

Validation of a Mobile Application for Pediatric Nursing Care and Education

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Received: September 12, 2025

Accepted: November 7, 2025

Online Published: November 17, 2025

doi:10.11114/jets.v14i1.7954

URL: <https://doi.org/10.11114/jets.v14i1.7954>

Abstract

This study aimed to validate the “Pocket Childcare” app in terms of content, structure, presentation, and relevance, analyzing its potential as a support tool for teaching in nursing residency programs. This is a methodological study with a quantitative approach, which included content and design adjustments based on official documents from the Brazilian Ministry of Health and recent scientific evidence. The validation was conducted with 17 experienced practitioners in child and/or family health, who evaluated the application using the Health Education Content Validation Instrument (HECV), applying the Content Validity Index (CVI) and the Kappa coefficient. The results showed high agreement among the panel, with an CVI of 1.0 for content and structure/presentation and 0.98 for relevance, in addition to Kappa coefficients between 0.78 and 0.85, indicating excellent reliability. The panel highlighted the clarity of the information, practicality, breadth of topics, navigability, and attractive design as positive points. They also highlighted the innovative nature of the app, considering it an indispensable resource for both healthcare practice and pediatric nursing education, as it contributes to the safety of care, the standardization of procedures, and the strengthening of clinical reasoning. It can be concluded that “Pocket Childcare” has been validated as an effective and relevant tool, establishing itself as an educational and care technology capable of improving professional practice and enhancing the teaching-learning process in pediatric nursing.

Keywords: mobile applications, educational technology, child care, pediatric nursing

1. Introduction

Childcare is one of the pillars of primary healthcare for children, and is essential for monitoring growth and development, preventing illness, and providing guidance to families. In Brazil, its consolidation is linked to public policies such as the Comprehensive Child Health Care Program, the Statute of Children and Adolescents, and, more recently, the National Policy for Comprehensive Child Health Care, which reinforce the importance of comprehensive care (Brasil, 2018; Brasil, 2023a).

Nurses play a central role in this process by performing physical examinations, monitoring developmental milestones, and promoting health education among families. This practice, however, requires continuous updating and systematic organization of the stages of the consultation in order to align with current clinical recommendations. (Nogueira et al., 2020).

In this context, digital technologies emerge as support tools, offering protocols, tables, calculators, and evidence-based guidelines. Mobile applications promote standardization of care and clinical decision-making (Milton & Subramaniam, 2023; Bayer et al., 2025).

These features are especially relevant for younger generations, who naturally use mobile devices in their learning processes (Roman et al., 2017).

However, most of the available solutions were developed in foreign contexts, without full adaptation to the Brazilian healthcare system and the specificities of the pediatric population served (Nievas-Soriano et al., 2021).

Despite advances, there is a shortage of national technologies that fully address childcare consultations at all stages, from the neonatal period to the first two years of life (Nievas-Soriano et al., 2021). This gap motivated the development of the “Pocket Childcare” app, designed to support both nursing care and pediatric education.

Given this, this study aimed to validate the “Pocket Childcare” app in terms of content, structure, presentation, and relevance, analyzing its potential as a tool to support care and teaching in childcare nursing consultations.

2. Method

This is a methodological study with a quantitative approach, focused on the content validation of a mobile application for nursing consultations in childcare (Worthen; Sanders; Fitzpatrick, 2004).

The first version of the “Childcare pocket” application was built as a tool for clinical support. Due to the need to expand its educational nature and update its content, adjustments were made based on Instructional Design, which includes the phases of analysis, design, development, implementation, and evaluation (Filatro, 2007; Filatro, 2019).

To guide the readjustments, it was necessary to repeat the analysis and design phases, which were performed in the first version (N. E. K. Bayer; A. P. Bayer & Marchiorato, 2025). This was done to consider current parameters and possible changes or content updates related to childcare (analysis), as well as potential design readjustments for the proposed target audience. The first version of the application focused primarily on clinical support, although it also aimed at teaching. In this new version, the goal was to transform the product into a tool of equal importance for both education and clinical support, and the development phase was also carried out.

