ICT in the development of phonological awareness. A critical literature review

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ABSTRACT

The phonics dimension is essential for early literacy development and is a fundamental aspect of cognitive expansion. For this reason, phonological awareness has become a topic of great importance in education due to its significant impact on the development of reading and writing, basic learning skills. This study offers a theoretical review of a corpus of recent studies that reveal the contribution of technological resources to the development of phonological awareness in pre-school, with the intention of pointing out trends and research possibilities in this field. From a sample of 137 articles published in the last 15 years, and after a critical and systemic analysis carried out in different phases, 22 articles have been selected whose content focuses on pre-school and first year primary school children, in which ICT has been applied. The holistic analysis demonstrates the positive effect of these technologies on the development of phonological awareness. It is concluded that there is a direct relationship between phonological awareness and literacy in pre-school education, as well as the need for more rigorous research to obtain more precise results.

KEYWORDS: Phonological awareness; Information and Communication Technologies; Preschool Education; Research methodologies.

1   INTRODUCTION

The phonological awareness is a basic pillar for the acquisition of both reading and writing; in this sense, it can be said that it has a bidirectional nature (Wise et al., 2008). Some researchers argue that phonological awareness is the first of the manifestations of metalinguistic awareness (Sancho, 2014). Another group of authors argues that, like phonological awareness, metalinguistic awareness is an integral part of the oral language acquisition process and that, therefore, they develop simultaneously (Marshal & Morton, 1978). After making an exhaustive review of the academic literature related to this topic, it can be observed that phonological awareness does not constitute a homogeneous entity (Jiménez, 2019). Since the development of this capacity contemplates, according to the perspective of the researchers, different levels of understanding, assimilation, and development, which, in turn, present different degrees of complexity, depending on the linguistic unit that is being observed, studied, and manipulated (Gutiérrez & Diez, 2018).

The phonological awareness is structured on three levels: (1) syllabic awareness level that refers to the ability to segment a lexical unit into syllables, identify syllables and their position, or manipulate them; (2) the intrasyllabic level implies the ability to fragment the syllable into its elements: the onset and the rhyme; and (3) the phonemic level, which constitutes the most complex level of skills related to phonological awareness, it is related to the ability to recognize the minimum phonic units of language, the phonemes, both vowel and consonant (Gutiérrez & Diez, 2018). In general terms, this structure has not changed, that is, it continues to be recognized in the same way by specialists in the field. And,

according to Jiménez (2019), there would be a fourth level, that is (4) the lexical one, which refers to the ability to identify those units that make up a phrase or sentence.

Currently, research offers a broad overview of the topic in two main aspects: how ICT has been incorporated into the educational environment and what its effects have been. However, no research examines how the use of technology in a pre-school classroom may or may not improve phonological awareness. Based on our findings, we can affirm that more studies are needed to get a better perspective on the relationship between the pedagogical use of ICT and the development of phonological awareness and its different levels. Thus, in the same vein, it is important to explore the uses of technology and how it can facilitate early literacy instruction and development (Elimelech & Aram, 2019). Following these ideas, the main purpose of this theoretical review goes beyond establishing the state of the art; what is sought is to determine the strengths and weaknesses of the few researches that have been conducted so far and to understand what the prospects are for expanding this field of knowledge.

2   METHODOLOGY

In this paper, we want to analyze the most significant studies on the relation between the ICT use and the development of phonological awareness in preschool students in different countries. So, we have made a critical theoretical literature review to generate a reliable documentary corpus and facilitate the corresponding analysis. For this purpose, we followed the PRISMA protocol (Moher et al., 2009).

To fulfill the general objective, and following the paradigms of a systematic analysis, we designed a descriptive study whose Specific Objectives (SO) are the following: (SO1) To verify the level or levels of phonological awareness that are evaluated in the different types of study; (SO2) To identify the technological resources that have been used in the development of phonological awareness, determining the most recurrent and the least contrasted; (SO3) To identify the level of impact of the different ICTs on the development of phonological awareness; (SO4) To identify and analyze the specific intervention times of each proposal, taking into consideration the duration of the sessions (where children were exposed to an activity based on any technological device) and the total intervention program; (SO5) To specify the characteristics of the schoolchildren involved: age, socioeconomic level and mother tongue, among others; (SO6) To determine which are the most appropriate parameters for future research, based on the conclusions and recommendations given by the authors, in such a way that they have scientific relevance and a future significant impact on the development of phonological awareness and the skills of literacy through the use of ICT and specialized educational software.

