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Perceptions of nursing students after a simulated educational intervention on neonatal pain: qualitative study

Percepções de discentes de enfermagem após intervenção educativa simulada sobre dor neonatal: estudo qualitativo

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ABSTRACT

BACKGROUND AND OBJECTIVES: Pain results in immediate, significant, and sometimes permanent consequences for the health of the newborn. Its assessment and management are necessary responsibilities in the care of this population; therefore, educational and awareness initiatives are fundamental within the academic setting to ensure effective and safe clinical practice. The objective of this study were to describe nursing students perceptions of newborn pain through an educational intervention with sensory simulation.

METHODS: This exploratory, descriptive, qualitative study involved 22 nursing undergraduates who underwent a sensory simulation during an elective course in an undergraduate program at a federal public university in the countryside of Minas Gerais, Brazil. Data collection was conducted between April and August 2023 through a virtual platform, using self-assessment questions. The data were subjected to content analysis, as proposed by Bardin.

RESULTS: Participants considered the educational intervention timely and satisfactory, perceiving it as a new way of learning and assigning meaning to the care of newborns in pain.

CONCLUSION: The educational intervention enabled students to construct knowledge about neonatal pain in a critical and reflective manner, contributing to the improvement of care provided in the neonatal context.

KEYWORDS: Newborn, Nursing students, Pain perception, Teaching.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A dor acarreta desdobramentos imediatos, importantes e por vezes permanentes na saúde do recém-nascido (RN). Avaliá-la e manejá-la são prerrogativas necessárias na assistência a este público e, para tanto, ações de ensino e conscientização são essenciais ainda no âmbito acadêmico a fim de garantir uma prática efetiva e segura. O objetivo deste estudo foi descrever as percepções de discentes de enfermagem à dor do RN, por meio de uma intervenção educativa com simulação sensorial.

MÉTODOS: Estudo exploratório, descritivo, de abordagem qualitativa, realizado com 22 graduandos de enfermagem submetidos a uma simulação sensorial durante disciplina eletiva de um curso de graduação em uma universidade pública federal localizada no interior de Minas Gerais, Brasil. A coleta de dados foi realizada entre abril e agosto de 2023, por meio de uma plataforma virtual, utilizando questões de autoavaliação da atividade. Os dados foram submetidos à análise de conteúdo, conforme proposto por Bardin.

RESULTADOS: Os participantes consideraram a intervenção educativa oportuna e satisfatória, percebendo-a como uma nova forma de aprender e atribuir significados ao cuidado de RN com dor.

CONCLUSÃO: A intervenção educativa possibilitou aos discentes a construção de conhecimentos sobre a dor neonatal de maneira crítica e reflexiva, contribuindo para a qualificação da assistência prestada no contexto neonatal.

DESCRITORES: Dor, Ensino, Estudantes de Enfermagem, Percepção da dor, Recém-nascido.

HIGHLIGHTS

- Robust teaching methods combined with theoretical lectures, practical training and simulations of real-life situations, and assessment. The innovative method of this study used empathy to immerse students in the role of a neonatal patient, which transcended intellectual reasoning and established effective and emotional learning
- The active teaching methods applied emerge as a strategic alternative for learning good clinical practices, redefined in line with the Sustainable Development Goals (SDGs), which encourage safe and qualified care, minimizing the negative repercussions of long-term unrelieved pain experiences in newborns
- Innovative strategies for undergraduates can facilitate the dissemination of technologies aimed at scientific empowerment, promoting a careful look at neonatal pain management, minimizing the tendency to address the topic only in the professional field

INTRODUCTION

Pain is one of humanity's oldest and most complex health problems. Despite technological advances in health sciences, it remains a condition that causes significant discomfort and suffering[1,2]. It is estimated that between 30% and 70% of hospitalized patients experience pain, even with the several recommendations that exist for its proper management[3]. This high prevalence contributes to increased healthcare costs, worsened quality of life, and higher mortality rates[3,4].

As a subjective experience, pain has emotional and behavioral components that directly influence treatment approaches, which are still fragmented and inconsistent, compromised by inequalities in access to services and insufficient training of health professionals[2,5]. As a result, the care provided does not always meet society's expectations for a holistic, evidence-based care with a multidisciplinary approach[3].

