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# Addressing Experience in Design Research: The case of young children as users of medical products

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## Abstract
The focus on people's experiences with products is gaining increased attention in the design research community. Currently, research and discussions on user experience revolve mainly around everyday consumer products. However, there is a need for more knowledge about people's experiences with products that they are *compelled to use* for medical reasons. This paper draws attention to people's experiences with medical products from a design research perspective. It analyses experience components and concepts and relates them to the case of young children as users of medical products. The goal of the paper is to analyse and assess the suitability of these concepts for that type of products and suggest categories that support an experience-based approach when designing for young children as users of medical products.

***Keywords: Experience, Experience design, Design of medical products, Children***

## 1. Introduction
Designers seek to understand interactions between people and products mainly to design improved products and enhance the positive experience when people use them. Jordan [1] e.g. regards pleasure in product use as the emotional and hedonic benefits and displeasure as the emotional and hedonic penalties. If we consider typical consumer products, the consequence of felt displeasure may be that people simply stop using the specific product. With regard to medical products, experienced displeasure may have more drastic consequences in terms of people's health and quality of life. Here, displeasure may e.g. cause that people are afraid or unmotivated to use them, forget to use them, use them in the wrong way or even refuse to use them. These disadvantages may especially appear when the users are young children who do not completely understand why they need to use such products. Currently, research on how designers can support people's experiences with products that they are compelled to use for medical reasons is limited. This paper attempts to extend the knowledge of experience design in this area by assessing experience concepts that are suitable for designers in order to study and design for young children's medical experiences.
Young children are assumed to belong to a user group that has initially an unmotivated attitude towards using medical products. Considering young children as the specific user group of interest also implies challenges in terms of recognising and applying appropriate design methods when aiming at influencing user experience. These two aspects may provide interesting results for a generic design study of experiencing medical products.
Following the introduction, the second section of the paper introduces a case study of young children who are treated for respiratory diseases in the hospital. The third section investigates experience concepts and assesses their relevance in relation to the case presented. Based on

this, a set of categories is proposed to support an experience-based approach when designing for young children as users of medical products. Concluding remarks and an outlook for further research are presented in section four.

## 2. Case: Young children as users of medical products in the hospital

The case study focus is on young children, aged three years and younger, as users of nebuliser devices in hospital settings. Nebulisers are used for treating respiratory diseases such as asthma and respiratory syncytial virus (RSV) by administering medication in the form of breathable mist for the patient to inhale passively through a facemask. Receiving medicine through passive inhalation, as opposed to active, is suitable for young children. Although mostly used in hospital settings, nebulisers can also be used for continuing treatment at home. The children who need hospital treatment live in isolated rooms during their stay, which can typically last for several days. These children are a group of patients who require close follow up, as they often need treatment every two hours. A single treatment typically lasts for five to ten minutes. As young children generally need help with the treatment, health personnel and parents are also regarded as users of nebulisers. Nebuliser treatment is challenging because children often resist by protesting or fighting against the treatment. The reasons for resistance can be a combination of pain, fear and lack of understanding of both the situation and the treatment. Poor collaboration and struggles affect children's hospital and medical experiences, as well those of their parents and heath personnel, in various ways. Another direct consequence is reduced effect of the medicine. In order to illustrate the case studies settings, Table 1 presents a short narrative based on one of several observational studies carried out at St. Olavs Hospital.

**Table 1. Narrative**

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| *Adrian sleeps on his mother's lap. Her arms are tenderly placed around him; she strokes his head and observes him with a loving glance. Adrian lies calmly with one pacifier in his mouth and another pacifier in his hand. They sit in bed. Two screens are in the room, one is on the wall and the other one is mounted on a solid arm and hangs over the bed. A loud beeping sound disrupts the peaceful atmosphere once in a while. A nurse enters; she wears a long white coat and blue gloves. She tells the parents that he will get saline because of the good effects this has given previously. Then the nurse connects the nebuliser to the oxygen outlet and the room is filled with a noisy wheeze-like sound. She gives the device to the mother who places the facemask over the boy's mouth and nose. Adrian moves a bit as he notices something close to his face, and then he starts coughing. He starts to rub his eyes. As he leans back against his mother's chest, the mother is not able to position the mask close enough to his face. Adrian wakes up. He whimpers and pushes the mask away. The mask is pushed back and forth; it becomes a struggle. He looks up at his mother with an expression that suggests questioning and frustration. The mother asks him if he wants to hold the device. He replies by pushing it away. The mask is being held at a distance from the boy; the damp is blown in his face. Suddenly the beeping sound is back. It catches his attention. Adrian closes his eyes and the mother is allowed to place the mask on his face again. She praises him and strokes his foot. The mother is singing quietly to him while stroking his hands. Even though he allows this action it is obvious that his patience is growing thin. As Adrian begins to protest heavily the nurse tries to assist by holding the mask to his face. The mother explains that this is good for him. The nurse grabs his ball from the bed in order to distract him. Adrian gets furious. The nurse says that maybe it was a mistake to take his ball. The mother and the nurse are now both pushing the mask on the boy's face. He pushes the mask, kicking and crying. Adrian calls for his dad. The father decides to place him on his lap. Both the mother and the father are now holding the mask to the boy's face. He still keeps pushing the nebuliser away. The mother then holds the mask on a distance to his face. The damp stops; the treatment is completed. The mother says to Adrian that they are all done and asks if he wants to look at the device. Adrian turns away and leans close to his father.* |