At this stage, official documents from the Ministry of Health and recent scientific evidence were considered. The new design was structured in partnership with information technology professionals, ensuring responsiveness, navigability, and an interface suitable for the target audience.

For the redesign, current trends in colors and structures of pediatric mobile applications used by health professionals and students were investigated. To this end, trends used in other pediatric applications and color palette recommendations registered by the ChatGPT chatbot (OpenAI, 2024) were evaluated, which led to the choice of pastel green and purple colors.

The development of content adjustments and the new design was carried out in partnership with a professional developer in the field of Information Technology, using specific tools such as the React Native framework based on the JavaScript (JSX) programming language, the Microsoft Visual Studio Code source code editor, the Expo CLI library, the Android Studio emulator, FlatList and React Navigation components, and Object-Oriented Programming.

Illustrations and image adaptations were created using the Canva Pro graphic design platform. The application was tested several times during development on a Samsung Galaxy s22 mobile device. The application was built to be fully responsive, adapting to the screens of Android devices with operating systems equal to or higher than 7.0 (Nou Gat).

It is presented as an educational tool consisting mainly of instructional materials, in addition to some interactive tools such as calculators for calculating BMI and corrected age. It is important to note that this version does not store or read personal data (it does not have a login option) and, therefore, does not violate the General Data Protection Law.

After the adaptations, the application underwent content validation by a panel of experienced professionals referred to throughout the text as the “panel.” Thirty nurses with at least two years of experience in child and/or family health, working in healthcare or teaching, were invited to participate. The final number of participants was seventeen, in line with the recommendations in the literature for this type of validation (Alexandre & Coluci, 2011; Cassiano et al., 2020).

Once development was complete, the product underwent content validation by seventeen panel, according to the following inclusion criteria: nurses specializing in child health or family health for at least two years and/or nursing professors teaching courses in child health or family health for at least two years.

The panel received the application in APK format or, when unavailable, in a demonstration video or PDF material, in addition to an electronic form adapted from the Educational Health Content Validation Instrument (CVIES) (Leite et al., 2018). The questionnaire covered dimensions of content, structure, presentation, and relevance, assessed using a four-point Likert scale (Ghisi; Merlo; Nagano, 2006), as well as space for qualitative comments.

For content validation, we opted to use the Delphi method, in which results are analyzed through rounds of questionnaires that assess trends and dissenting opinions, as well as justifications, systematizing and compiling them until the minimum expected agreement is reached (Marques; Freitas, 2018).

After the considerations pointed out by the panel in the first round, adjustments were made. However, at this point, as there were no changes that altered the structure of the mobile application and after reaching the minimum agreement required, it was not necessary to go through a second round of validation.

The analysis of the responses was conducted using descriptive statistics, calculation of the Content Validity Index (CVI) (Souza; Alexandre; Guirardello, 2017), and Brennan and Prediger's Kappa coefficient (1981), interpreted according to Fleiss's classification (1981). The acceptance criterion was $CVI \geq 0.80$, with the ideal being ≥ 0.90 .

Ethical aspects followed CNS Resolution No. 466/2012, which does not require submission to the CEP/CONEP system when validation involves only experienced practitioners, without characterization as research participants.

3. Results

3.1 Structure and Design Adjustments.

The final version of the application consisted of an opening page and a home page with navigation menus (Figure 1), in addition to 13 sections organized in the following order: general guide, medical history, neonatal screening, corrected age, anthropometric data, vital signs, physical examination, primitive reflexes, neuropsychomotor development, vaccines, food introduction, supplemental medications, and guidelines. The last section on guidelines was subdivided into three items: general guidelines, breastfeeding, and accident prevention.

The structural and content adjustments were supported by official documents from the Brazilian Ministry of Health and other materials based on scientific evidence (national and international articles) related to nursing consultations carried out in childcare for children under two years of age, as shown in Table 1.

