

Childhood immunization and the emotional reactions of mothers during the vaccination process

Analysis and contribution of the Design for Experience

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This paper presents an exploratory study that sought to identify possible emotional reactions of mothers during the vaccination process of their children, as well, the causes of these emotions and the *concerns* related to the use of products and services involved in child immunization process. In this way, the study relies in the context of Design for Experience and the *appraisals* theory for applying thematic evaluation model on interviews. The aim of the research is to indicate project design guidelines that can minimize or maximize the emotions identified in mothers.

Keywords: *Childhood immunization; Emotional reactions, Design for experience, Appraisal theory, Design Project guidelines.*

1. Introduction

Childhood immunization is the first step to prevent viral diseases. According to Varella (2012), the vaccines provide protection for the child's immune system, providing greater chances of developing healthily and, assisting in the eradication of certain diseases.

In Brazil, although vaccination is an action for the individual and collective welfare, it is believed that, facing the large concentration of doses during the first six months of the children lives, there may be physical and emotional discomforts, both for the child, as for their parents and guardians.

For this reason, it was sought to investigate, regarding childhood vaccination process, the emotional reactions of mothers, the causes of these emotions and the concerns - which relates to expectations, goals, needs and perceptions of mothers associated to the use of products and services during the vaccination process. For this, it was used the of appraisals theory, specifically the thematic model, to support the construction, application and analysis of research and, also, evaluate emotions. The study fits into the context of Design for Experience, in order to indicate, through design project guidelines, solutions that can maximize or minimize the emotional reactions.

This article is the result of exploratory research, using in-depth interviews with eight mothers with children between the ages of 0-4, in a period of intense vaccination. Furthermore, to support the theory of Design for Experience, theory of emotions and appraisals, it was based in Demir, Desmet and Hekkert (2009), Scherer, Schorr and Johnstone (2001), and Tonetto and Costa (2011) as the principal authors.

2. Design for Emotion and Experience - theoretical considerations

Personal experiences, according to Holbrook and Hirschman (1982), arise from events that are laden with

emotional meanings and are consequence of the interaction between users and a set of stimuli, whether in terms of products, services, or communications. In accordance to Scherer (2005), it was understood that an event, to which an organism is exposed, stimulates a specific response after being processed and evaluated. Relating this concept to design, not only it is designed the shape and function of artifacts, but it seeks, furthermore, understand the products and services considering the experiences and emotions of individuals.

The design profession, acting in strategic level, searches for new contributions to the design process in other areas of study. According to Tonetto and Costa (2011), in covering psychology, it was allowed the recognition that certain emotions, when desired, can be obtained, or minimized, through projects. For the authors, the Design for Experience, in that it represents a major step in order to meet in an innovative and competitive way the needs and desires of people, broadens the vision of designer and presents intimate relationship with strategic issues.

Thereby, it is possible to reflect about the reason whereby the emotions become relevant for design projects. According to Lazarus (1991), emotions express individual meanings in a determined context. People are influenced by emotions, which contribute the physical and mental health of the individual. For the author, there is no way to dissociate cognition, motivation, adaptation and physiological activity. From an emotional reaction, one can learn about their relationship and interaction with the environment. In the same context, Desmet and Hekkert (2007), cite that emotion - that is the result of a cognitive process, is caused by the interpretation of an event or product.

In this relationship of interaction and interpretation between human and product-service, it is considered, in accordance to Desmet and Hekkert (2007), three dimensions of experience. For the authors, these dimensions include: the experience of meaning (meaning assignment through cognitive processes); aesthetic experience (aesthetic pleasure through the senses, sensations and perceptions); and emotional experience (emotional response demonstrated by emotions and feelings).

Desmet (2002), in this sense, asserts that emotions are more relevant to the experience, because they allow the identification of affective reactions in individuals' interactions with the products and/or services, filling information gaps and strongly influencing decision making.

