the stimulation workshops for one year and evolved skills in alphabet recognition, reading, writing and small text interpretation. Each one of them advanced according to his/her rhythm.

M.E. was able to perform fluent reading of words with simple syllabic structures (consonant-vowel) of up to 4 syllables, such as “*PIRULITO*” (lollipop), and to perform small

interpretations of text with this structure of words. Throughout the workshops, she developed the skills of transposing and manipulating syllables and creating new words, from those presented previously. Her writing followed the same rhythm of reading learning. She improved a lot in behavior, becoming more and more motivated and participatory.

G.S. demonstrated an ability to identify the letters of the alphabet, confusing those who presented similar writing, such as “M/N”. She began writing her own name, with visual support, and syllabic reading of simple structure words, with up to 2 syllables.

K.S. evidenced the possibility of identifying the letters of the alphabet, writing her name down, without any visual support, and reading the words with up to 3 syllables, confusing only the sound pairs, due to the difficulty of obtaining auditory feedback, due to the phonological alteration in oral language.

P.F. began writing his own name with visual support and started to recognize all the letters of the alphabet. He continued to present much difficulty in fine motor coordination, which made the writing intelligibility difficult. For better understanding of his writing ability, he used mobile alphabets, boards and loose alphabet letters. He showed great resistance to reading, presenting escape behaviors during many activities. However, when he was able to keep up with his activities, he managed to read loose syllables and dissyllable words with ease.

N.M. began to perform fluent reading of words with simple syllabic structures (consonant-vowel) and some complex (consonant-consonant-vowel), such as “*BICICLETA*” (bicycle). He performed cursive writing with ease, with small orthographic errors compatible with the level of language. He made small interpretations of text and became more extroverted.

The results of the comparison between the pre-test, before the stimulation workshops, and the post-test, after the children with Down syndrome participated in the intervention proposal, aiming at the development of oral language and, especially, access to comprehension of the alphabetical system, will be presented below.

The results regarding phonological awareness, two different measures for phonological work memory, rapid automated naming, and finally the results in reading a balanced word list, were analyzed.

Table 1 shows that phonological awareness had significant evolution in practically all stimuli, except for synthesis, syllabic segmentation and alliteration.

Variables	Before		After		t	p-value
	Means	Standard deviation	Means	Standard deviation		
Syllabic synthesis	65,00	41,833	100,00	0,000	-1,871	0,135
Syllabic segmentation	55,00	51,235	85,00	22,361	-2,058	0,109
Rhyme	10,00	22,361	75,00	43,301	-3,474	<b>0,025*</b>
Alliteration	15,00	33,541	60,00	45,415	-2,449	0,70
Syllabic manipulation	10,00	22,361	65,00	13,693	-5,880	<b>0,004**</b>
Syllabic transposition	0,00	0,000	60,00	22,361	-6,000	<b>0,004**</b>



Phonemic segmentation	0,00	0,000	50,00	17,678	-6,325	<b>0,003**</b>
Phonemic synthesis	0,00	0,000	55,00	20917	-5,880	<b>0,004**</b>
Phonemic manipulation	5,00	11,180	50,00	25,000	-4,811	<b>0,009**</b>
Phonemic transposition	0,00	0,000	45,00	20,917	-4,811	<b>0,009**</b>

**Table 1.** Phonological awareness test - before and after comparison - N = 5

Source: Elaborated by the authors.

\* Significant values ( $p \leq 0,05$ ).

\*\* Significant values ( $p \leq 0,01$ ).

On the other hand, the comparative results of the phonological work memory between before and after the intervention, now evaluated by the repetition of digits, were also not significant (Table 2).

Variables	Before		After		t	p-value
	Means	Standard deviation	Means	Standard deviation		
Number of words correctly repeated in 14 sequences	22,80	3,564	25,80	5,891	-1,936	0,125
Maximum number of dissyllable words repeated in sequence	14,40	1,342	17,80	3,899	-2,369	0,77
Maximum number of trissyllabic words repeated in a sequence	8,40	2,510	8,00	2,345	0,784	0,477

**Table 2.** Real-word repetition test - Verbal short-term memory - before and after comparison - N = 5

Source: Elaborated by the authors.

\* Significant values ( $p \leq 0,05$ ).

\*\* Significant values ( $p \leq 0,01$ ).

In the comparison between the pre-test and post-test, when the phonological work memory was measured by the repetition of non-words, the dissyllables revealed statistical significance between the two moments, as shown in Table 3.

