THE ADVENTURE OF A HOSPITALIZATION
BRINGING THE REVERSAL THEORY TO LIFE

Ruijs, F., Desmet, P.M.A., Sonneveld, M.H.,
Delft University of Technology

freyaruys@gmail.com, p.m.a.desmet@tudelft.nl, m.h.sonneveld@tudelft.nl

ABSTRACT
The design & emotion research domain has produced a rich palette of theoretical and methodological approaches that support designers in their attempts to ‘design for emotion’. In this paper, we focus on situations that involve negative emotions that cannot easily be ‘solved’ through design (for example, sadness caused by the loss of a loved one). The main question addressed is: is it possible to use reversal theory for designing products that transform given strong negative emotions into positive experiences? This question is particularly relevant for situations in which the cause of the negative emotion cannot be removed or solved through design. The paper describes a design case in which this question was explored by designing a product that supports children who are hospitalized for a surgical procedure. One concept was developed by means of the reversal theory and protective frames, transforming the experience of a hospitalization into that of an adventure.

Keywords: Reversal theory, design case, hospital, negative emotions.

INTRODUCTION
Emotion-driven design generally aims to design products and technology with the intention to evoke pleasant or avoid or reduce unpleasant experiences (Demir et al., 2009). Although relatively young, the design & emotion research domain has produced a rich palette of theoretical and methodological approaches (for an overview, see Desmet & Hekkert, 2009) that support designers in their attempts to ‘design for emotion’. Jordan (1999) published his famous pleasure framework, distinguishing sources of pleasure in human-product interaction, followed by influential work by Desmet (2002), Norman (2004), and Hassenzahl (2010). They investigated how products and technology can be developed that evoke enjoyment, pleasure, satisfaction, inspiration, and other kinds of positive experiences.

In this paper, we focus on situations that involve negative emotions that cannot easily be ‘solved’ through design. Some examples are the sadness caused by the loss of a loved one, the anger caused by being fired for no good reason, the fear caused by awaiting the results of a blood test, or the frustration caused by being stuck in a traffic jam. These are emotion-laden situations in which personal concerns are at stake. Can (and should) design influence these emotions? Can we design a product or technology that reduces the sadness of a person mourning over the death of his spouse? Probably not. It seems inappropriate to assume that design can take away this negative emotion. And yet, at the same time, it is interesting to explore whether design can somehow contribute to the experience – in a way that respects the negative emotion, without necessarily aiming to reduce it.

Recently, Fokkinga & Desmet (2012) have shown that the distinction between positive and negative experiences reduces the complexity of emotions experienced in human-product interactions; negative emotions are not always unwanted. They propose that negative emotions can actually enrich user experiences, and explain under what conditions negative emotions can be a rich experience as opposed to plainly unpleasant. The theoretical basis for their framework is ‘reversal theory’ developed by Apter (2007). This theory explains how pleasant and unpleasant experiences are interconnected rather than opposites, and how unpleasant experiences can
be transformed into pleasant experiences and vice versa. The main question addressed in the current paper is: is it possible to use reversal theory to design products that transform given strong negative emotions into positive experiences? This question is particularly relevant for situations in which the cause of the negative emotion cannot be taken away or solved through design. This paper describes a design case in which this question was explored by designing products that support children who are hospitalized for a surgical procedure. After a brief overview of reversal theory, the design case is presented. In the discussion section, we reflect on our gained insights in how reversal theory can be used to design products that ‘transform’ negative emotions. The main focus is on the reversal theory is complemented with additional models.

THE ADVENTURE OF A HOSPITALIZATION

‘The Adventure of a Hospitalization’ was the first author’s graduation project of the ‘Design for Interaction’ master’s program at Delft University of Technology, in the Netherlands. The project was completed in 20 weeks and integrated design research and conceptual design at the front-end of innovation. The project was completed at the Emma Children’s Hospital, which is part of the Academic Medical Centre in Amsterdam and one of five specialist children’s hospitals in The Netherlands. The Emma hospital has 170 beds, divided between seven wards, in which about 4700 children are hospitalized every year.

