

The role of phonological awareness for reading, writing and mathematics in Brazilian studies and main assessment instruments: a narrative review

O papel da consciência fonológica para a leitura, escrita e matemática em estudos brasileiros e principais instrumentos de avaliação: uma revisão narrativa

El papel de la conciencia fonológica para la lectura, la escritura y las matemáticas en los estudios brasileños y los principales instrumentos de evaluación: una revisión narrativa

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Abstract

Introduction: Phonological awareness is a very important skill for reading, writing and math in many school years. Its investigation and evaluation has been carried out in different contexts with typical or atypical populations to understand how it develops and consequently contribute to research on academic performance. **Objective:** The aim of this paper is to study the influence of phonological awareness on

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academic performance in Brazilian studies and to present the main standardized instruments used in the assessment to this skill. **Methods:** Articles from the last five years were searched in LILACS and SciELO databases using descriptors in English: “phonological awareness” and “reading” or “writing” or “mathematics” or “academic performance” or “academic ability”, as well as descriptors in Portuguese using the same expressions. Open access studies carried out in Brazil, published in Portuguese, English or Spanish, which used a standardized instrument and presented the descriptors mentioned in the title or abstract, were selected. **Results:** Of the 18 articles analyzed, 17 concluded that phonological awareness was important for reading, writing and mathematics, with reading and writing being the most investigated skills. The instruments used assess the main components of phonological awareness and were developed by Brazilian authors. **Conclusion:** The findings show that phonological awareness is a very important skill for academic performance in different grades. It reinforces the need for monitoring, assessment, and early intervention with skill in typical and atypical children.

Keywords: Reading; Handwriting; Mathematics; Academic Performance

Resumo

Introdução: A consciência fonológica é uma habilidade muito importante para leitura, escrita e matemática em muitos anos escolares. A sua investigação e avaliação tem sido realizada em diversos contextos com populações típicas ou atípicas para entender como ela se desenvolve e, conseqüentemente, contribuir para pesquisas sobre desempenho acadêmico. **Objetivo:** O objetivo deste trabalho é estudar a influência da consciência fonológica no desempenho acadêmico em estudos brasileiros e apresentar os principais instrumentos padronizados utilizados na avaliação desta habilidade. **Métodos:** Realizou-se busca de artigos dos últimos cinco anos, nas bases de dados LILACS e SciELO usando descritores em português: “consciência fonológica” e “leitura” ou “escrita” ou “matemática” ou “desempenho acadêmico” ou “habilidade acadêmica”, assim como descritores em inglês usando mesmas expressões. Foram selecionados estudos de acesso livre, realizados no Brasil, publicados em português, inglês ou espanhol, que utilizaram um instrumento padronizado e apresentaram os descritores mencionados no título ou resumo. **Resultados:** Dos 18 artigos analisados, 17 concluíram que a consciência fonológica foi importante para a leitura, escrita e matemática, sendo que a leitura e escrita foram as habilidades mais investigadas. Os instrumentos usados avaliam principais componentes da consciência fonológica e foram desenvolvidos por autores brasileiros. **Conclusão:** Os achados evidenciam que a consciência fonológica é uma habilidade muito importante para o desempenho acadêmico em diversas séries escolares. Reforça-se a necessidade de monitoramento, avaliação e estimulação precoce com a habilidade em crianças típicas e atípicas.

Palavras-chave: Leitura; Escrita Manual; Matemática; Desempenho Acadêmico

Resumen

Introducción: La conciencia fonológica es una habilidad muy importante para la lectura, la escritura y las matemáticas en muchos años escolares. Su investigación y evaluación se ha realizado en diferentes contextos con poblaciones típicas o atípicas para comprender cómo se desarrolla y conseqüentemente contribuir a la investigación sobre el rendimiento académico. **Objetivo:** El objetivo de este trabajo es estudiar la influencia de la conciencia fonológica en el rendimiento académico en los estudios brasileños y presentar los principales instrumentos estandarizados utilizados en la evaluación de esta competencia. **Métodos:** Se buscaron artículos de los últimos cinco años en las bases de datos LILACS y SciELO utilizando descriptores en portugués: “consciência fonológica” e “leitura” ou “escrita” ou “matemática” ou “desempenho acadêmico” ou “habilidade acadêmica”, así como descriptores en Inglés usando las mismas expresiones. Se seleccionaron estudios de acceso abierto realizados en Brasil, publicados en portugués, inglés o español, que utilizaron un instrumento estandarizado y presentaron los descriptores mencionados en el título o resumen. **Resultados:** De los 18 artículos analizados, 17 concluyeron que la conciencia fonológica es importante para la lectura, la escritura y las matemáticas, siendo la lectura y la escritura las habilidades más investigadas. Los instrumentos utilizados evalúan los principales