This perspective also applies to the neonatal population, which is often neglected in clinical settings, especially in Neonatal Intensive Care Units (NICUs). Newborns (NBs) are exposed to multiple painful procedures associated with vulnerable clinical conditions, which contribute to continuous experiences of pain[6-8]. When experienced early in life, pain can negatively impact neurodevelopment through epigenetic mechanisms and structural brain changes[7].

Accurate assessment of neonatal pain is essential but challenging, as NBs are nonverbal and depend entirely on caregivers[5-9]. However, a systematic review indicated that nursing students' knowledge of pain management has evolved little in the last two decades, even with curriculum updates, demonstrating that training is still insufficient with regard to its identification and treatment[9-11].

Teaching pain management is considered a sensitive indicator of nursing practice, as it directly reflects patient-centered care[9]. A high level of technical knowledge, combined with an empathetic and conscious attitude, is essential for nurses to provide safe and humanized care, positively impacting clinical outcomes and the satisfaction of patients and families[8-10].

A review pointed out that empathetic learning is one of the objectives in health education and that studies that sought to teach empathy as a skill used active methodologies as a strategy. However, according to the study, although simulation enables real-life experience and experimentation with patient vulnerability, it is still a tool used by a minority[12].

A review study that evaluated educational interventions on pain for nursing staff indicated that active methodologies are used in this context; however, of the 33 studies included, none were focused on the neonatal population, demonstrating the need for interventions aimed at assisting this population[13].

It should be noted that the approaches adopted in the management of neonatal pain, with a focus on professional training, must be integrated with the Sustainable Development Goals (SDG)[14], which emphasize the need for joint actions to address global challenges regarding humanized and qualified care for newborns in NICUs, through appropriate actions that promote pain relief and advance the overall health of newborns[15].

In this context, it is important to understand how nursing students perceive and interpret neonatal pain during their academic training using effective methodological tools.

The present study's objective was to describe the perceptions and meanings attributed by nursing students to pain in newborns through a simulated sensory educational intervention. The study sought to answer the following guiding question: "Did the educational intervention with sensory simulation contribute to the nursing students' learning in pain management in NB?".

METHODS

This exploratory, descriptive study with a qualitative approach enabled us to deepen our knowledge of the subject under study and to present the perceptions and opinions of nursing students about their lived reality. The manuscript was prepared in accordance with the recommendations of the Consolidated criteria for reporting qualitative research (COREQ)[16], an instrument made available by the Enhancing the Quality and Transparency Of health Research (EQUATOR) network.

The study was conducted at the Integrated Nursing Training Center (NUTI - Núcleo de Treinamento Integrado em Enfermagem) of an undergraduate nursing program at a federal public university in the state of Minas Gerais, Brazil, between April and August 2023.

The study population consisted of nursing students enrolled in the Neonatal Nursing elective course, which is part of the aforementioned undergraduate program. The sampling was intentional, adopting the following inclusion criteria: having previously taken the compulsory courses Women's and Children's Health and being regularly enrolled in the elective course in question. The final sample was defined using the criterion of data saturation, i.e., when the information collected began to repeat itself and did not add new elements relevant to the object of the study, being considered sufficient to answer the research question[17].

The educational intervention was structured in four distinct stages. The first consisted of using the Modular Object-Oriented Dynamic Learning Environment (Moodle) platform to present specific content on pain in NBs. In the second stage, a simulated class was held, addressing practical care, the use of specific scales for pain assessment, as well as pharmacological and non-pharmacological measures for its control. The third stage involved a 15-min sensory simulation using materials, sounds, and flavors that interfere with pain perception, with the objective of promoting reflection on the participants' individual experiences with pain. Finally, the fourth stage comprised the application of an assessment using an online tool. For each phase of the intervention, teaching material was prepared in interactive text format, developed by the researchers with the aim of promoting learning retention (Table 1).

Data collection and organization

After the sensory simulation, an online form was sent via Google Forms to evaluate the activities, accompanied by a Free and Informed Consent Term (FICT), presenting the study objectives and instructions for completing the form. At the bottom of the

Table 1. Educational intervention on pain assessment and management in newborns.

