

## Contributions of educational technologies to the promotion of breastfeeding: integrative review

*Contribuições das tecnologias educativas para promoção da amamentação: revisão integrativa*  
*Aportes de las tecnologías educativas para promover la lactancia materna: revisión integradora*

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### Abstract

**Objective:** To analyze the contributions of educational technologies to the promotion of breastfeeding in the literature. **Methods:** Integrative review, with search and selection in CINAHL, MEDLINE/PubMed, BDENF, Scopus and LILACS databases. The descriptors Postpartum Period; Technologies; Educational Technology; Breastfeeding; and Nursing were used. It was identified 1256 publications that when applying the eligibility criteria resulted in the inclusion of 17 primary studies, published in Portuguese, English and Spanish, without time frame. Data extraction was performed using a validated instrument and adapted according to variables of interest. **Results:** The search for the evaluation and implementation of educational technologies aimed at promoting breastfeeding led to the development of tools that facilitate the care process for professional training and support, and support and guidance to parents and family members. In this sense, different technological resources were identified that contributed to the improvement of knowledge and skills, as well as greater maternal and child safety. **Conclusion:** Educational technologies are promising and revolutionary methods for the development of care practices, such as breastfeeding, representing a tool to support professionals, patients and families by allowing the exchange of information, monitoring cases and gaining knowledge.

**Descriptors:** Postpartum period; Technologies; Educational technology; Breastfeeding; Nursing.

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### Whats is already known on this?

Studies on the clinical relevance and benefits of educational technologies on breastfeeding are still incipient and reflect the need for further scientific investigation.

### What this study adds?

The incorporation of educational technologies in the practice of breastfeeding contributes to the acceptance of mothers, training of professionals, and support for family members.



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### Resumo

**Objetivo:** Analisar na literatura as contribuições das tecnologias educativas para a promoção da amamentação. **Métodos:** Revisão integrativa, com busca e seleção nas bases de dados CINAHL, Medline/PubMed, BDNF, Scopus e LILACS. Utilizaram-se os descritores Período Pós-parto; Tecnologias; Tecnologia Educacional; Aleitamento Materno; Enfermagem. Identificaram-se 1256 publicações que ao aplicar os critérios de elegibilidade resultaram na inclusão de 17 estudos primários, publicados nos idiomas português, inglês e espanhol, sem recorte temporal. A extração de dados foi realizada por meio de um instrumento validado e adaptado conforme variáveis de interesse. **Resultados:** A busca pela avaliação e implementação de tecnologias educacionais voltadas para promoção da amamentação levou ao desenvolvimento de ferramentas facilitadoras do processo de cuidado para capacitação profissional e apoio, suporte e orientação aos pais e familiares. Nesse sentido, foram identificados diferentes recursos tecnológicos que contribuíram para o aprimoramento do conhecimento e de habilidades, assim como maior segurança materna e infantil. **Conclusão:** As tecnologias educacionais constituem métodos promissores e revolucionários para o desenvolvimento das práticas de cuidados, como a amamentação, representando ferramenta de apoio aos profissionais, pacientes e familiares por permitir a troca de informações, monitoramento de casos e ganho de conhecimento.

**Descritores:** Período Pós-parto; Tecnologias; Tecnologia Educacional; Aleitamento Materno; Enfermagem.

### Resumen

**Objetivo:** Analizar en la literatura las contribuciones de las tecnologías educativas para la promoción de la lactancia materna. **Métodos:** Revisión integradora, con búsqueda y selección en las bases de datos CINAHL, Medline/PubMed, BDNF, Scopus y LILACS. Se utilizaron los descriptores del período posparto; Tecnologías; Tecnología Educacional; Amamantamiento; Enfermería. Se identificaron un total de 1256 publicaciones que, al aplicar los criterios de elegibilidad, resultaron en la inclusión de 17 estudios primarios, publicados en portugués, inglés y español, sin marco temporal. La extracción de datos se realizó mediante un instrumento validado y adaptado según las variables de interés. **Resultados:** La búsqueda por la evaluación e implementación de tecnologías educativas dirigidas a la promoción de la lactancia materna condujo al desarrollo de herramientas que facilitan el proceso de atención para la formación profesional y apoyo, apoyo y orientación a los padres y familiares. En este sentido, se identificaron diferentes recursos tecnológicos que contribuyeron a la mejora de conocimientos y habilidades, así como a una mayor seguridad materno-infantil. **Conclusión:** Las tecnologías educativas son métodos promisorios y revolucionarios para el desarrollo de prácticas de cuidado, como la lactancia materna, representando una herramienta de apoyo para profesionales, pacientes y familiares al permitir el intercambio de información, seguimiento de casos y adquisición de conocimientos.

