

# Educational technology for infants' families to identify warning signs: a validation study

*Tecnologia educacional às famílias de lactentes sobre identificação de sinais de alerta: estudo de validação*

*Tecnología Educativa para las familias de Lactantes sobre la Identificación de Señales de Alerta: Estudio de Validación*

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## ABSTRACT

**Objective:** To validate, with the target audience, the usability and appearance of a serialized album about the warning signs to the health of children below 2 months. **Method:** Methodological validation study with the target population of an educational material in the form of a serialized album. 11 mothers with children under 2 months of age participated. The domains evaluated were: Objectives, Organization, Writing Style, Appearance, and Motivation. Data were analyzed using descriptive and statistics, and the data agreement index was calculated. **Results:** The global data agreement index was high (0.99). Mothers had positive responses, recognizing the excellence of the material: attractive figures that were easy to understand. **Conclusion:** The validation of the serialized album provides mothers with the abilities and knowledge they need to identify warning signs in regard to the health of their children, providing them with autonomy, corresponsibility, and helping them develop better child health practices.

**Descriptors:** Child Care; Nursing; Educational Technology; Child Health; Validation Study.

## RESUMO

**Objetivo:** Validar com o público-alvo a usabilidade e aparência do álbum seriado sobre os sinais de alerta à saúde de crianças menores de 2 meses. **Método:** Estudo metodológico de validação com o público-alvo de um material educativo tipo álbum seriado. Participaram 11 mães com filhos menores de 2 meses de idade. Os domínios avaliados foram: Objetivos, Organização, Estilo de escrita, Aparência e Motivação. Os dados foram analisados por meio de estatística descritiva e cálculo do Índice de Concordância dos Dados. **Resultados:** O Índice de Concordância dos Dados global foi elevado (0,99). As mães relataram críticas positivas, reconhecendo a excelência do material: figuras atrativas, de fácil entendimento e compreensão. **Conclusão:** A validação do álbum seriado adiciona habilidades e conhecimentos às mães na identificação dos sinais de alerta à saúde de seus filhos, trazendo autonomia, corresponsabilidade e o desenvolvimento de melhores práticas à saúde infantil.

**Descritores:** Cuidado da Criança; Enfermagem; Tecnologia Educacional; Saúde da Criança; Estudo de Validação.

## RESUMEN

**Objetivo:** Validar junto al público la usabilidad y apariencia del álbum seriado sobre las señales de alerta a la salud de los niños menores de dos meses. **Método:** Estudio metodológico de valoración con el público-objetivo de un material educativo tipo álbum seriado. Participaron once madres con hijos menores de dos meses. Los ámbitos evaluados fueron: Objetivos, Organización, Estilo de redacción, Apariencia y Motivación. Los datos se analizaron mediante estadísticas descriptivas y el cálculo del índice de concordancia de datos. **Resultados:** El Índice de Concordancia de Datos global fue alto (0,99). Las madres han hecho comentarios positivos, reconociendo la excelencia del material: figuras atractivas, de fácil comprensión y entendimiento. **Conclusión:** La validación del álbum seriado agrega habilidades y conocimientos a las madres en la identificación de las señales de alerta para la salud de sus hijos, aportando autonomía, corresponsabilidad y el desarrollo de mejores prácticas para la salud de los niños.

**Descriptorios:** Cuidado del Niño; Enfermería; Tecnología Educacional; Salud del Niño; Estudio de Validación.

## INTRODUCTION

Child mortality is an important indicator of the state of health of a population. Its reduction is one of the Millennium Development Goals (MDG) and is a priority among the Sustainable Development Goals (SDG), to be reached until 2030. World epidemiological data show the progress in reducing child and youth mortality, which has decreased almost 60% since 1990. Currently, 70% of accounted data involve children below 5 years old<sup>(1)</sup>.

Brazil reached the goal determined by the MDG early, having reduced by two thirds the mortality of children below 5 years old by 2015<sup>(2)</sup>. Despite this reduction, the causes of the remaining deaths are mostly avoidable, and survivable depends on whether there is a life-threatening situation at birth. Moreover, deaths in children below 5 years of age mostly take place in the very early stages of their lives, meaning that survival is lower in earlier age groups<sup>(3)</sup>.

The early stage of life is one high vulnerability to many different risks, which can be biological, such as weight at birth, prematurity, intrahospital complications and home complications<sup>(3)</sup>; or socio-economic, which can include issues related to income, education levels, and context, that is, related to infrastructure and access to essential basic services<sup>(4)</sup>. This quick overview shows that these clients require specialized care, so their health is better protected<sup>(5)</sup>.

