

Review articles

Bibliometric analysis of the literature on phonological awareness in bilingual children

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ABSTRACT

Purpose: to characterize the profile of scientific production in the international literature on phonological awareness in bilingual children between 2011 and 2020.

Methods: a bibliometric analysis was made with the search for articles in ERIC, LILACS, MEDLINE, and SciELO databases, using descriptors in English. The articles were selected based on the eligibility criteria, by reading the titles, then reading the abstracts, and lastly, reading the full-text articles.

Results: a total of 1,167 articles were analyzed, 1,152 of which were excluded for not meeting the inclusion criteria. Hence, 15 articles were selected for full-text reading and bibliometric analysis. The United States was the country with most publications, followed by Brazil, Singapore, and China. The approach of the studies was predominantly quantitative, followed by qualitative; the most common type of study was cross-sectional, with samples of more than 100 participants.

Conclusion: there was a greater number of publications in the last 3 years, most of them cross-sectional ones, presenting better phonological awareness performance among bilinguals, with positive results in reading.

Keywords: Multilingualism; Child Language; Language; Child; Development

INTRODUCTION

Bilingualism, though still a widely debated term, is a global phenomenon. It identifies people who are fluent in at least two languages, capable of efficiently producing and understanding both of them¹.

New languages can be acquired in two ways. The first one is the early acquisition, when the person learns the second language (L2) between birth and childhood. This is further classified into simultaneous (when two languages are acquired at the same time) or sequential (when L2 is learned after the first language [L1] has been fully acquired). There are also the late bilinguals, who acquire L2 in adolescence or adulthood^{2,3}.

The demand for bilingual education has increased over the years, due to the increasingly dynamic and globalized world. Hence, parents have chosen to provide bilingual education to their children, so they will be prepared to live in such a world and experience other cultures^{4,5}. Moreover, using L2 to learn regular school subjects further helps acquire that language^{6,7}.

The literature is not yet unanimous on the best method to teach L2, as there are various acceptable bilingual teaching plans⁸. However, studies state that bilingual education must be based on a well-planned program, with the following characteristics: teaching to read and write in the mother tongue, and afterward developing these skills in L2; teaching school subjects in L1, without translating them, thus providing the basis for the comprehension of L2; and teaching and helping students master L2 in quality well-developed classes⁹.

Students must understand the rules of the alphabetic principle of writing (i.e., the links between phonemes and graphemes) to learn to read and write, both in L1 and L2. In its turn, understanding this principle requires the phonological awareness skill¹⁰.

Phonological awareness is the ability to segment a sequence of letters into sound units (phonemes) and manipulate them¹¹. This skill is used to associate graphemes to phonemes and understand that such units are present in different words¹⁰⁻¹².

Thus, providing bilingual education to children while they are learning to read and write may positively influence their cognitive development, including attention, working memory, executive functions, and reading skills¹³⁻¹⁵.

Concerning phonological awareness, bilingual children can learn phonological aspects faster than monolingual ones, according to the cross-language transfer theory¹⁶. Phonological awareness transfer from L1 to L2 and vice-versa demonstrates that when

bilingual children have this skill stimulated in one language, it will probably be transferred to the other one, as well¹⁷.

An eight-article integrative review showed that six of them revealed benefits in the phonological awareness of bilingual children in comparison with monolingual children. The bilingual children performed better in phonological awareness than their monolingual peers. Thus, L2 may positively influence the development of phonological awareness¹⁸.

Therefore, the following research question was established for this study: "What is the profile of the scientific production in the Brazilian and international literature addressing the role of phonological awareness in bilingualism?". Bibliometrics is a quantitative analysis method for scientific studies and it can be used, in this case, as a methodology to measure the scientific production and contribution regarding the present topic^{19,20}.

Hence, the objective of this bibliometric review is to characterize the profile of the Brazilian and international scientific production on phonological awareness in bilingual children.

METHODS

This is a bibliometric review of the state-of-the-art research on the role of phonological awareness in bilingualism. Bibliometrics quantitatively analyzes information to organize, characterize, and classify publications retrieved via search mechanisms, making it possible to identify patterns and the state-of-the-art in a given field²¹. Articles published in the last 10 years (between January 2011 and April 2020) were searched in Brazilian and international journals in ERIC, LILACS, SciELO, and MEDLINE databases. The said period was established to search for publications because the topic in question was still incipient in the first decade of the 2000s. Moreover, this research aims to gather recent information in order to meet its objective of outlining the profile of the scientific production on bilingualism. The following descriptors regarding the topic were used, with the free terms and the Boolean operators in English: bilingualism AND phonology, bilingualism AND phonological awareness, and bilingualism AND phonological skills.