**Descritores:** Período Posparto; Tecnologías; Tecnología Educacional; Amamantamiento; Enfermería.

## INTRODUCTION

Exclusive breastfeeding in the first six months of life, as well as its maintenance for two years, has epidemiological, social and health impacts because it contributes to the prevention of childhood morbidity due to diarrhea and respiratory infections, in addition to reducing the occurrence of maternal overweight and diabetes and favoring the strengthening of the bond between mother and baby.<sup>(1)</sup>

According to the World Health Organization (WHO), four out of ten babies were exclusively breastfed in the first half of their life in 2019. In high- and middle-income countries, 23.9% of children are exclusively fed breast milk in the first six months of life. The index represents a decrease compared to 2012, when the rate reached 28.7%. In underdeveloped countries, the rate of exclusive breastfeeding in the first half of life is above the global average about 40%, reaching 50.8% and in Brazil the estimates are 38.6%.<sup>(2,3)</sup>

Given the above, since it is common in Brazil to occur early weaning, bringing developmental and immunobiological losses, in addition to mechanics and psychomotor losses for the infant, the importance of implementing public policies that encourage breastfeeding is emphasized, seeking that this practice occurs more frequently in the first months of life.<sup>(4)</sup>

Among the benefits, it is observed that in comparison to the health of the infant who consumes other types of food, the health of what is exclusively breastfed with breast milk becomes more stable if considered the same period. Associated with this, breastfeeding promotes the strengthening of the mother-infant bond, generating happiness, satisfaction and pleasure for both.<sup>(5)</sup>

In Brazil, in 1981, the National Program to Encourage Breastfeeding was instituted, aiming at the promotion, protection and support of the practice through the structuring of programs and public policies. The result of the approximately three-year effort was concluded with the signing of MH Ordinance number 322/88, which contemplated all stages of implementation and operation of Human Milk Banks, becoming the first country to have such a legal instrument.<sup>(6)</sup> In the same perspective, seeking to strengthen the principles and guidelines already established, the Child-Friendly Hospital Initiative was created in 1992.<sup>(7)</sup>

In 1998, the Brazilian Human Milk Bank Network was created and in 1999 the implementation plan of the "Project of the National Network of Human Milk Banks" was approved.<sup>(8)</sup> In 2008, the Breastfeeding Network Brazil was established, aimed at the promotion, protection and support of breastfeeding in the Primary Health Care network<sup>(9)</sup> and later, Ordinance number 1,130, of August 5, 2015, was published,

which instituted the National Policy for Comprehensive Care to Children's Health (PNAISC) within the scope of the Unified Health System (SUS).<sup>(8,10)</sup>

Studies<sup>(11,12)</sup> showed that support services for puerperal women after hospital discharge promote benefits and meet the WHO recommendations on the ten stages of effective breastfeeding, reflecting in the improvement of the practice and the increase in its indicators.<sup>(13)</sup> In this sense, the literature considers that different technological resources are fundamental to guide and promote breastfeeding<sup>(14)</sup> and the operationalization of this action includes the entire health team in order to support and assist the mother, family and child for a more peaceful and successful breastfeeding process.<sup>(15)</sup>

According to Ordinance 2,690, of November 5, 2009, health technology management is defined as the set of management activities related to the processes of evaluation, incorporation, dissemination, management of the use and withdrawal of technologies from the health system.<sup>(16)</sup>

Educational technologies can be expressed by different resources involving software such as applications and games, as well as virtual learning environments and video platforms favorable to the breastfeeding process, since this moment can be experienced unnaturally for all women and be rooted by doubts, curiosities and complications. In this new stage of women's lives, it is necessary to maintain interaction and feedback to achieve satisfactory results and promote maternal and child health.<sup>(17)</sup>

Despite the clinical relevance and benefits related to technological incorporation in breastfeeding practices, studies aimed at identifying educational technologies, as well as their contributions, are still incipient, reflecting the need for new scientific investigations. Thus, the analysis of the literature on the subject may contribute to the identification of possible gaps and favor the creation and implementation of innovative educational technologies that help promote breastfeeding. Considering these assumptions, this study aimed to analyze in the literature the contributions of educational technologies to the promotion of breastfeeding.

## METHODS

This is an integrative review of the literature based on six stages: 1) identification of the theme and elaboration of the research question; 2) search and selection of primary studies; 3) data extraction; 4) critical evaluation of results; 5) synthesis of knowledge; and 6) presentation of evidence.<sup>(18)</sup>

Considered one of the main resources of evidence-based practice, this method allows the inclusion of different methodological approaches, resulting in the synthesis and analysis of the knowledge produced and providing effective and cost-effective interventions. It also contributes to discussions about research results, as well as arouses the need for reflections on the realization of new investigations.<sup>(19)</sup>

Taking into account the first methodological stage, the following research question was elaborated, which was structured according to the PICO strategy. As Population, pregnant and postpartum women were defined, as Phenomenon of interest were defined the educational technologies and as Context the promotion of breastfeeding.<sup>(20)</sup> Thus, this review was guided by the following question: What is the scientific evidence on the contributions of educational technologies to the promotion of breastfeeding?