Table 1. Summary of information and theoretical references used in the 13 sections of the application

Section	Brief description	Theoretical framework
Quick summary of the nursing consultation	Quick guide to the main topics of care. It is divided into humanized reception, medical history, anthropometry, vital signs, physical examination, guidelines, and frequency of consultations.	Brasil, 2012; Brasil, 2024a; Brasil, 2024b; Hockenberry; Rodgers; Wilson, 2023.
Medical history	Provides information about the data to be collected during the newborn's first and subsequent visits.	Paraná, 2020; Brasil, 2012; Hockenberry; Rodgers; Wilson, 2023.
Neonatal screening	Provides information about the tests recommended by the Ministry of Health, which are the heel prick test, ear test, tongue test, heart test and eye test.	Brasil, 2014; Brasil, 2016a; Brasil, 2018; Brasil, 2021a; Brasil, 2021b; Brasil, 2023b.
Corrected age	It recalls the classifications of prematurity according to gestational age (late preterm, moderate preterm, and extreme preterm) and birth weight (low birth weight, very low birth weight, and extremely low birth weight). It also provides a calculator to assist nurses in calculating corrected age.	Brasil, 2012; Brasil, 2016b; Santos, 2019; Righi <i>et al.</i> , 2017; Brasil, 2024a; Brasil, 2024b.
Anthropometric data	It recalls parameters for weight, height, head circumference, and BMI according to the Ministry of Health's Handbook for boys and girls.	Brasil, 2024a; Brasil, 2024b.
Vital signs	Review the main vital signs, namely temperature, heart rate, respiratory rate, blood pressure, and pain, based on the reference values of the American Heart Association's Pediatric Advanced Life Support and pain scales Neonatal Infant Pain Scale (NIPS and Face, Legs, Activity, Cry, Consolability – revised).	SBP, 2019a; Sedrez; Monteiro, 2020; American Academy of Pediatrics, 2020; Hockenberry; Rodgers; Wilson, 2023.
Physical examination	Reinforces the main focuses of the physical examination, general inspection, fontanelles, head and skull, neck, chest, abdomen, genitals, upper and lower limbs, and neurological status.	Brasil, 2012; Rabelo, 2018; SBP, 2019b; Universidade do Estado do Pará, 2019; Silva; Solé, 2022; Hockenberry; Rodgers; Wilson, 2023.
Primitive reflexes	It describes the main reflexes and up to what age they are observed in children, such as plantar support, sucking reflex, search reflex, palmar and plantar grasp reflex, plantar skin reflex or “Babinski” reflex, Moro reflex, tonic-cervical reflex, gait reflex, escape from asphyxia reflex, and Galant reflex.	Rabelo <i>et al.</i> , 2020; Brasil, 2012.
Neuropsychomotor development	Reiterates the developmental milestones in children with the “Classification and Conduct Instrument for the Integral Development of the Child.”	Brasil, 2024a; Brasil, 2024b
Vaccines	It includes the Ministry of Health's 2024 national vaccination schedule, which indicates the recommended vaccines according to the child's age.	Brasil, 2024c; Brasil, 2024d; Brasil, 2024e; SBP, 2024a.
Food introduction	Provides simple and fun information on introducing foods from 6 months onwards, with tips on foods from different food groups.	Brasil, 2019.
Additional medications	Shows the recommended doses of vitamin A, D, and iron according to the guidelines of the Brazilian Society of Pediatrics	SBP, 2021a; Brasil, 2022.
Guidelines	It is divided into three topics with information focused on the main aspects of newborn care, breastfeeding, and accident prevention.	SBP, 2024b; SBP, 2021b.

Source: authors, 2025.