## 3. Experience concepts in design research

Many current concepts of user experience aim to grasp elements of user-product interaction that go beyond traditional usability aspects such as effectiveness and efficiency [e.g. 2-7]. From this it follows that people's experiences with product use can best be understood in a broad sense by considering aspects such as product semantics, affordance, pleasure and participation. Theories are however many and diverse, and this section presents some central experience concepts that are relevant for the case study, rather than summarise the debate of experience design.

### 3.1 Experience as relation between people and products

In a product context, experience is often referred to as user experience or product experience. According to Hassenzahl, user experience includes all aspects of interacting with a product [2]. Desmet and Hekkert share an equally broad view by referring to product experience as all possible affective experiences involved in human-product interaction [8]. Forlizzi and Battarbee [3] distinguish between experience, an experience and co-experience. *Experience* is understood as a constant assessment of our goals relative to the people, products and environments that surround us at any given time, *an experience* is seen as a type of experience with a beginning and an end that often inspires emotional and behavioural changes in a person and *co-experience* takes place in social contexts where experiences are created together or shared with others [3]. Experience is a complex and multi-faceted construct. Even though it is recognised as a subjective phenomenon, it is important for designers to know what constitutes experience when aiming to design for specific relations between people and products.

### 3.2 Experience components

Meaning and sense are two distinct manifestations of experiencing things [9]. Put simply, while meanings are made or constructed, sense mainly is intuitive and spontaneous. In addition to these two experience components, Desmet and Hekkert draw attention to a third component, namely emotional response [8]. The following section takes a closer look at these terms.

*Meaning*

Meaning can be regarded as a component of experience [8]. Krippendorff reflects on user experience semantically and puts a lot of emphasis on what artefacts *mean* to people affected by them: "*Humans do not see and act on the physical qualities of things, but on what they mean to them"* [5, p.47]. Meaning is therefore argued to be a defining concern for designers. Meanings are dynamic in the sense that they emerge, are maintained and embedded in conversational and cultural contexts [10]. The meanings that people attach to specific products are also dynamic and will depend on personal, social and cultural aspects. Furthermore, meanings are constructed through cognitive processes. Through interpretation, memory and associations we can for instance recognise product characteristics and assess a product's significance [8]. Designers need to take into account that the existence of products depends on being meaningful to the network of stakeholders [5].

*Sense*

On a sensory level, people experience products through seeing, touching, hearing, smelling and tasting them. Krippendorff describes sense as "a dimensionless feeling with numerous deviations, such as feeling discomfort or pain, being frightened in unfamiliar situations, losing control and or being uncertain what to do" [5, p.51]. The desirable state of sense is described as "the feeling of being comfortable within one's world, at home, safe and assured that one is on track, in tune or in sync with what is going on" [5, p.51]. Desmet and Hekkert refer to the

aesthetic experience as the degree to which all our senses are gratified [8]. The kind of experience that is generated is determined by the degree to which a perceptual system manages to detect structure, order, or coherence and assess a product's novelty or familiarity [8]. Aesthetic experiences involve pleasure and displeasure [8].