From this perspective, Meroni and Sangiorgi (2011), cites that Design for Experience, among other things, involves understanding the emotional aspects of the interaction of people with objects, environment, and other individuals. To Demir, Desmet and Hekkert (2009), in this context, the design project aims to enhance or minimize certain emotions. Thus, it is important to identify the causes of emotional reactions, in accordance to the users needs and expectations.

Further, it is essential to emphasize that it is not possible to understand the emotion out of the context in which it occurs. Hence, Tonetto and Costa (2011), argue that the design professional, aiming to design for experience, should not limit themselves to their own beliefs and experiences, because it can be different from the users to whom the project is intended.

It is verified, for this reason, the importance of an analysis that can make explicit and assist in the identification of the causes that spark these emotions - whether positive or negative - in the users or in their interaction with products and / or services. In order to better understand how this process occurs, the design can appropriate of the *appraisals* theory.

An appraisal, according Lazarus (1991), is an evaluation of relations with the environment made by the

individual himself. Scherer, Schorr and Johnstone (2001) clarify, in a simplified form, that the *appraisals* theory is how emotions are elicited by evaluations of events and situations. Demir, Desmet and Hekkert (2009) complement that, this theory search results of evaluations as a diagnostic on wellness relations of the individual and the effects provided by the understanding or exploration of man's interaction with the product. Therefore, according to the *appraisals* theory, the emotion is caused by an evaluation (*appraisal*) of a particular event or situation, which may be considered or not, potentially beneficial (DESMET; HEKKERT, 2007).

In the context of the *appraisal* theory, the worries, the expectations, goals and interests of the users about the use of product and/or services, comprises the *concerns*. These help in understanding the expectations of users that process their evaluations. In the model of Desmet (2002) – which is based on the *appraisals* theory and attempts to propose a way of understanding the emotional relationship of people with products (Tonetto; COSTA, 2011) - the emotions involve three main aspects: evaluation, worry and stimulus. For the author, the interactions between these aspects evoke emotions. It is understood that, in this sense, the designer can perform their design interferences.

The literature also reports two prominent approaches on the description and differentiation between *appraisals*: componential evaluation and thematic evaluation. The componential approach is described by several questions. Each issue focuses on a different aspect of the situation. The answers given for each question are named as *appraisals'* component, and each distinct emotion involves a particular pattern of these components (DEMIR; DESMET; HEKKERT, 2009).

On the other hand, according to the cited authors, the thematic approach describes the *appraisals* in a more abstract way, from statements that reflect the personal meaning of a situation - what constitutes the *appraisals'* subjects. Each described emotion involves a distinct personal meaning. Scherer, Schorr and Johnstone (2001), cite that this type of model provides an understanding of the origin of an emotion, how it is combined, integrated and assimilated to a pattern.

To Demir, Desmet and Hekkert (2009), both approaches may be useful in understanding and projecting to emotions. The componential evaluation, for example, is most widely used in research for product design, because it contributes in a particular way to characterize certain points, such as the type of material being used. However, the thematic evaluation is another viable alternative that can contribute, also, for designing service projects.

It is verified, thus, that the thematic approach provides more than the sum of the components, because it can provide a full understanding of the intentioned emotions. In this evaluation, with a broader process of questioning, goes to the heart of the issues that is being investigated, allowing the problem to be better identified, without letting "superficial issues" masking what really needs to be resolved.

Therefore, designing for emotional experiences becomes an important factor for the design activity. Relating the theoretical context to the topic of this article, it can trace design project guidelines of products and/or services in order to maximize positive reactions and minimize negative reactions in the interaction between mothers and the process of their children's vaccination.

3. The childhood immunization and emotional reactions of mothers

According to Portal da Saúde (2012), the official source from the Brazilian Health Department that presents information about diseases and public health programs - vaccines are one of the main ways to prevent disease in

children. In Brazil, the vaccines are available at no cost in public health facilities or purchased through private health clinics. Vaccine development in Brazil is moving at a rate that positions the country among the best in the world regarding vaccination. The result of this investment reflects in vaccine that is more complete by single doses.