componentes de la conciencia fonológica y fueron desarrollados por autores brasileños. **Conclusión:** Los hallazgos muestran que la conciencia fonológica es una habilidad muy importante para el desempeño académico en los diferentes grados. Refuerza la necesidad de seguimiento, evaluación e intervención temprana con habilidad en niños típicos y atípicos.

Palabras clave: Lectura; Escritura; Matemáticas; Logro académico

Introduction

Phonological Awareness (PA) is a skill that allows reflecting that spoken language can be segmented into small distinct units, the sentence can be segmented into words, and in turn, words into syllables and syllables into phonemes. It is a skill that consists of analyzing and reflecting explicitly and consciously on the structure or phonological segments of oral language¹.

Numerous scientific researches have shown that PA is essential for reading comprehension² in 2nd and 3rd-year students of the first cycle of basic education in public and private schools³; for writing in 2nd grade students⁴ and basic math skills in kindergarten children⁵. Other research shows that PA deficits would be related to learning difficulties or low performance in this skill. For example, in comparing performance in students with dyslexia, intellectual development disorder and Attention Deficit Hyperactivity Disorder (ADHD), the authors concluded that phonological awareness was also deficient in these disorders⁶. In specific learning disorder, which is characterized by persistent and detrimental difficulties in basic academic reading, writing, and/or mathematics skills⁷, the problems start during early childhood, when the child has problems in segmenting spoken words into syllables; recognizing words that rhyme; trouble in recognizing phonemes in a set of words that start with the same sound⁷, which means, problems related to PA skill.

Due to its importance, this skill has been monitored to understand how it develops in children with typical or atypical development, which implies the need to have accurate instruments to assist in this monitoring and, consequently, to obtain reliable results from these assessments. In the Brazilian context, no study was found regarding a literature review on the role of PA in the three skills (reading, writing, mathematics), and that presented the assessment instruments. Still, it is known that many tests used in Brazil are originally foreign (American

or European) that are later adapted for use in different areas⁸ and for the PA construct, there is still no list of instruments and their description.

Besides monitoring, intervention programs using PA activities have been developed and, in turn, show their effectiveness in developing academic skills. At the end of the intervention, the training aimed at promoting reading development for at-risk and non-risk children found more significant progress in word decoding⁹, reading and comprehension than in the control group¹⁰.

On the other hand, studies that have investigated the contribution strength of PA concerning other cognitive skills (CS) such as: working memory (WM); executive functions (EF); rapid automatized naming (RAN) and vocabulary have presented discordant, controversial and debatable results about the power of each of the skills in reading, writing and mathematics. In an investigation into initial learning to read and write, phonological awareness was a more significant predictor than syntactic awareness, selective attention, and working memory¹¹, demonstrating a strong and highly significant correlation. On the other hand, in the relationships among reading, phonological awareness, language and executive functions in preterm and low-risk children, both phonological awareness and executive functions presented strong significant correlations for reading.¹² Nevertheless, in a survey of reading fluency and spelling accuracy processes, concluded that although PA was the strongest predictor of spelling, rapid automatized naming was a powerful predictor of reading fluency in English children¹³. These discordant results were also verified in a study with deaf and hearing children, where no significant effect of phonological awareness was found. Still, vocabulary significantly explained the variation in reading fluency for the two groups.¹⁴ Thus, this aspect is considered very important to be analyzed mainly in Brazilian studies because it can help future discussions on these themes. Moreover, the study is relevant insofar as it will add the knowledge of the area, contributing to

the existing gap, enabling discussions that can help indicate new directions for future investigations and allowing the monitoring and development of intervention strategies based on scientific evidence.