*Emotion*

Emotions such as joy, fear, desire, satisfaction and irritation also represent a component of experience. Emotions are functional in the sense that they establish our position in relation to our environment by pulling us toward or pushing us away from certain people, objects, actions and ideas [8]. With regard to products, pleasant emotions will pull us to products that are regarded as beneficial while unpleasant emotions will push us away from products that are regarded as unfavourable [8]. Desmet and Hekkert draw upon appraisal theory and argue that, contrary to popular belief, an emotion is the result of a cognitive process [8]. This means that an emotion is elicited by an evaluation or appraisal of an event or a product as opposed to the event or product itself. The cognitive process that causes the emotion is however often automatic and unconscious [8].

*Meaning, sense and emotion*

The three experience components are interdependent; they influence and trigger each other in various ways. Sensory experience can e.g. give rise to an emotional experience because people are motivated to seek products that provide pleasure and avoid products that provide displeasure [8]. The meaning component can elicit emotions because people can appraise a certain product meaning as beneficial or harmful [8]. Krippendorff emphasises the essential relation between meaning and sense by focusing on the concept of *affordance* [5]. Affordance is explained to be the perception of one's ability to do something with what is sensed. Affordances of products should cover at least the range of meanings they convey to people [5].

### 3.3 Appraisal of the experience components for the case

With the intention to deliberately influence people's experiences with products – the meanings, senses and emotions related to product use, Krippendorff suggests that artefacts should be designed to afford users' three modes of attention: *recognition, exploration* and *reliance* [5]. Recognition is driven by sense. The degree to which a product is recognisable is related to expected users' past experiences, common sense and prevailing conventions [5]. With regard to medical products to be used by young children, recognition is especially central in order to establish a trusting relationship between the child and the product. Familiar product features that are recognised in a positive way have the potential to override unmotivated behaviour. Sensory experiences elicited during interaction with the nebuliser such as a noisy wheeze-like sound, an unfamiliar taste and a cold silicone facemask may be recognised as scary or threatening and contribute to displeasure.

Exploration deals with orientation towards the product's face, figuring out how it works and how it might be handled. Exploration is thus discovering what kind of relation, or rather affordance, you can have with a product. Whereas children learn to see affordances, most adults have an established understanding of what they can do and what things in their environment can do for them [5]. The range of meanings associated with the nebuliser can be characterised as wide because the group of stakeholders is rather diverse. For nurses and parents, the attached meaning is probably much related to the function of the device. For young children however, the perceived affordances of the nebuliser do not necessarily match their meaning making styles. The nebuliser does not suggest how to interact with it in such ways that the treatment can be experienced as interesting, stimulating or even fun. Many

children have to use the nebuliser without a clear understanding of why, when or how long it takes. Designing for understandable affordances can be seen as a possibility to achieve desirable relations between children and medical products.
Reliance occurs when we no longer think about how products work, but instead are concerned with what they do to our world. Krippendorff argues that achieving reliance is a primary aim of human-centred design. Interfaces should be meaningful to start with but then disappear for the benefit of other concerns [5]. Achieving a reliance relationship is especially relevant with regard to medical products. For children a reliance relationship with the nebuliser will indicate that they in some way accept the treatment and are motivated to using the product.
With regard to medical products for children, Krippendorff's three modes invite designers to explore the opportunities to facilitate experience in terms of senses, meanings and emotions.

### 3.4 Experience and pleasure concepts

Jordan's experience framework builds on a hierarchy of consumer needs in terms of functionality, usability and pleasure [6]. The main argument here is that people are looking for products that show an understanding of their values and lifestyles rather than for functional products. Pleasurability lies in the interaction between a person and a product as opposed to being a product characteristic: "…usability-based approaches to design are - in effect, if not in intention - dehumanizing. This is because such approaches tend to encourage a view of people as simply cognitive and physical processors in a user-product-task system. Pleasure-based approaches, on the other hand, encourage a holistic view of users, striving to gain a rich understanding of human diversity" [6, p.205]. Consequently, in the four-pleasure framework, products are seen as not merely functional tools, but as "*living objects* with which *people* have *relationships*" [6, p.7].
Jordan classifies four categories of pleasure sources related to product use: physiological, psychological, sociological and ideological pleasures. Not every product can be designed to offer all four types of pleasure. However it is important that designers identify the particular benefits that a product should provide [6]. Despite its rather unexplained assumptions on the notion of pleasure and its ubiquitous definitions of terms such as 'product' and 'pleasure', some aspects of Jordan's framework provide important supplements to Krippendorff's semantic approach. The pleasure concepts and their value for the case are discussed in the following section.