The search was carried out from October to November 2020, through electronic access to the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medical Literature and Retrieval System onLine (MEDLINE/PubMed®) via National Library of Medicine, Scopus, Nursing Database (BDENF) and Latin American and Caribbean Health Sciences Literature (LILACS). For access, the computerized resources offered by the Journal Portal of the Coordination for the Improvement of Higher Education Personnel were used.

To operationalize the search process, controlled and uncontrolled descriptors indexed in the Medical Subject Headings (MeSH), Health Sciences Descriptors (DeCS) and List of Headings of CINAHL Information Systems were selected, as described in Box 1. The combination of terms was performed considering the Boolean operators OR (union of terms belonging to the same domain of the PICO strategy) and AND (intersection of descriptors).

**Box 1.** Research question according to PICO strategy. Teresina, Piauí, Brazil, 2020.

PICO	DeCS*		MeSH** and CINAHL List***	
	Controlled	Uncontrolled	Controlled	Uncontrolled
P	<b>Pregnants</b>	Pregnant Women; Mujeres Embarazadas; Grávidas; Mulher Grávida; Parturiente; Parturientes; Puerpera.	<b>Pregnant women</b>	Pregnant Woman; Woman, Pregnant; Women, Pregnant.
	<b>Pregnancy</b>	Pregnancy; Embarazo; Gestação.	<b>Pregnancy</b>	Gestation
	<b>Postpartum period</b>	Postpartum period; Postpartum period; Puerpério.	<b>Postpartum period Postnatal Period</b>	Postpartum; Postpartum Women; Puerperium; Lactation; Puerperium.
I	<b>Technology</b>	Technology; Tecnología; Technological System; Technologies; Software Technologies and Applications.	<b>Technology</b>	--
	<b>Educational technology</b>	Educational Technology; Tecnología educacional; Tecnología instruccional.	<b>Educational Technology</b>	Instructional technology; Technology, Educational; Technology, Instructional.
	<b>Social marketing</b>	Social Marketing; Mercadeo Social.	--	Social Marketing
	<b>Information Technology</b>	Information Technology; Tecnología de la Información; CT; TIC em Saúde; TIC na Saúde; Tecnologia da Informação e Comunicação; Tecnologia de Informação; Tecnologias da Informação; Tecnologias da Informação e Comunicação; Tecnologias da Informação e Comunicações; Tecnologias de Informação.	--	Information Technology
	<b>Simulation</b>	Simulation Technique; Simulación.	<b>Simulations</b>	--
	<b>Health Technologies</b>	Biomedical Technology; Tecnología Biomédica; Tecnologia Aplicada aos Cuidados de Saúde; Tecnologia Aplicada à Assistência à Saúde; Tecnologia Médica; Tecnologia em Saúde; Tecnologias em Saúde.	<b>Biomedical Technology</b>	Biomedical Technologies; Health Care Technology; Health Technology; Technology, Biomedical; Technology, Health; Technology, Health Care.
Co	<b>Breastfeeding</b>	Breast Feeding; Lactancia Materna; Aleitamento; Alimentação ao Peito; Amamentação.	<b>Breastfeeding.</b>	Breastfeeding; Exclusive Breast Feeding; Exclusive Breastfeeding.

\*DeCS (Descriptors in Health Sciences) \*\*MESH (Medical Subject Headings) \*\*\*CINAHL (Cumulative Index to Nursing and Allied Health Literature)

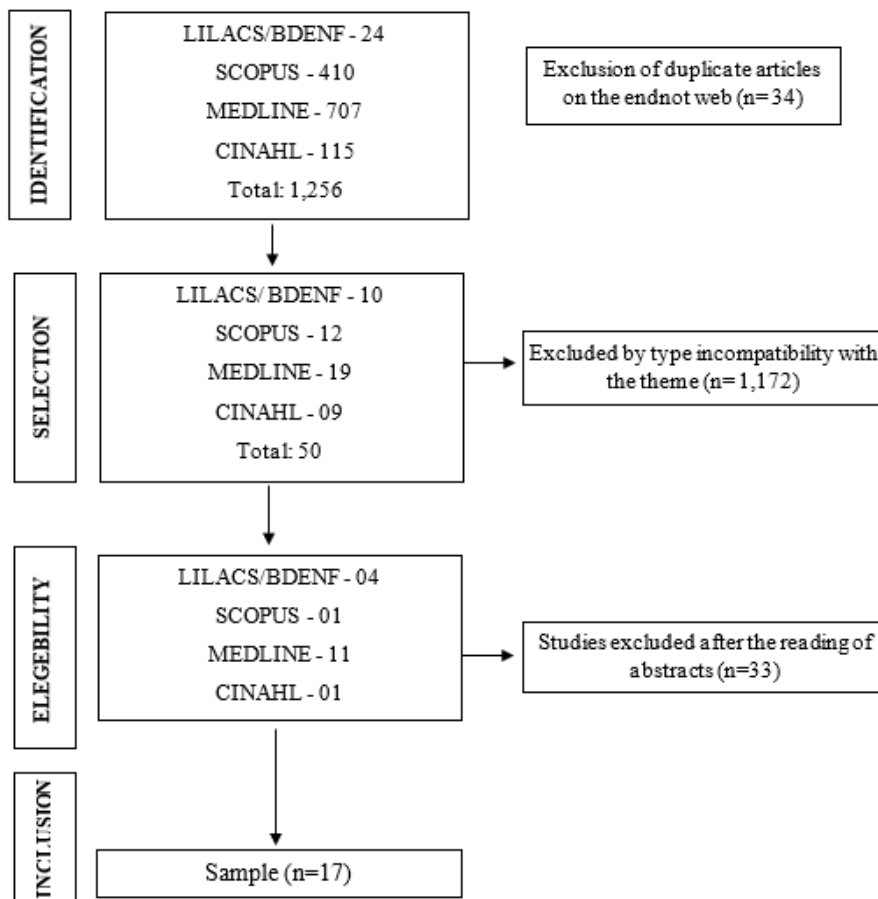
Source: authors (2020).