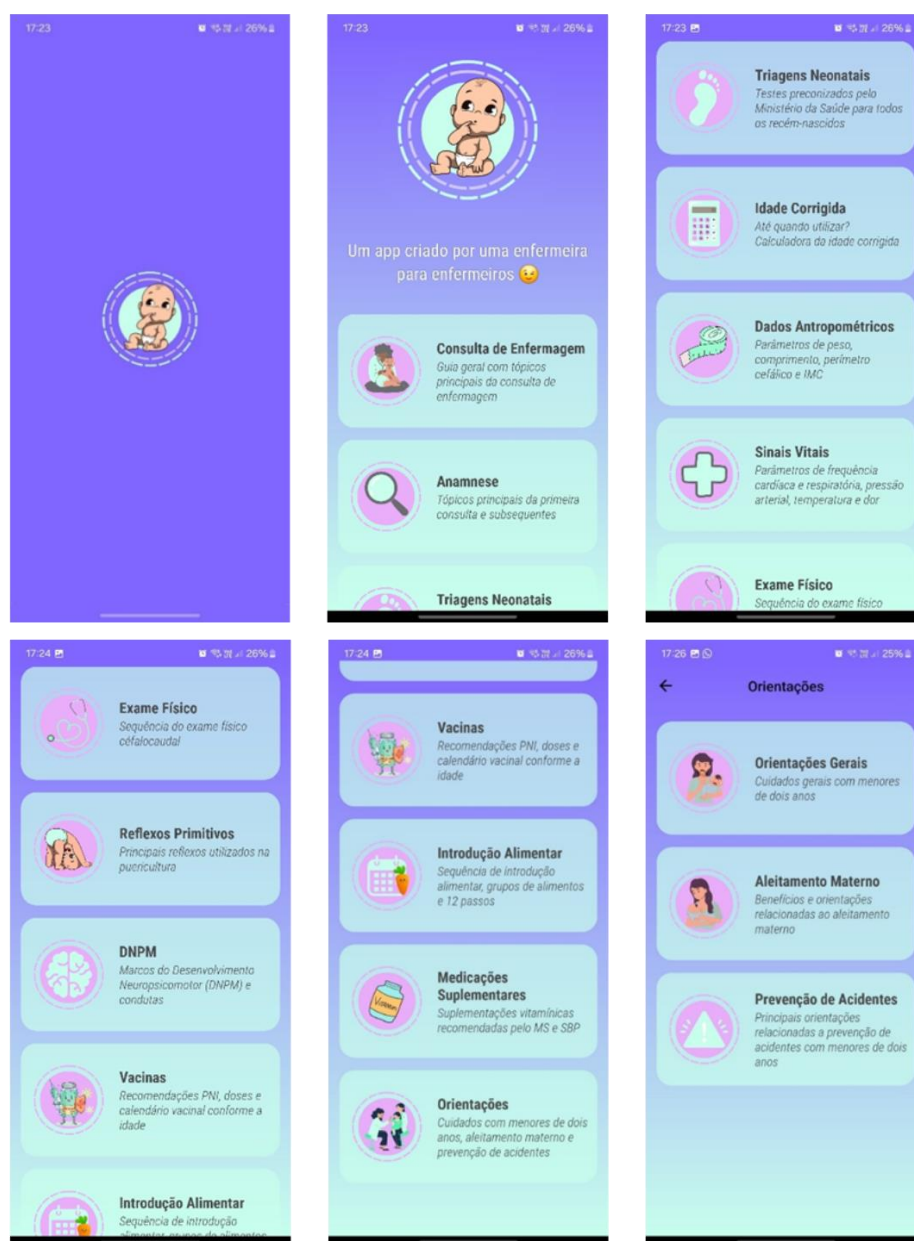


Figure 1. Compilation of images from the “Pocket Childcare” app

Source: authors, 2025.

3.2 Content Validation with Panel

Content validation was performed by 17 experienced professionals in child health and/or family health. Most were female, 15 (88.2%) aged between 20 and 59 years, mainly distributed in the 30-39 age group, totaling 6 (35.3%) and 5 (29.4%) aged 40-49 years. The time elapsed since graduation ranged from less than five to thirty years, with the majority having 11 to 20 years of experience, totaling 7 (41.2%) people. In terms of education, 58.8% had a specialization, while the rest were masters, doctors, or postgraduates.

All experienced professionals (100%) were nurses. In addition to being experienced professionals in child and/or family health, some interviewees also had other specializations, such as Pediatric and Neonatal Intensive Care Unit; Breastfeeding; Active Methodologies; Aesthetic Nursing; Public Health Management; Critical Patients; Management, Innovation, and Health; Maternal and Child Health; Materials and Sterilization Center; and Urgent and Emergency Care.

Most experienced practitioners had practical experience in childcare (88.2%), in addition to teaching (76.5%) and scientific production related to the topic. Regarding the use of digital technologies in health, 64.7% reported moderate experience, and 41.2% stated that they used health applications frequently or always in their professional practices. However, almost half (47.1%) had never used specific childcare applications.

