



# Students performance with and without learning difficulties in the 4th year of elementary school in phonological awareness tasks

Desempenho de alunos com e sem dificuldades de aprendizagem do 4º ano do ensino fundamental em tarefas da consciência fonológica

Estudiantes de rendimiento con y sin dificultades de aprendizaje en el cuarto año de la escuela primaria en tareas de conciencia fonológica

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## Abstract

**Objective:** to know the performance of students of elementary school in phonological awareness tasks and check for the difference between the performance of students with learning disabilities compared to students without learning disabilities. **Methods:** it was applied the test of phonological awareness with 35 students from the 4th grade of elementary school, 23 without learning disabilities and 12 with learning disabilities. After performing the test of phonological awareness with all students, the data were analyzed by statistical test “binomial” (ratios) using Bioestat 5.0. **Results:** It was observed statistically significant difference between the groups in rhyme subtests, alliteration, phoneme segmentation, syllabic

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manipulation, phonemic and phonemic transposition manipulation, and the group with learning difficulties presented a lower performance in those subtests. **Conclusion:** The difference in results between the two groups was higher in subtests of phonemic skills. The phonemic awareness has great influence on the development of decoding system, essential in the learning of reading and writing, it is worth highlighting the importance of its stimulation on school age.

**Keywords:** Learning; Education; Reading.

## Resumo

**Objetivo:** conhecer o desempenho de escolares do ensino fundamental em tarefas da consciência fonológica e verificar se há diferença entre o desempenho dos alunos com dificuldade de aprendizagem comparado aos de alunos sem dificuldade de aprendizagem. **Método:** foi aplicada a prova da consciência fonológica em 35 estudantes do 4º ano do ensino fundamental, sendo 23 sem dificuldade de aprendizagem e 12 com dificuldade de aprendizagem. Após realizar a prova de consciência fonológica com todos os alunos, os dados foram analisados pelo teste estatístico “binomial” (de proporções) utilizando o programa Bioestat 5.0. **Resultados:** Pôde-se observar diferença estatisticamente significativa entre os grupos nos subtestes de rima, aliteração, segmentação fonêmica, manipulação silábica, manipulação fonêmica e transposição fonêmica, sendo que o grupo com dificuldade de aprendizagem apresentou um desempenho inferior nos subtestes citados. **Conclusão:** A diferença de resultados entre os dois grupos foi maior nos subtestes das habilidades fonêmicas. A consciência fonêmica tem grande influência no desenvolvimento do sistema de decodificação, essencial no aprendizado da leitura e da escrita, sendo relevante destacar a importância de sua estimulação em idade escolar.

**Palavras-chave:** Aprendizagem; Educação; Leitura.

## Resumen

**Objetivo:** conocer el rendimiento de los estudiantes de la escuela primaria en tareas de conciencia fonológica y compruebe si la diferencia entre el rendimiento de los estudiantes con dificultades de aprendizaje en comparación con aquellos sin dificultades de aprendizaje. **Metodología:** se aplicó la prueba de la conciencia fonológica con 35 estudiantes de 4º grado de primaria, 23 sin problemas de aprendizaje y 12 con problemas de aprendizaje. Después de realizar la prueba de la conciencia fonológica con todos los estudiantes, los datos fueron analizados por estadística de prueba “binomio” (relaciones) usando BioEstat 5.0. **Resultados:** Se observó una diferencia estadísticamente significativa entre los grupos en subpruebas rima, la aliteración, la segmentación de fonemas, manipulación silábica, la manipulación y la transposición del fonema del fonema, y el grupo con dificultades de aprendizaje presentan un menor rendimiento en estas subpruebas. **Conclusión:** La diferencia en los resultados entre los dos grupos fue mayor en las subpruebas de habilidades fonémicas. El conocimiento del fonema tiene una gran influencia en el desarrollo del sistema de decodificación, esencial en el aprendizaje de la lectura y la escritura, es de destacar la importancia de su estimulación de la edad escolar.

**Palabras clave:** Aprendizaje; Educación; Lectura

## Introduction

Phonological awareness is the ability to analyze and reflect on the sound structure of words, or in other words, one must be able to identify, isolate, manipulate, combine, and segment phonological parts of the language to have phonological awareness.

Phonological awareness involves three sub-skills: the suprasegmental skills (rhyme and alliteration), syllabic skills (segmentation, synthesis, manipulation and syllabic transposition) and phonemic skills (segmentation, synthesis, manipulation and phonemic transposition) <sup>1</sup>.