For inclusion, primary studies were considered, available online in the consulted databases, published in Portuguese, English and Spanish, without time frame. Review articles, theses, dissertations, non-scientific materials, articles in which it was not possible to identify a relationship with the theme by reading the title and abstract, and duplicate records, which were considered only once, were excluded.

The selection was carried out independently by two reviewers, by reading the titles and abstracts and in view of this process, the software and reference manager "Endnote Web" was used to store and organize search results, as well as to exclude duplicate articles.

Initially, 1,256 productions were recovered, of which 34 were removed for duplicity, resulting in 1,222 articles for selection. Of these, 50 presented potential inclusion and after full text analysis, 17 were considered for sample composition. Figure 1 describes the methodological path that followed the recommendations proposed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).<sup>(21)</sup>

**Figure 1.** Flowchart of the process of identification, selection and inclusion of studies. Teresina, Piauí, Brazil, 2020.



Source: authors (2020).

For data extraction, the adapted *Joanna Briggs Institute* (JBI) form was used, in which the following variables of interest were prioritized: year, authors and country of publication; study objectives; methodological and population characteristics of the study; technology identified; main results and contributions to breastfeeding.<sup>(21)</sup>

The level of evidence was assessed according to hierarchical classification: level 1, meta-analysis studies of multiple controlled studies; level 2, individual study with experimental design; level 3, study with experimental design, as a study without randomization with single group, pre and post-test; level 4, study with non-experimental design as correlational and qualitative descriptive research or case study; level 5, case reports or data obtained in a systematic way, of verifiable quality or program evaluation data; and level 6, opinion of reputable authorities based on clinical competence or opinions of expert committees, including interpretations not based on research.<sup>(22)</sup>

The studies were analyzed and synthesized in a descriptive manner, elaborating a synoptic table to present the evidence. Furthermore, the productions were classified according to semantic similarity, resulting in the composition of two thematic categories: Description of technologies developed to promote breastfeeding; and Contributions of educational technologies to breastfeeding.



## RESULTS

The descriptive analysis of the study sample showed that the search for the development, evaluation and implementation of educational technologies aimed at promoting breastfeeding has grown in recent years, arousing the interest of researchers in different contexts of the national and international literature in seeking resources that present evidence of safety, quality and efficacy to improve maternal and child care practices.<sup>(23-24)</sup>

In this perspective, it was found that most studies were published in the English language and developed in different countries such as Brazil, South Africa, the United States, Canada, China and Australia, characterized by the predominance of interventions, the quantitative approach and the level of evidence 3.<sup>(23,25,26,27,28,29,30)</sup>

The technologies identified were considered facilitating tools of the care process, representing an important tool for professional training.<sup>(23-26)</sup> In this perspective, it was found, for continuing education activities, that video resources<sup>(29-31,27,28,32)</sup> high-fidelity simulators<sup>(25,33)</sup> and music technology<sup>(25)</sup> contributed to the improvement of knowledge and greater assistance security.

Other technological resources evidenced involved the development and evaluation of mobile applications<sup>(34)</sup>, serial album<sup>(32)</sup> and educational folders as a strategy of support, knowledge and guidance to parents and family members during the breastfeeding process. It is noteworthy that all technologies identified showed evidence of validity and effectiveness.

Box 2 presents the synthesis of knowledge, according to the main author, year of publication, database, purpose of the study, method and level of evidence, technology identified and contributions to the breastfeeding process.

**Box 2.** Description and contribution of educational technologies to promote breastfeeding. Teresina, Piauí, Brazil, 2020.

