Cogitare Enfermagem

EDUCATIONAL TECHNOLOGY ABOUT BREASTFEEDING FOR MOBILE DEVICES

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ABSTRACT

Objective: to describe the process to elaborate and validate an app for mobile devices as an educational technology about breastfeeding. Method: a methodological study carried out in June 2020 in five stages (literature review; content organization; elaboration of the app; validation of the app; adequacy of the educational technology). In the validation by 20 specialists, via Google Forms, the Content Validity Index was used, with a minimum value of 0.8. Results: the overall Content Validity Index was 0.96, varying between 0.1 and 1.0 among the evaluative items about content, appearance and usability. Improvements were suggested, being included for the final version of the educational technology. Conclusion: the app called "*Descomplicando a Amamentação*" ("Decomplicating breastfeeding") was assessed satisfactorily by specialists and can be used with the families in the health education process.

DESCRIPTORS: Children's Health; Breastfeeding; Validation Study; Educational technology: Family.

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INTRODUCTION

Breast milk is the most complex food option to nourish children, constituting the most sensitive, economical and effective intervention to reduce child morbidity and mortality[1]. In addition, it is capable of protecting them against infectious, chronic and acute diseases, as well as it favors the mother's and the infant's adequate emotional and psychological status through breastfeeding[2].

In exclusive breastfeeding, recommended for the first six months, the child is deprived of other liquid and solid foods, and breastfeeding must be continued in a complementary way at least until the age of two years old[1]. Despite global efforts, through programs and public policies to encourage breastfeeding, the rates of early onset, duration and exclusivity have not yet reached desirable levels[3]. Worldwide, only 35% of the mothers breastfeed their children exclusively during the recommended period. In several countries, even in Brazil, the goals recommended by the World Health Organization (WHO) were not reached[4].

The rapid diffusion of mobile devices, especially smartphones, can facilitate the dynamic role of nurses as health educators, even in the promotion of breastfeeding, aiming at reducing early weaning. This is because health technologies favor the acquisition of diverse information and the families' active participation and support, thus promoting the individuals' autonomy[5].

In the Brazilian territory, there is more than one smartphone per inhabitant, totaling 234 million of these devices. Adding computers, tablets and notebooks, there were 424 million digital devices in June 2020, that is, two devices of this nature per inhabitant in the country[6].

In Brazil, a number of research studies have evaluated the effectiveness of educational telephone interventions on breastfeeding duration and exclusivity[7] and on the effects of using a serial album on maternal self-efficacy in breastfeeding and its impact on exclusive breastfeeding[8]. Another study elaborated, validated and evaluated an educational intervention (flip-chart) about breastfeeding[9]. Internationally, an Australian research study evaluated the usability of a smartphone or tablet app that provides information about breastfeeding[10], and an American study determined breastfeeding support resources in mobile tools and characterized the social support provided[11].

An integrative review showed that, in the global and national contexts, the educational technologies most used and developed by health professionals to promote breastfeeding were the following: counseling, interactive computer, website, CD-ROM, SMS cell phone messages, forum theater, film, videos, cordel literature, serial album, newspaper and leaflet[5].

Thus, it was not possible to find international and national research studies on the development and validation of educational technologies to encourage breastfeeding for mobile devices developed by health professionals, including nurses, based on scientific evidence, to assist not only pregnant and postpartum women, but also family members. Consequently, the objective of this study was to describe the process to elaborate and validate an app for mobile devices as an educational technology about breastfeeding.

METHOD

A methodological study with a quantitative approach, conducted in June 2020, following five stages: 1st: literature review; 2nd: organization of the content; 3rd: elaboration

of the app (design and development); 4th: validation of the app; and 5th: adequacy of the educational technology. The research description was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

The first stage consisted in seeking recommendations from the WHO, the Ministry of Health and the Brazilian Society of Pediatrics for the composition of the theoretical content of the app, including breastfeeding in times of the Coronavirus disease 2019 (COVID-19).