Since hospitalization can be a stressful experience, childcare workers guide children and their parents, when they are at the Emma hospital. Unlike the medical staff of the hospital, the childcare workers focus specifically on the emotional well-being of the children and their family. (see Figure 1).

Each of the seven wards is supported by one or two childcare workers (depending on the size of the ward), which makes a total of ten regular childcare workers and some five interns. The childcare workers at the Emma prepare the children and their family members for surgical operations or special procedures, and guide them throughout the process. Although they

Figure 1: Childcare worker and parent preparing a child for surgery

Figure 2, the standard toolbox of a childcare worker

Childcare workers guide all children between three months and 12 years old (and younger and older children on request). Parents (or caretakers) play an important role in the preparation, but the main focus is on the child. In this project, the Emma childcare workers were considered to be the clients. Because one of their key challenges is to manage their time to make sure that they can provide high quality guidance to all children, the project set out to design ‘something’ that supports these professionals in guiding and preparing the children before and during hospitalization for a surgical procedure. This should enable them to protect the emotional well-being of the children in a way that meets their own high standards. In discussion with the clients, the decision was made to focus on children between the age of three and six years old.
Several intensive qualitative studies were performed to gain an understanding of the context of hospitalization at the Emma, the procedures and practices, and the various stakeholders, their needs, concerns, experiences and behaviour. A context-mapping study was carried out among the childcare workers, and family members were interviewed to understand the impact of a hospitalization. A workshop with the children offered insights into their understanding of the concept of emotions.

The combined outcomes of these studies provided insights into how children and their family experience hospitalization, and into how childcare workers provide support in these experiences. A full overview of the results is reported in Ruijs (2011). One of the most prominent findings was that, when hospitalized, children experience extreme emotional responses, both in terms of intensity and in terms of contrasts. Every day, the hospital staff encounters outrage and panic, but also joy and euphoria, sometimes within the same situation, and even coming from the same family or child. On several occasions the emotional tone changed suddenly and abruptly. In most cases it was difficult as a designer to understand or explain these reactions, their cause, or their severity. Quite often they seemed to appear out of thin air, without obvious reasons. For example, one of the children who participated in the research, a very energetic boy of 5 years old, was absolutely fascinated by all the hospital equipment. He ran around playing most of the day, completely unhindered by his surroundings. He wanted to hold his IV before the doctor gave him his IV line and he was not really bothered by injections. It seemed as if he was not frightened by the hospital or his surroundings as long as he was told what was going on. This changed when he was shown the respiratory mask for the operation. From that moment on, the emotion of this upbeat and curious boy changed instantly to screaming panic. And when the mask was put away, so did his reaction.

These extreme and contrasting emotions appeared to be a key phenomenon in the emotional well-being of children in the context of hospitalization. Because the ‘reversal theory’ developed and detailed by Michael Apter (2007) provides a clear explanation of the phenomenon of contrasting emotions, it was used as a framework in the current design project. In our view, this theory can be interesting for other design cases in which contrasting emotions play a role, and therefore we provide a brief summary of some of Apter’s key concepts, and discuss how they were used in the current design project.

**REVERSAL THEORY**

Reversal theory is a general model of personality, motivation and emotion that explains the dynamic qualities of human experiences. The theory in essence states that a person can reverse a positive to a negative experience and vice versa. An often-used example is the thrill of a rollercoaster or parachute jump: these activities can be very exciting, but they can also cause strong anxiety, and the same person can ‘reverse’ these contrasting experiences. The theory introduces some variables and concepts that can be used to explain these reversals of experience (and related motivations). Two concepts used in the theory have been employed in our design project: the ‘avoidance-excitement contrast’ and the ‘protective frame’.