2.1 Process

The development of this study was carried out in three phases: (1) Delimitation of the inclusion and exclusion criteria, and an additional documentary search that would allow meeting the proposed objectives. (2) Reading and scrutinizing the scientific information, based on a series of previously established categories and subcategories of analysis. (3) A critical discussion of the results obtained among the authors and of the document drafting.

The criteria followed to collect the set of papers to be studied were scientific articles and book chapters about related researching were included; on the other hand, thesis or dissertations and congress presentations were excluded. Only full papers were included, while short sources or abstracts were excluded. Regarding the period, publications from 2005 to 2020 have been taken into consideration while those texts published outside the range were excluded and, finally, the content of the papers to be included should have an explicit educational perspective and involve the mediation of ICT, while those documents with a medical or psychological focus were excluded. To carry out this phase, the following search string has been used, including the inclusion and exclusion criteria considered in multidisciplinary databases such as Scopus, Scielo, WOS, Dialnet, Google Scholar and ResearchGate. We provide the formula used to help the reader replicate the study:

(TITLE-ABS-KEY (phonological)) AND (TITLE-ABS-KEY (awareness)) OR (TITLE-ABS-KEY (preschoolers)) AND (TITLE-ABS-KEY (ICT)) AND (LIMIT-TO (DOCTYPE "article") OR (LIMIT-TO (DOCTYPE "chapter"))) AND (EXCLUDE (DOCTYPE "thesis") OR (EXCLUDE (DOCTYPE "conference")) AND (LIMIT-TO (DOC "full text") OR (LIMIT-TO (DOC "abstract")) AND (LIMIT-TO (PUBYEAR, 2020) OR (LIMIT-TO (PUBYEAR, 2019) OR (LIMIT-TO (PUBYEAR, 2018) OR (LIMIT-TO (PUBYEAR, 2017) OR (LIMIT-TO (PUBYEAR, 2016) OR (LIMIT-TO (PUBYEAR, 2015) OR (LIMIT-TO (PUBYEAR, 2014) OR (LIMIT-TO (PUBYEAR, 2013) OR (LIMIT-TO (PUBYEAR, 2012) OR (LIMIT-TO (PUBYEAR, 2011) OR (LIMIT-TO (PUBYEAR, 2010) OR (LIMIT-TO (PUBYEAR, 2009) OR (LIMIT-TO (PUBYEAR, 2008) OR (LIMIT-TO (PUBYEAR, 2007) OR (LIMIT-TO (PUBYEAR, 2006) OR (LIMIT-TO (PUBYEAR, 2005)) AND (LIMIT-TO (SUBJAREA,

"edu") OR (EXCLUDE (SUBJAREA, "neur") OR (EXCLUDE (SUBJAREA, "heal") OR (EXCLUDE (SUBJAREA, "medi") OR (EXCLUDE (SUBJAREA, "busi") OR (EXCLUDE (SUBJAREA, "phar")) AND (LIMIT-TO (LANGUAGE, "spanish") OR (LIMIT-TO (LANGUAGE, "english") OR (LIMIT-TO (LANGUAGE, "portuguese") OR (LIMIT-TO (LANGUAGE, "italian"))

It ~~were~~ was found 137 articles (population) and when eliminating duplicates and applying refinement criteria, the sample decreased to 22, as shown in the flow chart from Moher et al. (2009) (Figure 1).
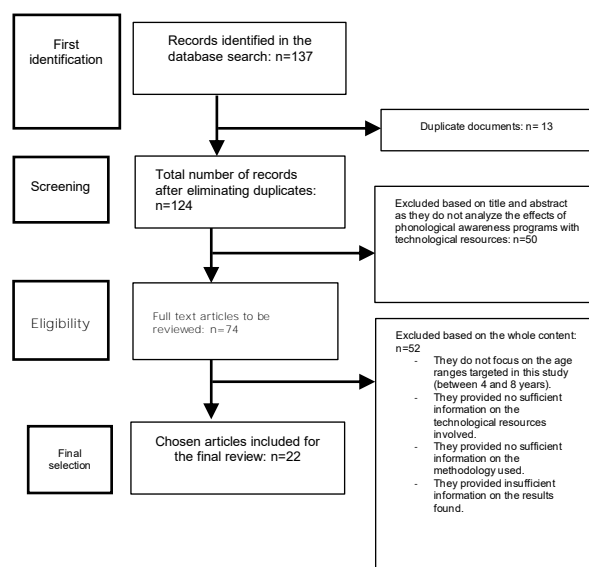

