Construction and validation of educational technology for non-pharmacological management of neonatal pain

Construção e validação de tecnologia educativa para manejo não farmacológico da dor neonatal

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ABSTRACT

BACKGROUND AND OBJECTIVES: Painful repeated experiences in the neonatal period can have deleterious effects in short and long term, as well as trigger abnormal patterns of behavior and sensory processing. In health care, the use of educational technologies can facilitate access to information and assist pain management in newborns. The objective of this study was to build and validate a folded brochure educational technology to guide mothers of newborns hospitalized in rooming-in accommodation on neonatal pain relief.

METHODS: Methodological study developed in five stages: situational diagnosis, literature review, construction of the folder, selection of judges and technology validation, from September 2019 to December 2020.

RESULTS: Educational technology developed was a folder entitled "non-pharmacological methods to relieve baby pain". Validation revealed a minimum agreement level of 0.78 and a maximum of 1. General Content Validity Index of the folder was 0.86, thus considering the folder as validated. Experts considered the educational material enriching and enlightening and its use may strengthen the practice of health education.

CONCLUSION: Educational technology proved to be valid in terms of appearance and content to guide and stimulate maternal participation in the management of pain in the newborn submitted to painful procedures in the rooming-in accommodation.

Keywords: Educational technology, Infant, Newborn, Pain, Validation study.

RESUMO

JUSTIFICATIVA E OBJETIVOS: As experiências dolorosas repetidas no período neonatal podem ter efeitos deletérios em curto e longo prazos, assim como desencadear padrões anormais de comportamento e processamento sensorial. Na assistência à saúde, o uso de tecnologias educacionais pode facilitar o acesso à informação e auxiliar no manejo da dor no recém-nascido. O objetivo deste estudo foi construir e validar uma tecnologia educativa do tipo *folder* para orientar mães de recém-nascidos internados em alojamento conjunto sobre alívio da dor neonatal.

MÉTODOS: Estudo do tipo metodológico desenvolvido em cinco etapas: diagnóstico situacional, revisão de literatura, construção do *folder*, seleção dos juízes e validação da tecnologia, no período de setembro de 2019 a dezembro de 2020.

RESULTADOS: A tecnologia educativa desenvolvida foi um *folder* intitulado "métodos não farmacológicos para aliviar a dor do bebê". A validação revelou um nível de concordância mínima de 0,78 e máxima de 1. O Índice de Validade do Conteúdo geral do *folder* foi de 0,86, considerando o *folder* validado. Na avaliação dos especialistas, o material educativo foi considerado enriquecedor e esclarecedor e seu uso poderá fortalecer a prática da educação em saúde.

CONCLUSÃO: A tecnologia educativa mostrou ser válida quanto à aparência e ao conteúdo para orientar e estimular a participação materna no manejo da dor do recém-nascido submetido a procedimentos dolorosos no alojamento conjunto.

Descritores: Dor, Estudo de validação, Recém-nascido, Tecnologia educacional.

INTRODUCTION

Prevention and treatment of pain must be the objective of all health professionals involved in newborn (NB) care, not only due to ethic aspects, but also to the deleterious potential of repeated exposure of the NB to stressful and/or painful factors[1]. Exposure to repeated stimuli at an early stage of development may alter pain threshold, as well as perception and long-term modulation. Scientific evidence indicates that NB exposed to acute stress may suffer permanent behavioral consequences and that NB pain control results in benefits in the physiological, behavioral and hormonal responses[2,3].

In the rooming-in accommodation, NB experience in the first 24 hours of life several painful procedures related to diagnostic and therapeutic purposes, such as intramuscular injections,

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blood draws, and heel puncture for blood glucose monitoring, one of the most common procedures performed in healthy term NB[4,5]. Non-pharmacological interventions such as breastfeeding, kangaroo position, non-nutritive suction and wrapping have been recommended for pain management during procedures because they have proven efficacy and low risk to the NB, as well as low operational cost[6,7].

Within this context, the mother's participation in the NB pain relief becomes fundamental, not only in the physical presence, but in the emotional and mental involvement[8]. In that sense, health education becomes a tool that enables the inclusion of maternal care in the process of pain management of NB submitted to painful procedures. The use of printed educational technology is a viable resource for informing and raising awareness of the population, which can build new paths for health promotion through shared knowledge and active participation, the materials being at the service of the patient's autonomy in care. Nevertheless, literature is scarce in approaches to educational tools that promote guidance about pain, specially the ones directed to maternal participation[9,10].