Objective

To study the influence of phonological awareness on academic performance in Brazilian studies and present the profile of the main standardized instruments used to assess this ability.

Method

This is a literature review study that performed an electronic search of scientific articles published from 2015 to July 6, 2020, in LILACS and SciELO databases, considering the representativeness of these databases for Brazilian publications. The search took place in July 2020 and selected articles investigating phonological awareness and one of the basic academic performance skills. Search descriptors with the following combinations in English were used: “phonological awareness” and “reading” or “writing” or “mathematics” or “academic performance” or “academic ability,” as well as descriptors in Portuguese using the same expressions.

The inclusion criteria were: to present the descriptors mentioned in their titles or abstract; be conducted in the Brazilian context and published in the given period; be performed with a typical or atypical population; present in its evaluation an instrument developed or adapted and that is standardized for the Brazilian population; be published in Portuguese, English or Spanish and be of free access. Exclusion criteria were: case, review,

psychometric studies, duplicated in the databases; study whose objective was not to investigate phonological awareness and reading, writing and mathematics skills.

The selected studies were read in full and analyzed according to the following items: the objective of the studies and the main academic performance skills analyzed; the age and performance of PA in the participants (typical or atypical); the strength of PA's contribution regarding other important cognitive skills for reading, writing and mathematics performance, and finally the description of the instruments used in all studies.

Results

After searching and performing the appropriate filters in relation to the year and place of publication in the LILACS and SciELO databases, 361 articles were found, of which 285 were excluded because they were duplicates. After reading their titles, 27 articles were excluded because they were case studies and literature review studies and did not meet the proposed objectives. They did not investigate the PA and its influence on academic performance. Subsequently, after reading the abstracts, 15 studies were also excluded because they were conducted outside Brazil. 16 articles were excluded in the last stage because they were psychometric studies and did not use standardized PA instruments/tasks. At the end of the process, 18 articles were selected for analysis. Figure 1 shows the entire pathway of the article search process, and Table 1 presents the description of the main information of the studies selected from the databases.

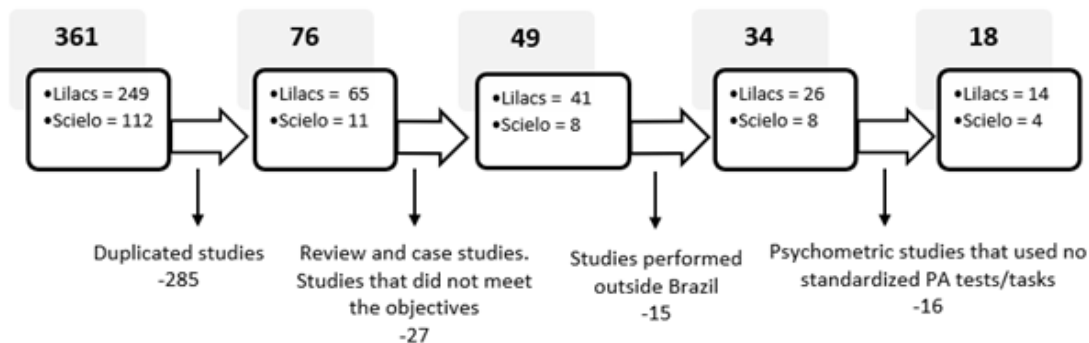


Figure 1. Pathway of the article search process

Table 1. Description of the main information of the studies selected from the databases