Figure 1. Flow chart of the analytical selection process

Source: Own elaboration

2.2 Sample for the critical-analytical review

All the articles finally submitted for reviewing and for deep-critical analysis focus on preschool education. Most of these are of shared authorship, only 3 belong to one author, meanwhile there are 7 articles done by two authors, two with 3 and the rest with 4 or more authors. In Table 1 we collect the totality of records that make up the resulting sample after the searches were carried out, indicating their authorship, the title of the work on its original version, the technological resource involved, as well as the level or levels of phonological awareness that have been considered.

Author (year)	Title	Technological resource envolved
Amorim et al (2020)	Using Escribo Play Video Games to Improve Phonological Awareness, Early Reading, and Writing in Preschool	EscriboPlay, educational software
Bus–& Kegel (2012)	Effects of an Adaptive Game on Early Literacy	Living Letters, computer-assisted learning

	Skills in At-Risk Populations		Korat & Blau (2010)	Repeated Reading of CD-ROM Storybook as a Support for Emergent Literacy: A Developmental Perspective in Two Ses Groups	Electronic book, e-book, narrated book
Durán et al (2015)	Eficacia de un tratamiento en Funciones Ejecutivas sobre las Habilidades Matemáticas Básicas y la Conciencia Fonológica en niños de Educación Infantil	Computer-assisted learning	Korat & Segal-Drori (2016)	E-Book and Printed Book Reading in Different Contexts as Emergent Literacy Facilitator.	Electronic book, e-book, narrated book
Elimelech & Aram (2020).	Using a Digital Spelling Game for Promoting Alphabetic Knowledge of Preschoolers: The Contribution of Auditory and Visual Supports	Digital spelling game, video games, videos, audio-visual activities	Lucarelli et al (2016)	Potenziare l'abilità di consapevolezza fonologica: uno studio preliminare sull'efficacia di un percorso educativo attraverso l'utilizzo di tecnologie specifiche	Structured software "EnPlain", educational software, multimedia software
Engströma et al. (2019)	Computer-assisted reading intervention for children with sensorineural hearing loss using hearing aids: Effects on auditory event-related potentials and mismatch negativity	GraphoGame	Luna et al.(2018)	La lengua escrita en preescolar: una propuesta socioconstructivista con apoyo de recursos informáticos	Computer-assisted instruction, camera
Fernández et al. (2016)	Effects of a voice recognition system on phonological awareness and reading skills in Spanish preschool children	Voice Recognition System (VRS)	Montiel et al. (2016)	Desarrollo de materiales de aprendizaje multimedia para fortalecer la lecto-escritura en la educación infantil	Multimedia material "Escaletras" (designed with authoring tool Jclic)
Guindeira & Gil (2017)	Jogos Educativos Digitais & Consciência Fonológica	Digital educational games (designed with Powerpoint)	Orozco (2015)	Desarrollo de la conciencia fonológica en niños de preescolar a través del recurso educativo Digital Adaptativo (REDA) "El universo mágico de las palabras"	EWN "The magic universe of words"
Hintikka et al. (2005)	Computerized training of the correspondences between phonological and orthographic units	Computer-based training	Pérez-Lisboa (2017)	Descubriendo el lenguaje a través de la realidad aumentada y la pizarra digital.	Augmented Reality (AR), interactive whiteboard (IDB)
Karemaker et al. (2010)	Enhanced recognition of written words and enjoyment of reading in struggling beginner readers through whole-word multimedia software	Oxford Reading Tree (ORT) whole-word multimedia software for Clicker	Quilca (2017)	Desarrollo de la conciencia fonológica. Uso del software Jclic con niños de preescolar	Authoring tool Jclic
Kartal & Terziyan (2016)	Development and Evaluation of Game-Like Phonological Awareness Software for Kindergarteners: JerenAli	Software designed for this purpose: JerenAli	Rogowsky et al. (2017)	Playful learning with technology: the effect of computer-assisted instruction on literacy and numeracy skills of preschoolers	Computer-based training
Kartal et al. (2016)	Training for Phonological Awareness in an Orthographically Transparent Language in Two Different Modalities	Experimental software with 14 modules	Shamir & Shlafer (2011)	E-books effectiveness in promoting phonological awareness and concept about print: A	Electronic book, e-book, narrated book

