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Phonological Awareness and Reading Skills: Impact in the Digital Society

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Abstract

This study investigates the factors influencing the development of phonological awareness and its impact on reading skills among third-year basic education students. Employing a descriptive-exploratory approach at a correlational level, it is based on a comprehensive review of bibliographic sources and field-collected data. The Phonological Knowledge Evaluation Test (PECO) was used to measure phonological awareness, evaluating the manipulation of syllables and phonemes. To assess reading skills, the revised Battery of Evaluation of Reading Processes (PROLEC-R) was utilized. The results reveal significant associations between phonological awareness and lexical, semantic, and syntactic processes, although difficulties in reading comprehension persist. It is concluded that reading challenges could be linked to communicational variables within the context of a digital society, dominated by multimedia stimuli. This study highlights the importance of strengthening phonological awareness from the early stages of education to improve reading skills in basic education students.

Keywords: *Digital literacy, child cognitive development, educational technology, reading comprehension, primary education*

1. Introduction

This research addresses the relationship between phonological awareness and reading skills, two essential abilities for learning to read. These skills enable individuals to access knowledge and education, which are inalienable rights for all human beings. Despite efforts by governments and non-governmental organizations, optimal reading levels have not been achieved among children, youth, and adults. Although significant progress has been made in reducing past illiteracy rates, functional illiteracy remains a persistent problem. This term refers to the limited ability to comprehend what is read, make inferences, or engage in critical thinking that enhances the quality of reading, even after surpassing the stage of simple and mechanical decoding.

Various studies have investigated reading difficulties. Authors such as Osorio-Valencia et al., (2018) and Cervantes et al. (2023), highlight the importance of perceptual-motor skills, such as spatial-temporal location, rhythm, body schema, laterality, spatial orientation, and directionality, in the development of reading and writing. However, other authors like Kjeldsen et al. (2019) and Pittas (2018), argue that skills related to phonological information processing play a crucial role in reading processes.

In previous decades, reading instruction focused on phonetic-syllabic methods, which began with visual recognition of letters and syllables followed by assigning them a sound and possible interpretation (A. Núñez-Naranjo et al., 2025). However, this mechanical memorization did not always lead to substantial comprehension. With the emergence of phonological methods in the early 2000s, greater importance has been placed on understanding sounds within their everyday and natural contexts, allowing for their identification, internalization, and attribution of meaning along with their corresponding mental representation (Binaoui et al., 2023)

Note the significance of phonological methods in the acquisition of reading and writing processes and in text comprehension. However, more than two decades have passed, and reading limitations remain evident. A study conducted by the OCDE-PISA (2017) determined that Ecuador ranks below most countries in the region in reading proficiency. Only "49% of students reached the minimum level of competence in reading" (INEVAL, 2018). Additionally, the OECD and the Ministry of Education confirmed that Ecuadorian students scored very low in reading performance.

Reading is a fundamental tool for acquiring knowledge (A. F. Núñez-Naranjo et al., 2024), making the figures published by the INEC (2012) concerning. "26.5% of Ecuadorians do not dedicate time to reading, of which 56.8% do not do so due to lack of interest and 31.7% due to lack of time" (pp. 3-4). It can be inferred that the lack of interest is due to limited reading comprehension, which turns the act of reading into a routine and unappealing activity.

Although several factors impact reading habits such as culture, reading skills, motivation, and text characteristics, this investigative work focuses on the acquisition of reading skills in early school years and their relationship with phonological abilities (Sekar, 2014). The objective is to determine the phonological aspects involved in reading processes that can prevent future difficulties in reading acquisition and achieve automation in both decoding and comprehension.

2. Background

Phonological processing, understood as the cognitive ability that handles sounds and their mental representations, is essential for language acquisition and reading skills. However, researchers' interest focuses on specific phonological elements that affect reading in its decoding and comprehension components. Sanabria Boudri. et al. (2019), mention that phonological processing involves linguistic awareness, including semantic awareness for internalizing meanings, syntactic awareness for word agreement and order, lexical awareness for providing sense in production, and phonological awareness, which according to Fresneda and Mediavilla (2018) is the metalinguistic skill that allows reflection on oral language by intentionally identifying, segmenting, or combining sub-lexical units of words, such as syllables, intrasyllabic units, and phonemes.