Stage I: Theory
Made available to students via the Moodle platform one week before the content was offered.
A pre-test on pain in NBs was made available via an online form to assess participants' prior knowledge. After the responses were submitted, supplementary material on the topic was made available on the student portal to support independent study before the class.
Content:
• Concepts about neonatal pain;
• Approach of stress and pain intensity caused by procedures in neonatal units;
• Pain assessment tools and their applicability in neonatal clinical practice;
• Non-pharmacological and pharmacological measures for pain and stress relief in NBs and possible combinations of strategies;
• Impacts of pain on child development and its repercussions in adulthood.
Stage 2 – Practice
In the laboratory of skills, a simulated scenario was created to develop skills related to pain assessment and management, as well as clinical decision-making.
The students were organized into groups, and one student from each group was assigned to act as the nurse in charge, who was to assess and decide on strategies for pain and stress relief in the face of a heel prick on the NB to measure blood glucose in the presence of the mother (clinical actor).
After the scenario was performed, the participants were guided to a debriefing, in which they were able to rethink each moment of the scenario, what they thought needed improvement, and the strengths, and they were able to reflect on and express the feelings generated by the plot and their own participation.
Activity:
• Practice pain assessment and management in a simulated neonatal environment.
Stage 3 – Sensory Simulation
The room temperature was lowered, and background noises such as crying, telephones, and hospital equipment whistles were played to simulate the conditions commonly found in neonatal units.
The students sat in chairs arranged in a circle and were blindfolded in an attempt to create a sense of the unknown and unpredictability of the procedures.
For sensory stimulation, ice packs were applied to exposed areas of skin to simulate the thermal sensation of the touch of healthcare professionals' hands, stethoscopes, and other equipment used in NB care.
Tourniquets and light touches with sharp objects were used to represent procedures such as venous catheterization, lack of care during certain interventions, and multiple punctures.
After two minutes of these unpleasant sensations, the background audio was changed to a calm and serene environment, the students were covered with blankets to remind them of the warmth and comfort that comes from being wrapped up, they were rocked with gentle touches of the hands, and offered a sweet treat to remind them of the sweet solutions and relief they can bring.
During the reflection period, the participants shared their experiences in the activity. Awareness was raised again about the proper assessment of pain and its relief, the frequency and intensity of invasive procedures, the inability of NBs to consciously understand what is happening around them, and, finally, the impact that the individual decisions of health professionals, including students in training, can have on the quality of care provided.
Experience:
• Experience the stress and pain to which NBs admitted to neonatal units are exposed through sensory simulation.
Stage 4 – Assessment
The online post-test form was sent to students, with questions related to the assessment of knowledge acquisition and an additional question about their experience and satisfaction with participating in the sensory simulation for further analysis.

first page, participants could sign one of the following options: 1 – I have read and agree to participate; 2 – I will only participate in the evaluation activity; 3 – I have read and do not agree to participate. Students were redirected to the evaluation, and data was collected from those who agreed to participate.

The form was divided into two parts: individual characterization of the students participating in the study, containing information such as age, gender, marital status, and academic period, and an open question: "Tell me about your learning about NB pain after participating in the educational intervention. Would you like to say anything else?". The responses were recorded on the Google Forms platform itself, then transferred and stored in a Microsoft Office Word® document.

Data analysis was inductive and conducted using Bardin's content analysis, understood as a set of communication techniques, through systematic procedures consisting of three stages[18]:

1) Pre-analysis: in this phase, two researchers conducted a skim reading and then a thorough reading, independently evaluating the material, and subsequently sharing their perceptions, hypotheses, and the relationship between the material and

the study objective. The choice of material for analysis was made jointly, and decisions were made by consensus. In the event of disagreements, a third researcher would have acted as a mediator, but this was not necessary.

2) Data processing: at this stage, the researchers evaluated in detail the selection of material obtained from the pre-analysis, identifying the units of meaning for coding followed by categorization.
3) Data inference and interpretation: after categorization, the data were interpreted and related to the study objectives and the available theoretical framework on educational interventions and neonatal pain.

The data were organized by the researchers to ensure quality and analytical rigor, but were not returned to the participants for certification.

To preserve the anonymity of the participants, they were identified with the letter "D" (Students) followed by a number according to the order of admission to the study (D1, D2...D22).

The project was approved by the institution's Research Ethics Committee and obtained a Certificate of Ethical Appraisal, in accordance with Resolution No. 466/2012 of the Brazilian National Health Council[19].