Eligibility Criteria

The eligibility criteria to select the sample were as follows: a) articles published in Brazilian and

international journals in full text and available in the database; b) in English; c) experimental, observational, and review articles published in English in the last 10 years. Opinion articles, case series, case studies, communications, and articles approaching bilingualism for deaf people were not included.

The articles were selected by reading their title, then reading their abstract, and lastly reading the full text

of articles potentially relevant to the review. Duplicate articles were excluded and the variables of interest regarding the selected articles were extracted and tabulated in a spreadsheet, with the following data: year of publication, journal name, country of publication, research design, keywords, the journals' impact factor, Qualis, and main indexing, objectives, and results (Figure 1).

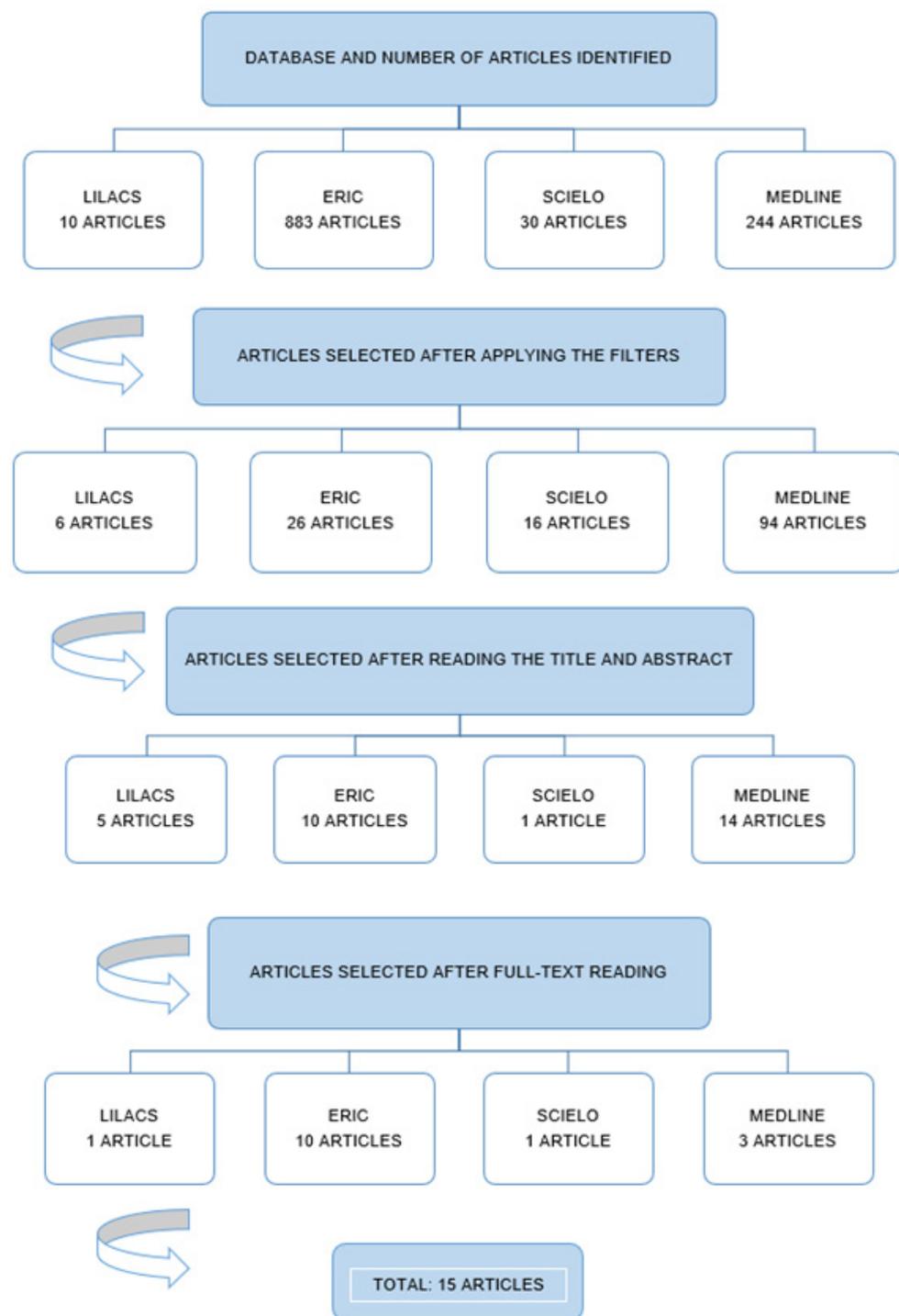


Figure 1. Flowchart of the search

The descriptive analysis of the results was made based on frequency distribution, with their absolute (n) and relative (%) numbers.

LITERATURE REVIEW

A total of 1,167 articles published between January 2011 and April 2020 were found. Of these, 1,152 were excluded for not meeting the eligibility criteria. Such a high number of studies were due to a restricted descriptor selection – especially regarding the population of interest of the research, as there could be comparative studies between children and adults. Nonetheless, considering that this is still an incipient topic, it was decided to read the articles in full text to outline this criterion. Another hypothesis for this expressive initial number is the significant quantity of publications with the isolated descriptors that were chosen. Hence, the filters and Boolean operator combinations were essential to select the articles – which