Many studies with children show that phonological awareness, in some form, has a positive influence on the literary process, independent of the orthography of the learned written language <sup>2</sup>. Therefore, the words of structures contribute to the learning process of reading and writing, and thus, this highlights the importance of stimulating the phonological awareness of school children.

As mentioned earlier, phonological awareness has a strong relationship with reading and writing, so a child who develops phonological awareness skills will likely not have difficulty developing its reading and writing skills. Furthermore, a child who has good reading and writing skills will present a higher level of phonological awareness compared to those who lack written language skills.

The processes connected to the reception (reading) and expression (writing) of the written language are performed and absorbed by means of learning through decoding and coding activities that depend on the ability to associate phoneme-grapheme. Therefore, when a person demonstrates that knows how to identify segments of speech (syllables and phonemes); this signifies that he can perform tasks involving phonological awareness. Thus, if a person possesses and can use phonological awareness, it appears that he can also promote the phoneme-grapheme association without difficulty, and perform reading and writing tasks with ease <sup>3</sup>.

Working memory is a fundamental factor for the learning process of reading and writing, because with it, all the phonological and visual information are recorded and then transferred to the long-term memory. This enables learning the written language <sup>4</sup>. The working memory has an important role in tasks involving phonological awareness; as for the

execution of a task involving phonological awareness task, it is necessary that the verbal material is maintained in the working memory to allow success in resolving the <sup>5</sup> requested task. Studies suggest changes in phonological awareness and working memory can influence the intellectual literacy of normal children <sup>6</sup>.

With the knowledge that the principal characteristic of a learning disability is low performance in activities of reading, writing, or mathematical calculation <sup>7</sup>; it is presumable that a child with such difficulties would show a lower performance in phonological awareness skills.

Various studies report the relationship between phonological awareness and learning difficulty. Research concerning this subject has relevance to generate information about the development of phonological awareness in the school environment, as it can provide educators and professionals in public education some aid for the detection of deficiencies. This can generate knowledge of the relationship between the learning of written language and phonological awareness skills. Teaching professionals may be more encouraged to carry out activities involving these kinds of tasks, and the learning process and school performance can improve for students. Currently, such practice is not common in most public schools.

Thus, the present study has the objective to gain the insight into the performance of elementary school students in tasks of phonological awareness and to verify if there is a difference between the performances of students with learning difficulties compared to students without learning difficulties.

## Methods

This survey was conducted after approval of the CAPI (Institution Committee Research Advisor) of the University of West Sao Paulo under Protocol 1748 and the CEP (Research Ethics Committee) of the same institution, under protocol CAAE: 20492713.9.0000.5515.

The study was executed with 35 students, of these, 23 without learning difficulties (Group I) and 12 with difficulties (Group II), from the fourth year of elementary school in a public school in the municipality of Santo Anastácio, in the interior region of the state of São Paulo.

The selection of students in the fourth year of elementary school to participate in the research



was because students at this age are expected to be literate. Considering this, it is possible to classify students with literacy difficulties from those who are literate.

The teacher of the specific classroom used by the research participants pointed out those who presented learning difficulties based on teacher-executed assessments, and according to performance by students in daily classroom activities. Students with learning difficulties were characterized as those who did not develop reading and / or writing abilities as expected for their ages. This criterion was used for the division of the groups (with and without learning difficulties). A speech-language evaluation was not performed to identify difficulties reported.

The researcher proctored a test of the phonological awareness of the students<sup>9</sup>. This test is composed of 10 subtests, each consisting of four items. Each subtest consists of two initial examples used by the examiner as explanations to the student. The result of the subtests was presented as a score, with a maximum of 40 correct answers. The test was applied individually to each student in the school library; the quietest place with the least amount of people. This helped prevent interference with the performance of the research participants.

Data collection occurred after the signing of the Free and Informed Consent Term (Appendix A), which was delivered to 41 parents and / or guardians at a routine school meeting with parents. However, only 35 of the parents authorized. The TCLE explained the steps, methods, and objectives of the research.

After execution of the phonological awareness test with the authorized students, the results were then analyzed, with an aim to observe and link deficiencies in phonological awareness with learning difficulties.

The data were analyzed quantitatively in a descriptive form by the correlation and dependence of variables. Results were analyzed by the binomial statistical test (of proportions), using the program Bioestat 5.0, with significance level of 5%.