RESULTS

Twenty-two nursing students participated in the study, distributed as follows: ten (45.45%) in their seventh semester, six (27.28%) in their eighth semester, four (18.18%) in their ninth semester, and one (9.09%) in their tenth semester of the nursing program, all female, aged between 20 and 34 years old.

Based on the discourses, two categories were established, as shown in Table 2.

Category 1 - Understanding NB pain

Sensations and feelings

When participants were asked how they felt when participating in the sensory simulation of pain in newborns, sensitive perceptions of agony, alertness, anxiety, and disturbance were identified, as illustrated by the following reports:

> [...] *I was immediately distressed by the situation; the excess of stimuli really makes you feeling alert and very anxious* [...] (D3).

Table 2. Categories and subcategories originating from Bardin's analysis.

Categories	Subcategories	Indicators	Operational definition
Learn about NB pain	Sensations and feelings	Agony	Gain an in-depth understanding of NB pain through sensory simulation.
		Feeling of alertness	
		Anxiety	
		Disturbance	
	Empathetic learning	Perceive and understand the NB	
		Put yourself in someone else's place	
		Feel like you are in that situation	
		Perception of intensity	
	Reflections about the practice	Qualified information	
		Reception during care assistance	
		Guided conduct after training	
		Perceived changes in oneself	
Qualified strategies for learning about the NB	Innovative teaching strategies	Concrete idea after the experiment	The contrast between learning with traditional methods and learning with innovative, qualified, and satisfying strategies.
		Qualified practice	
		Effective and didactic practice	
		Interest	
	Perception of realism	Simulation of a NICU	
		Concept of reality	
	Impact of ambience	Discomfort caused by a non-harmonious environment	
		Induction and potentiation of environment-related pain	
	Satisfaction	Unforgettable experience	
		Exceeding expectations	
		A stimulating and enjoyable experience	

[...] *this simulation left a mark on me because of the sensations I felt* [...] (D7).

I found it very interesting [...] *when we are in professional practice, we don't realize how much noise bothers and disturbs us...* (D15).

Empathetic learning

During the workshop, students highlighted the importance of perceiving and empathically understanding the pain of others, with interpretations about being in the situation and the intensity of possible sensations, as demonstrated in the reports presented:

[...] *it enabled me to perceive and understand a little of what a NB experiences in relation to pain...* (D2).

[...] *it was like walking in someone else's shoes* [...] *putting myself in the place of that newborn...* (D4)

[…] *simulating what happens to another person is the best way to perceive and reflect on how to evaluate future behaviors regarding another person's pain* [...] (D7).

[...] *participating in the awareness workshop made me better able to put myself in the newborn's place* [...] *and realize that actions that are normal for us, such as dragging a chair, talking louder, or a telephone ringing, can be much more uncomfortable and harmful to newborns than to us adults...* (D10).

It changed [...] *because before the activity, I understood that excessive stimulation is stressful for newborns, without really understanding what it is truly like to have that much stimulation at the same time...* (D9).

Reflections about the practice

Participants reported that the experience of sensory simulation provided important insights into the adoption of appropriate pain relief management in newborns, such as qualified information, welcoming care, professional practice behaviors, and the perception of having changed, as evidenced in the following statements:

[…] *I realized the importance of informing the patient about the procedure we are going to perform* [...] *speaking gently to improve their condition* [...] *making them feel welcome* (D6).

[...] *I leave with a much clearer idea and understanding of the subject, which I hope to be able to use after completing my training (D8)*

[…] *combining theory with simulation made it possible to have a better understanding of reality, and to see that things that seem insignificant can have an enormous impact on the current and future quality of life of the newborn* [...] *because these newborns are more sensitive in their handling and care* [...] (D17).

[...] *I understood the importance of learning how to manage pain so that this newborn can develop fully and be able to recover completely* (D18).

[...] *in the future, when I work with the little ones, I will be sensitive to the fact that their care must be special and unique* (D21).

The participants' responses show that the sensory simulation stimulated critical reflections on the recognition of pain in NBs and the adoption of evidence-based practices for its relief, aiming to optimize neonatal comfort and safety.

Category 2 - Qualified strategies for learning about the NB

Innovative teaching strategies

In this study, students emphasized that effective and didactic learning should occur through qualified, engaging, meaningful strategies that are integrated into various aspects of life, built on relationships and interactions with pre-existing knowledge, which enables the reframing of the learning process, as evidenced in their statements:

[...] *by learning through awareness-raising activities, I gained a much clearer idea of how a non-harmonious environment can trigger painful reactions* (D1).