Assistance to children, aimed at reducing morbidity and mortality, went through many changes, especially in regard to the emergence of technologies and the training of professionals, contributing for positive results such as the increase in child survival and the improvement in the quality of child care<sup>(6-7)</sup>.

These positive results are due to the adequate identification of health hazards, since recognizing these diminishes child and neonate mortality, and reduce the incidence and worsening of diseases, sequelae, and complications<sup>(7)</sup>.

The increase of child survival requires specific care to reach goals related to improving the health and quality of life of this age group. In practice, when children are discharged from the hospital, their parents have often not received good support to be able to provide them with safe care at home, which would allow them to avoid risks and mitigate potential health problems that might affect the baby<sup>(8)</sup>.

Some studies show reports from mothers that indicate discomfort and insecurity in regard to the discharge of their children, as they report that they do not have knowledge enough to provide care, especially concerning the recognition of signs and symptoms that may suggest a disease<sup>(9-11)</sup>. As a result, actions to educate and raise awareness about child care are essential for parents to feel that they can carry out their role adequately after hospital discharge<sup>(11)</sup>.

In this context, the actions of the nurse stand out due to their social role as educators. A more careful evaluation of the real educational needs in the transition from hospital to home promotes the improvement of parents' knowledge, increasing their trust and autonomy as they provide home care to the child<sup>(8-12)</sup>. Therefore, the participation of the nurse when providing guidance is paramount, since studies have shown that there is a direct correlation between the preservation of the health of the child at home and the preparedness of parents<sup>(11)</sup>.

Among the guidance they provide, advice about warning signs stands out, as these are suggestive of health issues that

could compromise the child's health and development. Therefore, educational activities focused on essential daily care for the child must be gradually and continuously performed with the parents during the entire period of child hospitalization<sup>(8)</sup>, strengthening the care of the families with their children at home to prevent fast-evolving morbidity and mortality in this age group<sup>(13)</sup>.

As we consider the Brazilian context and the importance of adequate care provided by the parents, we can find some recurring warning signs in children below two months that lead them to be referred with urgency to referral services: bradycardia, effort to breathe, convulsions, dietary and gastrointestinal imbalance, dehydration, hypoactivity, and navel infections<sup>(13)</sup>.

Furthermore, the global initiative *Saving Newborn Lives*, whose main goal is improving neonate survival rates in developing countries, has a scoring system for the main warning signs in the international level, and standardized specific preventive measures to be adopted by professionals and parents when caring for children under two months. Therefore, based on these materials, this study highlighted the following warning signs that must be recognized early: difficulty breathing; difficulties eating; feeling cold; fever; certain cutaneous-mucous infections; eye and umbilical cord stump infection; jaundice; convulsions; sudden death; and suffocation<sup>(14)</sup>.

Considering the above, the use of educational technologies (ET) with adequate language, images, design/layout, and motivation, adapted to cultural specificities, has been able to lead to a dialog between professionals and caregivers, in addition to being a tool to give support to mothers in the care for their children<sup>(15)</sup>.

It should also be highlighted that the album created was printed in color, in both sides of 110g Couche paper, 40cm wide per 32cm tall. It was organized according to nine warning signs, with the following subtitles: Difficulties breathing; Difficulties eating; Feeling cold; Fever; Eye infection; Umbilical cord stump infection; Convulsions; Jaundice; Sudden death; and Suffocation. These signs were selected because they are the most common in children below two months of age, being important to prevent and control health in these clients<sup>(14)</sup>. The album also included cards to present to the public, with images representative of their content. On the back of these slips, there are forms/scripts previously validated by judges and aimed at the professionals to aid them during their explanation.

ET validation is a strategy of methodological development that, through the systematic use of the knowledge available, aims to develop, evaluate, and optimize methodological tools and instruments<sup>(16)</sup>.

Therefore, the validation of this album with its target audience allows us to determine the usability of the educational material, increasing the reliability and specificity of the data. The material can also become a viable resource to construct new pathways for health promotion, using shared knowledge and active participation, aiding in parental care and broadening autonomy and corresponsibility in childcare.

## OBJECTIVE

To validate a serialized album about the warning signs to the health of children below two months of age with its target audience, in regard to its use and appearance.

## METHODS

### Ethical aspects

The study followed the ethical principles of research involving human beings, according with Resolution No. 466/12.

### Design, period, and place of study

This is an excerpt from a methodological study originated from the dissertation: "Constructing and validating educational materials to identify health warning signs in children under two months". The study followed the SQUIRE — reference for quality improvement studies, from the EQUATOR network.