Therefore, this lack of guidance is a challenge that highlights the need for research, especially regarding the use of educational tools that improve NB care. Aiming at the use of educational materials in clinical practice, the present study's objective was to build and validate a folded brochure educational technology to guide NB mothers in rooming-in on neonatal pain relief.

METHODS

A methodological type of study developed in the period of September 2019 to December 2020 in five stages: situational diagnosis, literature review, folded brochure development, selection of judges and validation of the technology. Methodological studies feature the development of data collection instruments aimed at defining a construct, formulating the items of the instrument, developing the instructions for users, and testing the reliability and validity of the instrument.

Situational diagnosis

Carried out with puerperal women in the rooming-in of a maternity hospital school, a reference institution for neonatal risk care located in Rio de Janeiro. The rooming-in area is composed of nine nursing wards, three of them with five beds, two with six beds, two with four beds and two wards deactivated due to construction works, totaling 35 beds.

An interview was conducted with the help of a structured script containing questions about the knowledge of these women about neonatal pain and its non-pharmacological management. Twenty puerperal women who met the inclusion criteria participated in this stage: mothers of full-term NB, who were effectively breastfeeding and who did not require resuscitation in the delivery room. In addition, the NB needed to have a prescription for capillary blood glucose testing.

The exclusion criteria were puerperal women who were not in clinical conditions to participate in the study with a medical diagnosis of postpartum depression; with contraindications for breastfeeding; who did not wish to breastfeed; with immediate postpartum complications; birth trauma; and those who did not wish to participate. The interview took place from September 2019 to March 2020. The women's participation was voluntary, and the sampling was defined by convenience.

The second stage of the study consisted of a literature review, using the following research question: What is the scientific production on non-pharmacological methods of pain relief for NB admitted to rooming-in units? The search was carried out in the LILACS, Medline and Cochrane Library databases during April of 2020. The descriptors "Pain", "Newborn", "Educational Technology" and "Validation Study" were used. Inclusion criteria were articles from journals in Portuguese and English, free for full reading, that addressed the research topic, and published in the last five years. The exclusion criteria were duplicate articles in the databases and articles whose abstract and full text were not found.

The articles selection in the database was initially performed by reading the titles and abstracts, for later selection after reading the full text of those that met the inclusion and exclusion criteria. Fifty-eight articles that met the inclusion criteria were found, and, of these, 38 were excluded due to not meeting the study objectives after the abstracts were read, which resulted in 20 articles used in the construction of the educational technology.

Folder development

In the third stage, held between May and June 2020, the development of the preliminary content of the folder material started from the gaps and doubts pointed out by the puerperal women and answered based on the evidence found in the second stage of the study. The content was sent to an illustration and design professional for the creation of the graphic designs, formatting, and layout. The first version of the folder was submitted to the judges for validation.

Selection of judges

The judges selection for the validation of the appearance and content of the folder was carried out from June to September 2020. The identification of the judges was established intentionally, through the search of curricula in the database of the *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq - National Council for Scientific and Technological Development). The professionals who met the following criteria were considered expert judges: being a nurse; having a master's and/or doctor's degree; having researched neonatal nursing, neonatal pain, and NB health; working in the fields of NB health, neonatal nursing, neonatal pain, health promotion, and health education.

An e-mail invitation letter containing the research objectives and the Free and Informed Consent Term (FICT) was sent to the selected judges. After consent to participate, the folder in Portable Document Format (PDF) and the evaluation instrument were sent via Google Forms®. A number between six and 20 judges is recommended for the validation process. This is not well defined in the literature, but people who study and have experience on the subject to be evaluated are considered. Thus, the number reached, consisting of 16 judges, was considered sufficient for the validation of content.

Content validation

In order to validate the folder, an adapted content validation instrument structured in two parts was used: the first with the judges' characterization, and the second divided into three blocks: 1- Objectives: the purposes, goals or similar to be achieved with the use of the educational material; 2- Structure and presentation: how the guidelines are presented, including its general organization, structure, presentation strategy, coherence and formatting; 3- Relevance: the characteristic that assesses the degree of significance of the presented educational material[11].

The development of the items was done according to their relevance and relation to the object being studied: educational technology for non-pharmacological management of pain in NB through maternal care, and they were related to the adequacy of the information, language, illustrations, applicability in the scientific environment, size, information sequencing, if the folder serves as a basis for multipliers and suggestions for material improvement.

Therefore, the propositions were presented to the judges in blocks of analysis and organized as a measurement tool, using a Likert-type scale[12]. Four levels of response were used: 1. Inadequate; 2. Partially adequate; 3. Adequate; 4. Totally adequate.