[...] *learning through this experience certainly had a profound impact on my learning* [...] *I realized that this learning is for my professional practice* [...] *it gave me a sensitive experience of how I should look at the patient* [...] *whether it is a newborn, a child, or an adult* (D12).

[...] *I found this qualified learning practice we had to be extremely interesting and necessary* [...] (D13).

The students pointed out that the activity was effective and educational and that it contributed significantly and importantly to learning about pain management and newborn care:

[...] *it was important to plan effectively for the management of pain in newborns* [...] *for me, it was very important to participate in this activity* [...] *it enabled me to understand the importance of excellence in care* [...] (D05).

[...] *it was super effective and educational* [...] *it was very interesting to be able to participate and understand the painful mechanisms that can affect newborns* (D13).

> [...] *the importance of the need to safely manage pain in newborns, so that they can develop fully and be able to recover completely* [...] *ensuring more respectful and dignified care for newborns* (D14).

> *The awareness-raising exercise was perfect and meaningful in putting us in the shoes of hospitalized newborns* [...] *it made me rethink some actions that should be taken during care in general* [...] *I learned that care provided to newborns must be of the highest possible quality* (D16).

Perception of realism

The students highlighted that the application of innovative pedagogical strategies favored a perception of realism that had not existed before, especially because it was a Neonatal Intensive Care Unit, broadening their critical comprehension of the care context:

> [...] *it was very interesting* [...] *this way of learning gave us a small taste of all the stress that newborns go through in the NICU* (D16).

> *People talk about the importance of having a peaceful environment, but after this experience we realized even more how stressful this environment is for babies* (D19).

Impact of ambience

Through sensory simulation, students reported that the environment can cause discomfort, induce and intensify pain in NBs, and directly interfere with patient care, as well as with workers in these environments:

> [...] *through this activity, I was able to experience it firsthand and really measure how a disorganized and noisy environment affects babies and workers in these sectors* [...]. *From now on, I'll pay much more attention to reducing noise as much as possible inside a neonatal ICU* (D11).

> [...] *it made me think in a way I had never thought before. Of course, I already recognized that the environment can directly interfere with care* [...] *that the environment can induce pain and symptoms* [...] *but I had never imagined how this would be in closed environments such as intensive care, which induces symptoms such as pain in newborns and can also induce this symptom in the work team* (D20).

> *By participating in the awareness-raising activity, I gained a much more concrete idea of how a non-harmonious environment can enhance the perception of pain* (D22).

Satisfaction

Both in the guided reflections in stage three and in the responses to the subsequent evaluation, the students expressed satisfaction with the method and how meaningful their participation was, as can be seen in the following quotes:

> *It was a very important learning experience and it will not be forgotten.* (D06).

> [...] *to this day, I believe it was one of the best classes ever* (D11).

> *I loved it, the induction of awareness was incredible, fundamental for retaining the content and especially for understanding its importance* (D12).

> *I really liked it* [...] *they are exceeding expectations* (D16).

> [...] *it was a heartfelt way of learning that I will carry with me for the rest of my life* [...] (D21).

DISCUSSION

From the participants' statements, sensitive perceptions about the topic of NB pain were identified in a broader concept, which led the students to critical reflection, making them active subjects in this process. These results indicate that health education is still focused on technique and that, by experiencing a sensory simulation, students gained a better understanding of the peculiarities related to pain in newborns, with the aim of applying this knowledge in their care practice[7-8]. The intervention carried out can be seen as a relationship of problematization of the student in the academic training environment, allowing the insertion of knowledge transfer to be guided and learned during the training process[20].

By participating in the sensory simulation experiment, the students recognized the relevance of professional practice in pain management, with an emphasis on neonatal pain. They reported that, during their undergraduate course, the content related to pain is mostly theoretical, with an emphasis on pain assessment, which limits the application of practical skills. Literature corroborates this report, showing that predominantly expository teaching approaches, centered on the transmission of knowledge, do not favor the development of skills related to essential practices throughout academic training[21].