In addition, a third concept that was also used is that of ‘complex qualities’, proposed by Fokkinga & Desmet (2012) as a means to translate reversal theory to design practice. The ‘avoidance-excitement contrast’ and protective frame are briefly introduced below.
THE AVOIDANCE-EXCITEMENT CONTRAST
In principal, people can have two contrasting motivational modes: the anxiety-avoidance mode and the excitement-seeking mode, each represented by a line in figure 4. In the excitement-seeking mode people experience high arousal as pleasant (excitement), and low arousal as unpleasant (boredom). In the anxiety-avoidance mode, this hedonic tone is reversed: high arousal is unpleasant (anxiety) and low arousal is pleasant (relaxation). It is interesting to see that people can ‘flip’ between these two modes. For example, a deep-sea diver can experience excitement, but this excitement can instantly reverse to become anxiety when he notices that his oxygen-tank is not as full as he thought it was. In that case, the hedonic tone switches from pleasant to unpleasant, while his arousal remains high. The opposite can also occur: for instance, when a parachute that initially failed to open suddenly functions as normal (Apter, 2007).

PROTECTIVE FRAMES
Protective frames can best be introduced with an example. Listening to a scary story or riding a rollercoaster are examples of stimuli that are logically expected to be experienced as unpleasant. They are, however, enjoyed by many people. The reason that these stimuli are experienced as enjoyable is because they are experienced within a specific frame of reference that makes them enjoyable. Most people are unlikely to experience exploding buildings as enjoyable. However, we can enjoy watching buildings explode in movies and find it thrilling: the realization that it is ‘just a movie’ provides a mental ‘protective frame’, which enables us to enjoy something we would not enjoy without that frame. Experiencing fear through a movie is one example of a protective frame. A protective frame can be seen as a safety zone, which enables you to experience negative emotions in an enjoyable way. The frame assures you there is no real threat to you. Apter (2007) distinguishes between three different kinds of frames.

The confidence frame: there is danger, but I am able to control it
The safety zone frame: there is danger, but I am at a safe distance from it
The detachment frame: there is danger, but I am not interacting with it.

For application in the design domain, Fokkinga & Desmet (2012) came up with four additional frames.

A possibility frame: there is an obstacle or danger, but I can see possibilities to work around it or remove the obstacle
A rebellion frame: gives permission to do something that is otherwise forbidden or frowned upon (writing on walls, eating with hands) indulging in the experience
An implication frame: supports on given up temporary pleasure now, for the greater good or an ultimate goal, in the future
A universal frame: puts the current situation into a bigger frame of reference, the bigger picture. For example, in a hospital environment the realization of one’s mortality (which can be seen as putting the current situation into a bigger frame) can cause a sentimental reaction.

A protective frame can enable people to be, get, or stay in an excitement-seeking mode. If this frame is absent, people will be in an anxiety-avoidance mode. This explains the reversal: while in an excited state, something can happen that takes away the protective frame (e.g. the lion escapes from its cage, the parachute malfunctions), and our excitement will instantly flip to anxiety. Hence, in situations that evoke high arousal, negative emotions, we can aim to design products that provide or strengthen a protective frame. Because this will not take away the source of the negative emotion, but it may help ‘reverse’ the negative emotion towards a less unpleasant (or even pleasant) experience, we set out to reformulate the aim as: design a product for children that provides a protective frame, creating a safe environment in which the negative emotions that come with a hospitalization will be experienced in a less negative, or even positive, way.

THE USE OF REVERSAL THEORY
This section shows the use of the reversal theory within the project. On several occasions, the reversal theory provided insights and in-depth knowledge during the design case. The reversal theory was essential to the design case in four different phases. It
is then remarkable to see that the theory was applicable during the entire design process, which shows the diversity of its application and usefulness.

**Analysis – Field Research:** During the field study the emotional reactions of the patients and family were observed at the hospital. However, to design for these emotional reactions required an understanding into ‘the why’ of these reactions. The reversal theory provided the theoretical backbone for this understanding.

**Creating Personas:** To bring the different ways to experience a hospitalization to life, personas were created. The reversal theory provided a strategy to map the challenges for each persona.

**Creating Protective Frames:** To create a safe environment for each of the personas, a protective frame was established for each of the personas.

**Making a Design concept:** the protective frames and personas provided design guidelines and inspiration to translate theory to a concept.