Authors	Article Title	Year	Age / Grade	Outcomes	Instrument (author/s)
Rosal et al. ²³	Contributions of phonological awareness and rapid serial naming for the initial learning of writing	2016	3 to 6 years	PA and rapid serial naming contribute for the initial learning of writing.	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)
Barby et al. ²⁵	Development of Metaphonological Skills and Reading and Writing skills in Students with Down Syndrome	2016	9 to 15 years	The skills developed during the intervention, through phonological mediation, enabled the participants to acquire initial learning of written language.	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)
Cavallieri et al. ²¹	Students' performance with and without learning difficulties in the 4th year of the elementary school in phonological awareness tasks	2017	4th year of ES	PA has shown significant influence on the development of the decoding system, essential in the learning of reading and writing.	Phonological Awareness Test by Oral Production - PATOP (Capovilla and Capovilla 1998)
Barbosa et al. ²⁴	Relationship between spelling levels, phonological awareness and letter knowledge	2016	5 and 6 years	Significantly, the participants who had better PA skills and letter-name knowledge at the beginning of the school year improved their spelling skills at the end of the year.	Phonological Skills Profile - PSP (Alvarez, Carvalho, & Caetano, 1998)
Coelho e Correa ¹⁸	Reading comprehension: Cognitive abilities and types of text	2017	7 to 8 years	PA, rapid automatized naming (objects) and comprehension monitoring contributed to reading comprehension in narrative and expository texts.	Metalinguistic and reading skill tests - MRST (Cunha & Capellini, 2009)
Santos e Ferraz ³²	Skills assessment related to reading comprehension in elementary school	2017	3rd, 4th and 5th of the EF	PA and word recognition had correlations with reading comprehension, especially the higher contribution of word recognition.	Phonological Awareness Assessment Script - PAAS (Santos, 1996)
Cárnio et al. ¹⁹	The role of phonological awareness in reading comprehension	2017	4th year of EF	A correlation was found between PA and reading comprehension of sentences and texts	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)
Mendes e Barrera ²⁶	Phonological Processing and Reading and Writing Skills in Literacy	2017	3rd year of EF	PA and phonological memory are the skills that contributed most to the initial performance in reading and writing.	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)
Moreschi e Barrera ²⁷	Multisensory/Phonics Program: Effects in kindergartners at risk for presenting literacy difficulties	2017	5 and 6 years	Significant effect of the multisensorial intervention with phonics emphasis for children at risk, for the performance in PA, letters knowledge and early reading and writing skills in kindergarten children.	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)

Authors	Article Title	Year	Age / Grade	Outcomes	Instrument (author/s)
Santos e Barrera ¹⁶	The impact of training on phonological awareness skills in writing preschoolers.	2017	4 and 5 years	A positive effect of the intervention on both the development of metaphonological skills and the participants' writing skills.	Phonological Awareness Task - PAT (Santos, 2004)
Santos et al. ¹⁵	Language skills: the relationship between phonological awareness and writing.	2017	7 to 12 years	Existence of a positive and significant correlation between PA and writing and the existence of differences, both between school years and between Brazilian regions.	Phonological Awareness Assessment Script - PAAS (Santos, 1996)
Gonçalves-Guedim et al. ²⁸	Performance of children with attention deficit hyperactivity disorder in phonological processing, reading and writing	2017	9 to 12 years	Schoolchildren with ADHD had lower performance in PA skills, access to the lexicon, working memory, reading and writing of words when compared to schoolchildren without ADHD, with good school performance.	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)
Dias e Seabra ²²	School performance at the end of elementary school I: contributions of intelligence, language and executive functions	2017	9 and 11 years	PA, vocabulary and executive functions, especially cognitive flexibility, can be considered stronger predictors in understanding the performance of 5th-grade students.	Phonological Awareness Test by Oral Production - PATOP (Capovilla and Capovilla 1998)
Michelino et al. ³⁰	Performance in psychopedagogical and neuropsychological tests of children and adolescents with developmental dyslexia and learning difficulties.	2017	8 to 16 years	No significant differences were found between the groups in the PA. The results indicated that the group with Developmental Dyslexia presented more difficulties in tests that evaluate working memory and visual discrimination, besides specific reading and writing errors than the control group.	Picture Choice Phonological Awareness Test - PCPAT - computerized version (Capovilla, Marcilio, Seabra)
Pelosi et al. ³¹	Playful Activities for the Development of Oral and Written Language for Children and Adolescents with Down Syndrome	2018	9 to 12 years	The systematic stimulation of cognitive-linguistic abilities, especially the phonological ones, favored the learning of the reading and writing of children and adolescents with Down syndrome.	Phonological Awareness Test by Oral Production - PATOP (Capovilla and Capovilla 1998))
Castro e Barrera ²⁹	The Contribution of Emergent Literacy Skills for Early Reading and Writing Achievement	2019	6 to 7 years	PA's significant and independent contributions and knowledge of letters for writing; however, only PA significantly and independently contributed to reading words and reading comprehension skills.	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)
Pazeto et al. ²⁰	Prediction of arithmetic competence: role of cognitive abilities, socioeconomic variables and the perception of the teacher in Early Childhood Education	2020	1st year of J1 and J2	PA, vocabulary, knowledge of letters, reading and writing of words were able to explain 62% of the variability in Arithmetic Competence in the 1st year.	Phonological Awareness Test by Oral Production - PATOP (Capovilla and Capovilla 1998)
Donicht et al. ¹⁷	Spelling errors and phonological awareness skills in children with typical and atypical phonological development	2019	6 to 10 years	The correlation was inversely proportional between the PA performance and the number of spelling errors (those that alter the syllabic structure) for both groups, demonstrating that the more errors of this type, the lower the performance in syllabic, phonemic and total PA.	Phonological Awareness: Sequential Assessment Instrument - PASAI (Moojen et al., (2007)