In the second stage, a quiz on the main questions regarding the topic was prepared, based on studies developed by the institutional research group, which identified uncertainties regarding breastfeeding among family members of newborns[12], in addition to the educational booklet called "*Descomplicando a Amamentação*" ("Decomplicating Breastfeeding"), previously elaborated and validated between expert judges and target audience, whose creators make up the team of this research. The booklet includes guidelines on the advantages of breastfeeding, exclusive and supplemented breastfeeding, and breastfeeding on demand, as well as tips on baby position, correct latch and breast care[13].

The third stage was conducted by a professional specialized in computer systems, using the Dart language along with the Flutter Framework. In the fourth stage, a number of specialists participated as evaluators in the study, through selection by convenience consulting the Lattes Curriculum and resorting to the Snowball technique[14]. The sample was non-probabilistic, comprised by 20 evaluators, according to the recommendations found in the literature[15].

The inclusion criteria were the following: professional nurse, specialist in neonatology and/or pediatrics and/or obstetrics and with previous experience in educational practices related to breastfeeding. The exclusion criterion was performing exclusively administrative activities, with no relationship with educational practices about the topic.

The 20 eligible professionals were invited by means of email messages, sending diverse information about the research. After their acceptance, the link with the first version of the app and the validation instrument was sent via Google Forms, stipulating a 10-day deadline for the answers. There were no refusals or withdrawals.

The validation instrument used allowed the evaluators to analyze the app's content, appearance and usability, as well as to make suggestions. Each item had a Likert scale with four options numbered from 1 to 4,namely: "I strongly agree", "I fairly agree", "I strongly disagree", "I fairly disagree".

The fifth stage consisted in adequacy of the educational technology, based on the suggestions made by the evaluators. The results were evaluated globally and per item, using the Content Validity Index (CVI), calculated by adding up answers three and four ("I fairly agree" and "I strongly agree"), divided by the total number of answers. Items with a minimum value of 0.8 were validated. The items that did not reach this score would be reviewed[15].

The study was approved by the Research Ethics Committee, under opinion No. 4,051,040.

RESULTS

The study elaborated and validated an app for mobile devices called "Descomplicando a Amamentação" ("Decomplicating Breastfeeding"); therefore, the stages of this process are described below.

The first stage collected information about breastfeeding, including benefits,

recommendations, complications, curiosities and guidelines on breastfeeding in times of COVID-19. This survey took place in the Ministry of Health's Booklet No. 23 on Primary Care about breastfeeding and complementary feeding[16] and in the Warning Note of the Brazilian Society of Pediatrics about breastfeeding during the pandemic[17], based on scientific evidence.

In stage two, the content was organized into themes and, subsequently, an extensive analysis of the official information and recommendations surveyed in the first stage was carried out, culminating in the following tabs on the app's main menu: "cartilha" ("booklet") (Decomplicating Breastfeeding), "quiz" (main doubts), "em destaque" ("in the spotlight") (tips and main problems with breasts), "COVID-19" (breastfeeding in times of COVID-19), "agosto dourado" ("golden August") (information about the breastfeeding month) and "quem somos" ("who we are") (designers of the educational technology).

Development of the quiz aimed at quickly clarifying doubts about breastfeeding; therefore, 15 questions were created, with two alternative answers for each (true or false), covering issues related to the app's content and the most common questions about this practice.

In the elaboration of the app, stage three, recommendations for the development of educational materials were considered, including ease of reading, clarity of information, appeal and good usability. Design and development were carried out by a professional specialized in computer systems.

The design chosen was the instructional design, with browsing structure, free download for the Android platform and interface, to ensure interaction, autonomy and ease in the commands. With several specialization cursors in web and mobile, the programming language used was Dart, together with the Flutter Framework, both Google technologies.

In the writing style, the same font of the booklet was used in all the tabs, except in "quem somos" ("who we are"), namely: Trebuchet MS size 40 for titles, size 18 for texts and size 24 for subtitles. The booklet colors, in a green shade, were maintained in the app.