After the judges assessed the content, content validation was performed descriptively, using the Content Validity Index (CVI), considering a CVI of 0.78. The CVI is a widely used formula for data analysis for content validation of instruments in the health field. There is no consensus in the literature about the acceptable concordance rate. Some authors argue that the number of judges should be considered. With the participation of less than five raters, all should agree to be representative. In the case of six or more, a rate of no less than 0.78 is recommended[12,13].

The CVI calculation was done through the sum of items marked as "3. Adequate" and "4. Totally adequate" by the judges divided by the total answers.

$$\text{Formula: CVI} = \frac{\text{Number of answers 3 or 4}}{\text{Total number of answers}}$$

The development of the study met the national and international standards of ethics in research involving human beings, in accordance with the Resolution MS/CNS 466/2012, and was approved by the Research Ethics Committee of the Maternity Hospital School of the Federal University of Rio de Janeiro, opinion number: 3.522.231.

RESULTS

The final version of the folder, "non-pharmacological methods to relieve baby pain", was composed of two pages in A5 format, double-sided, with 2 folds and 7 illustrations in total (Figure 1). The folder was divided into seven topics: definition of neonatal pain, identification of pain in the NB, breastfeeding, kangaroo position, non-nutritive suction, wrapping the baby and situations in which one can use non-pharmacological methods to relieve NB pain, which resulted in the folder's sections.

For the process of situational diagnosis, 20 puerperal women were interviewed. Table 1 describes the variables of the participants of the first stage of the study. About 50% of the women interviewed were between 18 and 29 years old, 65% were single, 60% declared having brown skin, 45% had completed high school and 70% declared being employed.

The answers obtained in the first stage of the study were essential to outline the content addressed in the folder from the level of prior knowledge of mothers about neonatal pain of term NB undergoing calcaneal puncture in rooming-in accommodation. For this, a structured interview script was developed, which verified that 90% of the interviewees believed that the NB feels pain, 95% had no knowledge about neonatal pain and 75% believed that there are ways to relieve NB pain.

As for the methods of neonatal pain relief, 27% of women believed that analgesic drugs are the most effective methods to relieve pain in infants, followed by breastfeeding (22%), kangaroo position/skin-to-skin contact (21%) and pacifier (9%). Of the interviewees, 21% could not give an opinion.

Regarding the manifestations of pain, 70% of the answers indicate crying as the most frequent sign of NB pain, followed by facial expressions with 19% and body movements with 11%. A consensus among all interviewees, 100% of them considered maternal participation as important in the care of NB pain.

Table 1. Description of the variables of puerperal women participating in the situational diagnosis stage

Variables	n	%
Age (years)		
13 to 17	2	10
18 to 29	10	50
30 to 45	8	40
Marital Status		
Single	13	65
Married/stable union	7	35
Separated/divorced	0	0
Race/color		
Yellow	0	0
White	5	25
Indigenous	0	0
Black	3	15
Brown	12	60
Schooling		
Primary incomplete	2	10
Primary complete	2	10
High school incomplete	4	20
High school complete	9	45
Higher education incomplete	0	0
Higher education complete	3	15
Employed		
Yes	14	70
No	6	30