In addition, panel were also asked about their familiarity with childcare applications or those related to nursing consultations for children under two years of age. The responses identified were “never heard of and/or never been introduced to and/or never investigated” (47.06%), “heard of and/or been introduced to and/or investigated once or twice” (35.29%), “I have heard of it and/or been introduced to it and/or investigated it three to four times” (5.88%), and “I have heard of it and/or been introduced to it and/or investigated it five or more times” (11.76%).

Regarding the usefulness of mobile applications, only 5.9% of panel stated that they should not be used in childcare, while 88.2% recommended their frequent or constant use. For educational purposes, there was unanimity: all recognized their relevance, with 100% indicating that they should be used frequently or always in pediatric teaching.

In the three areas analyzed (content, structure/presentation, and relevance), the app achieved scores above the minimum expected (CVI ≥ 0.80). The content showed complete agreement among the panel (CVI = 1,0), with only specific suggestions for spelling adjustments and the inclusion of practical reminders (such as the use of gloves when examining genitals and an image of an appropriate car seat to prevent car accidents). The structure and presentation also obtained a CVI of 1.0, with a positive evaluation of clarity, objectivity, logical organization, and sociocultural adequacy. The core of relevance obtained a CVI of 0.98, indicating almost unanimous agreement on the scientific relevance, innovation, and interest of the material. Tables 2, 3 and 4 show the agreement regarding content, structure/presentation, and relevance.

Table 2. Frequency of agreement on the content of the Pocket Childcare app according to CVIES by panel

Description of the item evaluated	Core: content			
	Strongly Agree N (%)	Agree N (%)	Disagree N (%)	Strongly Disagree N (%)
The content consistent with the application's goal of “providing support in care and teaching during the child's nursing consultation”.	14 (82.35%)	3 (17.65%)	0	0
The content consistent with the nurse's needs during the child's nursing consultation.	13 (76.47%)	4 (23.53)	0	0
The application appropriate for nurses to guide those responsible for the children seen during nursing consultations.	12 (70.59%)	5 (29.41%)	0	0
The content capable of promoting behavioral and attitudinal change in order to improve nursing care.	11 (64.70%)	6 (35.30%)	0	0
The content capable of providing knowledge and retention of that knowledge as it is used during the nursing consultation.	9 (52.94%)	8 (47.06%)	0	0
The content appropriate for the teaching-learning process.	13 (76.47%)	4 (23.53)	0	0
The content clarify questions about the topic covered.	13 (76.47%)	4 (23.53)	0	0

Source: authors, 2025.

Table 3. Frequency of agreement on the core structure and presentation of the Pocket Childcare app according to CVIES by panel

Description of the item evaluated	Core: structure and presentation			
	Strongly Agree N (%)	Agree N (%)	Disagree N (%)	Strongly Disagree N (%)
The language appropriate.	15 (88.24%)	2 (11.76%)	0	0
The language clear and objective.	16 (94.12%)	1 (5.88%)	0	0
The information/references presented scientifically accurate.	13 (76.47%)	4 (23.53)	0	0
There a logical sequence to the proposed content.	15 (88.24%)	2 (11.76%)	0	0
The material is appropriate for the sociocultural level of the proposed target audience.	14 (82.35%)	3 (17.65%)	0	0
The information is well structured in terms of agreement and spelling.	14 (82.35%)	3 (17.65%)	0	0
All information contained in the registration form is required.	14 (82.35%)	3 (17.65%)	0	0

Source: authors, 2025.

Table 4. Frequency of agreement on the core relevance of the Pocket Childcare app according to CVIES by panel

Description of the item evaluated	Core: structure and presentation			
	Strongly Agree N (%)	Agree N (%)	Disagree N (%)	Strongly Disagree N (%)
The topics cover the key aspects that should be emphasized in childcare.	15 (88.24%)	2 (11.76%)	0	0
The material stimulate learning during the nursing consultation in a relevant way.	14 (82.35%)	3 (17.65%)	0	0
The material spark interest in the topic.	13 (76.47%)	3 (17.65%)	1 (5.88%)	0
The material scientifically relevant to the field of pediatric nursing.	12 (70.59%)	5 (29.41%)	0	0
The material present technological innovation for the field of pediatric nursing.	11 (64.70%)	6 (35.30%)	0	0

Source: authors, 2025.