The illustrations were based on the booklet called "Descomplicando a Amamentação" ("Decomplicating Breastfeeding"), aiming to represent the target audience and the current pandemic context, with changes in the images referring to COVID-19, through the introduction of mask drawings. In the icons of the tabs, Scalable Vector Graphics images from the Undraw website were used, suitable for creating websites, products and apps.

In the fourth stage, 20 nurses participated in the validation process, all female (100%); nine (45%) PhDs; seven (35%) specialists; and four (20%) Masters. Regarding their experience with educational practices about breastfeeding, the mean time was 12.4 years, and their mean age was 39.5 years old. Chart 1 presents the evaluators' assessment regarding content, appearance and usability.

Chart 1 – Assessment by the specialists regarding content, appearance and usability. Rio das Ostras, RJ, Brazil, 2020 (continues)

Regarding content			
Item	I strongly disagree/ I fairly disagree	I strongly agree/ I fairly agree	Item's CVI
The app facilitates learning the concepts used and their applications	0	20	1
The app provides full help	2	18	0,9

Diverse information that promotes breastfeeding is addressed	0	20	1
It invites/encourages changes in the population (pregnant and puerperal women and family members of newborns and lactating infants)	1	19	0,95
The app is suitable to be used by any lay person	2	18	0,9
The app's content corresponds to the content present in the scientific literature	0	20	1
The app is appropriate to its intended purpose	0	20	1

Regarding appearance

Item	I strongly disagree/ I fairly disagree	I strongly agree/ I fairly agree	Item's CVI
The app is appealing to pregnant and puerperal women, as well as for family members of newborns and lactating infants	1	19	0,95
The size of the texts is adequate	1	19	0,95
The app's interface is appealing	2	18	0,9
The images are easy to understand	2	18	0,9
The colors are adequate	1	19	0,95
The number of questions included in the quiz is adequate	0	20	1
The app seems to be organized	0	20	1

Quanto à usabilidade

Item	I strongly disagree/ I fairly disagree	I strongly agree/ I fairly agree	Item's CVI
The app is easy to handle	0	20	1
All the screens offer easy access to the app's frequently used menus and functions	0	20	1
Overall mean CVI = 0.96			

Source: The authors (2020)

The mean CVI for all the items was greater than 0.8 (80%), both for content and for appearance and usability, indicating that the app presented a satisfactory assessment, reaching an overall mean value of 0.96 (96%). In the evaluative items, the index varied between 0.9 (90%) and 1 (100%). Despite this assessment, the suggestions made by the evaluators were analyzed and incorporated, to the extent possible.

In stage five, the educational material was adapted to the evaluators' opinions, by modifying items judged incoherent, or even including improvements through the adequacy of information and terms, images, layout and font (Chart 2).

Chart 2 – Synthesis of the analysis of the changes suggested by the specialists. Rio das Ostras, RJ, Brazil, 2020