The serialized album was created using an adapted version of the stages suggested by Echer<sup>(17)</sup>: 1) submission of the qualified project to the Research Ethics Committee; 2) survey in literature and situational diagnosis with the target audience; 3) construction of the two-sided serialized album, using mainly images targeted at the target audience, with drawings and layout on the front created by a design professional, and, on the back, a form-script with content to guide the parent, thus directing the professional during exposition using the material (Figure 1); 4) quality assurance of the material through the validation of judges (specialists in the field of health and technical experts in the field of communication/design); 5) evaluation of usability and appearance through a validation by the target-audience.

In this excerpt, the following will be presented: validation of the materials considering appearance and usability by the target-audience (formed by eleven mothers of children below two months of age); and the final version of the album. The research was carried out in the outpatient follow-up clinic of a referral maternity for women's and children's health in Fortaleza, a city in the state of Ceará, from January to March 2020.

### Study sample: eligibility criteria of the target-audience

To form the sample, an odd number of subjects was used to avoid draws in the responses and dubious questions, a strategy recommended by Pasquali<sup>(18)</sup>. This meant that eleven mothers of children under two months of age participated during the outpatient follow-up consultation of their children. The study excluded mothers with psychological and/or psychiatric diagnoses (postpartum depression, baby blues, mood disorders, neurological diseases) or difficulties in understanding or expressing themselves that prevented them from participating in the educational intervention or answering the instruments.

Participants were chosen randomly, being directly addressed individually as they waited for the consultations in the outpatient clinic, more specifically, in the waiting room of the consultation office. All mothers agreed to participate. To guarantee the anonymity of participants, they were identified by the letter M (mother) followed by a number (M1...M11).

### Study protocol

After participants agreed and signed the Free and Informed Consent Form (FICF), the serialized album was presented to the mothers individually, through exposition and dialog. Then, the validation instrument was applied.



**Figure 1** - Prototype of a version of the serialized album "Warning signs in the health of the baby: how to identify and provide care early", Fortaleza, Ceará, Brazil, 2020

The validation instrument used, adapted from Teixeira and Mota<sup>(19)</sup>, is formed by two parts: the first included a characterization of the target audience, and the second had 24 questions regarding the validation of usability and appearance of the album. These questions were separated in five blocks which evaluated: Objectives (three questions); Organization (seven questions); Writing style (five questions); Appearance (four questions); and Motivation (five questions).

The questions were scored using a Likert type scale, following the scoring system: Totally Adequate (TA) (1 point); Adequate (A) (1 point); Partially Adequate (PA) (0 points); and Inadequate (I) (-1 point).

Each analysis block aimed to develop, evaluate, and/or improve the serialized album. In the Objectives block, the goal of using the ET was evaluated; in Organization, we analyzed the criteria of general organization, structure, presentation strategy, coherence, and formatting; in Writing Style, we evaluated linguistic characteristics, understanding, and writing style; in Appearance,

we assessed degree of significance of the serialized album; and finally, for Motivation, the significance degree of the ET and its capacity to impact and be of interest were evaluated by the target audience<sup>(19)</sup>.

### Analysis of results and statistics

To validate the album, we calculated the Data Agreement Index (DAI), which measures the proportion of participants of the target audience who agree about specific aspects of the instrument and its items. The DAI was measured according to statistical values attributed considering the score of the instrument: **1** when the evaluation was positive (TA, A); **0** (zero) when the evaluation is not positive nor negative (PA); and **-1** when the evaluation is negative (I). After each answer was scored, the DAI was calculated using the mean of the scores of the items analyzed, considering the total responses for each aspect of the instrument evaluated by the target audience. Items that reached an Agreement Level of 70% or more between participants were considered to be validated. The agreement percentage was calculated considering the number of participants who agreed, divided by the total of participants, multiplied by 100<sup>(19)</sup>.

Data was tabulated in the software Microsoft Excel (version 2010) and analyzed using descriptive statistics.