The Kappa coefficients confirmed excellent agreement among the panel: 0.78 for content (95% CI: 0.74–0.82; $p < 0.001$), 0.85 for structure/presentation (95% CI: 0.81–0.89; $p < 0.001$), and 0.78 for relevance (95% CI: 0.68–0.88; $p < 0.001$).

In addition to the suggestions, the panel pointed out several positive aspects, such as clear and objective structure, clarity of information, dynamic distribution of content, coverage of specific topics, practicality and ease of use, recommendations for guidance directed at findings beyond simple identification, use of images that guide procedures and content, and choice of color palette and graphic design.

Some panel have classified the device as an indispensable resource for professionals to perform their duties safely and an excellent teaching-learning tool that will contribute significantly to high-quality care, promoting the overall health of children at all levels.

4. Discussion

The validation of the Pocket Childcare app as a support tool during nursing consultations with children under two years of age and as a teaching device is part of the growing incorporation of digital technologies in healthcare (Faria; Oliveira-Lima; Filho, 2021).

A review by Fonseca et al. (2021), which analyzed publications between 2014 and 2019, identified the United States and Australia as leaders in the field, while countries such as Egypt, Mexico, and Brazil had a low number of studies. Despite this, there has been an expansion of e-Health practices in Brazil, driven by the Covid-19 pandemic, which accelerated the adoption of digital solutions for remote monitoring (Celuppi et al., 2021). This scenario has contributed to consolidating mobile applications as tools with great potential, especially for nursing, the largest health professional category, which operates in multiple contexts (Mayer; Blanco; Torrejon, 2019).

In the present study, 35.3% of experienced practitioners reported occasional use of health apps in their practice, and 23.5% stated that they used them weekly. Similar findings were described by Mayer, Blanco & Torrejon (2019) among Spanish nurses, where half of the participants used apps in their care. Among those who did not use them, reasons such as lack of information, perception of uselessness, technical limitations, and mistrust regarding security stood out.

National research also shows the advancement of nursing in the field of m-Health, both in care and educational contexts (Lima & Barbosa, 2019). However, it is still common to develop apps without scientific validation, which can compromise their reliability (Netto & Salvador, 2020). In addition, Silva et al. (2024) point out that in Brazil, many technologies are neglected, delaying their effective incorporation into the SUS.

Several authors argue that nursing applications should be built using structured methodologies and scientific rigor in order to ensure applicability and safety (Barra et al., 2017). Successful experiences have already been reported in the development of pediatric applications through Instructional Design, as in Nunes (2020) and Carvalho et al. (2024).

In pediatrics, there has been growth in applications focused on child care (Nunes, 2020; Silva et al., 2021; Piccoli; Trindade & Canabarro, 2022; Siebert et al., 2022; Feldman et al., 2022; Crehan et al., 2022; Carvalho et al., 2024), but most focus on specific diseases or specialties (Tantacharoenrat et al., 2018; Siebert et al., 2022). Only 2.6% of the applications studied by Nievas-Soriano et al. (2022) were created specifically for pediatric nursing, which explains the interviewees' lack of familiarity with resources similar to those developed in this study.

Research shows that, when used by nurses, mobile applications aid clinical decision-making and reduce diagnostic errors, corroborating the positive perceptions of the panel in this study (Siebert et al., 2022; Feldman et al., 2022; Crehan et al., 2022). Among the benefits described are: agile communication, more accurate diagnoses, time optimization, and greater care safety, especially when based on scientific evidence (Domingos et al., 2022; Campos; Silva & Amorim, 2024).

Despite the advantages, there are barriers to the adoption of these technologies, such as lack of knowledge, limited access to the internet or devices, concerns about privacy and costs, and a preference for traditional methods (Campos; Silva & Amorim, 2024; Domingos et al., 2022). Overcoming these challenges requires regulation, investment, and professional training (Fonseca et al., 2021). It should be noted that such technologies do not replace clinical reasoning but act as support for professional practice (Carvalho & Souza, 2024). Pocket Childcare was developed under this premise, stimulating clinical judgment rather than replacing it.