Suggestions	Changes accepted
On the "agosto dourado" ("golden August") tab, write the title in gold and insert the symbol	
Change the title of tab 3 to "em destaque" ("in the spotlight") and remove the terms "a criança é privada" ("the child is deprived of") and "pelo menos" ("at least") and "até 2 anos" ("up to 2 years old") from the text.	
Unify terms in all the tabs: covid-19/novo coronavírus; extração manual do leite humano/ ordenha; mamas/peitos/seios; lactente/criança (COVID-19/new coronavirus; manual extraction of human milk/milking; mammas/chest/breasts; infant/child)	
In "cartilha" ("booklet") tab, the picture of the baby bottle, the "X" has to cover the nipples	
In the quiz, questions 13 and 14 must accompany the form of the other TRUE/FALSE questions; Question 6, only talk about beer; Question 7, replace the word "aréola" ("areola") with "parte mais escura da pele próxima ao bico" ("the darkest part of the skin near the nipple"); Question 12, only address use of the baby bottle	
In the "em destaque" ("in the spotlight") tab, insert situations of complications with the breasts	
Present the "quem somos" ("who we are") tab at the end of the app	
In the "COVID-19" tab, insert an image of the mother wearing a mask	YES
Change the app's color palette in accordance with the tones of the booklet and figures	
Correct the following terms: "leite materno limpo" ("clean breast milk") and "esvaziar por completo" ("empty completely")	
In the "cartilha" ("booklet") tab: Page 15, include the suggestion about the human milk bank as a source of support; Page 16, insert the breast's sun exposure time; Page 19, correct the information that the mother can plan up to 15 days in advance to freeze/store her own milk; Page 20, correct the information that the mother does not need to wash her breasts before collecting milk, only if she notices any dirt; Page 21, correct the information that the bottle should not be dried with a clean cloth, but at room temperature; Page 24, add the Brazilian milk bank network portal, which has telephone numbers and addresses of the units in Brazil, and correct the title to "Que existem a doação de leite aos Bancos de Leite Humanos" "So that there is milk donation to Human Milk Banks"; Page 20, correct the breast massage technique	
Talk about protective shells in the "em destaque" ("in the spotlight") tab	
Clarify what "alimentação complementada" ("complemented feeding") means	
Mention the two types of milk extraction in the "cartilha" ("booklet") tab	
Correct the statement about offering both breasts at the same feed	
Add that tandem breastfeeding does not cause abortion in the "em destaque" ("in the spotlight") tab	
Include more information about involving family members and fathers to favor breastfeeding	
Talk about exterogestation	
Change the screen scroll type to "bottom up"	NO
Add some accessibility technology for people with sight impairments	

Source: The authors (2020)

Regarding content, it was suggested to invest in the support of the family members to favor breastfeeding; however, this topic was already contemplated. Furthermore, the exterogestation topic was proposed, but it was not accepted as it is not the focus of the app.

As for usability, the suggestions were about the type of screen scrolling and accessibility for people with visual impairments, which were not met due to technical and financial impracticability. The initial screen with the tabs of the final version of the app called "*Descomplicando a Amamentação*" ("Decomplicating Breastfeeding") is presented in Figure 1; and the access QR Code, in Figure 2.

Figure 1 – Representation of the initial screen of the app called "Descomplicando a Amamentação". Rio das Ostras, RJ, Brazil, 2020
Source: The authors (2020)

Figure 2 – Access QR Code for the app called "Descomplicando a Amamentação". Rio das Ostras, RJ, Brazil, 2021
Source: The authors (2020)

DISCUSSION

The assessment by the specialists evidenced that the app is a pertinent and valid educational technology about breastfeeding, with an excellent overall CVI. In addition, it has aspects that can assist in breastfeeding by clarifying doubts and presenting its different benefits, as well as issues of the practice itself and management of the main breast complications.

The use of mobile apps in health care has been growing rapidly by favoring mobility, precision and agility, in addition to assisting professionals in providing guidelines to the population. Some apps located in the online stores support breastfeeding; however, certain contents are contrary to the official recommendations and do not represent the reality of the breastfeeding woman[18], which corroborates the motivations for elaborating the app in question.

Low adherence to and interruption of breastfeeding are often associated with gaps in maternal and family knowledge[19]. However, globalization and the use of the Internet have contributed for mobile apps to progressively gain space in the population, through the possibility of sharing relevant information that helps to improve the breastfeeding rates[20].

The breastfeeding practice is interspersed by uncertainties that hinder its satisfactory implementation. The main doubts are related to breastfeeding duration and practical management, especially involving time between feedings, latch, position and care of the breasts[12,21]. These topics were included in the app, aiming to minimize such doubts.

The use of educational technologies is characterized as a care and education in health process, supported by the construction of individual and collective knowledge[22]. Through them, it is possible to contribute to the promotion of breastfeeding, increasing the rates and duration of this practice, therefore being a source of support for the families[5].