**UNDERSTANDING EMOTIONAL RESPONSES**
Above we described the example of a curious and upbeat boy who instantly started to panic when he was shown a respiratory mask (and the panic disappeared when the mask was put away). Reversal theory provided the theoretical framework to understand these contrasting emotions. The emotional state of the boy simply flipped (reversed) between the two modes of the arousal model. Because the emotional state of the boy was characterized by high arousal (upbeat and curious), his negative response was also high in intensity; his enthusiasm flipped to panic. In other words, the high arousal, negative emotions, such as panic reactions, cannot be seen independently of the high arousal, positive emotions (e.g. excitement) which children also experience in the same context. The protective frame also explains why his emotion initially was upbeat and curious. It was clear that the general hospital surroundings were within his protective frame; he did not feel threatened. The respiratory mask was not. His mother explained why: he was generally not very afraid, as long as he could see what was going on. Being sedated frightened him (as did the respiratory mask, by association) because he could no longer observe what was happening.

**CREATING PERSONAS WITH REVERSAL THEORY**
Understanding the emotional responses was the first step towards formulating design guidelines. As it needs to suit the wide variety of children hospitalized at Emma, the design of the product required a classification of the way children experience a hospitalization.

The analysis phase of the project showed that ‘play’ is one of the most important tools of the childcare workers, partly because playing is a key activity of children between three and six. Play is used to master skills and knowledge, deal with emotions and as a way to relax. As a key activity, play was an essential concept for this project. To classify the different ways in which the hospitalization is experienced, we used the play character model that was developed by Gielen (2010), based on the work of Kolb (1984). The model distinguishes four behaviour styles that are differentiated by two behavioural dimensions (see Figure 5). The horizontal axis (imaginative versus realistic) in Figure 5 represents the likeliness to behave in a certain manner in a situation or towards a toy. The imaginative child tries to incorporate the situation or toy in a fantasy or storyline, whereas the realistic behaviour would be to test and understand the situation.

![Figure 5: The play character model (adapted from Gielen, 2010)](image)

The vertical axis (active versus passive) represents the distinction between making use of motor skills (e.g. running and acting out) and the sensory perception within the interaction (i.e. the enjoyability of the interaction). The distinctions combine to four distinct behaviour styles.
**Dreamer:** Dreamers are imaginative and reflective. Activities will mostly be imaginative: they will create their own imaginary version of reality. Their toy is linked to their imaginary world. An example is a toy rocket, which reminds them of flying between the stars.

**Actor:** Actors have a high energy level and will use different roles to play out different sides to a story. One of their favourite games will be to dress up. A mask or cape or puppets will be among the toys they love most.

**Thinker:** Thinkers are calm by nature, but very curious. They want to know everything! They are most happy exploring and discussing concepts and things. They would love binoculars, through which they could explore everything, but remain at a safe distance.

**Achiever:** Achievers are active by nature and will turn most activities into a competition. They are very keen to learn new skills and show them off. Their toy has to be active, like a bike or skateboard, on which they can play games and learn all sorts of tricks.

As these styles reflect how a child approaches a new situation and starts playing within it, we assumed that they could be used as the basis to design protective frames in the context of the hospitalization. The challenges for each persona were mapped, using the characteristics of the play characters within the reversal model. For example, Achievers will actively approach a situation, relying on skills. They will find joy in overcoming all the obstacles; in goal-oriented activities. However, when they are unable to overcome an obstacle, they will experience frustration and anger. The following two pages provide (a summary of) the four personas (Figure 6, 7, 8 & 9) created from the play character model in combination with the reversal theory.

**CREATING A PROTECTIVE FRAMEWORK**

The personas represent four different ways in which children can experience the hospitalization, and what kind of protective frames will be effective for what kind of behavioural style. Within the personas, particular pitfalls and challenges were mapped. For example, Thinkers love exploring, but when the exploring becomes obtrusive (e.g. something unexpected happens), they will experience fear. Mapping the challenges created a good overview of the moments within a hospitalization that are either beneficial or harmful.