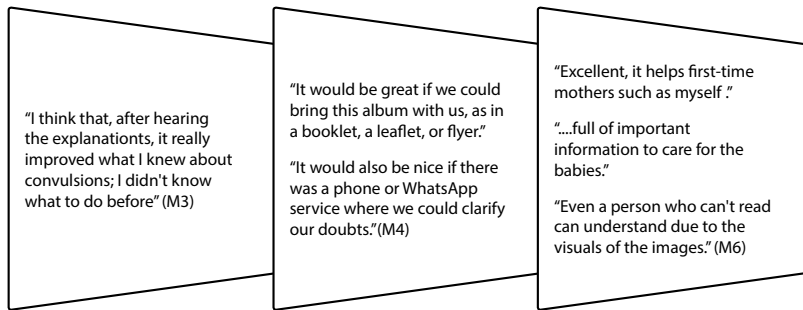
### RESULTS

The demographic results revealed the following data about the mothers who participated in this study: their mean age was 27 years old, most were brown (82%, n=9), 8 (73%) were in stable unions or married, while 3 (27%) were single. Regarding their educational level, 5 (46%) studied from 5 to 8 years; 4 (36%) from 9 to 12 years; and 2 (18%), for 12 years or longer. Regarding family income, 2 participants (18%) received at least one minimum wage, while 8 (73%) received from three to five minimum wages. 4 (36%) mothers were catholic, and 7 (64%) evangelical. The mean gestational age was 36 weeks and 2 days, with a minimum of 33 weeks and 5 days and a maximum of 40 weeks.

The evaluation of the mothers regarding Organization, Writing Style, Appearance, and Motivation showed an 100% Agreement Index. Nonetheless, the Objectives block presented a DAI of 94%, and the item which highlights the applicability of the album by any health professional in the field of health presented the lowest individual DAI, with 81% (Table 1).

**Table 1** - Organization of target audience responses according to Objectives, Organization, Writing Style, Appearance, and Motivation, and percentage index agreement, Fortaleza, Ceará, Brazil, 2020

	TA	A	PA	I	DAI (TA+A/number of evaluators)
<b>BLOCK 1 - OBJECTIVES</b>					
1.1) Did the serialized album help you identifying warning signs in your child?	11	0	0	0	1
1.2) Is the educational instrument useful in the daily care of your child?	11	0	0	0	1
1.3) Do you think that any health worker could use this album?	8	1	2	0	0,81
Subtotal	30	1	2	0	
Percentage of the block					94%
<b>BLOCK 2 - ORGANIZATION</b>					
2.1) Did the cover catch your attention?	10	1	0	0	1
2.2) Is the size of the letters visible?	10	1	0	0	1
2.3) Is the order of the topics understandable?	11	0	0	0	1
2.4) Are the images coherent with what is being said?	11	0	0	0	1
2.5) Is the material (paper/impression) appropriate?	10	1	0	0	1
2.6) Is the number of cards sufficient?	10	1	0	0	1
2.7) Are the titles of the cards coherent, considering the topic?	11	0	0	0	1
Subtotal	73	4	0	0	
Percentage of the block					100%
<b>BLOCK 3 - WRITING STYLE</b>					
3.1) Is the size of the written letter visible?	11	0	0	0	1
3.2) Is it easy to understand the content written?	11	0	0	0	1
3.3) Is the content written related with the topic of the album?	11	0	0	0	1
3.4) Do you feel pressured or intimidated by reading the album?	10	1	0	0	1
3.5) Are the words written in a light and upbeat way?	11	0	0	0	1
Subtotal	54	1	0	0	
Percentage of the block					100%
<b>BLOCK 4 - APPEARANCE</b>					
4.1) Do the presentation cards (images) seem organized?	10	1	0	0	1
4.2) Are the drawings simple and understandable?	11	0	0	0	1
4.3) Are the drawings coherent with what is written?	11	0	0	0	1
4.4) Is the number of drawings enough?	11	0	0	0	1
Subtotal	43	1	0	0	
Percentage of the block					100%
<b>BLOCK 5 - MOTIVATION</b>					
5.1) In your opinion, is any mother who receive guidance with this album going to understand what it is about?	11	0	0	0	1
5.2) Are the contents of the serialized album presented in a logic and coherent way?	10	1	0	0	1
5.3) Did you feel motivated to read the album until the end?	11	0	0	0	1
5.4) Do the educational materials address subjects necessary for mothers to care for their children at home?	11	0	0	0	1
5.5) Did the serialized album encourage you to have a new attitude when confronted with some warning sign to the health of your child?	11	0	0	0	1
Subtotal	54	1	0	0	
Percentage of the block					100%



**Figure 2** - Comments and suggestions by the target audience regarding the album "Warning signs to the health of the baby: how to identify and provide care early"; Fortaleza, Ceará, Brazil, 2020

The global DAI found was 0.99, and the DAI per block was 100% in the criteria of Organization, Writing Style, Appearance, and Motivation in regard to the use and reading of the serialized album. The block that evaluates the Objectives of the educational technology, in turn, presented a 0.94 agreement index. The question about whether the instrument could be applied by any professional was considered to be Totally Adequate by eight participants, Partially Adequate by two; and Adequate by one. The results, thus, showed that the target audience of mothers validated the serialized album.