Author/ year/ Database	Objective	Method/level of evidence + characteristics of the study population	Technology	Contributions to breastfeeding
Cherubim D. et al. 2019. <sup>(23)</sup> MEDLINE / PUBMED	To create and validate a musical educational technology for learning the physiology of lactation for professional training in health.	Methodological study with application of a conceptual framework of Knowledge Translation. All Brazilian regions participated in the validation.  Level of evidence: 3	Musical technology.	The translation of knowledge contributed to the creation and validation of musical ET about the physiology of lactation, which was configured as a facilitating tool for teaching in the health area
Ma YY. et al. 2018 <sup>(24)</sup> MEDLINE / PUBMED	Test the effectiveness of a DVD training method for breastfeeding for clinicians, on enhancing their knowledge and confidence in breastfeeding support skills of mothers and mothers in positioning and attachment and manual expression (HE).	A randomized clinical trial was conducted at three hospitals in Zhejiang Province, China, in 2014. Participants were recruited prior to their routine breastfeeding training course and randomly allocated to the Intervention Group (IG) and Control Group (CG).  Level of evidence: 2	Video feature in DVD format with four educational sessions.	It improved professionals' knowledge and confidence in the two breastfeeding support skills. However, the effect on professionals' practice and breastfeeding outcomes needs to be examined in the future..
Sadovnikova A. et al. 2020 <sup>(25)</sup> MEDLINE / PUBMED	To increase the confidence of health professionals in clinical lactation skills.	Development and evaluation of a high-fidelity lactation simulation model, a high-fidelity lactation simulation (LSM) model, and how resident physicians, obstetric nurses, students, and clinical lactation specialists provided	Prototype of Lactation Simulation Models (LSM)	Increased the knowledge of students and professionals about lactation; in addition to the acquisition, retention and transfer of psychomotor skills for patients' care.

		feedback on LSM prototypes. University of Michigan Level of evidence: 3		
Prado C. et al. 2013 <sup>(33)</sup> SCOPUS	To relate the experience of Tele nursing in the Tele breastfeeding of the National Tele Health Program in Brazil at the São Paulo Center.	Experience report study. The work methodology adopted is the creation of a multidisciplinary group of pediatricians, wards, speech therapists, nutritionists and dentists. Location: São Paulo Level of evidence: 5	Multimedia materials Photos, illustrations, videos and dynamic three-dimensional images.	It trained FHS professionals in relation to breastfeeding with a view to subsidizing knowledge, attitudes and skills that generated reflection, commitment and sensitivity, according to the expected competencies of these health team workers.
Abissulo CMF. et al, 2016 <sup>(34)</sup> LILACS	To validate realistic low-fidelity simulators as innovative educational technologies for guidance to postpartum women on breastfeeding, handmade.	Exploratory, cross-sectional research with a quantitative and qualitative approach. Intentional sampling was performed with 24 postpartum women in the rooming-in of a public maternity ward, distributed into two groups of 12: control group and experiment. Level of evidence: 4	Facilitating learning simulators.	In the validation of realistic low-fidelity simulators, the judgment of puerperal women was relevant, since the purpose was for the material to be adequate, attractive and useful to the target audience.
Javorski M. et al. 2018 <sup>(35)</sup> LILACS	To evaluate the effects of the use of a serial album on maternal self-efficacy in breastfeeding and its repercussions on exclusive breastfeeding in the first 2 months of the child's life.	Clinical trial, Intervention study, controlled and randomized. The population was composed of pregnant women. The study was developed in the Basic Health Units (BHU) of the Sanitary District IV in the city of Recife, Pernambuco, Northeast Region of Brazil. Level of evidence: 2	Serial album based on the concept of self-efficacy to breastfeed.	After the educational intervention, there was a statistically significant difference in the averages of the Breastfeeding Self Efficacy Scale – Short-Form (BSES-SF) scores between the women in the intervention group and the control group.
Adam M. et al. 2019 <sup>(36)</sup> MEDLINE / PUBMED	Quantify the causal effect of the MOVIE program and context in which the intervention occurred and the mechanisms by which it promoted changes.	Randomized cluster-controlled study stratified in urban communities of the Western Cape. 84 mentor mothers (CHWs hired by the Philani Maternal Child Health and Nutrition Trust) will be randomized 1:1 into intervention and control arms, stratified by neighborhood type. Level of evidence: 2	MOVIE	Empowerment for a “next generation” of digital education in maternal and child health, a generation of innovative educational tools, rooted in the needs and contexts of the audiences they intend to serve.
Demirci J. et al. 2016 <sup>(37)</sup> MEDLINE / PUBMED	To describe feasibility and acceptability direct-to-consumer telelactation (DTC) for rural mothers.	Randomized clinical trial of telelactation. Semi-structured interviews that explored the impact of telelactation through the mobile app in rural zone of Pennsylvania. A subset of mothers was assigned to the intervention arm, as population. Level of evidence: 2	Direct-to-Consumer Telelactation (DTC) – two-way video feature	The interviewees reported that telelactation was convenient and efficient, provided a necessary service in rural areas without breastfeeding support services and increased the mother's confidence in breastfeeding.