To prevent children from experiencing these pitfalls, a protective frame needed to be determined per character. Reasoning that when the child is within its protective frame, a hospital visit becomes considerably more tolerable. The kind of protective frame that will work differs between the characters. Different protective frames work for different people, in the same way that some people like scary movies or a rollercoaster and others do not care for them.

It was a challenge to determine which protective frame would fit which character. On the basis of reversal theory, Fokkinga & Desmet (2012) proposed the ten ‘complex qualities’. These were used as a reference in this process. The complex qualities each represent a combination of a positive and negative emotion that form a rich experience through the use of a protective framework. These ten complex qualities are:

- **The self-sacrificing:** The self-sacrificing is an experience that mixes an aversion to do something, with the feeling that it is good you are doing it.
- **The challenging:** Joy and frustration are the ingredients of the challenging experience, which are not separable. There would be no fun in winning (joy), if there was not at least the possibility of losing (frustration).
- **The sadistic:** Sadism is a wilful act to either inflict pain or damage on someone.
- **The exciting:** Excitement starts with risk. It is about doing something you are afraid of doing, but hoping to come out better at the end. But there also has to be the possibility that something can go wrong; without danger no excitement.
- **The indulging:** The indulging is about enjoying activities that you shouldn’t really enjoy. It is not about finding the barriers of what you would dare to do, but rather what you are willing to do.
- **The scandalous:** The scandalous is a complex quality that on one hand amazes, shocks or even outrages people, but on the other hand has such an attractive quality that make people want to know everything about it.
- **The eerie:** Something is eerie when it gives you the creeps; it makes you hairs stand up and gives you a
**PIP – THE ACTOR**

**OFFERING CONTROL**

A control frame for Pip.

**PIP’S CHARACTER IS**

**TO EXPERIENCE A SITUATION BEFORE HE HAS THOUGHT THROUGH WHAT IS GOING TO HAPPEN.**

He is energetic by nature. Combining the two will mean that Pip usually has a high arousal level. And because he will throw himself into a new situation, without thinking, he will at times come across something that he didn’t expect and threatens him. Because of his high arousal level, this will result in panic. Likewise, he will experience joy when in control of the threat.

Visualized, the interaction of Pip with the threat will look like above. If the threat is under control, it will result in joy. If not, it will cause panic. What makes the threat controllable is a protective framework. If we assume that the hospital poses the threat in the interaction, then Pip needs a protective framework that will give him control over the situation to give him a feeling of joy.

A product for Pip will focus on giving him this control.

---

**CHARLIE – THE THINKER**

**OFFERING SAFETY**

A distance frame for Charlie.

**CHARLIE’S CHARACTER IS**

**TO ANALYZE A SITUATION BEFORE DELVING INTO IT.**

He is calm, but curious by nature. And this curiosity will stimulate him to search the boundaries of his comfort zone. At times he will even cross it to satisfy his curiosity. When looking at Charlie’s natural energy level, it can be expected that his arousal level is mediate. Especially since he is used to push the boundaries of his comfort zone.

However, when something unexpected happens, or he is no longer in control of that what he is exploring, fear will arise. His natural reaction will be to step back until the situation is under control again.

Visualized, Charlie’s exploring behaviour will look like above. When he is safe in his exploring, he will experience fascination. When that what he is exploring comes too close and Charlie feels no longer safe, he will experience fear. To evoke the fascination Charlie needs a protective framework that creates a distance between him and that which he is exploring to make him feel safe. A product for Charlie will focus on providing this safety.
**Sophie - The Achiever**

**Sophie's Dominant Play Character is Achiever.** Sophie is energetic by nature and always up for trying something new. She loves competition and learning new things. Sophie always wants people around her. It is no fun, to compete on your own. There has to be someone to compete with. Sophie's favorite toy is her bike. She can do all kinds of games with it.