In addition, the Portal da Saúde (2012), informs that for the organization of the vaccination system was created the National Immunization Program (PNI - from the term in portuguese *Programa Nacional de Imunizações*), by the Department of Health Surveillance of the Health Ministry, in 1973. The objective of this program is to facilitate the access of vaccine through campaigns and specific actions to eliminate and control diseases in the country, providing, thus, better health conditions for the Brazilian population. The program provides free of charge services, such as: registration and application vaccine doses, logistics of the necessary materials, events for the immunization promotion, adverse reactions monitoring, supervision of results by state and vaccination room, and immunological information system.

To achieve the intended efficiency, the PNI promotes vaccination of children who, in turn, receive around 32 different types of vaccines. The Portal Brazil (2012), presents an orientation table for the application of each vaccine according to the age of the child. This table is provided for parents in the application of the child's first vaccine, to the records in the course of their physical and biological development.

It can be observed that, generally speaking, in relation to the vaccination schedule, children aged 0 to 4 years old go through a period of intense vaccination, by injections or taken orally. The childhood immunization issue had concerned the authors of this article, because it is a routine compulsory to all those who have children. The children, in turn, cry, dodge out, reactions that, although unpleasant, are apparently natural due to the painful action performed. So it, the research has focused on the mothers and not in children.

Therefore, beyond to these findings, arose among the authors, the interest in investigating the emotional reactions of mothers in relation to the vaccination process of their children, identifying the emotions and their proper causes. To answer this question, was followed a search method, as explained below.

4. Research method and data collection

Using exploratory research, in-depth interviews were conducted considering the saturation criteria, in other words, the search was ended when the answers found in recent interviews presented no new information regarding previous interviews. Thus, eight mothers were interviewed in all, with children between the ages of 0 a- 4 years who vaccinate their children, both in private clinics and public health centers. It was understood that, interviewing both profiles, it would get more inputs for discussion.

Data collection was conducted through, semi-structured, in-depth interviews under the guidance of the theory of appraisals in the thematic evaluation model, which provides more abstract answers, but at the same time a full understanding of the intentioned emotions. The goal was to identify the emotional reactions of mothers, the causes of these emotions and the concerns related to the use of products and services during the vaccination process.

5. Analysis and discussion of the data

For purposes of content analysis, interviews were transcribed and mother's verbal manifestations were organized into a table, relating the statements that justified the subject focus. Thus, it was possible to identify the

emotions expressed in the descriptions made by mothers, the concerns, as well as the causes of these emotions.

The analysis required subjective interpretation of the researchers of this article, who observed the statements themselves, the mothers' voice intonation, and their expressions shown during the interview. Some mothers also were specific about their feelings.

For example, in certain speech, one mother uses the word "tension" to describe her feeling when there was changes in particular vaccine. Considering also the mother's voice intonation, her apparent expressions during the interview, and the context of what she was explaining, the researchers considered that the feeling of apprehension was exposed, related to nervousness and the fear by not knowing the new vaccine and the reactions it can cause.

Thus, in order to obtain a consistency in the relations proposed, the identified emotions in the survey with mothers, in the immunization process, were categorized based on the emotion classification elaborated by Parrott (2011). The classification proposed by this author foresees the categorization of emotions into primary, secondary, and tertiary, whereas the primary emotions are organized into six categories: love, joy, surprise, anger, sadness and fear, and it is unfold in secondary and tertiary emotions.

From the content analysis of the interviews realized with mothers, it was identified five tertiary emotions: apprehension, insecurity, irritation, anguish and safety. With tertiary emotions, it was possible to verify from which primary and secondary emotions that are derived, as shown in Table 1, broadening the perspective on the emotional causes in the mothers' interactions with the immunization system.

Table 1. Tertiary emotions identified in interviews, based on the classification of Parrot (2011)

Primary	Secondary	Tertiary
Fear	Nervousness	Apprehension
Sadness	Negligence	Insecurity
	Suffering	Anguish
Anger	Irritation	Irritation
Joy	Contentment	Safety

Considering the tertiary emotions identified in the interviews analysis, it is presented below a summary table (Table 2), exemplifying one of the speech for each emotion found. Then, the analysis will be better addressed and each of the identified emotions will be discussed.