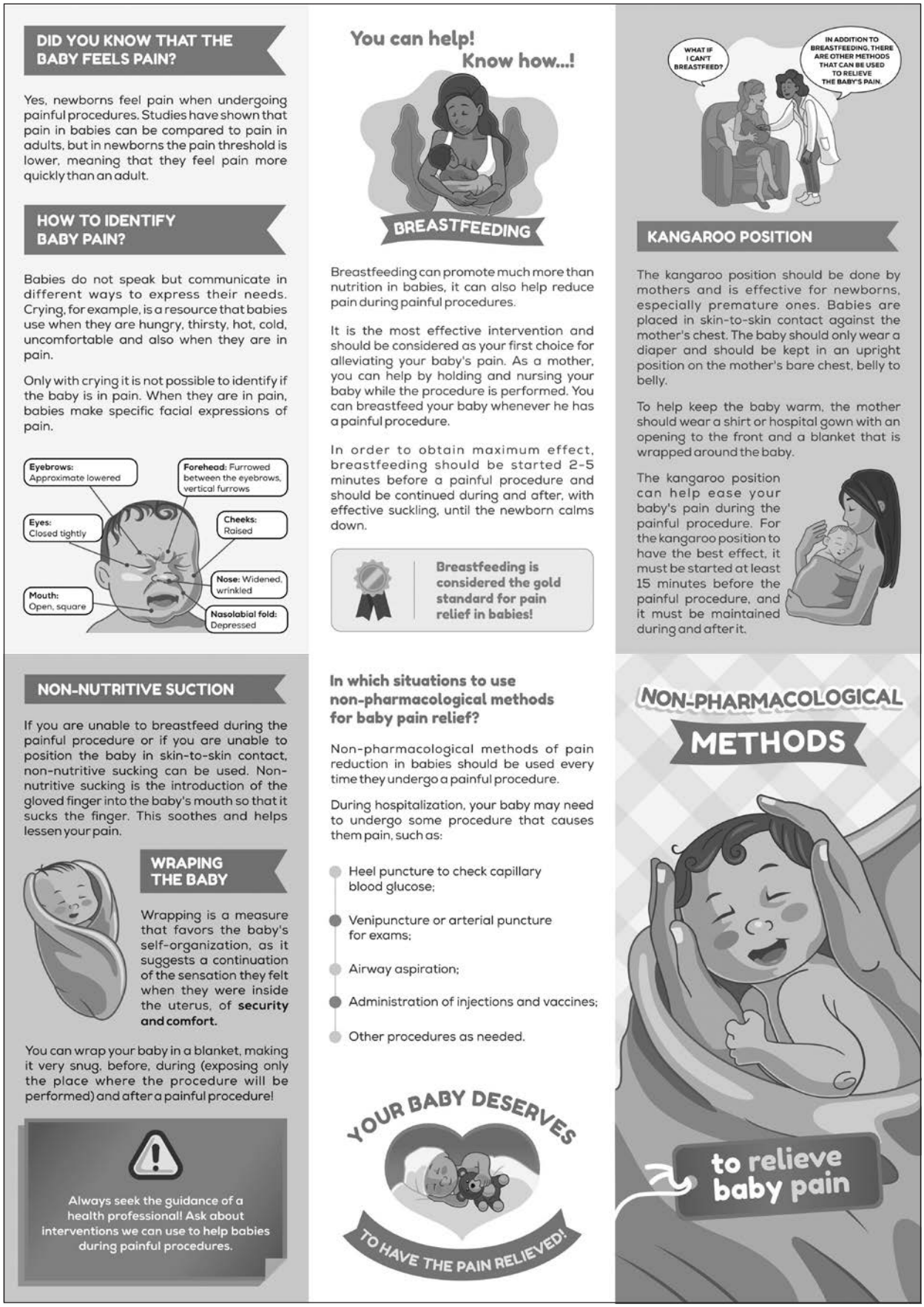

Figure 1. Non-pharmacological methods to relieve baby pain

Regarding the preparation of the folder's text, a wealth of content was found, however, some information had high scientific level, which made comprehension difficult. The information considered essential to provide adequate support were paraphrased again, considering the objectivity, accessible language, easy understanding and attractiveness of the information. The ideas were highlighted through illustrations that took ethnic diversity into consideration. The illustrations were placed close to the text to which they referred, using images that were relevant to the reality of the target audience. An initial template was prepared with the topics, texts, and images that were sent to an illustration and design professional for the development of graphic design, formatting, and layout.

After the folder development process, the fourth stage was carried out, which was the selection of experts. Sixteen judges, considered experts after meeting the inclusion criteria, participated in the validation process; all were nurses, 31.2% had a master's degree and 68.8% a doctorate. The judges had an average of 15 years of professional experience.

In the process of judging the items that make up the folder's validation instrument, which is the fifth step of the methodology, none of the judges evaluated the items as inappropriate. All reached agreement within the established level (CVI > 0.78). Results are shown in table 2.

As shown in table 2, from the total of 17 items comprising the folder validation instrument, the items "the information is well structured in subject-verb agreement and spelling." and "the length of the title and topics are appropriate, "showed perfect concordance index (CVI = 1.00). According to the average of the proportion of items rated as ''Adequate" and ''Totally ''adequate" by the judges, the ''relevance" block presented a higher average validation, followed by the ''structure and presentation" block and the ''objectives" block, as shown in table 3.