was based on the combination of the abovementioned free terms and Boolean operators, using the previous selection criteria. This resulted in 15 articles selected from MEDLINE, ERIC, LILACS, and SciELO.

The number of articles per year of publication varied considerably. Only one article²² from 2011 was found, which investigated the acquisition of phonological reading skills in monolingual and bilingual children, pointed out as a little developed type of study on the topic at the time. The participants of both groups used their phonological awareness reading skills, and the results revealed better performance among bilingual children.

There was an increase between 2012 and 2014 in relation to 2011, but no studies were published in the following years (2015 and 2016). It increased again after that, especially in 2019, which concentrated the greatest number of published studies, totaling 26.66% (four articles) (Figure 2).

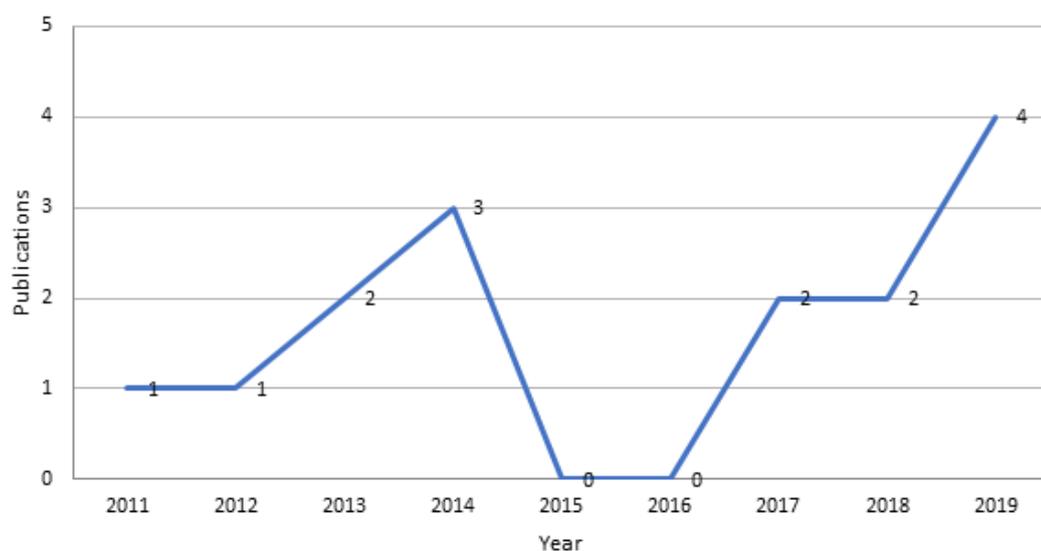


Figure 2. Publications per year

The 2019 studies focused on investigating the participants' performance in phonological awareness skills, especially comparing different groups. One study²³ investigated the phonological awareness competence in bilinguals at different levels. Another one²⁴ sought to understand the roles of phonological skills in people whose L1 was Chinese and L2, English. On the same perspective of these articles, researchers²⁵ compared Chinese-English bilinguals with English monolinguals regarding phonological awareness and other linguistic skills.