Table 2. Examples of concerns, emotions and causes identified

Concern	Emotion	Cause	Example of evidence in the speech
Receive clear information about vaccines and procedures	Apprehension	Lack of clarity in information	"When it the paralysis vaccine was changed, from oral dose to injection, the nurse was asking lots of questions for the doctor, then I started getting tense, will they apply a wrong vaccine? Then I kept my eye (<i>in the situation</i>). However, she was just clearing up doubts. However, I am always watching. "

Having a sanitized environment	Insecurity	Lack of hygiene	"Until at the very place, a better place to put your son, a sanitized place, because we feel that has no cleaning of the environment itself and the places where the child lies, when one enters, another exits."
Having an adequate infrastructure	Irritation	Infrastructure problems	"It gets everyone together at the reception, mothers, children, elderly, anyone who needs to be vaccinated. Since the room is bigger, you did not even finish the vaccine, already have another child coming, or another adult in the same space."
Watch the child in pain	Anguish	Needle stick, injection itself	"It's hard to see her having pain, I wished it was me, Surely, but at the same time I know it is important. It is a sinking heart, because I keep thinking how it would be if it were me."
Having an information guide	Security	Receipt of children's health book.	"This book is really cool because it shows each vaccine. It has guidelines."

According to the sample table, it is verified, from the analysis, that the first *concern* identified includes the mothers' expectations to receive clear information about vaccines that would be applied and the procedures for vaccination. However, what the interviewed mothers reported finding in public health facilities was the lack of information provided by doctors and nurses responsible for the application of vaccines. They do not explicit which vaccine is being applied, or even record information in an objective way in children's health book, as it is identified in the speech of one mother: - *"Just take the vaccine out of refrigerator and apply. They may be applying anything. And then just write something in the book. If it is a problem, Will I charge from whom? No trustworthiness it is transmitted"*.

Furthermore, according to the interviewed mothers, if they do not question insistently, professionals also do not report about the reactions that the child may have after vaccination, as fever, for example, or what procedure should be adopted for the next dose, like to avoid breastfeed a few minutes before the vaccine. In this regard, many mothers also reported receiving contradictory information, depending on the point of service, with major communication problems in public health facilities.

The lack of information has caused apprehension about the procedures for not meeting the mothers' expectations. Misinformation can cause apprehension about some mothers refuse to vaccinate their children, because they are afraid of what can happen with children's health: - *"If the doctor does not advise acquaintances that do not know why they are doing that vaccine, so they don't take the kids to vaccinate."*

Next apprehension is insecurity, mainly related to the lack of hygiene of the place. Here the *concern* is manifested both in public health facilities, as in private clinics, because the mothers do not have the possibility to check the cleaning procedures before the time of vaccination, or check for negligence. The lack of hygiene can be relate to the danger of contamination of children in contact with the used utensils, as the place where the kid is placed, dressing materials and even the syringe: - *"I am afraid because they put a little cotton on the vaccine."* The interviewed mothers would like to find a clean environment, witch was aware about the sterilization procedures of the spaces destined to vaccination. The mother expect, as *concern*, that the place is clean, but they can not feel completely safe due to the speed and frequency with which children are attended. In this aspect, highlight the following part of the speech explained by one of the mothers: - *"I'm very concerned about the hygiene. I take a*

cloth and place the cloth over the stretcher. I'm worried to have some blood, something that may come into contact with her and give her allergy".