Table 2. Description of objectives, structure, presentation, and relevance in the Educational Technology evaluation stage

Objectives	CVI
Are consistent with the NB needs regarding neonatal pain care.	0.87
Promotes change in behavior and attitudes.	0.81
Structure and presentation	CVI
Messages are presented in a clear and objective manner.	0.81
Can be inserted in the scientific neonatal field.	0.93
The information presented is scientifically correct.	0.87
The proposed content has a logic sequence.	0.87
The material is appropriate for the sociocultural level of the proposed target audience.	0.78
The information is well structured in subject-verb agreement and spelling.	1.00
The writing style corresponds to the knowledge level of the target audience.	0.78
Illustrations are expressive and sufficient.	0.81
The illustrations present key visual messages so the readers can understand the main points on their own.	0.81
The length of the title and topics are appropriate.	1.00
The conversational style facilitates text comprehension.	0.81
Relevance.	CVI
Topics portray key aspects that should be reinforced.	0.93
The material proposes to the target audience to acquire knowledge regarding the non-pharmacological management of NB pain.	0.93
It's suitable for use by any health professional in their educational activities.	0.81

CVI = content validity index.

Table 3. Mean Content Validity Index

Blocks	CVI
Objectives	0.84
Structure and presentation	0.85
Relevance	0.89
General	0.86

DISCUSSION

In this study, an educational technology in the form of a folded brochure for maternal guidance on the non-pharmacological management of NB pain was developed and validated. The production of evidence on the use of technologies to strengthen actions in health education is growing. Furthermore, the importance of education for maternal participation in NB care is observed, and it is necessary that nurses mediate these actions, using tools that facilitate the learning process, such as the use of educational technologies[14].

Studies show that the practice of developing, validating, and applying educational materials has shown positive results[15,16]. Thus, it's important that educational technologies about the non-pharmacological management of neonatal pain be developed and validated for use in clinical practice, to contribute to improve NB care.

As important as the reliability of the information contained in an educational technology is the understanding of those for whom it's intended. The development of printed educational materials is a means of communication between the professional and the patient that requires a direct and intuitive way to convey the addressed content[17]. Thus, it's essential that the target audience can easily comprehend the health educational materials.

When developing an educational material, it's necessary to know the population context for which it's intended, through a participatory, communicative, and collective approach, in order to define care strategies[14-18]. Therefore, the present study was also concerned with building an educational material that could be easily comprehended, with easy-to-understand vocabulary and illustrations.

From this perspective, it was necessary to perform small adjustments to the language of the material during the validation process. This situation is similar to the findings of Brazilian methodological studies on the validation of educational technologies that also presented the need to modify language in order to make the content clearer to readers and that needed to be adjusted until a satisfactory and effective result was obtained[19,20].

The indexes obtained in the judges' evaluation process showed an overall CVI of 0.86, thus the folder's material was considered validated. The index adopted in this study is higher than the minimum CVI value of 0.78 used. Through the CVI, the proportion of agreement among the judges is analyzed for the judged items. Similarly, other studies that tried to validate educational materials express the importance of the index to confirm the quality and final applicability of the material[22].

The indexes obtained in the process of content validation of the folder indicated its high reliability and trustworthiness for use with mothers of NB undergoing painful procedures in rooming-in units. Moreover, this study aims to provide a reference for studies in the field, as well as a source of information and knowledge about maternal participation in NB pain care. Nurses experienced in NB health participated in this process, which expresses recognition of the relevance of promoting the opinion of specialists on the subject in order to ensure greater reliability to the technology.

It's important to mention that the educational technology was not built with the intention of replacing the verbal guidance provided by nurses during care, but to stimulate/empower even more the mother's participation in pain relief during painful procedures, even in NB in rooming-in, which are considered healthy, but who also have the right to have their pain relieved.

As a limitation of the study, it's possible to mention the significant amount of information presented in the folder, the complexity of the subject addressed, and the difficulty in reducing the texts, which can make the reading tiring. It's suggested that the folder should also be validated with mothers in rooming-in to verify its practical applicability to the target audience.

The folder material is relevant because it's a new technology for health education with the objective of informing mothers about non-pharmacological methods that can be applied by themselves to relieve their babies' pain. The folder can also be used by the entire team of health professionals who work with NB in the rooming-in setting. Finally, since knowledge is dynamic and changeable, it reinforces the importance of creating new educational technologies that help to minimize doubts related to maternal care when facing NB pain.

CONCLUSION

The methodology used in the study was able to develop and validate an educational folder for maternal guidance on the non-pharmacological management of neonatal pain. The educational technology was validated according to content and relevance.

AUTHORS' CONTRIBUTIONS

Andressa da Silva Melo
Data Collection, Conceptualization, Resource Management, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing, Validation, Visualization

Danielle Lemos Querido
Conceptualization, Project Management, Writing - Preparation of the original, Writing - Review and Editing, Supervision, Validation, Visualization

Bruna Nunes Magesti
Data Collection, Conceptualization, Project Management, Research, Methodology, Writing - Preparation of the original, Writing - Review and Editing, Supervision, Validation, Visualization

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