## Results

For the analysis of the results, the number of students who successfully completed each subtest was observed. To be considered correct, the student needed to correctly answer 50% or more of each subtest.

Comparing the performance between the groups, starting from the analysis of the results shown in Table 1, a statistically significant difference ( $p < 0.05$ ) was observed between Group I and Group II in rhyme, alliteration, syllabic manipulation, phonemic segmentation, phonemic manipulation and phonemic transposition. Group II showed inferior performance in the mentioned subtests, revealing that this group presented more difficulty in the majority of tasks of the phonological awareness test. In the phonemic subtests, the difference between the groups was greater compared to the subtests of rhyme, alliteration, and syllabic manipulation.

In the subtests of syllabic synthesis, phonemic synthesis, syllabic segmentation, and syllabic transposition, there was no statistically significant difference between the groups.

**Table 1.** Percent of students that correctly answered the phonological awareness sub-tests, divided by Group 1 (without learning difficulties) and Group 2 (with learning difficulties)

Sub-tests	Group I	Group II	Value of p
Syllabic Synthesis	100%	100%	1,0000
Phonemic Synthesis	95,65%	91,66%	0,0689
Rhyme	100%	83,33%	0,0438*
Alliteration	100%	75%	0,0121*
Syllabic Segmentation	100%	100%	1,0000
Phonemic Segmentation	91,30%	50%	0,0057**
Syllabic Manipulation	100%	83,33%	0,0438*
Phonemic Manipulation	95,65%	50%	0,0014**
Syllabic Transposition	95,65%	75%	0,0683
Phonemic Transposition	78,26%	16,66%	0,0005**

Source: The author.

Notes: Binomial Test\*( $p < 0,05$ ); \*\*( $p < 0,01$ ).

## Discussion

Phonological awareness can be shown through a diverse array of abilities, such as segmenting, manipulating, and synthesizing phonemes and syllables. Having phonological awareness requires the knowledge that speech can be segmented and, in addition to this, knowledge concerning the manipulation of these segments. During their developmental process, a child may become conscious of phrases, words, syllables, and phonemes as separate units. In this form, phonological awareness gradually develops as children become aware that words, syllables, and phonemes are identifiable units<sup>9</sup>.

Phonological awareness develops parallel to literacy. When literacy is occurring, phonological awareness is constantly improving, which helps the development of cognitive function and the construction of the learning process<sup>10</sup>. Moreover, for students without learning difficulties, who are in the fourth year of elementary school (an age where they should be literate), it is expected that they perform well in tasks involving phonological awareness. Such is found in the present study, where a large part of Group I presented good results in all the subtests.

The results show that the students of both groups performed better in syllabic skills than in phonemic skills, as occurred in a study with 60 students from the second to fourth grades. They were divided into six groups; three groups of 10 students with learning disabilities, and three composed of 10 students without learning disabilities. For all

groups, the same difference in the performance of tasks and syllabic phonemic was observed<sup>11</sup>.

A study of children with and without learning disabilities showed that in rhyme and alliteration, groups with learning difficulties presented these altered abilities<sup>12</sup>, corroborating with the present study, in which Group II showed a statistically significant lower performance compared to Group I in these two tasks. In the same study<sup>12</sup>, under-performance of the group with learning difficulties was observed in syllabic manipulation tasks, phonemic manipulation, and phonemic transposition in relation to the group without learning disabilities, which shows similarities to the present study. The authors point out that this difference between the groups is because students with learning difficulties show deficits in perception of initial and final sounds of words, which leads to difficulties for the grouping of words that apparently are similar phonologically. This demonstrates a block in the use of the phonological working memory, and prevents formations of new words from syllables and phonemic segment acquired through learning at the early stages of literacy. However, another study that compared students with good academic performance to those with an interdisciplinary diagnosis of learning disability found that there was no statistically significant difference between the two groups with regard to rhyme and alliteration<sup>13</sup>.

Comparing the rhyme and alliteration tasks, researchers observed that children in the second to fourth grade of elementary school performed better in alliteration tasks compared to rhyme tasks<sup>14</sup>. However, in the present study, Group I presented good



performance in both tasks, and Group II showed inferior performance in alliteration compared to activities involving rhyme.

Students with difficulty processing speech-sound stimuli may encounter obstacles in targeting and manipulation of phonological structure of language, and thus can exhibit reading and writing difficulties<sup>8</sup>, as previously mentioned. Moreover, it is possible that Group II students have difficulty in processing the speech stimuli, since they perform lower in most tasks of phonological awareness.