### 3.5 Pleasure concepts – an appraisal in relation to the case

According to Jordan *physio-pleasure* has to do with stimuli from the sensory organs such as taste, smell and touch. The physical benefit of the nebuliser is the relief that is caused by using the product - here improved breathing and healing of the respiratory system. In cases where children resist treatment this benefit is difficult to achieve. Benefits with the use of this product are in general those pertaining to the sensory pleasures. Using the nebuliser may give children pleasant sensory feedbacks if they experience the medicine as relief of pain or discomfort. Some nurses regard the special taste of the medication mist as an element that may cause children to resist. It is also cold. The loud wheeze-like sound produced by the nebulisers that are oxygen driven can be considered a fear-provoking aspect. When the facemask covers the patient's mouth and nose it may give a tickling feeling in the face. Other tactile feedbacks will be experienced with the plastic and silicone components. Children who are able to hold the device are often encouraged to do so by the nurses because an active role may contribute to that children feel more in control of the treatment situation. However, the nebuliser does not specifically communicate or encourage the act of holding through its design. The physio-pleasure category is very relevant for the case two reasons. First, it strongly relates to children's acceptance of medical products through embodied interaction

with the product. Second, from a designer's point of view, product elements such as dimension, weight, colour, sound, material and product grip can be integrated deliberately in the product solution to increase or decrease physio-pleasure, influencing children's motivation and interest to interact with the product.
Jordan regards *socio-pleasures* as those that enable people to be comfortable or to avoid discomfort in relationships with others. *Psycho-pleasures* are those that concern people's cognitive and emotional reactions whereas *ideo-pleasures* relate to people's moral and cultural values to product use. Because many children resist and protest during nebuliser treatment, the social relationships with the caretakers in the specific setting may become problematic. A parent may for instance switch between providing comfort on the one hand, and exert physical restraint on the other hand. This may perceived as confusing from a child's point of view, and stressful from the parent's point of view. In many cases, the nebuliser fails to support decent interaction as parents and health personnel feel compelled to defy their own limits by exercising a firm grip on the child and pressing the facemask to the child's face. A forced interaction causes a range of negative emotions such as anger, frustration, fear, guilt, doubt, sadness and shame amongst children as well as parents and health personnel - emotional reactions that can be discussed in terms of psycho-pleasures. The psycho-pleasure category is relevant for considering both the kinds of emotions that relate to being a patient as well as the emotions that may be triggered during interaction with a medical product. With regard to ideo-pleasure, parents may find themselves acting reluctantly when children resist treatment, but since medical treatment is necessary they can somehow accept to act in ways they normally would not. In many cases thus, nebuliser interactions create dilemmas for parents as well as nurses. The socio- and ideological pleasure categories are important for considering how co-experiences take place during treatment as well as for analysing how social and ideological aspects affect the patient-product interaction.

### 3.6 Experience and empathy methods

Fulton Suri [7] identifies two different aspects of experience that designers need to acknowledge. First, people's *subjective experiences* are independent of the designer's control. Subjective experiences are those affected by people's internal states, moods, personal associations or context. Although designers can influence experience it cannot be designed. Second, designers can adjust design expressions to influence experience appropriately. Design expressions are all the *expressive qualities* inherent in the products, environments, media and services that are designed: the *formal qualities* such as sound, smell, mass and texture and the *behavioural qualities* such as feedback, rhythm, sequence, layering and logic. For expressed design qualities to shape and support people's experiences in desired ways, designers should understand as much as possible about personal, social and cultural influences as well as interpretations of design elements and their expressions [7]. Therefore, Fulton Suri calls attention to design methods with strong focus on empathy [11].
Empathy is a powerful tool for gaining understanding of users' experiences. Designers need to ask themselves: "If *I* were in the users shoes, how would I react in this context?" [12, p.453]. Looking at what people do, asking them to participate and trying things ourselves contribute to empathic realisations [11]. If we want to learn about people's thoughts and feelings, an empathic interpretation of what they say and do is necessary. This requires a creative balance between detailed observation and subjective imagination [11]. Creative expression, such as collage-making and diary-keeping, is powerful in terms of probing people's experiences and can be valuable especially when people might find it difficult to articulate or reveal attitudes and thought-processes verbally [11].