<p>Gross SM. et al. 1998<sup>(26)</sup> MEDLINE / PUBMED</p>	<p>To evaluate the effects related to the introduction of motivational videos and/or peer counseling in special clinics of the Supplemental Nutrition Program for Women, Babies and Children (WIC) that serve African-American women in the duration of breastfeeding.</p>	<p>Experimental intervention study. Pregnant women were enrolled before or at the 24<sup>th</sup> week of pregnancy and followed up until the 16<sup>th</sup> week postpartum. 115 African-American WIC participants who initiated breastfeeding and who were enrolled in 1 of 4 clinics. Level of evidence: 3</p>	<p>Motivational video</p>	<p>Increase in the number of women breastfeeding with the use of educational technology. Motivational videos can positively affect the duration of breastfeeding among African-American women.</p>
<p>Habibi MF. et al. 2012<sup>(27)</sup> MEDLINE / PUBMED</p>	<p>To describe the maternal experience of the lactation consultation through videoconference, compared to the standard face-to-face care, using the theory based on the development of models.</p>	<p>12 mothers participated in a videoconference and a face-to-face consultation during a visit to the study site. Using grounded theory methods, responses to an in-depth telephone interview were analyzed 3 days after the consultation for the main themes and a proposed theoretical model. Level of evidence: 3</p>	<p>Video conference (computer, webcam and microphone).</p>	<p>During the experience, we identified maternal characteristics in relation to interaction with technology, as well as that professional-patient confidence determines acceptability for this type of consultation, and thus we had a good acceptance and use of remote consultation.</p>
<p>Habibi MF. et al. 2018<sup>(28)</sup> MEDLINE / PUBMED</p>	<p>To evaluate the relationship between remote lactation visit acceptance using video conferencing and (a) maternal demographic factors, (b) technology acceptance subscales, (c) maternal learning style preferences, and (d) other potentially explanatory maternal factors.</p>	<p>Cross-sectional online study. English-speaking mothers who were at least 18 years old, had a baby of 4 months or less, and who reported the onset of breastfeeding were eligible to participate. Mothers were recruited from 27 randomly selected states. Level of evidence: 3</p>	<p>Social media channels Craigslist and parent-oriented Facebook groups.</p>	<p>Acceptance of the use of videoconference for lactation consultation.</p>
<p>Kellams AL. et al. 2016<sup>(38)</sup> MEDLINE / PUBMED</p>	<p>To determine whether a low-cost prenatal education video improves hospital rates of initiation and exclusivity of breastfeeding in a low-income population.</p>	<p>A multicenter, randomized, controlled study was conducted in four prenatal clinics. A total of 522 low-income women were randomized during a prenatal visit that took place in the third trimester to watch an educational video about breastfeeding or nutrition and prenatal exercise. Level of evidence: 2</p>	<p>Featured Video</p>	<p>Exposure to the intervention did not affect breastfeeding initiation rates or length of hospital stay. The lack of effect on the onset of breastfeeding persisted even after controlling for the partner, parent or other household member and infant complications.</p>
<p>Rojjanasrirat W. et al. 2012<sup>(39)</sup> MEDLINE / PUBMED</p>	<p>To evaluate the reliability and feasibility of home videoconference for breastfeeding assessment and support in the United States.</p>	<p>Case report. The study used 4 secure real-time videoconferences sessions to provide lactation support to 10 mothers at home in the United States. Level of evidence: 5</p>	<p>Videoconference</p>	<p>All participants "strongly agreed" that they felt comfortable talking about breastfeeding issues using video conference at home.</p>



White B. et al. 2019 <sup>(31)</sup> MEDLINE / PUBMED	To describe the evaluation of the Milk Man application process that was tested in the Parent Infant Feeding Initiative randomized controlled trial.	4-arm randomized factorial clinical trial. Participants were recruited directly by research team members from prenatal classes at hospitals in metropolitan Perth, Western Australia, between August 2015 and December 2016.  Level of evidence: 2	Mobile app Milk Man (Library that included information intended to encourage parents to read information about breastfeeding)	Acceptable source of breastfeeding information and support for parents and prospective parents who use the app during the perinatal period.
Friesen CA. Et al. 2015 <sup>(40)</sup> CINAHL	To explore the feasibility of using video conference technology to provide breastfeeding education and support to low-income women by an International Board certified lactation consultant. (IBCLC)	The TLPP (Telelactation Pilot Project) connected IBCLCs from the Breastfeeding Center (BC) at Indiana University Methodist Hospital in Indianapolis. The women who received education and support were located in a community health center (CHC) in the center of the city, where they received primary care. The videoconference sessions were juxtaposed to the prenatal and postnatal visits regularly scheduled at the CHC.  Level of evidence: 3	Videoconference	It has enabled the reach of a wider customer base, and expert support that otherwise women would not have received.
Franco MS. et al. 2019 <sup>(32)</sup> BDENF	To describe the experience of the elaboration and application of an educational technology as a way to promote maternal self-efficacy in breastfeeding in the postpartum period.	Descriptive study, type of experience report. Resulting from the actions carried out by members of the Collective Health Research Group (GPeSC), of the Child and Adolescent Health area, of the Federal University of Piauí, Picos-PI campus.  Level of evidence: 5	Printed Educational Folder "Every woman is able to breastfeed."	Elaboration of an educational folder for postpartum women, whose objective was to promote empowerment in maternal self-efficacy in breastfeeding.
Silva et al. 2017 <sup>(30)</sup> BDENF	To build and validate an educational game for adolescents about breastfeeding.	Methodological study with game construction and content and appearance validation based on the evaluation of fifteen judges.  Level of evidence: 3	Educational game composed of 35 pieces that contain the questions that the nurse must ask the adolescents, as well as the direction of answers that will lead the nurse/facilitator.	The use of this technology during the pregnancy-puerperal cycle will facilitate the practice of nursing, considering that the game is a tool capable of meeting the main doubts that permeate the daily lives of adolescent mothers, encouraging breastfeeding.