Variables	Before		After		t	p-value
	Means	Standard deviation	Means	Standard deviation		
One syllable	72,00	17,889	72,00	10,954	0,000	1,000
Two syllables	28,00	26,833	76,00	16,733	-3,539	<b>0,024*</b>
Three syllables	32,00	30,332	72,00	30,332	-1,633	0,178
Four syllables	8,00	10,954	40,00	40,000	-1,835	0,140
Five syllables	12,00	10,954	16,00	26,077	-0,408	0,704
Six syllables	0,00	0,000	8,00	10,954	-1,633	0,178

**Table 3.** Non-word repetition test - before and after comparison - N = 5

Source: Elaborated by the authors.

\* Significant values ( $p \leq 0,05$ ).

\*\* Significant values ( $p \leq 0,01$ ).

Table 4 presents the results for the subtest of Auditive Sequential Memory, called Digit Span (ITPA).

Variables	Before		After		t	p-value
	Means	Standard deviation	Means	Standard deviation		
2-digit sequence 1st attempt	40,00	54,772	40,00	41,833	0,000	1,000
2-digit sequence 2nd attempt	40,00	54,772	70,00	27,386	-1,177	0,305
3-digit sequence 1st attempt	13,32	18,239	6,66	14,892	1,000	0,374
3-digit sequence 2nd attempt	6,66	14,892	0,00	0,000	1,000	0,374
4-digit sequence 1st attempt	0,00	0,000	0,00	0,000	-	-
4-digit sequence 2nd attempt	0,00	0,000	0,00	0,000	-	-
5-digit sequence 1st attempt	0,00	0,000	0,00	0,000	-	-
5-digit sequence 2nd attempt	0,00	0,000	0,00	0,000	-	-
6-digit sequence 1st attempt	0,00	0,000	0,00	0,000	-	-
6-digit sequence 2nd attempt	0,00	0,000	0,00	0,000	-	-
7-digit sequence 1st attempt	0,00	0,000	0,00	0,000	-	-
7-digit sequence 2nd attempt	0,00	0,000	0,00	0,000	-	-

**Table 4.** Digit Span Test - ITPA - before and after comparison - N = 5

Source: Elaborated by the authors.

\* Significant values ( $p \leq 0,05$ ).

\*\* Significant values ( $p \leq 0,01$ ).

Table 5 shows the means of isolated word readings, classified by type, in the moments before and after the intervention, in which the only significant data was related to the reading of high frequency trisyllables.

Variables	Before		After		t	p-value
	Means	Standard deviation	Means	Standard deviation		
High frequency regular word 2 syllables	30,00	44,721	80,00	44,721	-2,236	0,089
High frequency regular word 3 syllables	0,00	0,000	70,00	44,721	-3,500	<b>0,025*</b>
High frequency word with rule 2 syllables	0,00	0,000	0,00	0,000	-	-
High frequency word with rule 3 syllables	0,00	0,000	30,00	44,721	-1500	0,208
High frequency irregular word 2 syllables	10,00	22,361	20,00	27,386	-1000	0,374

High frequency irregular word 3 syllables	0,00	0,000	0,00	0,000	-	-
Low frequency regular word 2 syllables	0,00	0,000	0,00	0,000	-	-
Low frequency regular word 3 syllables	0,00	0,000	0,00	0,000	-	-
Low frequency word with rule 2 syllables	0,00	0,000	20,00	27,386	-1,633	0,178
Low frequency word with rule 3 syllables	0,00	0,000	0,00	0,000	-	-
Low frequency irregular word 2 syllables	0,00	0,000	0,00	0,000	-	-
Low frequency irregular word 3 syllables	0,00	0,000	0,00	0,000	-	-
Regular pseudoword 2 syllables	0,00	0,000	20,00	44,721	-1000	0,374
Regular pseudoword 3 syllables	0,00	0,000	0,00	0,000	-	-
Pseudoword with rule 2 syllables	0,00	0,000	0,00	0,000	-	-
Pseudoword with rule 3 syllables	0,00	0,000	0,00	0,000	-	-
Irregular pseudoword 2 syllables	0,00	0,000	10,00	22,361	-1000	0,374
Irregular pseudoword 3 syllables	0,00	0,000	0,00	0,000	-	-

**Table 5.** Reading of isolated words - before and after comparison - N = 5

Source: Elaborated by the authors.

\* Significant values ( $p \leq 0,05$ ).

\*\* Significant values ( $p \leq 0,01$ ).

#### 4 DISCUSSION

The functional literacy of children in the initial grades of Elementary School has not been an easy task for Brazilian educators (INEP, 2016; Ação Educativa & Instituto Paulo Montenegro, 2016). The complexity becomes greater when students are children with Down syndrome, who present more compromised linguistic aspects than children with typical development, especially in the field of phonology and morphosyntax, linguistic deficits that interfere in the literacy process (Bissoto, 2005).