The development of the educational intervention in this study aimed to integrate the teaching of relational skills into nurse training, focusing on the incorporation of teaching strategies that promote active learning. These strategies are designed to enable the development of more effective skills through teaching methods that encourage active participation by students and satisfaction with the method and learning[22,23]. It should be noted that strategies based on active teaching methods contribute significantly and effectively to the development of students' skills, especially in the sense of comprehending care in the face of patients' painful experiences, with an emphasis on the specific needs of NBs. It is considered that this educational intervention achieved its purpose

in the students' statements, contributing to the construction of collaborative and meaningful technical knowledge[21,24].

In the participants' reports, it was evident that the experience led them to reflect on the evaluation of future behaviors related to the management of others' pain, a process triggered by the simulated intervention. The humanistic training of health professionals is a fundamental premise in health care, as established in the Brazilian National Curriculum Guidelines (DCN - *Diretrizes Curriculares Nacionais*) for Undergraduate Nursing, which emphasize that each person is a unique individual with their own history, needs, and values. The humanistic training of health professionals is a fundamental premise in health care, as established in the National Curriculum Guidelines (DCN) for Nursing Graduation, which emphasize that each professional must ensure that their practice is carried out in an integrated and continuous manner with the other instances of the health system[25].

In this context, it is essential to define specific content for nurse training that addresses the knowledge and skills necessary for the advancement of science and pain management, based on essential concepts about the complexity of pain management, including its multidimensional nature, pain assessment, and the specific clinical conditions of each patient[2,9-11].

In this sense, active teaching methods emerge as a strategic alternative for learning good clinical practices, redefined in line with the Sustainable Development Goals (SDGs). These practices aim at safe and qualified care, with the goal of minimizing the negative repercussions of long-term unrelieved pain experiences in NBs[11,15,26]. In addition, innovative strategies implemented in undergraduate education can facilitate the dissemination of technologies aimed at scientific empowerment, promoting a careful look at neonatal pain management. This approach not only contributes to immediate care but also to the future, fully aligning with the goals of the 2030 Agenda for Sustainable Development[14].

The participants reflected on the importance of a harmonious environment, emphasizing that it is crucial to avoid intensifying painful reactions in newborns. In this context, the adoption of innovative teaching strategies facilitates understanding of the influence of the environment on care practices. When discussing the environment of newborn care, they emphasized the direct impact it has on both the care provided and the working conditions of professionals[21,24,26].

This aspect is particularly relevant when considering the Brazilian National Humanization Policy (*Política Nacional de Humanização*), which aims to promote humanization in health services and is seen as an essential tool for improving both the quality of care and working conditions[27-29].

Reflection on the educational interventions implemented through sensory simulation demonstrated effectiveness in knowledge acquisition, changing attitudes toward newborn pain, and satisfaction with the teaching method. Several studies that used active teaching strategies in different contexts of formal education for health professionals corroborate this perspective, showing that such interventions can result in positive changes in clinical practice, especially in the management of neonatal pain[30-31].

Study limitations

The limitations of this study result, in part, from the fact that it was conducted at a single educational institution, which prevents comparison with other groups. Moreover, it should be noted that the use of the Moodle platform, adopted for elective courses, is a recent teaching practice, which restricted the number of participating students. Another limiting factor was the remote collection of data using Google Forms, which also impacted on the number of participants.

CONCLUSION

The intervention presented in this study provided nursing students with knowledge that promoted meaningful learning on the subject. As a highlight of the study, it should be noted the positive perception and satisfaction with the intervention, which used active and problematizing methodologies that stimulated productive discussions throughout the process. The results pointed to opportunities for replicating the intervention in other contexts because it was well received by participants and its teaching strategies proved effective in promoting relevant debates on the topic. In this context, the theoretical resources and methodology applied contributed significantly to the construction of knowledge, guiding care practice and stimulating critical reflection on the care of NBs with pain.

This work demonstrated that sensory simulation provokes deep reflection and empathetic learning, which is strongly recommended in the study of neonatal pain. Since knowledge is a social and evolutionary construct, this study aims to support future research that expands the use of this strategy with investigation through validated questionnaires on knowledge acquisition and satisfaction in a significant sample for conclusive results, which is also replicable and recommended for health training programs working in the neonatal context. In addition, the reproduction of this sensory simulation in a professional environment is desirable in order to bridge the gap between scientific production and real and immediate usefulness for health practices.

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