### 3.7 An appraisal of empathy-based methods for the case

With regard to the case, it may be a challenge to include the youngest children with an empathy-based approach. Spending time with young children and familiarising with their various ways of expression is important. Insight into the experiences of siblings, parents, health personnel and pedagogues should also be aimed for in order to gain understanding of their experiences situated around the medical treatment of the young children. Through own engagement in relevant activities and circumstances, designers can increase their empathic realisation of what it feels like to use a product in real contexts or simulated situations. Trying to get insight in young children's experiences during nebuliser treatment is challenging. Even though every designer has experienced childhood, it is impossible to experience the world as a child again. However, it is possible to simulate a situation wherein the premises are as follows: You cannot breathe normally, you are ill and tired, a facemask is pushed to your face, a device that is making a loud noise is held in your field of vision, your trusted caretaker is holding your arms in a fixed position, you do not know how long this is going to remain and why this is being done.

### 3.8 Some reflections on the experience concepts

Common for all concepts analysed here is the human-centred perspective as an overall premise for design activity. This means acknowledging that we design for real people. Adapting this key perspective has some important implications for selecting categories to support an experience-based approach when designing for young children as users of medical products. Firstly, people's bodily experiences, emotions and meaning making have to be explored thoroughly to adjust design expressions. This affects, secondly, the design methods that are employed in order to shed light on the issues of physical experience, emotions and meaning making.

Krippendorff's three modes of recognition, exploration and reliance provide general categories for addressing the experience components of sense, meaning and emotion. Jordan's classification is useful for integrating specific aspects of pleasure. Jordan's framework also helps designers to look at all possible benefits that a product may offer during interaction. Analysing the nebuliser treatment in terms of pleasure is considered a good starting point for understanding the situation in terms of physiological, psychological, sociological and ideological pleasures. Fulton Suri emphasises a set of methods that aims at promoting empathic inspiration for design activity. Krippendorff and Jordan similarly promote the use of participatory methods.

Key perspectives and aspects identified from the concepts above are gathered in categories to support experience design in the case of children's medical products. The following four categories are considered relevant for an experience-based approach:

*Human-centred design perspective*

Involving children in the process of designing products and new technology for children is commonly acknowledged [e.g. 13, 14]. However, much research in the design field builds on an understanding of children as "cognitive incomplete" beings or "human becomings" [15]. The need for viewing children as "human beings" and adapting a more socio-cultural approach by focusing on children's agency, competence and participation in the world is increasingly being recognised as an important premise for designing children's products [e.g. 15-17]. An implication of viewing young children as competent communicators is that researchers and practitioners need to readdress their relationship with young children and accordingly their roles [18]. Eisner's theories [e.g. 19, 20] on children's *play, learning and meaning making* might supplement Krippendorff's human-centred approach and contribute to

enlarged notions of recognition, exploration and reliance. Designers can also seek inspiration and learn from the Reggio Emilia Philosophy, which is founded on the understanding that children express themselves and create meaning through a multitude of languages [21].

*Bodily and sensory experiences*
Medical products that successfully afford children's recognition, exploration and reliance, have the potential to be used under less challenging circumstances as described above. By carefully considering a medical product's expressive qualities and how they are intended to relate to physio and psycho-pleasures, designers can contribute to more pleasurable experiences for children.

*Social aspects*
Personal, social and cultural aspects all shape people's experiences. Seeking to support children's medical experiences involves acknowledging the various roles that they have, such as being a child, a patient, a family member and a member of society. As medical treatment of young children takes place in a social context, the social aspects are regarded to be important. By considering how a medical product's expressive qualities are intended to relate to socio and ideo-pleasures, designers can contribute to more desirable co-experiences for the network of stakeholders involved in the medical treatment.

*Empathy design*
Designers need to adapt their design methods in order to gain empathy for the concerns of the people they design for. As children differ from each other - just like adults do, a variety of methods should be used in order to facilitate the strengths of the participants. Through empathy, designers can gain understanding of users' meaning making, sense and emotion. Designers can contribute to more positive experiences during medical treatment by basing expressive product qualities upon empathic interpretations of people's healthcare experiences.

## 4. Concluding remarks
This paper explored experience components and concepts in relation to the case of young children as users of medical products. By assessing the suitability of these concepts for that type of products some key perspectives and aspects were gathered in categories. The four proposed categories: *human-centred perspective, bodily and sensory experiences, social aspects* and *empathy design*, represent important issues concerning the design of medical products for children from an experience-based point of view.
The findings of this paper aim to emphasise the importance of placing medical products for children on the design agenda. With regard to the case, the concepts and methods described need to be further adapted in relation to children and their caretakers. Designing for young children will for example require a more specific understanding of the ways children make meaning. My future research will add to this area by developing the categories further into an experience framework.

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