	comparison between children at risk for learning disabilities and typically developing kindergarteners	
Willoughby, et al. (2015)	Do ABC eBooks boost engagement and learning in preschoolers? An experimental study comparing eBooks with paper ABC and storybook controls	Libro electrónico, e-book, libro narrado

Table 1. Documentary records considered in the study

Source: Own elaboration

2.3 Analysis of data

To get valuable scientific information, the following categories of analysis were defined: research methodology used, intervention time, general characteristics of the students involved, level or levels of phonological awareness, technological resource, results achieved, conclusions and recommendations. To establish the categories of analysis, an inductive process has been followed, based on a thematic analysis and hermeneutical reading of the contents of the selected investigations (Guest et al., 2012). From this analysis, interpretation codes were developed, considering the explicit semantic content of the studies.

To guarantee the validity and reliability of the results obtained in this process, the coding was carried out, first by applying a pilot test with a corpus of 40 articles randomly chose, to validate the suitability of the template of categories of analysis. Afterwards, 5 international experts in phonological awareness and 2 in educational technology corroborated the accuracy of the template. Finally, the researchers established a consensus on the differences or similarities of the various constructs that emerged from the critical reading of the texts.

A second reading of each of the selected articles was carried out, under the premise of extracting the most relevant scientific information in a database created by the researchers, which was connected to a spreadsheet in which the most valuable information of the documents studied was stored, having as reference framework the categories and subcategories of analysis previously established. The Table 2 presents the 7 units of analysis with their respective definitions and their relationship with the specific objectives of this work.

Units of analysis	Definition	Specific objectives
Research methodology	This includes variables referring to the design of the study carried out, techniques and instruments implemented for data collection. Techniques and methods of analysis that provide scientific rigor and thus make validated results available are also included.	SO1
Intervention time	The intervention times developed in the study are disclosed, whether they refer to the total program or to the duration of the sessions included. The children's grouping methods in order to carry out the study are also included. This way, the context in which the intervention program is developed in terms of the time, space and grouping variable is made known.	SO4
General characteristics of the schoolchildren involved	The age range of the schoolchildren involved in the study is identified, as well as other defining aspects such as grade, family socio-economic level, socio-educational context and mother tongue. Studies related to learning difficulties or disability are also identified. The sample size is detailed.	SO5
Level(s) of Phonological Awareness being studied	The levels of phonological awareness studied in the article are identified: phonemic awareness, intrasyllabic awareness, syllabic awareness and/or lexical awareness.	SO1
Technological resource involved	The technological resources involved are identified as classified by Johnson (2019) and Quirós (2009), respectively.	SO2
Results achieved	The main results derived from how the study linking the use of technological resources to enhance phonological awareness has been carried out, what procedures or techniques have been followed to improve phonological awareness in preschoolers, what other resources have been used in the intervention. In short, what the main results, conclusions and difficulties recognized in the study are.	SO3, SO6
Recommendations	The prospective of the study, future lines of work, comments and observations derived from the interpretation of the study are presented.	SO7

Table 2. Units of analysis considered in the study

Source: Own elaboration

3 RESULTS

The theoretical analysis generates a series of data that allows to objectively deduce specific aspects about the trend of the most recent research on how the use of different technological tools enhance the development of phonological awareness in preschool students. From the information collected after scanning the articles, the following results have been obtained.

3.1 Trends of the analyzed studies

In this section we give a detailed overview that allows us to establish some important aspects of the researching topic such as the levels of phonological awareness that have been analyzed in the different studies as well as the technological resources, the procedures or techniques that have been applied to improve phonological awareness in children at the preschool level, among others.

A first descriptive analysis (see Table 3) shows that, among the group of the selected publications, 16 come from Eurasian countries: Spain, Finland, Holland, England, Israel, Italy, Portugal, Sweden, Turkey; and 6, from American countries: Brazil, Chile, Colombia, USA, and Canada.