Phonological awareness is essential for recognizing the structure of oral language and identifying phonological segments within syllables and words. This ability allows mentally representing words through their sound components, such as phonemes or syllables, and establishes a connection between these phonemes and their graphic representations González (2023). These connections require skills to recognize and interpret the sounds of phonemes, syllables, and words, known as phonemic, syllabic, and lexical awareness (Aghababian & Nazir, 2000; Améstica-Rivas et al., 2020; Fresneda & Mediavilla, 2018; Fuster, 2024).

In this framework, phonemic awareness, according to Gutiérrez-Fresneda (2017) , "involves the ability to segment and manipulate the smallest units of speech, which entails realizing that spoken words are made up of discrete sound units or minimal non-significant units" (pp. 339-440). That is to say, it enables the understanding of sounds individually, without syllabic combinations, since they do not have autonomous meaning on their own but are necessary to develop the ability to manipulate them. Through their combination, new sounds and meanings emerge when integrated into syllables and words. This type of phonological awareness allows for the breakdown of words into their basic sound units, in different positions whether initial, medial, or final. Moreover, it facilitates the identification, manipulation, and phonemic analysis, enabling the integration of these sounds into syllables and words from their.

Syllabic awareness is the ability to segment, identify, and/or manipulate the syllables that make up words (Parra Bravo & Bojorque, 2022). Along these lines, it is recognized as the phonological representation of sonic combinations that are pronounced in a single vocal emission. This type of phonological awareness expands language comprehension by combining individual sounds into syllables, enabling fluency in pronunciation and mental representation with a certain level of meaning. This subsequently allows for the segmentation and blending of sounds, laying the foundation for complex phonological skills.

Lexical awareness, according to Landerl et al. (2019), is the ability to identify the words that make up sentences and manipulate them, being capable of discovering that two words share the same group of sounds, either at the beginning or end of the word. Essentially, it allows for awareness of the phonological structure of speech and knowledge of graphic units, understanding that sentences are composed of words whose organization gives them a specific sense and meaning. This mastery facilitates the interpretation of complex messages and texts (Fresneda & Mediavilla, 2018). These meanings may vary depending on the position, characteristics, and contextual representation of the words. Lexical awareness is crucial for understanding the meanings of words that give language its meaning.

As analyzed in previous paragraphs, the development of different phonological awareness contributes to the acquisition of language skills and the reading process (Hesham et al., 2024; Muñoz-Oyarce et al., 2020), especially crucial in early childhood, between the ages of 4 and 8. Along these lines, it is essential to emphasize the alphabetic principle, which enables decoding words by converting their graphemes into phonemes (Cotto Pidgeon & Flores Reyes de Reichenbach, 2022). This ability is fundamental for reading and writing acquisition as it facilitates phonological decoding and the development of automatic visual word recognition, a key skill for achieving reading fluency. The alphabetic principle states that a phoneme can be represented by one or more graphemes, which when decoded through reading, allow recognition of syllabic combinations and words to attribute them meaning and sense.

Similarly to how sounds reach cognitive representation levels through phonological awareness, reading in its consolidation processes reaches milestones that enable achieving fluent and comprehensive reading. These milestones are known as lexical, semantic, and syntactic processes (Manzano-León et al., 2023)

In this context, lexical processes enable the recognition of words and retrieval of their meanings (Fuster, 2022). This storage occurs through cognitive processes that encode and associate images and words, related to the internal organization and integration of long-term memory. Reader's lexical processes are supported by the acquired ability to associate mental representations and sounds to form words.

Lexical processes access written signs through the lexical route and the phonological route. The lexical route, according to Montesinos Mardones et al. (2022), is used with known words, as immediately upon reading the word, a connection is established between the written form of the word and its meaning. This route allows for the global reading of orthographically regular or irregular words that have been stored and used daily with greater reading accuracy and speed, being the most frequently used route (Lara-Díaz et al., 2024; Reyes Furcal, 2023).