Abbreviations: PA – Phonological Awareness / EF - Elementary School / J1 and J2 – Kindergarten 1 and 2.

Of the 18 articles analyzed, 17 concluded that PA was important for reading, writing and mathematics skills in several aspects. For writing, the results showed a positive and significant correlation between PA and several skill domains in elementary school students¹⁵. Another study that verified the effects of an intervention program concluded that there was a positive effect on the development of metaphonological skills and the writing skills of preschoolers¹⁶, in addition to an inversely proportional correlation between phonological awareness and spelling errors, demonstrating that the more errors, the lower the performance in syllabic, phonemic and total phonological awareness¹⁷.

In the reading skill, the results showed that the PA contributed to the reading comprehension of narrative and expository texts¹⁸ and for sentences and texts reading¹⁹. Regarding mathematical ability, the only study showed that PA was able to explain 62% of the variability in arithmetic competence in the 1st year²⁰. For studies that evaluated learning difficulties and academic performance, phonological awareness significantly influenced the development of the decoding system, which is essential in learning to read and write in children with this difficulty²¹. PA was considered a significant predictor in the performance of 5th grade students²².

As for the number of studies, writing ability (six studies)^{15-17, 23-25} and reading and writing (six studies)²⁶⁻³¹ were the most investigated, followed by reading (three studies)^{18,19,32} and mathematics (arithmetic) with only one study²⁰. Two studies investigated the role of PA in learning difficulties²¹ and in school performance²². Regarding the objectives, ten studies intended to verify, analyze and investigate the role and contribution of PA in academic skills^{15,17,18,20,22-24,26,29,32}, four investigated effects of intervention programs using PA skills^{16,25,27,31} and four intended to compare, characterize and know the profile of the participants in this skill^{19,21,28,30}. The participants in all the analyzed studies were aged between 3 and 15 years, that is, children from kindergarten to the end of elementary school.

Regarding the contribution or importance of phonological awareness and other cognitive skills to academic performance, six studies showed that both PA and rapid automatized naming skills, letter name knowledge, phonological working memory, working memory, flexibility and the vocabulary contributed significantly to the learning of reading, writing and mathematics at different ages^{18,20,22-24,26}.

On the other hand, two studies showed that working memory and visual discrimination were significant concerning phonological awareness for reading and writing in participants with developmental dyslexia and learning difficulties³⁰. Word recognition had a higher contribution to reading comprehension than PA³². In this topic, a study investigating PA and knowledge of letters for initial reading and writing skills showed that only PA contributed significantly and independently to word reading skills and reading comprehension²⁹.

For the performance of phonological awareness in participants who have some disorder or disability, a study found that students with ADHD had lower performance in PA, reading and writing of words when compared to students without the disorder²⁸. Another study pointed out that a systematic intervention and stimulation of PA in Down Syndrome favored the learning of reading and writing of children and adolescents with this disorder³¹.