Regarding the language of the publications, 14 records are written in English, 6 in Spanish, 1 in Portuguese and 1 in Italian. Regarding the year of publication, in 2005 we found 1 article, in 2010 2 articles were found, 1 in 2011, 1 in 2012, 3 in 2015, 6 in 2016, 4 in 2017, 1 in 2018, 2 in 2019 and 1 in 2020. From our point of view, the fact that there are no interruptions in the publications around the chosen subject demonstrates the investigative interest that it arouses in the academic community.

The relatively little production of articles, in the last 15 years, related to the topic studied here does not necessarily mean that the subject is unimportant or that there are few academics interested in researching about it. The lack of more studies on the use of ICT in the development of phonological awareness may be due to several circumstances, on which researchers should delve more deeply; we particularly believe that the main factors are the following: preschool teachers do not have a research discipline or simply, due to their workload, they do not have the time to publish their experiences and findings. Another aspect to consider is that perhaps the use of ICTs at the preschool level is still low in most of the educational establishments that serve this population.

It should be underlined that, although the articles analyzed do not present evidence on any of these statements, we think they are true and they should be taken into account in order to generate an always necessary teaching reflection, that leads those directly involved (in this case: teachers of preschool and primary education and university teachers) to improve both classroom didactics and the quality and depth of research in education, at any level or context.

Furthermore, regarding the levels of phonological awareness that have been studied in these investigations, it should be noted, first, that in 5 articles the authors do not specify the levels worked on the remaining the studies they do mention this aspect. In some of them, the authors mention, as part of their object of study, the smallest units of oral language and phonemes, that is, the phonemic awareness. From the analyzed publications in this theoretical review, there are 9 articles that take into consideration four levels of phonological awareness (phonemic, intrasyllabic, syllabic and lexical); in 4 articles the researchers tackle three levels; in 1 article, two levels; and 3 articles refer to a single level. In this sense, it is suggested that future research will be more specific in the levels that are worked out, as well as why and how they are stimulated.

Finally, following Johnson's (2019) classification, the implemented ICT resources mentioned are: Computer Assisted Instruction (CAI) and educational software in 6 articles, respectively; e-books are studied in 4 articles; authoring tools are studied in 3 articles; and specific technologies such as video games and augmented reality

on the digital whiteboard are mentioned in 1 article, respectively. However, if we look at the categorization of digital educational resources, set out by Quirós (2009), 10 articles focus on interactive resources such as collaborative games, virtual whiteboards, etc.; 9 articles use transmission resources such as e-books, computer-assisted teaching or text and voice recognition systems, among others; and only 3 articles mention active resources such as software and creativity games. In short, we see that the focus is on those technological resources based on collaborative learning, followed by those that use information as a means of developing phonological awareness.

Country	Language	Levels CF	ICT by Johnson (2019)	ICT by Quirós (2009)
Brazil: 1 (4,54%) Canada: 1 (4,5,4%) Canada: 1 (4,54%) Chile: 1 (4,54%) Colombia: 2 (9,10%) England: 1 (4,54%) Israel: 4 (18,18%) Italy: 1 (4,54%) Netherlands: 1 (4,54%) Portugal: 2 (9,10%) Spain: 3 (13,63%) Sweden: 1 (4,54%) Turkey: 2 (9,10%)	English: 14 (63,64%) Spanish: 6 (27,27%) Portuguese: 1 (4,54%) Italian: 1 (4,54%)	4 niveles: 9 (40,91%) 3 niveles: 4 (18,18%) 2 niveles: 1 (4,54%) 1 nivel: 3 (13,63%) Unspecified: 5 (27,73%)	Authoring tools: 3 (13,63%) CAI: 6 (27,27%) Digital whiteboard and augmented reality: 1 (4,54%) Ebook: 4 (18,18%) Educational software: 6 (27,27%) Specific application: 1 (4,54%) Videogames: 1 (4,54%)	Active: 3 (13,63%) Interactive: 10 (45,45%) Transmission: 9 (40,91%)

Table 3. Descriptive analysis of the documentary corpus.