While the sublexical route, according to Montesinos Mardones et al. (2022), is used when we start reading or with unfamiliar words, and involves a grapheme-to-phoneme conversion of each letter of the word to then consult the word store and assign meaning to that sequence of sounds. Reading through this pathway entails deciphering graphemes, assigning each letter an arbitrary sound in order to structure and give meaning to a word. This route is best employed for reading unfamiliar words and/or pseudowords (Andrews & Hersch, 2010; Reyes Furcal, 2023).

Therefore, the reading process utilizes both routes, which complement each other, allowing for accurate reading of previously stored words. When words are not registered, the sublexical route is immediately employed

On the other hand, syntactic processes in reading, or grammatical analysis of sentences, require syntactic rules for segmenting a sentence into its components. This facilitates the construction of a syntactic structure and the extraction of its meaning. It involves three essential operations: assigning labels (subject, verb, predicate) to each word within a sentence; identifying the relationship between components; and providing the syntactic framework through hierarchical ordering (Fuster, 2022). Syntactic awareness is the process by which sentences are structured and given meaning, taking into account the grammatical rules of each language.

Similarly, phases have been established to achieve syntactic awareness. The first level reflects tacit knowledge of syntactic rules; the second level reflects the ability to manipulate elements that structure language; the third level refers to the ability to analyze and identify grammatical rules; and the fourth level is characterized by the ability to reflect on one's own knowledge of syntactic rule (Navarro & de los Reyes Rodríguez, 2014). Syntactic awareness is not a prerequisite for reading but develops once children have acquired the reading process. The grammatical rules of the language become easier to understand, assimilate, and utilize as texts are read, enabling them to reach comprehension of reading as a subsequent level in reading proficiency.

The semantic process involves extracting meaning from what is read and integrating it with memory. This entails constructing a mental model based on the information presented in the text and the information stored in memory to generate meaning (Landerl et al., 2019). The semantic component is responsible for giving meaning to words and their combination when they appear in a sentence, as well as for expressing meanings across a sequence of events, organizing and relating information, acquiring and using abstract categories (Sanabria Boudri. et al., 2019). This ability energizes the reading process, as it engages a series of cognitive and grammatical skills that are intertwined with pragmatics. According to Toapanta (2020), "semantics deals with understanding the meaning of words, while pragmatics deals with understanding (...) and interpretation (...), which is why these two branches of linguistics cannot be separated" (pp. 5-6). Semantic awareness is related to the level of vocabulary developed by an individual, meaning that a greater repertoire in semantic awareness leads to better comprehension of texts, giving meaning to sentences and paragraphs.

2.1 Reading proficiency

Reading proficiency is conceived as the skill in reading acquired through the proper development of all previously described phonological and linguistic abilities (A. Núñez-Naranjo et al., 2024). This process begins in the early years of schooling, when children manage to identify and recognize the 30 graphemes and phonemes that make up the alphabet, according to their language. Moreover, when a person starts schooling to acquire reading skills, they already possess the development of basic cognitive processes and phonological and semantic skills from their oral language (Ferrand, 2000; Larroca- & Saavedra, 2023).

In the same vein, Cotto Pidgeon and Flores Reyes de Reichenbach (2022) assert that children acquire this skill within a few months of starting to learn to read, so technically, it can be said they already know how to read at that point. However, once the rules of grapheme-to-phoneme conversion are automated, the acquisition of precise and fluent reading is enhanced, allowing them to become proficient readers. This process of automatization is crucial as it shifts reading from a conscious and laborious activity to an automatic and fluid skill. Precise and fluent reading not only enhances speed and accuracy but also facilitates reading comprehension, enabling readers to focus more on the meaning of the text rather than on the decoding process.

2.2 Digital Literacy Implications

Sartori (1997) describes a society where images predominate over text, which has led to a decline in deep and reflective reading skills. However, it is important to recognize that digital tools also offer significant opportunities to improve phonological awareness and reading skills, especially when used in a strategic and supervised manner.

On the one hand, gamification has proven to be an effective tool for fostering interest and motivation in learning to read. Educational applications that incorporate interactive games can help students develop phonological skills in a playful way, allowing them to practice syllable segmentation, phoneme identification, and sound blending in an engaging and motivating environment (Jiménez-Pérez et al., 2023). These tools not only improve word decoding accuracy, but also promote reading fluency and comprehension.