Source: authors (2020).

## DISCUSSION

In this review, intervention studies<sup>(24,33,27,38,34)</sup> predominated, among them the randomized clinical trial, which has a high impact because it allows establishing cause and effect relationships between the evaluated outcomes. Also, other designs such as the methodological and observational approach were highlighted due to their clinical relevance, since they direct decision-making and allow care to be based on evidence and elements of quality, safety and efficacy<sup>(23,26,33,27,28,40)</sup>

In this perspective, amid the care challenges, as well as the deficiencies of public health policies, different technologies were identified in the national and international scenario that presented sensitivity and precision indicators for continuing education activities, as well as for guidance and support to parents and family members.<sup>(23-26)</sup>

### **Description of technologies developed to promote breastfeeding**

The technologies analyzed mostly involved the use of videoconference for the consultation of breastfeeding, verifying in addition to its viability, the proof of the expected benefits and the high degree of acceptability during the prenatal and postpartum period. This technology also made it possible to address and evaluate the key points for effective breastfeeding, providing health education through monitoring of practice and guidance provided in real time.<sup>(28-37)</sup>

Multimedia resources expressed by videos, photos, three-dimensional images were also prevalent technologies in this review, being constantly used for professional training on breastfeeding practices, as well as for the improvement of knowledge and for the development of confidence and care support skills.<sup>(35-26.38)</sup>

Other investigations sought to evaluate the effects of clinical models of high-fidelity simulation on breastfeeding indicators, aiming to subsidize the knowledge of professionals and promote the development of continuing education activities. This resource is an interactive pedagogical instrument, which is characterized by the structuring of precise and realistic scenarios aimed at the development of reasoning and clinical competence, as well as increasing self-confidence in the decision-making process.<sup>(25.35)</sup>

In addition, simulated practice can be directed to individual needs and learning rhythms. This practice enables the promotion of good health practices, the improvement of managerial skills, the improvement of professional performance and performance based on integrality of care and social responsibility.<sup>(41)</sup>

The use of music technology was evidenced in a study, which considered this tool as a facilitating strategy for teaching in the health area and for learning the physiology of breastfeeding.<sup>(25)</sup>

Telelactation was a tool that can be leveraged to increase access to International Board Certified Breastfeeding Consultants (IBCLCs), enabling the connection of breastfeeding mothers to remotely located consultants through audiovisual technology.<sup>(26)</sup> IBCLCs focus exclusively on breastfeeding.<sup>(32)</sup>

Mobile applications were evaluated in two studies, being considered, most often, as an important informational tool on breastfeeding, with a high acceptance rate and potential to support future parents during the perinatal period. It is noteworthy that only one of the studies aimed to evaluate the effect of the intervention on exclusive breastfeeding and that the other because it contains wide availability of information, proved to be an alternative promoter of communication.<sup>(29)</sup>

Playful technologies were also identified, proposing an educational modality that considers the student as the protagonist of the intellectual formation process.<sup>(37)</sup> When an educator makes the choice to use games for teaching, it is possible to develop various skills such as logic, memory, visual perception, as well as specific content chosen to be worked.<sup>(40)</sup>

In addition, the educational folder represented another analysis tool, being applied in student training activities, to bring them closer to the breastfeeding process through a bibliographic survey, in addition to identifying the difficulties in the practical field and measuring the level of self-confidence of women to then carry out the elaboration of the technology.<sup>(42)</sup>

Nursing has been gaining prominence in the creation and implementation of educational technologies to provide care, with opportunities to implement and/or develop them for greater growth, recognition and appreciation of the profession, thus favoring the relationship between professional and client.<sup>(40)</sup>

Therefore, it is considered that educational technologies have been used to contribute as a health promotion strategy, constituting dynamic teaching resources capable of impacting the improvement of the quality of care and breastfeeding indicators.