Source: Own elaboration

4 DISCUSSIONS

The theoretical review that we have carried out allows us to conclude that the use of technological tools, as pedagogical support for the development of phonological awareness, has a positive effect on preschool students; this has been verified through standardized tests in most of the investigations. In all cases, this type of intervention attains a positive assessment for its functionality thanks to the adaptation of the technological tool to the context and the educational purpose that mostly focuses on improving certain skills related to phonological awareness, such as: letter knowledge, letter sound knowledge and phoneme segmentation (Kartal & Terziyan, 2016), emergent writing, name letter knowledge and phonemic sensitivity (Bus & Kegel, 2012), syllabic awareness and phonemic awareness (Fernández et al., 2016), and metaphonological ability (Lucarelli et al., 2016).

On the other hand, there is sufficient evidence to affirm that this type of intervention also contributes significantly to the literacy

process (Korat & Blau, 2010; Karemaker, et al., 2010; Korat & Segal-Drori, 2016), and it also has an impact on better performance in reading and writing (Bravo et al., 2006; Amorim et al., 2020; Rogowsky et al., 2017; Kartal et al., 2016).

The technological resources used in this type of intervention, focused on preschool children and, in some cases, also on first grade children are of different types, although there is a certain tendency to use free access educational software (such as JClic or Educaplay), which can be adapted to the context and the requirements of students and teachers (Kartal & Terziyan, 2016; Kartal et al., 2016; Amorim et al., 2020; Lucarelli et al., 2016; Karemaker et al.; Orozco, 2015); or also electronic books (Korat & Blau, 2010; Korat & Segal-Drori, 2010; Shamir & Shalafer, 2011; Willoughby et al., 2015). The authors of one of the studies included in this analysis (Luna et al., 2018) point out that the computer resources most used in this type of didactic intervention, with a socio-constructivist approach, are the computer, the printer, scanner, video beam, online activities, video storytelling, Microsoft (Word, Power Point, Paint); while another study highlights the importance of easily acquiring some useful supplies for this type of practice, such as Amazon Fire tablets, or other low-cost technological devices (Amorim et al., 2020).

The different tests reveal that the evolution in the phonological awareness of the children who have participated in these experimental groups is not due only to the use of the computer, but also to the application of specific games and software aimed at improving their PA, with the accompaniment of a teacher for a specific period: 1 month (Elimelech & Aram, 2019), 3 months (Bus & Kegel, 2012), 5 months (Luna et al., 2018), 1 year (Guindera & Gil, 2017). According to the results given in these articles, specialists note significant differences in the level of learning that children achieve through this type of game, assisted by a teacher, while the evolution with the use of other technologies such as digital books (Elimelech & Aram, 2019) has been non-existent. Here, it is important to highlight that there is not enough certainty about the proper time to carry out an effective intervention. We could think that the longer the intervention lasts the better results will be achieved. However, we consider that, considering the great impact that preschool education has on students, this aspect should be carefully examined. Likewise, researchers should consider the possibility of doing longitudinal investigations and evaluating the long-terms effects of using ICT in these early ages.

Guindeira & Gil (2017) claim that assisted play favors the autonomy, participation, interest, persistence, and participation of the children involved in the process. Furthermore, this type of intervention favors a decrease in disruptive behavior and resistance to carry out the proposed activities, while increasing tolerance to frustration. Similarly, Hintikka et al. (2005) argue that children who have participated in this type of test felt motivated, made fewer mistakes, and experienced fewer difficulties in the learning process as the test progressed. So, all this shows that the use of ICT not only influences the better development of Phonological Awareness, but also prompts autonomy and disposition towards learning, in general.

5   CONCLUSIONS

This study contains a critical theoretical review focused on recent and current research regarding the impact of technological resources in the development of phonological awareness in

preschool students. This theoretical review responds to a set of questions that are explained in the development of this article and provides a rigorous analysis of some of the variables that we have considered relevant to show up the advance in the field as well as the aspects to be improved in future investigations. Among the variables studied are the language of the publications, the average age of the students involved in each research, the intervention time, the sample size; we have also pointed out whether the studies consider the socioeconomic level of the participants, whether or not they are aimed at students with a particular disability. Finally, the analysis also offers a systematic review of the types of software or computer programs used in the various interventions.

After setting a rigorous categorization framework, from a group of more than 100 documents, a total of 22 academic articles, published in the last 15 years, were reviewed to find out the possible relationship between the different levels of phonological awareness and the technologies used for its development. The data collected allows us to verify that we have blocks of publications each one focused on different technological resources, but that they suggest a tendency to use interactive resources more than expository ones. Nevertheless, we believe that a comparative study between these two kinds of technological resources would be very useful to understand better the difference on the impact level they have on children language development and how and when to use them.