On the other hand, artificial intelligence (AI)-based reading applications offer a personalized approach to developing reading skills. These applications can be adapted to the individual level of each student, providing exercises and immediate feedback that reinforce phonological awareness and reading comprehension. For example, some platforms use algorithms to identify specific areas of difficulty, such as phoneme identification or syntactic comprehension, and offer personalized activities to overcome these challenges (Medeiros et al., 2020).

In addition, multimedia resources, such as audiobooks and educational videos, can complement traditional instruction by providing pronunciation and intonation models, which facilitate the internalization of the sounds of the language. These resources are especially useful for students learning in bilingual or multilingual environments, as they allow them to become familiar with different phonological patterns and expand their vocabulary in a contextualized manner.

However, it is crucial to balance the use of digital tools with traditional reading activities and human interaction. As Vera-Pazmiño et al. (2022) point out, direct interaction with parents, teachers, and peers remains critical for the development of deep and contextualized language skills. Therefore, educational strategies must integrate both the advantages of technology and the benefits of personal interaction to promote comprehensive development of phonological awareness and reading skills.

3. Methodology

This study adopts a quantitative methodology with a descriptive-exploratory and correlational approach, based on a thorough review of bibliographic sources and the application of field techniques.

3.1 Population

The study focuses on students from a single educational institution ("Rincón del Saber"), made up of 90 third-year students, which allows a detailed and controlled analysis of the relationship between phonological awareness and reading skills in a specific context. The selected institution is located in an urban environment in the city of Quito, which reflects particular socioeconomic and cultural characteristics. It is likely that students in this institution have access to more advanced educational and technological resources compared to those attending schools in rural or less economically developed areas. In addition, the educational level of families and the support they provide to students at home may vary significantly in other contexts, which could influence the results obtained.

3.2 Phonological Awareness Assessment

Phonological awareness was assessed using the Phonological Knowledge Assessment Test (PECO), designed to measure the level of phonological awareness and the ability to manipulate syllables and phonemes in words. The PECO consists of six activities: Activities 1, 3, and 5 assess the syllabic level, while Activities 2, 4, and 6 assess the phonemic level. The reliability of the test was determined using Cronbach's Alpha coefficient, yielding an internal consistency of 0.866. Additionally, the test demonstrated significant predictive and concurrent validity, supporting its robustness as a measurement instrument.

3.3 Reading Processes Assessment

The Battery for the Assessment of Reading Processes, revised version (PROLEC-R), was used to assess reading processes. This battery was internally validated using Cronbach's Alpha coefficient, showing high reliability across all subtests, except for oral comprehension, where moderate consistency was observed. Regarding criterion validity, moderate correlations were found in all cases, which is suitable considering that teacher assessment involves an external measure that can be partially subjective and less systematized.

The construct validity of PROLEC-R was confirmed through internal validity of all its main and secondary indices, showing medium to high correlations in the indices of letter identification processes and syntactic aspects. Furthermore, correlations among speed indices were high to very high, indicating good performance in tasks that typically require similar execution in other evaluative contexts.

3.4 Factorial Validity

Factorial validity was crucial for the analysis as it allowed exploring the relationship between the statistical model used and the underlying theory. The results obtained suggest that the theoretical model underlying PROLEC-R is effective in explaining the reading behavior of the subjects, highlighting its utility and relevance in the current educational context