**Offering Possibilities**
A possibility frame for Sophie

**Sophie's Character is to treat a new situation as a new challenge.** She will actively approach it and try to work through everything that crosses her path, relying on her skills. She is by nature energetic and will therefore be more likely to have a high arousal level. She will find joy in overcoming all the obstacles; in telic-oriented activities. However when she is not able to overcome the obstacle, she will experience frustration and anger.

Visualized, Sophie's challenge behaviour will look like above. When she overcomes an obstacle, she will experience joy, when she can not, she will experience frustration. Sophie needs a possibility frame, to experience joy. To provide Sophie with enough possibilities to overcome the obstacle, she will be able to.

**A product for Sophie will focus on creating possibilities.**

**Damian - The Dreamer**

**Damian's Dominant Play Character is Dreamer.** This means Damian is quite literally a dreamer. He is creative and imaginative and will have his own version of reality. He is, by nature, very calm and will need a lot of incentive to become more active. Damian's all-time favourite toy is his TinTin rocket. He loves to think about the stars and how it would be like to fly amongst them.

**Offering Interaction**
An interaction frame for Damian

**Damian's Character is to observe a new situation before entering it.** He will be quite hesitant in approaching it and it will take a while before he will participate. While he is observing, Damian is likely to create his very own imaginative version of the reality. Damian is calm by nature and this results in a low arousal level, even more so guided by his receptive behaviour. When however, he is no longer stimulated in his dreaming-desire and there are no new incentives to thrill him, he will fall into a state of boredom depression.

Visualized, Damian's dreaming behaviour will look like above. When Damian gets an incentive that will fill the absence and start the dreaming behaviour, he will experience desire. However, when Damian has nothing to dream about, he will experience sadness (in the form of boredom depression). A product for Damian needs to focus on facilitating the incentive that will get him dreaming.
cold shiver, but you still want to know more about it.

**The grotesque:** The grotesque is about being fascinated with something that disgusts you, physically or mentally.

**The sentimental:** Sentimentality is a strange occurrence. It is the feeling of being overwhelmed with emotion over a seemingly small matter. On one side, there is just the simple and direct situation, but that situation implies on the other side a much bigger theme, which overwhelms you.

**The unreachable:** The unreachable provokes a sort of impossible emotion; it triggers a longing for a positive object or situation that is (currently) out of reach.

The protective frames of the four rich qualities the challenging, the eerie, the exciting, the unreachable which are closest to the four characters were used to select the protective frame that would fit each of the personas. The kind of frame connected to the different personas is provided with the personas on the following pages.

The four personas in combination with the four protective frames resulted in four strategies to deal with a hospitalization. Now aware of their ‘character’, both child, family and the childcare workers can better understand and anticipate emotional responses during a hospitalization. In the design process the protective frames provided a bridge between theory and practice. The protective frames explain what is required to prevent the pitfalls. For example, the protective frames explain that the character Actor rushes into a situation without thinking it through. At times and certainly in the hospital, he will encounter a threat he did not anticipate. When he is in control of the threat, he will experience joy, otherwise, panic. A product for an Actor will therefore focus on providing control for the Actor.

**THE CONCEPT: THE ADVENTURER’S KIT**

With the four strategy and starting points a product was designed for the Emma Children’s hospital. One concept was developed that included elements for each of the four strategies: the adventurer’s kit. The adventurer’s kit is a small suitcase (handed to the children at the outpatient’s clinic) that contains a passport, a flag, and four sets of toys, each set related to one strategy (figure 10). One of Apter’s principles is that responses and, as a result, character can change with a different environment. In line with this principle, the kit provides not just one, but all four products related to the strategies. This enables the childcare workers, children and family to decide which strategy to use at any moment during the hospitalization procedures.

![Figure 10: Receiving the Adventurer’s Kit at the outpatient’s clinic](image)

Combining the toys with a passport and a flag changes the overall tone of the hospital visit to an adventure.