In general, we can affirm that the different investigations that have been analyzed here, in addition to focus on the levels of phonological awareness, as the main object of study, have also highlighted other important aspects in the context of the investigation, such as: technological resources, the size of the group, the socioeconomic conditions of the sample, the characteristics of the intervention and the reading process.

However, when talking about language development, we cannot ever forget that this process begins even before the child enters academic life, in their family environment, where she/he acquires the first elements of language and vocabulary, with the help of lullabies, imitation of sounds and social relationships that constitute the first bricks for the subsequent development of their phonological skills (Defior & Serrano, 2011).

We know that this work is not exempt from methodological limitations. However, we believe that the analyses developed offer pertinent information for the academic community on the type of research that is being carried out in this field, which allows us to measure the scope of these studies and their impact, both academically and pedagogically. On the other hand, in various parts of the article we have pointed out some ways or strategies to improve the main aspects of the research methodology in this kind of studies related to the use of ICT in preschool education to obtain more reliable and replicable results (in different contexts), which in turn will have a positive impact on proposing effective improvements to the educational system, from its bases.

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LES TIC EN EL DESENVOLUPAMENT DE LA CONSCIÈNCIA FONOLÒGICA. UNA REVISIÓ CRÍTICA DE LA LITERATURA

La dimensió fònica és essencial per al desenvolupament de la primerenca alfabetització i constitueix un aspecte fonamental de l'expansió cognitiva. Per aquesta raó, la consciència fonològica s'ha convertit en un tema de gran importància en l'educació a causa del seu impacte significatiu en el desenvolupament de la lectura i l'escriptura, habilitats bàsiques d'aprenentatge. Aquest estudi ofereix una revisió teòrica d"un corpus d"estudis recents que revelen la contribució dels recursos tecnològics en el desenvolupament de la consciència fonològica en preescolar, amb la intenció d"assenyalar les tendències i les possibilitats de recerca en aquest camp. D'una mostra de 45 137 articles publicats en els darrers 15 anys, i després d'una anàlisi crítica i sistèmica realitzada en diferents fases, s'han seleccionat 22 articles el contingut dels quals se centra en nens de preescolar i primer curs de primària, en què s'han aplicant les TIC. L'anàlisi holístic demostra l'efecte positiu d'aquestes tecnologies en el desenvolupament de la consciència fonològica. Es conclou que hi ha una relació directa entre la consciència fonològica i l'alfabetització a l'educació preescolar, així com la necessitat de fer investigacions més rigoroses per obtenir resultats més precisos.

PARAULES CLAU: consciència fonológica; tecnologies de la informació i la comunicación; educació preescolar; metodologies de recerca

LAS TIC EN EL DESARROLLO DE LA CONCIENCIA FONOLÓGICA. UNA REVISIÓN CRÍTICA DE LA LITERATURA

La dimensión fónica es esencial para el desarrollo de la alfabetización temprana y constituye un aspecto fundamental de la expansión cognitiva. Por esta razón, la conciencia fonológica se ha convertido en un tema de gran importancia en la educación debido a su significativo impacto en el desarrollo de la lectura y la escritura, habilidades básicas de aprendizaje. Este estudio ofrece una revisión teórica de un corpus de estudios recientes que revelan la contribución de los recursos tecnológicos en el desarrollo de la conciencia fonológica en preescolar, con la intención de señalar las tendencias y las posibilidades de investigación en este campo. De una muestra de 45 137 artículos publicados en los últimos 15 años, y tras un análisis crítico y sistémico realizado en diferentes fases, se han seleccionado 22 artículos cuyo contenido se centra en niños de preescolar y primer curso de primaria, en los que se han aplicado las TIC. El análisis holístico demuestra el efecto positivo de estas tecnologías en el desarrollo de la conciencia fonológica. Se concluye que existe una relación directa entre la conciencia fonológica y la alfabetización en la educación preescolar, así como la necesidad de realizar investigaciones más rigurosas para obtener resultados más precisos.

PALABRAS CLAVE: Conciencia fonológica; Tecnologías de la información y la Comunicación; Educación preescolar; Metodologías de investigación.