Seven instruments were found in the analyzed studies: (1) CONFIAS – Consciência Fonológica: Instrumento de Avaliação Sequencial (Phonological Awareness: Sequential Assessment Instrument), which analyzes phonological awareness, written spelling tasks, and working memory test from the age of 4 onwards. It consists of synthesis, segmentation, identification, production, exclusion and transposition tasks at the syllabic (40 items) and phonemic (30 items) levels.²⁶ (2) PCFO - Prova de Consciência Fonológica por Produção Oral (Phonological Awareness Test by Oral Production), composed of 10 subtests that assess syllabic and phonemic synthesis, rhyme and alliteration; segmentation, manipulation and syllabic and phonemic transposition²⁰. (3) RACF – Roteiro de Avaliação de Consciência Fonológica (Phonological Awareness Assessment Script) that assesses alliteration (initial phoneme perception), middle sound and rhyme (final phoneme perception) of words³². (4) PROHMELE - Metalinguistic and reading skill tests that assess syllabic and phonemic identification (initial, medial, final,) and syllabic and phonemic manipulation (segmentation, addition, substitution, subtraction, combination)¹⁸. (5) PHF - Perfil de Habilidades Fonológicas (Phonological Skills Profile) is composed of 14 subtests that assess initial, final, medial analysis, the addition of syllables and phonemes, segmentation of sentences, segmentation of words, subtraction of syllables

and phonemes, substitution, reception of rhymes, sequential rhyme, syllable reversal and articulatory image²⁴. (6) TCF – Tarefa de Consciência Fonológica (Phonological Awareness Task) presents 14 tasks that assess judgment of phonological range, identification and production of rhyme, identification and production of alliteration, segmentation of sentences into words, segmentation of words into syllables, syllabic manipulation (omission and addition of initial and final syllables) and phonemic manipulation (omission and addition of initial and final phonemes)¹⁶. (7) PCFF – Prova de Consciência Fonológica por Escolha de Figuras (Picture Choice Phonological Awareness Test) - computerized version, assesses rhyme, alliteration, syllabic and phonemic addition, syllabic and phonemic subtraction, syllabic and phonemic transposition, and pun³⁰. Of the instruments presented, the studies that used the CONFIAS²⁶, PCFO^{20,22}, RACF^{15,32} have information about their psychometric studies, and the others did not present this data.

Discussion

This study aimed to present an overview of Brazilian production on the influence of phonological awareness on academic performance and to present the profile of the main standardized instruments for assessing this ability. The search in the databases was conducted very carefully in two databases (LILACS and SciELO). Perhaps this is a limitation since searches were not performed in other databases. On the other hand, some studies may have been left out during the whole process, and of those that were found, their specificities were probably not analyzed.

In general, regarding the role of phonological awareness for academic performance, all the results found and mentioned corroborate the findings of other studies that have demonstrated the importance of PA for performance in reading and writing. For example, a meta-analysis by the National Early Literacy Panel, which investigated which children's skills and aptitudes predicted later reading, writing, or spelling outcomes, found that PA correlated with decoding and reading comprehension and spelling in later years³³ just as it was important for simple arithmetic in kindergarten children³⁴.

As for the ability of reading and writing to be the most investigated, some research reports that the PA has been extensively researched in

its relation to learning to read and write¹⁶. It is probably the most researched to the detriment of mathematics, although it is an essential skill for academic performance. There are no discussions in the literature that support the fact that mathematics is less researched, and this study is unable to answer in this regard, suggesting future studies and discussions on this topic.

On the other hand, particularly regarding reading, the cognitive approach to assessing this skill argues that it can be considered a complex competence, which results from the interaction of several components, namely: word recognition, linguistic comprehension and fluency³⁵. Based on this model, it can be seen that despite the complexity, its evaluation in the Brazilian context is still conducted more generically (reading comprehension)^{18,29,30}. Well, it was found that of the nine studies that evaluated reading or reading and writing, only one study³² evaluated one of the components of reading (word recognition). As a 2014 survey pointed out, the lack of valid instruments to assess specific components of reading at the national level³⁵ may be one factor that makes reading ability not unraveled in many Brazilian studies. Or simply because in the method of some research, the components of the reading instruments used are not described.^{19,26–28,31}