They reported that the album aids in identifying signs of health issues in their children at home, highlighting how important it is for workers to be trained to transmit the information in the album in a simple way, managing the album adequately and, thus, facilitating audience understanding. The mothers also commented that the album was excellent and brought them new knowledge using attractive and easy-to-understand images.

## DISCUSSION

The process of validation by the target-audience is essential to perfect the material and disseminate safe information as widely as possible. Therefore, the evaluation of the ET at hand by the mothers was satisfactory, which is essential, considering that only through the participation of the target audience the educational content can be adequate to the reality and accessible to its population<sup>(20)</sup>.

The mothers also commented that the ET promoted an increment in new knowledge using easy-to-understand language and attractive images. This consideration is highly important, considering that, during the writing of an educational technology, it is paramount to carry out strategies that use every-day language, highlighting the actions in a positive way<sup>(21)</sup>.

Regarding the illustrative images, their role is to attract the reader, arousing and maintaining their interest on reading. They should make it easier to understand the contents, showing characters, scenarios, and experiences closer to those of the target audience; thus, they enable the emergence of new meanings and make it possible to understand the daily application of the content. Images that do not reflect the reality of the audience, on the other hand, may create distorted perceptions about the real characteristics of the environment or the characters<sup>(22)</sup>.

Regarding the identification of the signs of child health issues, the mothers stated that the serialized album is a positive

aid. However, they reiterate the importance of adequately trained professionals, which is demonstrated by the lower DAI in this block (81%).

Therefore, the use of ET as an education instrument in the daily practice of nurses is still scarce. This may be associated not only to the tiredness caused by the work routine, but also to the inexperience and lack of knowledge about the use of this tool<sup>(23)</sup>.

Therefore, for these health education technologies to be implemented and used correctly, health workers must be prepared beforehand through specific training in the area, to facilitate the improvement of the cognitive, social, and

personal resources that complement their technical abilities and contribute for the safe and efficient performance of this process. Therefore, professional practice qualification, as it brings innovations and new ways to provide assistance, culminates when practices are actually changed<sup>(23)</sup>.

In general, the serialized album was validated by the mothers. The validation of an ET shows its scientific pertinence and enables its use in institutions, contributing with the teaching-learning process as it favors significant learning, as long as the needs of the target audience are the starting point of its production<sup>(24)</sup>.

That said, the adequate use of this ET contributes for new perspectives regarding respect to the home care of children below two months of age. Nonetheless, the creation of technologies for care, such as this album, can be listed as a challenge for the health team, in regard to developing educational strategies that can be alternatives and strengthen the right of parents to participate in the process of caring for the health of their children.

## Study limitations

After a careful search about the topic in the main databases (SciELO, LILACS, Scopus, MEDLINE, CINAHL, BVS, Web of Science), we found few scientific articles or manuals about the warning signs in home care, which limited the construction of the educational material. Moreover, during the interviews with the mothers, we could see that the workers were insecure about how to present the album in an attractive and understandable way, indicating the need to train the professionals to use the resource adequately.

## Contributions to the fields of Nursing, Health, or Public Policy

The serialized album, when considered to be valid by its target audience, encourages parents to make decisions based on knowledge and professional practice. This encourages health education using actions to train the parents, considering them as the main actors of this process, in both hospital discharges and in the general care with the child. In addition to educational actions in health services, it would also be possible to make the album available for families at home by creating a digital version, to guarantee a wider dissemination of the health information contained therein.

The development of these health education actions and a wider access to the ET at home can provide self-confidence and autonomy for parents. This would lead to improvement in child

health, reflecting on a diminution of morbidity indexes, hospitalizations, and health care costs, which would, in turn, have an effect on quality of life and health.

## CONCLUSION

The serialized album was found to be valid to advise mothers in regard to caring for their children and identifying warning signs common in children below two months of age and was elaborated for the education of this target audience. This technology was evaluated by the mothers, reaching a high level of global Data Agreement Index.

The ET favors the adoption of new strategies to promote home care to children below two months of age. Therefore, the use of the serialized album in daily clinical practices can help parents care for their children at home, in order to encourage healthy practices, discourage improper ones, and negotiate conducts, addressing actions to promote children's health and prevent health issues.

As a result, we recommend further research towards the creation of educational technologies as a means to train subjects and allow them to become actors in the process of health. This will increase the chances for these subjects to, when confronted with signs of health issues, make timely decisions, avoiding further complications and improving the quality of life and health of their children.

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