4. Results

4.1 PECO Test Application

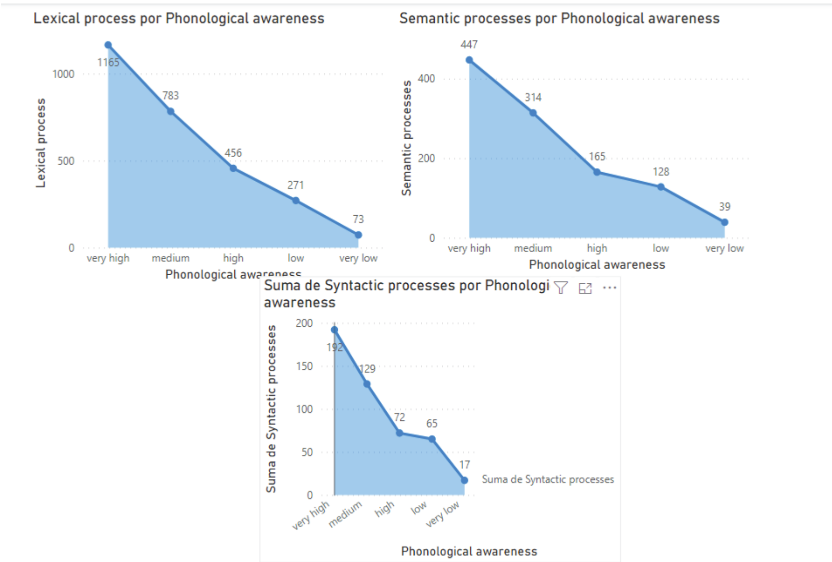

Figure 1: PECO Test Application

Note: The results show that in the study population, lexical awareness is at a very high level, semantic awareness is at a moderate level of development, and syntactic awareness is at a lower level of development.

Lexical Awareness: Students demonstrate a very high level of recognition and manipulation of words within sentences. They showed a notable ability to identify and work with words, indicating a strong mastery of lexical phonological structures.

Semantic Awareness: Shows a moderate level of development in understanding meanings and using vocabulary. While students demonstrate good basic understanding, there is still room for improvement in the depth and breadth of their vocabulary and in understanding semantic nuances.

Syntactic Awareness: Shows a low level of development in sentence structure and grammatical organization. The results indicate that students have difficulties in handling and applying complex grammatical rules, which affects their ability to construct and comprehend sentences effectively.

4.2 PROLEC Test Aplication

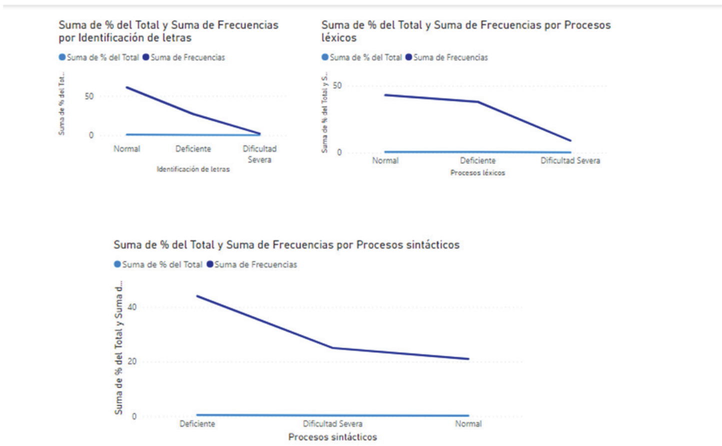

Figure 2: Prolec Test Application
Note: In the study population, it has been identified that a large percentage of the investigated individuals exhibit severe and deficient difficulties in syntactic reading skills.

Syntactic Reading Skills: A significant percentage of students demonstrate severe difficulties in understanding and constructing complex sentences. Deficiencies in syntactic awareness are reflected in their ability to read and comprehend texts with advanced grammatical structures.

Overall Performance in Reading Processes: While some students show adequate performance in word identification and comprehension, the majority face significant challenges in fluent and comprehensive reading of long and complex texts.

5. Discussion

In the contemporary context described by Sartori (1997) as "homo videns," where images prevail over text, reading skills are experiencing a significant decline. The transformation of communication processes due to the digital leap, as argued by (Villacrez Cañar, 2021), has introduced new dynamics where interaction and brevity are valued. New generations, oriented towards visual stimuli and concise messages, show a decrease in the habit of deep and reflective reading. This cultural shift poses challenges for education, which must adapt to digital literacy and promote critical and analytical reading in an image-saturated environment. It is essential for educational programs to incorporate strategies that foster reading skills beyond mere word decoding. This includes the development of deep syntactic and semantic competencies, crucial for comprehensive reading comprehension. As noted by Fresneda and Mediavilla (2018) y Parra Bravo and Bojorque (2022), while lexical awareness appears robust among the students studied, there are critical areas for improvement in syntactic and semantic awareness. Education must balance digital accessibility with the preservation of traditional reading skills to prepare students for critical analysis and informed interpretation of information.