The recent studies²³⁻²⁹ followed the same methodological model found in 2011²². Their differences lie in the groups of participants and the diversity of skills they studied, besides phonological awareness. One of the possible factors for the greater number of articles published in the last three years is the increased globalization – causing a greater demand for bilingual schools and consequently increasing the interest in studying their impacts and/or benefits in the children's learning.

As for countries, the United States had the most publications in the period, with 26.66% (four articles), while Brazil, Singapore, and China had 13.33% (two articles) each. The other countries had only one published study each (Figure 3). The publications were predominantly in English, while 13.33% (two articles) were in both Brazilian Portuguese and English. Hence, the United States is noticeably leading the publication

of research on bilingualism, in comparison with the number of studies published on the topic in other countries. This is especially due to the reality in many regions of the country, where there are children of Latin-American background³⁰, a large number of immigrants, and the emerging need for understanding how these children develop phonological awareness to learn to read and write.

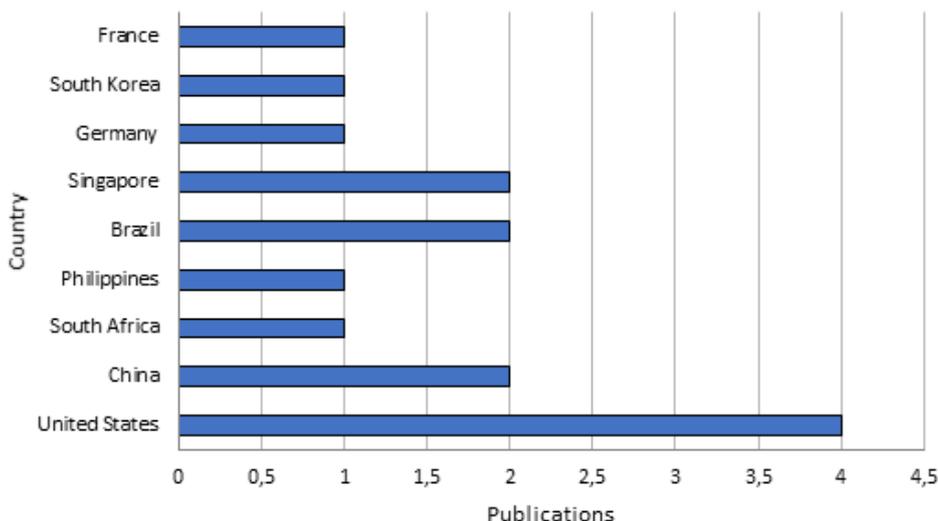


Figure 3. Number of publications per country

A total of 61 different keywords were found, of which multilingualism^{27,28,31}, phonological awareness^{22-24,26,29,32,33}, and bilingualism^{22,25,27,30,33} were the most frequent ones (Figure 4). Keywords are tools for database indexing, which makes them an important source of access to scientific articles. They enable

the researcher to obtain information on the content of a text beyond what has been presented by the title and abstract^{34,35}. However, the variety of descriptors found in this research and the lack of homogeneity in concordant keywords may reflect the difficulty in finding publications in the databases.

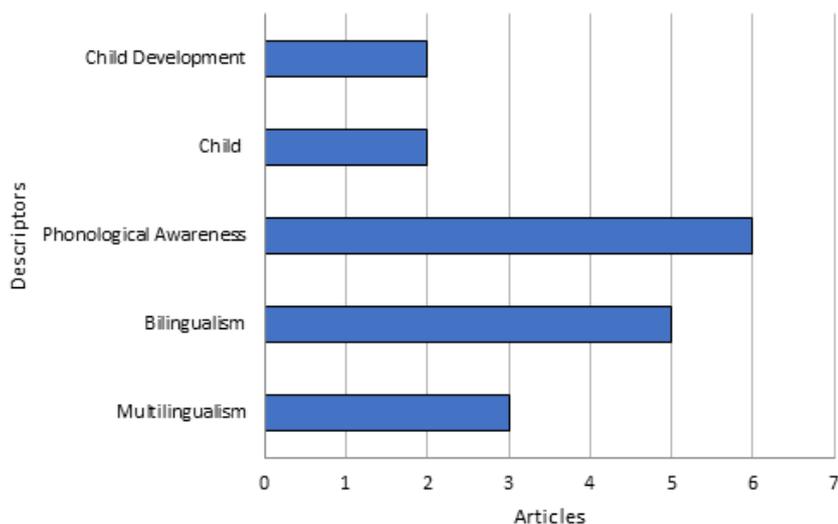


Figure 4. Descriptors of the articles

The *Reading and Writing* and *International Journal of Bilingual Education and Bilingualism* were the only two of the 12 journals with more than one publication – they had three and two, respectively (Figure 5). The *International Journal of Bilingual Education and Bilingualism*^{25,30} is a new journal, focused on topics such as bilingualism, multilingualism, bilingual education, and new language acquisition. The most cited one, *Reading and Writing*^{29,35,36}, is an open-access interdisciplinary and interprofessional academic journal