Researchers agree that phonological ability is important for reading acquisition, and difficulties in this ability are identified in most individuals with reading delay or dyslexia. This hypothesis has been supported by numerous studies that demonstrate delays in sensitivity to rhyme, alliteration, and phonemic segmentation related to the development of reading<sup>15</sup>. Although the difficulty of each student in the present study was not specified, lower performance of Group II was observed in the skills cited by the authors above. However, according to other research, the difficulty of learning usually comes from difficulty in reading and writing<sup>7</sup>. This can justify the lower performance in rhyme skills, alliteration, and phonemic segmentation of Group II. According to the study, children with learning difficulties present reading problems and phonological awareness difficulties, due to challenges of maintaining attention and problems with the mastery of basic learning strategies.

The deficit of phonological awareness may be closely related to auditory processing disorders, as hearing is the main route of entry that allows for language acquisition to become possible<sup>16</sup>. This fact was verified in a study with 44 children divided into two groups: a study group (composed of 22 children with a phonological disorder) and a control group (composed of 22 children with typical phonological development). Both groups passed the phonological awareness test and the simplified auditory processing evaluation<sup>17</sup>. The results showed that there is correlation between the variables. In both groups, more changes in the auditory processing tests resulted in fewer correct answers in the tasks of phonological awareness. People with learning disabilities often have worse performance in auditory processing tests due to the delayed maturation of auditory skills, and these skills are of fundamental importance in the process of learning to read and write<sup>18</sup>. With

this knowledge, it can be assumed that individuals with learning difficulties in the present study have some auditory processing deficiency, which may be a contributing factor for their low performance in tasks of phonological awareness. But to confirm this hypothesis, it would be necessary to perform an auditory processing evaluation.

As we could see, the group with learning difficulties presented greater difficulties in the test of phonological awareness, more specifically in the phonemic tests. Some authors explain this poor performance as a deficiency in access to mental lexicon due to modifications at different levels of information processing<sup>11</sup>.

A study, of 54 kindergarten and first grade elementary school children to identify what skills are able to predict subsequent performance in reading and writing, showed that among the tasks of phonological awareness, those involving phoneme awareness were more strongly correlated with reading and writing levels than those involving other phonemic awareness mentioned above (of syllables and rhymes)<sup>19</sup>. Therefore, we emphasize the importance of stimulating phonological awareness at school age, especially phonemic awareness. This enables better performances in reading and writing, and contributes to overall student learning. These same authors cite some causal factors of the learning problems, they are: deleterious effects of the auditory processing; hearing loss; disorders of the vestibular system, among others. In this study, students with learning difficulties were selected by their teachers according to their performance in the classroom evaluations. These students may have been considered as having learning difficulties because they present some factor such as those previously mentioned, but remain undiagnosed. Other factors may also be related to learning disabilities, such as head trauma, bleeding, tumors, diseases such as encephalitis and meningitis, malnutrition, and exposure to toxic chemicals (factors that can cause brain damage)<sup>7</sup>. However, to know what could lead these students to a learning disability would require a more detailed evaluation with medical diagnosis.

In Brazil, the knowledge of the profile of students with learning difficulties is of fundamental importance, since the high proportions of school-children who present problems in phonological skills make them easily confused for children who have developmental dyslexia. The children who



present problems in phonological skills show a failure in phonological access to information due to literacy problems<sup>17</sup>.

However, it would be interesting to add specific methods to analyze and characterize learning difficulties, as well as to investigate if there are other factors that could influence the learning of these students, such as hearing loss, emotional, social and economic factors, neurological dysfunction, and heredity, among others. These factors were not used in this research, and this can be considered as a limitation of this study.

## Conclusion

The results of this research showed that there was a difference between the studied groups, and the group with learning difficulties presented inferior performance in most phonological awareness tasks, especially in those tasks developing phonemic awareness.

Phonemic awareness is of utmost importance for the development of the decoding system, that is, for the child to be able to map each grapheme that constitutes reading and writing. Many people pay no attention to the sounds produced by speech (phonemes), but instead only to the meaning of the word as a whole. Thus, it becomes a challenge to get the child to perceive every sound that makes up a word. In this way, teachers should assist students in the development of phonemic awareness, working with targeting skills, manipulation and phonemic transposition, for example. Such effort would be favorable to the process of reading and writing development.

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