Phonological awareness emerges as a fundamental skill in literacy acquisition, essential for the creation, application, and organization of knowledge in a knowledge society. As Pittas (2018), points out, the development of phonological awareness in preschool prepares children adequately for reading acquisition. This process involves the ability to reflect on and manipulate language sounds, facilitating the transition to more complex skills in linguistic analysis and text comprehension (Sanabria Boudri. et al., 2019). The increasing use of mobile devices among children, as noted by Jiménez-Pérez et al. (2023), could negatively impact phonological awareness development by limiting direct human interaction, which is crucial for emotional and contextual language comprehension. Face-to-face interaction in family settings, emphasized by Vera-Pazmiño et al. (2022), plays a crucial role in the development of deep linguistic skills. Therefore, it is essential to balance technological access with rich human interaction opportunities that promote the comprehensive development of phonological and literacy skills from an early age.

In a globalized context, early exposure to multiple languages and bilingual education models is demonstrating significant benefits in phonological awareness development. Studies like Medeiros et al. (2020), indicate that bilingual children tend to exhibit greater proficiency in reflecting on and manipulating language sounds, which translates into an advantage in acquiring literacy skills. This relationship between linguistic diversity and cognitive skills underscores the importance of inclusive educational policies that recognize and promote the richness of languages and cultures in the educational process.

The analysis by (Demont & Gombert (1996) on gender differences in phonological awareness and literacy emphasizes the need to address disparities from an early age. Moreover, communication mediated by technological devices should be managed cautiously to mitigate potential negative impacts on children's psycholinguistic development. As suggested by González (2023), integrating phonological awareness into educational programs not only prepares children for reading but also promotes essential cognitive skills such as verbal memory and selective attention.

This study underscores the critical importance of phonological awareness, especially in its syntactic dimension, for the development of advanced reading skills. The ability to recognize and manipulate language sounds not only facilitates word decoding but also plays a crucial role in syntactic comprehension of texts. A strong command of phonological awareness from the early stages of education prepares students to interpret and apply grammatical rules effectively in reading and writing.

The analysis of this study highlights the need to adapt reading and writing processes to the current digital environment. The transition from word-centered communication to one that privileges multimedia products has significantly transformed educational dynamics. The predominance of visual stimuli and brevity in digital communication is reshaping how students interact with written information. It is essential for educational programs to integrate strategies that promote digital literacy and cultivate critical reading skills enabling reflective analysis, synthesis, and evaluation of information.

The shift towards multimedia communication has necessitated a reconfiguration of reading and writing processes. Students, influenced by a variety of visual and auditory stimuli, face unique challenges and opportunities in their reading development. This evolution underscores the need for adaptive educational policies that balance digital access with enriching learning experiences promoting interpersonal communication and the comprehensive development of language skills. This work emphasizes the importance of addressing these changes proactively to ensure all students can achieve optimal levels of reading competence in the current environment.

6. Limitations

Family environment is a key factor that can influence the development of language and reading skills. Previous studies have shown that children who grow up in homes with a high level of verbal interaction and access to reading materials tend to develop greater phonological awareness and better reading comprehension skills (Jiménez-Pérez et al., 2023). In this study, variables such as parental educational level, frequency of reading activities at home, or access to books and other educational resources were not controlled for, which could have affected the results.

Exposure to digital devices and the use of technology at home may also have a significant impact. On the one hand, moderate use of educational apps and digital tools can improve phonological awareness and reading skills, especially when interactive and gamified resources are used (Medeiros et al., 2020). On the other hand, excessive unsupervised use of digital devices can limit verbal interactions and reduce time spent on traditional reading, which could negatively affect the development of these skills.

The educational resources available at school and at home are also an important factor. Students with access to varied and quality reading materials, as well as educational support programs, may show greater progress in their reading skills. In this study, the impact of these resources was not evaluated, which could limit the generalizability of the findings to contexts with different levels of access to educational materials.

7. Future Work

Future research could include family surveys to assess the home language environment, technology use, and access to educational resources. Experimental designs controlling these factors could also be implemented to determine their specific impact on the development of phonological awareness and reading skills. In addition, future research could examine how sociocultural factors, such as home environment and access to educational resources, affect the development of phonological awareness and reading skills

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