that explores aspects of literacy in institutional, socio-cultural, and disciplinary contexts. The topics of the articles published in this journal encompassed comparisons between monolingual and bilingual children regarding metalinguistic awareness in writing²⁹ and the relationship of phonological awareness with learning to read and write³⁵ and with reading decoding³⁶. The bilingual subjects performed better in only one study²⁹, whereas the other ones did not show significant differences^{35,36}.

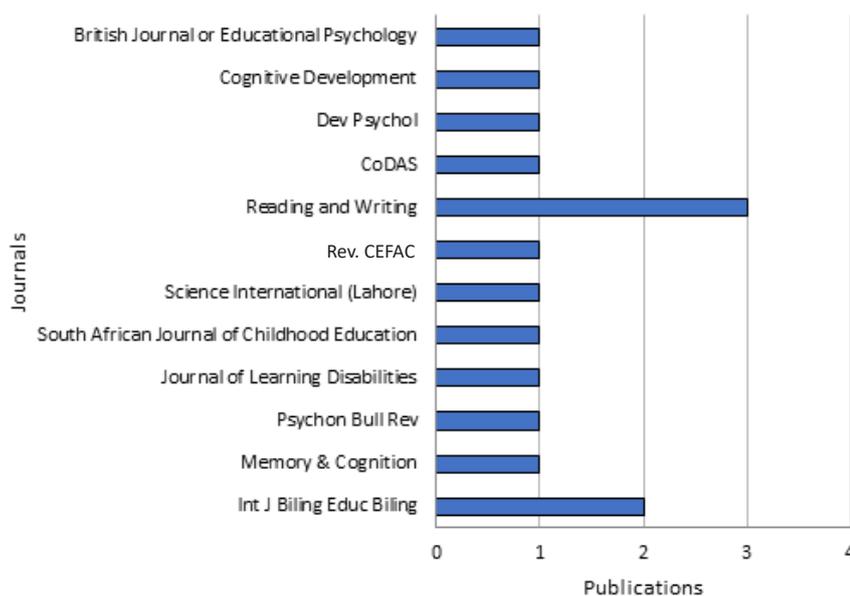


Figure 5. Number of journals

Similar to the descriptors, there was a variety of journals with publications. The *International Journal of Bilingual Education and Bilingualism* stands out among them, possibly as a reference in publications in the field, as it specifically approaches bilingualism.

Quantitative studies were the most recurrent type (93.33%, corresponding to 14 articles); only one article (6.66%) had a qualitative approach. This one was an integrative review that addressed issues of bilingualism in childhood and adulthood and literacy²⁷. Cross-sectional studies were the most frequent ones, totaling 12 (80%). Most of these compared participants in different groups regarding phonological awareness skills, collecting new data (Table 1). Regarding the sample, most studies had more than 100 participants.

Table 1. Methodological aspects of the studies

Methodological Aspects	
Type of Approach*	f
Qualitative	1 (6.66%)
Quantitative	14 (93.33%)
Type of Study**	f
Cross-sectional	12 (80%)
Longitudinal	2 (13.33%)
Review	1 (6.66%)
Study sample***	f
10-19	1 (7.14%)
20-39	1 (7.14%)
40-59	1 (7.14%)
60-79	3 (21.42%)
100 or more	8 (57.14%)

Note: In the *type of approach and **type of study, there were 15 articles; however, in the ***study sample, there were 14 articles because one was an integrative review.

Caption: f = frequency.

Cross-sectional studies, which are characteristically low-cost, can outline the profile of the studied population. In this bibliometric review, all of them had a comparative profile and demonstrated that bilingual children who are learning to read and write performed better in phonological awareness in reading in this group of children^{23-25,30,33,36}, as already identified in previous studies^{16,17}.