In addition to problems regarding hygiene, during the interviews, the mothers expressed another *concern*. They hoped to find a location with adequate infrastructure for passing strollers, a calm reception for the children and a place reserved for vaccination. These aspects not covered, irritation was caused on mothers. Many of the interviewed mothers expressed interest in finding a well-prepared local, even entertaining ludic aspects: - *"Its necessary to have something to attract him, to have an entertaining to reduce the trauma, because it has adult who is afraid, imagine them. You get there, you already enter, they will make the vaccine and it is done, there is no toy for them. "* Another mother also said: - *"It could have a child vaccination room, to have something more cheerful, more fun for the kids. "*

In what encompasses the accessibility of the places destined to vaccination, stands out: - *"Space is not much thought for mothers, the stroller, for example, does not pass in the hallway, so to take her, I need to get her out of the stroller. "* Regarding space for vaccination, many of the mothers interviewed did criticisms, as it is stands out in the speeches: - *"You have to have a room just for vaccination, because it is usually along with other assistance,"* says one mother. Yet another reinforces the unpleasant fact of being all together on the same reception, usually crowded and disorganized - even in private clinics - bringing together mothers, children, the elderly, already sick people, anyone who needs to be vaccinated.

Besides the emotional reactions already discussed, anguish is also manifested by virtue of pain sensation that is caused to the child at the time of vaccination. Although interviewed mothers know that vaccines are a benefit for children, and that pain is a physical aspect practically inevitable, according to the mothers, is distressing to witness the pain of their kid. It was identified, in this sense, some statements: - *"When she was younger, then I used to get very upset, When she was a baby, sure it used hurt me more than to hurt her. "* - *"In time to hold her little hand at the time of the vaccine I close my eyes to keep from crying." - "I hate to see her having pain, I wished it was me, of course, but at the same time I know it's important."*

It was observed, thus, that negative emotional reactions are predominant, but furthermore, it was possible to find a positive point that generated safety in mothers: the *concern* related to the expectation of an information guide. Although apprehensive about the confusion and lack of information from doctors and nurses, many mothers have found in the children's health book, the safety they needed: - *"Both public and private clinics give the book. Blue for boys, pink for girls. It has all the information about the child's health. "*

Interviewed mothers pointed to the book as something useful, because it indicates all vaccines that should be conducted, and contain records and information on child health, relating to physical and mental development of children. Moreover, some mothers positively highlighted the visual aspect of the book.

With the analysis, it was observed that the relation of welfare between mother and son is strong, especially in the first months of the babies' lives, where the child is fed through breastfeeding. In this sense, ensure the emotional welfare of mothers becomes relevant, even though the physical sensation of pain, by injection, they will not be felt by them. One of the interviewed mothers said: - *"If I feel right, I breastfeed better and he stay also calmer "*. It is understood from the research that the emotional reactions of mothers may interfere in the reactions of children.

With this, alleviate apprehension, insecurity, irritation and anguish, and enhance safety feeling at the time of

vaccination, it is of utmost importance. The Design for Experience can make use of the results found in this study in order to develop projects that deem consider more appropriate products and services for mothers and children.

Thus, from the identification of *Concerns* and the mothers' emotional reactions regarding children's immunization aged 0-4 years, is it possible to point design project guidelines for characterization of products and services for the childhood vaccination process, seeking to maximize the positive effects and minimize the negative ones of emotional reactions identified, independent of public or private services.

6. Design Project guidelines to the immunization process

In project terms, as indicated by Tonetto and Costa (2011), it is perceives that the designer can select the emotions explained in Table 2 to empower them or mitigate them intentionally in the design of projects for products and / or services. Furthermore, it is also stands out, that other dimensions of experience, as aesthetic and meaning experiences proposed by Desmet and Hekkert (2007), can be exploited intentionally and prioritized in the conception of projects to mitigate or enhance these emotions. Tonetto and Costa (2011) also point out that designers can only predict or manipulate the emotional impact of their projects, if they are aware of public *concerns* which are intended the products and / or services. Knowing these *concerns* was one of the intentions of this work.

To determine the design project guidelines, the objective is to point out the issues that should be taken into account at project time. To minimize the apprehension related to the lack of clarity of information passed by the professionals responsible for vaccination, while enhancing the safety of mothers, is essential to establish a service to report in an objectively way, with no contradictions in different locations of vaccination.

It is suggested a project of creation of computerized services that can integrate the flow of information provided by doctors and nurses, contemplating the vaccination's locals, medical documents, nurses, mother and child, procedures about vaccinations, explanations about the benefits of each vaccine and adverse reactions that can be caused.