**Passport for adventure and parents**

The first item used is the passport, in which the child will receive a stamp to check-in. The stamps (both check-in and check-out) are used to mark the boundaries of the hospitalization. Achiever-type children benefit most from these boundaries, as they are helped by a specific beginning and end. The passport will (to some extent) transform the experience of hospitalization into the experience of going on holiday, where you also need to check-in and out. This adds to the big frame and mindset of making it an adventure, instead of a hospitalization. The passport is also part of the parents’ protective frame, as they can use it as a diary, to give voice to their experiences – both good and bad.

**Flag for safety**

When children are at the Emma hospital, the flags they decorated at home comes into play. At the ward, when the bed is ready, the child and childcare worker
or one of the nurses can attach the flag to the bed (Figure 11).

Figure 11: Placing the flag at the bed to create a safe environment

Doing this will explicitly make the child claim the bed as theirs, making it a safe base within the new and alien hospital environment. Moreover, the act of taping the flag to the bed gives the children a sense of control and power. They are allowed to add something of themselves to this new environment. In doing so, the children will feel, by adding something personal to it, as if they 'undermine' the authority of the hospital. At the heart of the suitcase lies the story of a family. The four children of the family each embody one of the four personas. The family consists of Pip (an Actor), Charlie (a Thinker), Sophie (an Achiever) and Damian (a Dreamer). The accompanying protective frame and the personas are embedded within the stories, whereas the toys related to the character provide a coping strategy.

First set of toys: The actor
Pip has four animal friends (Figure 12). Each of the animals represents a different emotion. As an Actor, Pip can use them to look at a situation from several points of view. He feels like he can use the animals as a shield to hide behind. This gives him a way to discuss or feel anything he would like to try, without rushing into the situation. He will always act from the character of one of the animals. The four animals create the control that the Actor needs to stay within his protective frame.

Figure 12: The set of toys of the actor

Second set of toys: The thinker
Charlie’s protective frame focuses on keeping that which he explores at a safe distance. The frame keeps it exciting, instead of scary. This exploring behaviour is essential for the thinker, but requires a safe ‘base’. This is not easily done within a hospital. The safe base can be a parent who makes him feel safe, or a place where he feel safe. Because the Thinker requires a safe ‘base’ for exploring, making the bed ‘safe’ with the flag is important to a Thinker. To stimulate the exploring behaviour that makes a thinker happy, two of Charlie’s tools are a cup to keep anything to study and a figure of the human body, to learn about human features (Figure 13).

Figure 13: The set of toys of the thinker

When exploring the hospital and the abstract concepts that go with it, the hospital experience can easily get too close, especially when related to the illness of the child.

To keep the hospital experiences at a safe distance, Charlie’s last toy is a set of safety glasses. Looking through the glasses literally puts a distance between him and his surroundings. Also, because the glass is colored green, reality becomes distorted. This creates a distance between what is happening and him. The set of toys stimulate the Thinker’s exploring behaviour as well as create the detachment necessary to keep him within his protective frame.

Third set of toys: The Achiever
Because Achievers approach a new situation as an obstacle that can be overcome, Sophie’s protective frame focuses on keeping the hospitalization experience an obstacle that can be overcome. Since Sophie is an energetic kid, she will quickly get bored in a hospital environment. She is frustrated by being restricted to the bed and by, for example, an IV; she cannot find a way to release her energy. To give Sophie something extra to release her energy with,
within the boundaries of the hospital, one of her toys is a game. The game is an active game and requires skills, but can be done with the hands on the bed. (Figure 14).

There will come a moment when the game is no longer satisfying. Because Sophie will want to see some progress and know where she is moving to, her other tool is a roadmap of the hospitalization. Together with the nursing staff or childcare worker, Sophie can map her progress on this map with stickers. After each specific procedure, the procedure is closed with a sticker on her roadmap, making it a clear road to the end of the hospitalization. The set of toys creates a structured setting that suits the goal-oriented mind of the Achiever, as well as create possibilities to deal with the hospitalization, keeping the Achiever within the protective frame.