### **Contributions of educational technologies to breastfeeding**

The contributions of technologies involved the development of education and professional training activities, allowing the qualification of care in relation to breastfeeding, in addition to increasing the confidence of professionals, due to the improvement of clinical skills in prenatal and postpartum care.<sup>(123-34)</sup>

In this context, interventions have shown effectiveness in promoting the learning of breastfeeding practices, presenting themselves as valid instruments in learning processes. Thus, the importance of preparing nurses is highlighted, as well as the incorporation of technological resources in educational practices aimed at maintaining exclusive breastfeeding, both in the provision of direct care and in the organization of care.<sup>(40)</sup>

The use of multimedia resources, clinical simulation and music technology were associated with the improvement of knowledge and skills to support breastfeeding, showing promise in directing care practices to patient care.<sup>(25,34,35,28,31,38)</sup>

In addition, the development of mobile applications was an alternative that promoted informational support, being an effective instrument for increasing knowledge and disseminating information about breastfeeding<sup>(34)</sup> Other contributions were verified in studies that used videotapes to motivate and advise participants, positively impacting the duration of breastfeeding. However, the technological presentation occurred while the mothers waited for specialized care, not affecting their onset rates.<sup>(36,26,38)</sup>

The serial album also had a positive impact on breastfeeding self-efficacy scores, directly reflecting the maintenance of the exclusive practice for the intervention target group.<sup>(33)</sup>

In Brazil and the United States, the use of videoconference allowed us to evaluate the essential points for effective breastfeeding, enabling real-time guidance, cost reduction, time savings and greater access to health care. However, different limitations were evidenced in this modality, among them the need for skills to use the equipment, the variety of operating systems, firewall problems, image quality and acoustic instability to evaluate the process. Despite this, it is noteworthy that these problems did not compromise the acceptance of technologies, being corrected in a timely manner for the continuity of the evaluation processes.<sup>(28,31, 32, 37)</sup>

The use of educational games for adolescents as an educational device that can be applied by nurses during the pregnancy-puerperal cycle can direct population needs, in which the nurses/facilitators evaluate contents and experiences related to breastfeeding.<sup>(43,44,45)</sup> Educational materials play an important role in the process of health education, because in addition to facilitating the mediation of learning contents, they function as a readily available resource so that the patients and their families can consult them in the face of doubts in the development of care.<sup>(45)</sup>

The folder presented itself as a viable alternative for health information and awareness, opening ways to promote self-efficacy through joint participation in the shared construction of knowledge, providing puerperal women and their families with a later reading, which reinforces verbal guidelines and helps in decision-making.<sup>(42)</sup>

In nursing practice, the implementation of care based on technological methods has been gaining prominence because it is an innovative method and because it represents a tool that facilitates systematization and the work process, leading to welcoming, valuing subjectivity and individual needs and care planning considering the principles of integrality, efficacy and safety.<sup>(43)</sup>

The limitation of the study refers to the non-inclusion of studies with evidence level 1, characterized by meta-analysis studies of multiple controlled studies, because they were not identified in the search. It is considered that educational technologies are promising and revolutionary methods for the development of care practices, including breastfeeding, representing a tool to support professionals, patients and families by allowing the exchange of information, monitoring cases and gaining knowledge. It is suggested the use of technologies by health professionals to contribute to the health promotion process, since it is a valid, safe and effective means to reach the desired audience.

## CONCLUSION

It was evidenced that there is a growing interest of researchers in developing technologies that contribute to the promotion of breastfeeding in different care contexts, being experienced and evaluated in order to contribute work, individually and collectively with maternal and child care practices. Thus, it encourages a more detailed analysis of this scenario so that the existing deficiencies identified in current public policies are gradually remedied in search of universal and quality care.

It is also observed that the use of educational technologies of the type: simulation, *software* applications, music technology, videoconference, serial album favored the practice of breastfeeding, presenting a high rate of acceptance and contributing to the training of professionals and informative support to pregnant women, postpartum women and families. Mobile apps proved to be an acceptable

source of information and support during the perinatal period. However, technologies related to videoconferences presented difficulties in the use of teleconference equipment because they have a variety of operating systems and computers incompatible with the configuration.

Despite the evidence shown, it is still necessary that new research be carried out on educational technologies in health and their relationship with breastfeeding, so that there is a better basis for practice and clinical decision. In addition, more studies related to the training of professionals with the use of educational technologies are also needed, due to the importance of supporting women in the perinatal period.

## CONTRIBUTIONS

Contributed to the conception or design of the study/research: Anjos FLH, Almeida LC, Andrade EMR, Jorge HMF. Contributed to data collection: Anjos FLH, Almeida LC, Jorge HMF. Contributed to the analysis and/or interpretation of data: Anjos FLH, Almeida LC. Contributed to article writing or critical review: Anjos FLH, Almeida LC, Andrade EMR, Pereira LC, Souza AAJ, Jorge HMF. Final approval of the version to be published: Andrade EMR, Pereira LC, Souza AAJ, Jorge HMF.

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