The study identified that the father's support and participation are essential factors for successful breastfeeding[23]. Thus, it is justified how important it is to develop educational technologies aimed not only at the mothers, but at all the people who make up the support network for women, as intended in the development of the current app.

The first stage qualified the process to elaborate and validate the app, as it was based on the official recommendations about the topic. This stage, also carried out in a study on the validation of educational technology for venous ulcer care, constitutes an essential strategy to gather knowledge that supports safe practices in the health field[24].

The second stage (elaboration of the quiz) aimed at favoring a differentiated activity that merged the traditional teaching methodologies. Games have playfulness in the educational activities as a pedagogical assumption, as stated in a digital game validation study on sexual and reproductive health during adolescence[25], contributing to greater users' interest in the use of the app as it is not restricted to reading texts.

In stage three, for elaboration of the app, the concern was to devise an appealing and simple technology. Therefore, the use of images was a priority to convert the information into visual language, aiming to arise interest and at easing understanding[24]. Agreement of the color palette in the app was essential to promote the appeal in appearance, a suggestion reinforced by the judges.

The participation of specialists promoted the improvement of the educational technology until the final version, seeking to meet the particularities of the target audience, according to a study from Indonesia that developed videos to increase coverage of exclusive breastfeeding[26].

The app called "*Descomplicando a Amamentação*" ("Decomplicating Breastfeeding")

was satisfactorily assessed and validated regarding content, appearance and usability by qualified professional nurses. The inclusion of these specialists improves the credibility and acceptance of the educational technology[15,27].

The app obtained a global mean CVI of 0.96, showing validity, in line with other studies on the validation of educational technologies, as an educational material, in the form of a comic book, about the promotion of breastfeeding in schoolchildren[28]. The individual CVI values reached satisfactory levels; therefore, the app is organized, easy to read and handle, and has updated knowledge.

The evaluators made suggestions to ensure better quality in the educational technology. Regarding content, the need was identified to reformulate technical terms in order to adapt them to the lay language and favor a clear, objective and accessible approach. Another suggestion was to add diverse information related to the main problems with the breasts. Although there were already mentioned, it was considered prudent to give more prominence to the topic.

In terms of appearance, the mean CVI was 0.95 (95%), a value similar to the one found in a study about the validation of an educational game about breastfeeding for adolescents[29]. In addition, usability reached 100% agreement, a value higher than the one found in a study about the assessment of a breastfeeding app in Australia[10].

It is noteworthy that, in the results of an integrative review on the contributions of mobile apps to the practice of breastfeeding, no Brazilian studies were found; in addition to that, it was not clear whether their elaboration was based on scientific literature[30]. Such results corroborate the importance and potential for innovation of the app validated, especially in the Brazilian context.

The main study limitation is the COVID-19 pandemic, making data collection with the target audience unfeasible, which did not preclude validation of the educational technology, being a suggestion for continuity of this study. The gap in international and national knowledge about the use of apps on the subject matter, evidenced in the literature review, also limited a more specific discussion of the findings; therefore, its dissemination will minimize this gap.

CONCLUSION

The app called "Descomplicando a Amamentação" ("Decomplicating Breastfeeding") was satisfactorily elaborated and validated by expert judges in the field of Nursing to be used as an educational technology with pregnant women, postpartum women and family members in the health education process. It is available for free download for the Android platform in the Google Play Store.

This app is an innovative technology in the health field because it is developed based on scientific literature and official recommendations, in addition to helping not only mothers, but also family members, in breastfeeding in a didactic, interactive, free and independent way. It is thus expected that the study encourages scholars and health professionals, including nurses, in relation to the use of technological tools as an educational strategy in health.

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - Souza NA, Góes FGB , Mello N da C; Drafting the work or revising it critically for important intellectual content - Souza NA, Góes FGB, Mello N da C, Silva LF da, Silva ACSS da, Barcellos TMT; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - Souza NA, Góes FGB. All authors approved the final version of the text.