Two out of the 15 articles reviewed were longitudinal. The first one focused on testing over the years, in Cantonese-English bilingual children, the prosodic transfer hypothesis and the segmental phonological awareness transfer hypothesis, both alone and in combination, in the three latent variable structural equation models²⁶. For the segmental transfer model, the sensitivity to Cantonese intonation helped the segmental phonological awareness in that language, which longitudinally contributed to the segmental phonological awareness in L2 (English) and, as a result, to reading words in English. Generally, the study results support a unified phonological transfer model,

emphasizing the role of prosody in reading words in English among Cantonese-English bilingual children²⁶.

The objective of the second longitudinal study³³ was to examine whether there were different growth patterns in the basic reading skills between Turkish-German bilingual and German monolingual students. It also investigated whether a common reading model would equally fit both groups. The study revealed that both groups congruently developed their reading comprehension and other reading-related skills (phonological awareness and decoding). The authors also highlighted that the bilingual children in the sample had a slightly higher phonological awareness, though their development was similar to that of the monolingual group.

Lastly, the studies varied in terms of language transparency, phonological awareness performance, exposure time, and relationship with reading development. Table 2 shows the variety of results regarding phonological awareness between bilinguals and monolinguals, as there is yet no consensus on the advantages and disadvantages of bilingual education^{22-34,37}.

Table 2. Objectives and results of the phonological awareness performance in the samples

Study Title	Objective	Results of the phonological awareness performance
Learning to read in English: comparing monolingual English and bilingual Zulu-English Grade 3 learners ²²	To explore whether Zulu-English bilinguals have better results in phonological awareness, word reading, and reading comprehension tasks than their English monolingual peers.	Group EL1 (monolinguals) performed better in phonological awareness tasks than Group EL2 (bilinguals).
Phonological awareness skills of English as Second Language (ESL) learners: the case of first-grade Filipino Bilinguals ²³	To compare the performance of full and partial bilinguals in phonological awareness tasks.	The bilinguals proficient in L1 and L2 performed better in phonological awareness than the bilinguals more proficient in L1.
Bidirectional cross-linguistic association of phonological skills and reading comprehension: evidence from Hong Kong Chinese-English bilingual readers ²⁴	To investigate how phonological skills in L1 and L2 contribute to reading in both languages.	The study demonstrated the bidirectional association (from L1 to L2 and from L2 to L1) for reading comprehension – i.e., the knowledge of phonological aspects of Chinese contributed to reading comprehension in English, and the knowledge of phonological aspects of English contributed to reading comprehension in Chinese.
Simultaneous acquisition of English and Chinese impacts children's reliance on vocabulary, morphological and phonological awareness for reading in English ²⁵	To explore the role of bilingualism in the acquisition of reading, comparing bilingual with monolingual children.	There was no difference in the performance of bilinguals and monolinguals – except for the isolated word reading task, in which the bilinguals were superior.
Tone matters for Cantonese-English bilingual children's English word reading development: a unified model of phonological transfer ²⁶	To investigate whether there is a phonological transfer from L1 to L2 in Cantonese-English bilingual children.	The study demonstrated the presence of phonological transfer between L1 and L2.