Fourth set of toys: The Dreamer

Damian’s protective framework is a challenge, and it is not as straightforward as the others. As Damian’s favourite activity is to daydream, for him to do so requires something to dream about and an incentive to get him dreaming. For this to happen, there has be something, an object or experience, that he desires but cannot have, and something that reminds him of this desired ‘something’. At the hospital, at times, reality will hit him and ‘burst his bubble’. Depending on what caused the burst this can result in a response ranging from annoyance to panic. In this, the parents and childcare worker play a big role to keep the Dreamer calm. In relation to this, the third aspect becomes important; it is hard to read a dreamer from the outside.

Since dreamers are introverted and everything will play out in their head, people surrounding a Dreamer can have trouble assessing how a Dreamer is doing. To help them, Damian’s toy is a ‘dreamcatcher’ (Figure 15).

The dreamcatcher is a box in which he, before going to the hospital, can collect dreams to dream about. By making the dreamer’s ‘dreams’ visual with Damian’s toy, they can be ‘discussed’ together with the childcare worker. When the childcare worker has an opening to start communicating with the child, she can use her professional skills to assess how the child is doing. Although Damian’s toy provides a protective frame to keep him inside his bubble, it needed something extra for him to communicate with the childcare workers.

DISCUSSION

General theories of human experience, behaviour, and cognition can be inspiring for designers, because they reveal general patterns or principles that apply to many situations and interactions. At the same time, however, designers may find these theories abstract and outside their domain. Their challenge is to bring the theory to life, connecting general principles to the contextualized, concrete and real people they are designing for. This is where creative design research techniques can contribute; they can bring the abstract theory to life. Examples of such techniques are general ethnographic inquiries, context-mapping, personas and scenarios, and co-design. At the same time, an understanding of general psychological principles can help designers to add structure to these techniques.

The current design case used the general reversal theory both as a source of design inspiration and as a means to structure our design process. This created some challenges. To illustrate this, we can look at the protective frames. The most important step in the design case was the translation from protective frames to an actual design concept. The concept of protective frames within the reversal theory provides boundaries to start with. However, the guidelines provided by the protective frames are abstract and descriptive. For (prescriptive) design application, we found these guidelines only made sense when linked
to and combined with the personas. Only then, the translation and the added value of the protective frames became visible to the designer. So, whether the translation to an actual design concept can be made depends on the designer and the richness of the materials at hand. The more details (in, for example, the personas) the easier it became to translate these abstract boundaries of the protective frames to a realistic design concept. The outcomes of the study and the design case can be seen as a first exploration on how design can contribute to transform given negative emotions into positive experiences. The design case can be of inspiration to designers and showcases how reversal theory can be used to design, but the final product design is very much based on personal interpretation. For example, the design concept would have been different if we had chosen different complex qualities as frame of reference.

The ‘design for emotion’ research domain has been successful in adopting a variety of theoretical principles - pleasure frameworks from sociology (Jordan, 1999), appraisal theory from cognitive psychology (Desmet, 2002), and cognitive processing theory from neurology (Norman, 2004), to name a few. We are confident that the reversal theory will also finds its way to the design discipline. Fokkinga and Desmet (2012) were able to formulate design strategies to design for rich experiences, which are based on the protective frame theory. In the current design case, we found that the theory is also useful for design challenges in which strong negative emotions are a given fact to be dealt with. Although it is not possible to solve or remove the unpleasant experiences that children have to go through when being hospitalized, design can help these children in creating and maintaining a mental protective frame that helps them in dealing with the situation. Rather than solving the ‘experiential problem’, the adventurer’s kit helps the children in building their resilience to face this problem, by themselves and with their family.

ACKNOWLEDGEMENTS
We want to express our thanks to the Emma Children’s Hospital and in particular J.C. Konings for participating in the design case. Our special thanks go out to Suzanne van Engelen and Manissa Koning for their efforts in the research at the Emma. Thanks also to all participants in the research at the Emma Children’s Hospital. Special thanks to Mathieu Gielen and Steven Fokkinga for their inspiration and valuable discussion. This research was supported by the MAGW VIDI grant number 452-10-011 of The Netherlands Organization for Scientific Research (N.W.O.) awarded to P.M.A. Desmet.

REFERENCES