From this, it is appointed the need for automation to fill the book, to identify the needed materials and tools for the procedure, and for control systems as alerts for the forthcoming vaccines, professionals involved, health historical, voucher of the inputs used and authentication of child vaccination process. Thus, it can be promote transparency of information, process control by parents and rescue of information when the child is in adulthood.

With the structuring and digital processing data, it can be enable the connection of information with public health programs. It is stressed that, a visual language suited for graphic design of the computerized system can help in communicating information.

This type of integrated and computerized system, for mothers, serves as a more efficient alternative to the health book, but it mainly favors the health centers and vaccination clinics, because it standardizes the informations and provides that nurses remain up to date and able to communicate with mothers with greater clarity. For this, it as also proposes the creation of guidance services, training for professionals involved in the care of the child.

Additionally, it is pointed the need to give attention to standardization of vaccination procedures by nursing professionals, to avoiding risks of mistakes. The labels of the vaccines can be sorted by color or otherwise differentiation, so the mother can identify, visually, which vaccine is being applied.

Regarding the insecurity related to the environment hygiene and sterilization, it is recommended to focus on projecting parts that can be easily sterilizable and disposable coverings for the *stretchers* where babies are accommodated, and enhancing the effectiveness of cleaning for removing contamination risks. It is important to pay attention in the design of disposable products that do not pollute the environment and that can be easily processed, taking into consideration the environmental impact and risks generated by hazardous waste disposal of hospital origin.

To the irritation, related to infrastructure problems, guidelines are proposed to alleviate that emotion, such as creating broad and accessible environments, whenever possible, for example, spaces that facilitate the transition of children and parents with strollers. It is also needed to design the inclusion of attractive objects for children to distract them at the time of vaccination, for example, room decor, colorful toys, uniform and visual presentation of the attendants.

Furthermore, it also indicated the necessity of differentiating the access and exit of patients in the place of vaccination, to between one service and another, not to have contact with other children, adults or patients. It is needed to stick to one type of personalized service, that prioritizes the relationship with mothers and children throughout the vaccination service.

Regarding the reduction of mothers' anguish, it is suggested attention to the development of less painful and less invasive procedures, which diminish the children's pain sensation by piercing the skin. But it is also important to stick to the approaches realized by professionals, to prepare doctors and nurses, by ludic training, for providing distinguished service that contributes to the tranquility of the child.

Finally, it is directed to the creation of other services that may further contribute to the welfare of mothers, like customization in the attendance of women still in gestation, to advance the clarification of information and provide greater comfort and tranquility. It is indicated yet, the need to stick to situations outside the service, for example, the arrival and departure of mothers in the parking lot of the vaccination place.

7. Conclusions

This paper has presented the analysis and discussion of the results of an exploratory research realized from in-depth interviews with eight mothers of children between 0-4 years old, in a period of intense vaccination. The research was based on the *appraisal* theory, opting for the thematic evaluation model. It was investigated the emotional effects, the causes of these emotions and the *Concerns* related to the use of products and services available for vaccination.

In this way, were identified in the content analysis of the interviews, emotional reactions such as apprehension, insecurity, irritation, anguish and safety. Also it was discussed the fact that ensure the welfare of mothers becomes relevant, because emotional reactions can interfere with their children's reactions, therefore, mothers were the focus of this research. It was also highlighted that the mother's emotions were caused during the service of immunization in both private and public health centers.

An important aspect to be mentioned is that the process of identifying of the user characteristics used in this exploratory research can be extremely useful in design processes in other contexts of private and public health as well as the development of specific products and services related to other types of procedures aimed at the welfare of individuals.

Thus, in the specific case of vaccination, with the analysis and discussion of the results it was pointed design project guidelines so that designers can to explore the research and propose innovative and effective solutions that contribute to the minimization of negative reactions and enhancement of positive reactions in the process of childhood immunization.

As other approaches, it was understood that further research could be conducted with a focus on componential evaluation model, aiming to identify other emotions. May also be offered a further research, by analyzing the emotional reactions of children, beyond from mothers.

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