A growing number of studies suggest that explicit stimulation of phonological awareness can produce positive effects on both phonological awareness and reading ability in children with and without language difficulties, among them children with Down syndrome (Lamprecht, 1999, 2004; Lavra-Pinto & Lamprecht, 2010; Lavra-Pinto et al., 2014). And as seen in this study, the constant stimulation of these children, with the support of an interdisciplinary team composed of teachers, psychopedagogues, speech therapists and occupational therapists, will contribute to the literacy process of this group (Azevedo, Pinto, & Guerra, 2012).

The data of the study showed that, in relation to the phonological awareness, there was improvement in all the stimuli, although in syllabic synthesis, syllabic segmentation and alliteration, the data were not significant, probably because of the sample being small. There is a reciprocal relationship between phonological awareness and reading learning, in which larger units usually precede literacy, while phonemic skills are enhanced by the reading experience (Zorzi, 2003). However, it is worth mentioning that, at 4 years of age, the child begins to pay attention to the sounds of words, and gradually develops the phonological awareness. These results demonstrated the potential development (Vygotsky, 1991) of the participants, and how prepared they were for the construction of this learning.

In this research, the simpler skills were less significant, while the rhyme tasks and the more complex ones of syllabic level showed statistical significance between the two moments evaluated. This fact probably favored the process of learning the written language by the children of the group. Likewise, the tasks of the phoneme level presented statistical significance in the comparison between pre-test and post-test, showing that the little experience with reading has already been able to positively impact this ability. These results indicate that, contrary to what Mishra and Stainthorp (2007) proposed, phonological awareness demonstrated important evolution, through stimulation, in a manner compatible with the gain presented in the learning of written language.

In relation to the evaluation of the phonological work memory, two instruments were used: digit repetition and non-word repetition. The difference between the two moments evaluated was subtle, which confirms a data commonly described in the literature: working memory, in general, is frequently and intensely impaired in intellectual deficits (Pereira, Araújo, Ciasca, & Rodrigues, 2015). However, distinct from the evaluations used, where the stimulus was unique, sometimes with digits, sometimes with non-words, the stimulation of the letter had a broader scope, involving specific cortical analyzers: the name of the letter and its sound processed in the temporal cortex by auditory/semantic analyzers; letter writing involving tactile-kinesthetic stimuli in the parietal cortex and motor areas; and the visual of the letter processed in the occipital cortex. These stimuli are integrated into a posterior associative center, in border zones of superposition between the temporal, postcentral and occipital cortices (Luria, 1981).

The greater the number of significant associations on the same concept, the more easily the creation of the engram is, that is, the storage in the working memory and from this to the long memory, more specifically to the semantic memory (Eysenck, 2011). This explains, in part, why there was improvement in phonemic awareness, although the same did not occur with working memory, given the overlap of the significant stimuli along with the phoneme in question. In other words, the learning of a grapheme includes in its identity a name, a sound (significant) and a form (writing), and it is believed that the integration between these aspects facilitates the internalization of the grapheophonemic transposition. Thus, the presentation of the stimuli worked is highlighted, most of the time, developing phonological awareness with a visual support of the written word.

The item that significantly differentiated the pre and post-intervention moments was the repetition of non-words of two syllables, which favors the retention in memory of small words, most frequently used in literacy processes, and also in the selection of keywords used as

the basis for the proposed intervention. Like all learners, early in the process of understanding the alphabetic system, children and young people in this research also began to master regular high frequency words with 2 and 3 syllables (though only the latter were statistically significant). A similar result was described in another study, in which reading of regular words was easier (Barby & Guimarães, 2016).

The selection of words to expand the vocabulary of the book is another successful aspect of the workshops, since they were appropriate for the age group, contained the characteristics mentioned previously and were repeated in the activities, facilitating learning.

Although no data were found in the recent literature to prove the direct relationship between the verbal production of children and young people with Down syndrome and learning to read isolated words, receptive vocabulary markers proved to be good predictors for reading in the research by Hulme et al. (2012). The importance of receptive language was also highlighted by Byrne, Macdonald and Buckley (2002), who studied aspects of syntax and auditory processing in this population as being associated with reading. A justification for explaining how some people with Down syndrome may be better at reading than at verbal production may be related to their fairly good visual abilities (Fowler, Doherty, & Boynton, 1995).

It is also emphasized that extrinsic factors, such as the supportive therapies to which children have been subjected, and the influence of the family and school environments may have functioned as significant elements towards literacy and advances in phonological awareness.

## 5 FINAL CONSIDERATIONS

The data showed that the systematic stimulation of cognitive-linguistic abilities, especially the phonological ones, carried out by an interdisciplinary team, through language stimulation workshops, in group, was able to favor the learning of the reading and writing of children and adolescents with Down syndrome. The diversity of children and young people with Down syndrome (Snowling, Nash, & Henderson, 2008) as well as the reduced sample, can be considered as the limitations of this study.

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