Regarding the objectives, the Brazilian studies analyzed do not deviate from the trend of research in the area. Many international studies have proposed to verify, analyze, and investigate the role and contribution of PA concerning academic skills, characterize the profile of participants, and investigate the effects of intervention programs. For this last topic, research reveals that phonological awareness programs as measures of early interventions contribute significantly to language development, specifically in reading and writing.³⁶ In addition, they have emphasized the need for skill monitoring during early childhood and in elementary school for both typically and atypically developing children.³⁷

Research suggests that investigating phonological awareness from early childhood onwards is a matter of early intervention strategy. There is also a consensus that in literate societies, learning about written language begins practically from birth, reaching different levels of development even before the child enters formal education.³⁸, and the quality of kindergarten education plays a fundamental role in children's later success as future readers and writers.³⁹

About the contribution or importance of phonological awareness and other cognitive skills to academic performance, just as there is strong evidence that PA has a significant impact on the learning of reading, writing and mathematics, many studies have shown that other cognitive skills also have importance for academic performance. Results of a meta-analysis that sought to identify early childhood skills that best predict later performance in learning to read and write pointed out that six of them show moderate to strong predictive correlations, such as alphabet knowledge, PA, rapid automatized naming (letters/digits, objects/colors), name writing and phonological memory³³.

Therefore, it is consensual that phonological awareness is not the only necessary skill for academic performance. Somehow, PA predictive patterns in reading fluency, for example, are complex and depend on many factors.¹⁴ Therefore, studies have shown the role of knowledge of letters as a predictor of literacy⁴⁰, working memory on reading efficiency in children with dyslexia⁴¹. Thus, it is necessary to carefully analyze all the results of some of these studies due to the significant variability in terms of content and methodology. On the other hand, these findings provide new evidence that shows the independence of skills, where each process influences the acquisition of literacy skills in a different way.⁴² Bearing in mind that beyond the similarities, there are distinct differences in the way the different components relate to different literacy skills, which can be further influenced by the nature of the participants' language and spelling.¹³

In relation to the development of phonological awareness in samples of the atypical population, studies have shown that in children with dyslexia, for example, these deficits are often found and that, consequently, children with lower phonological skills are more likely to be diagnosed with dyslexia.⁴³, or have significant deficiencies in some components of mathematics⁴⁴. However, it is essential to point out that although a deficit in PA represents an important cognitive factor underlying a specific learning disorder or difficulty in reading, writing and mathematics, this deficit is not necessary or even sufficient to explain it. Therefore, academic performance problems must be investigated in detail and depth, considering that many factors may be involved and deserve special attention during evaluation and diagnosis.

It is essential to mention that all the instruments were developed by Brazilian researchers, demonstrating the advancement in this knowledge area compared to some areas of psychological assessment and alike, where there is a lack of instruments. Some are even used without complying with the criteria recommended in translation and cultural adaptation studies⁴⁵. The instruments assess the primary phonological awareness skills, namely: suprasegmental skills (rhyme and alliteration), syllabic skills (segmentation, synthesis, manipulation and syllabic transposition) and phonemic skills (segmentation, synthesis, manipulation and phonemic transposition)⁴⁶.

Conclusion

This narrative review aimed to present an overview of Brazilian production concerning the influence of phonological awareness on academic performance and to present the profile of the main standardized instruments used to assess this skill. The results show that PA is an essential skill for reading, writing and mathematics in different school years and grades in both typical and atypical children. Writing and reading (although the evaluated component was not specified) were the most investigated skills, to the detriment of mathematics, recommending that further studies be performed with this skill.

Besides phonological awareness, skills such as rapid automatized naming, letter name knowledge, phonological working memory, working memory, flexibility, vocabulary, visual discrimination and word recognition also influence academic performance differently, and the strength of one over the other may be related to the variability of research and the methodology of each study. Seven instruments developed by Brazilian researchers that assess the main components of phonological awareness were found.

Thus, considering the influence of phonological awareness on academic skills, monitoring it in typical and atypical children should be reinforced. In addition, it should be stimulated at an early age, especially with activities and games in early childhood education services and at home, under the responsibility of the children's parents and caregivers. This will contribute to developing academic skills in formal teaching and academic success in many school years.

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