Mobile applications can also positively impact the behavior of professionals and users, expanding access to health information and education (Domingos et al., 2022; Bonow et al., 2023). In the case of Pocket Childcare, its structure supports the comprehensive implementation of the nursing process (Conselho Federal de Enfermagem, 2024), covering medical history, physical examination, growth monitoring, immunization, and childcare guidance, which can reduce difficulties reported by nurses in practice (Siega et al., 2020; Soares et al., 2020; Neto et al., 2023).

In pediatric education, there is a shortage of specific applications for nursing. Initiatives such as Baby Date (Carvalho et al., 2024) and Wise Infant Development (Melo et al., 2022) have already demonstrated educational potential, and Pocket Childcare adds to this scenario as a pedagogical tool. In addition to supporting care, its proposal dialogues with active teaching methodologies, valued in contemporary training (Munir et al., 2023; Gomes, 2023).

With greater access to smartphones, the viability of using apps in health education is growing (Oliveira & Alencar, 2017), although it is still under-explored in pediatric nursing (Huang & Fang, 2023). Features such as images, videos, and calculators increase user appeal and interest (Morse et al., 2017; Santos et al., 2021; Lima et al., 2024), and Pocket Puericultura incorporates such elements, including calculators for BMI and corrected age. Careful attention to colors, design, and typography also enhances the user experience (Pereira et al., 2016).

The pedagogical potential of this tool is consistent with findings that associate mobile applications with active learning, greater engagement, and better academic performance (Filho; Kubrusly & Silva, 2018). UNESCO also recommends its

use in higher education, recognizing its positive impact on the development of clinical reasoning (Oliveira & Alencar, 2017).

Although the use of educational applications in nursing is growing, it should be noted that most initiatives focus on diagnoses, procedures, and diseases, rather than comprehensive childcare consultations (Melo et al., 2022). There is a need for more evidence-based research to reinforce the use of these technologies in pediatric education (Huang; Fang, 2023). Despite the challenges of implementing technological educational practices (Innocente; Cazella, 2018), such resources contribute to innovative, stimulating teaching that is aligned with contemporary transformations (Schmidt; Souza; Silva, 2022).

It is essential that nursing teachers conduct more evidence-based research to support teaching and learning through mobile technologies (Huang; Fang, 2023). Learning in nursing is complex and requires teachers to be skilled strategists, selecting and organizing the best tools to facilitate the process of knowledge acquisition by students (Anastasiou; Alves, 2015).

Although technological educational practices pose a major challenge (Innocente; Cazella, 2018), the use of advanced technological tools can make teaching more stimulating and encourage learning based on the four pillars of innovative education: integrative and innovative knowledge, development of self-esteem, training of entrepreneurial students and citizens (Schmidt; Souza; Silva, 2022).

Therefore, it is up to teachers to take advantage of the tools available and open themselves up to the contemporary world, in which technologies, when used well, can promote significant changes in teaching, breaking with traditional models and making learning more relevant and effective (Innocente; Cazella, 2018; Santos et al., 2021).

5. Final Considerations

The validation of the content of the Pocket Childcare mobile application aims to make it a support tool during nursing consultations with children under two years of age and a teaching device in light of the growing emergence of digital tools in healthcare.

It should also be noted that the device has been described as an indispensable resource for professionals to perform their duties safely, as well as being an excellent teaching and learning tool that will contribute significantly to high-quality care, promoting the overall health of children at all levels.

This tool paves the way for the production and encouragement of technological innovation related to pediatric nursing. It should also be noted that this tool does not dispense with the development of clinical reasoning, which is essential during training for pediatric care.

Acknowledgements

This work has been supported in part by the Fundação Araucária de Apoio ao Desenvolvimento Científico e Tecnológico do Paraná (FA) through a call for proposals for Applied Basic Research.

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

Authors contributions

All the authors participated from the conception to the final revision of the article. All authors have read and approved the final manuscript.

Funding

This work has been supported in part by the Fundação Araucária de Apoio ao Desenvolvimento Científico e Tecnológico do Paraná (FA) through a call for proposals for Applied Basic Research.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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