Study Title	Objective	Results of the phonological awareness performance
A comparative study on phonological acquisition and performance in phonological awareness by children exposed to a bilingual or monolingual family environment ²⁸	To verify and compare the phonological acquisition and performance in phonological awareness tasks between children exposed to a bilingual home environment and children exposed to a monolingual home environment.	The children exposed to a bilingual home environment got fewer answers right in the phonological awareness tasks, although no statistically significant difference was found.
Metalinguistic contribution to writing competence: a study of monolingual children in China and bilingual children in Singapore ²⁹	To investigate how the components of metalinguistic awareness contribute to reading comprehension in bilingual and monolingual children.	The bilinguals performed better in phonological awareness than the monolinguals.
The effects of Spanish heritage language literacy on English reading for Spanish-English bilingual children in the US ³⁰	To investigate the impact of bilingualism on children's literacy.	The bilinguals performed better in phonological awareness skills than their monolingual peers.
Profile of phonological awareness in bilingual and monolingual children ³¹	To compare the performance of phonological awareness skills in bilingual and monolingual students.	There was a differentiated performance in phonological awareness skills between the tested groups; the bilinguals had better results than the monolinguals. Bilingual children had greater mastery over the phonemic awareness skill, which is an integral and more complex part of phonological awareness.
The relationship between phonological awareness and executive attention in Chinese-English bilingual children ³²	To examine the relationship between phonological awareness and executive attention in bilingual children who are learning to read.	Bidirectional association between phonological awareness and the executive attention in the bilinguals.
Differential growth patterns in emerging reading skills of Turkish-German Bilingual and German Monolingual primary school students ³³	To compare the basic reading skills in bilingual and monolingual children.	Both groups similarly developed phonological awareness.
Do bilingual children possess better phonological awareness? Investigation of Korean monolingual and Korean-English bilingual children ³⁶	To investigate whether bilingual children have an advantage in phonological awareness skills.	The study results indicated that the bilingual children had an advantage over the monolinguals regarding phonological awareness.
Second-language learners' advantage in metalinguistic awareness: A question of languages' characteristics ³⁷	To investigate phonological, morphological, and syntactic awareness skills in children who are learning L2.	There were no significant differences between the bilinguals and monolinguals concerning phonological awareness.
Genetic and environmental overlap between Chinese and English reading-related skills in Chinese children ³⁸	To analyze the genetic and environmental influences on visual word recognition, receptive vocabulary, phonological awareness, phonological memory, and speech discrimination in L1 and L2 in twins.	The genetic factors play an important role in the phonological awareness of bilinguals, whereas the shared environmental factors contributed more to the Chinese phonological awareness. Moreover, learning to read in L2 did not interfere with the acquisition of L1.

Note: The review article²⁷ was not included in this table.

Captions: L1: first language; L2: second language; EL1: monolingual group; EL2: bilingual group.

The journals with the highest impact factors were the *Psychonomic Bulletin and Review*²⁷ and *Developmental Psychology*³⁹. This factor – which can be low, high, or non-impact – measures the quality of the journals and assesses the authors and researchers according to

their publications and citations³⁹. The journals listed as “not applicable” in the impact factor column of the table either did not have it or did not inform it on its website or in Scopus. The same applies to Qualis and indexing.

Table 3. The journals' impact factor, Qualis, and main indexing

Journal	Impact Factor	Qualis	Main Indexing
Science International (Lahore) ²³	1.365	Not applicable	Web of Science, Google Scholar
Reading And Writing ^{33,29,36}	1.445	Not applicable	ERIC, Scopus, Linguistics and Language Behavior
Psychonomic Bulletin and Review ²⁷	3.910	Not applicable	MEDLINE, Scopus, Google Scholar
Memory & Cognition ²⁶	1.694	Not applicable	MEDLINE, Scopus, Google Scholar
Journal Of Learning Disabilities ²⁴	2.144	Not applicable	ERIC, Scopus, MEDLINE
International Journal of Bilingual Education And Bilingualism ^{25,30}	2.168	Not applicable	Scopus, Thomson Reuters
Developmental Psychology ³⁸	3.063	Not applicable	Medline, ERIC, Scopus
Cognitive Development ³²	2.050	Not applicable	ERIC, Scopus, Linguistics and Language Behavior
CoDAS ³¹	0.540	B1	MEDLINE, PubMed, Scopus, SciELO, LILACS
CEFAC ²⁸	Not applicable	B1	LILACS, SciELO, Latindex
South African Journal of Childhood Education ²²	Not applicable	Not applicable	SciELO, ERIC, Scopus
British Journal of Educational Psychology ³⁷	2.506	Not applicable	MEDLINE, Scopus, Web of Science

Note: not applicable = data not found in the journal's website, Scopus, or Qualis CAPES.

Concerning the limitations of the study, despite its bibliometric design, new studies should focus on the descriptive approach of phonological awareness and its influence on written language development in bilingual children. There is also the emerging relevance of systematic review studies with meta-analyses, which can help understand phonological awareness strategies to favor the development of reading and writing in this population.

CONCLUSION

According to the findings, the profile of the scientific production in the international literature on phonological awareness in bilingual children shows an increase in the number of publications on the topic over the last 3 years; little variation among the studies regarding methodological aspects (type of study and approach); most of the journals where they were published have a relevant impact factor for the advancement of science in the field, especially considering phonological awareness as an important skill for reading development; the United States of America concentrated the largest number of publications; and *Reading and Writing* was the journal that published most studies in the period.

Thus, it is important to develop longitudinal studies analyzing not only the role of phonological awareness in bilingualism but also its consequences.

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