RUN FOR YOUR LIFE!

USING EMOTION THEORY IN DESIGNING FOR CONCRETE PRODUCT INTERACTIONS

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ABSTRACT

This paper describes a research through design study that investigated the possibility of using emotion theory in the materialization of an interactive product. It is argued that many design for emotion approaches are inspirational and useful in the conceptual phase of a design project, but not in the phase in which concepts are elaborated into final products. The starting points of the study were a design for emotion approach that uses negative emotions to enrich product experiences, and a product that was intended to add engagement to the activity of running by providing users with the experience of being chased. The process of materializing the concept into a prototype, and testing this prototype with participants, was guided by emotion theory. The reflection on this process led to several insights that are interesting for the design of concrete interactions in design for emotion approaches.

KEYWORDS: *design for emotion, research through design, design manifestations, user experience, prototyping*

INTRODUCTION

Imagine it is 9am on a Saturday; everything is still quiet outside. The birds are chirping, the sun is gently shining on your face, and you are running for your life. Just before the last corner you were able to shake off your pursuers for a minute, but they have redoubled their efforts and are at your throat again. The warning system on your wrist is counting back to ten meters; seven; four; two. You can hear the heavy breathing right behind you. You only need to get to the end of the street to be safe, but will you make it?

This is the user scenario of a product that was designed to enrich the experience of running. Through different types of feedback provided by a wearable device, runners get the experience of being chased by something. The concept for this product was developed using a theory-driven design for emotion approach, which guides designers in creating richer user experiences by introducing negative emotions into the product interaction (Fokkinga & Desmet, 2013). While developing the concept, the approach and the psychological theory behind it proved to be very helpful in answering design questions such as: What does the experience of running consist of? Which emotions are beneficial in this context? How could the product evoke such an experience?

However, this approach became much less useful when the concept was taken to the 'manifestation phase': the phase in which the product was materialized and the specific interactions were given shape. The relevant design questions in this phase related to more concrete topics like: What shape should the product take? How often should it provide feedback? Which combination of visual, auditory and tactile feedback most successfully evokes the intended experience?

When turning to other sources for inspiration, we found that this gap is characteristic of theory-driven design for emotion and design for experience approaches. Most of these approaches are very useful in the conceptual phase, but do not offer much guidance in manifesting concepts into final products. This means that designers are left to their personal taste, design sensitivity and experimentation to make sure the intended experience is also expressed or evoked by its concrete manifestation. Although this is not necessarily problematic, we think that there is great potential for theory-driven approaches to expand the range of design activities in which they can be inspiring and useful.

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In this paper, we describe a project that attempted to use the theory-based 'rich experience' approach in the concrete design and testing of a product for runners. By taking a reflective approach during the design and research explorations, we aimed to make a first step towards identifying the factors and challenges of using psychological theory in designing for the manifestation phase. In the following sections, we first introduce the theory-driven approach and the product concept that were the starting points for this project. Then, we explain how the project used the research-through-design method in a way that combined an explicit treatment of psychological and technological variables with a dynamically adjustable prototype. In the following section, we describe the insights we drew from the design and research process. Lastly, we discuss some implications of these insights and the new questions that they raise.

Figure 1 - Artist's impression of the Pursuit concept

CASE STUDY: DESIGN FOR FEAR EMOTIONS

This project used a theoretical framework that suggests how different negative emotions, if introduced under the right circumstances, can enrich user experiences in several ways (Fokkinga & Desmet, 2012a). This principle is rarely used in product design, but is abundant in the domains of art and entertainment. For instance, shock art, tearjerker movies, and tabloid magazines all make use of different negative emotions (disgust, sadness, and indignation, respectively) to increase their appeal to users. The rich product experience approach derived from this framework was the starting point for the design and research explorations in this project. The approach shows three necessary ingredients for the formation of rich user experiences: the selection of a suitable negative emotion, the elicitation of this emotion through the user-product interaction, and the presence of a 'protective frame' (Fokkinga & Desmet, 2013). The selection of the correct negative emotion for the situation is crucial, because each emotion has different effects on experience and behavior. For example, whereas sadness makes people more passive and reflective, anger makes them more active and assertive (e.g., Rucker & Petty, 2004).

In an earlier project, this approach was applied to the context of running. Running is popular in many countries, because it is a sport with a high activity intensity, which at the same time requires little in terms of skills and material investment. However, many runners may experience a lack of enjoyment during running, and as a result have difficulty finding the motivation to run as regularly as they want. It was hypothesized that fear emotions could add thrill, adrenaline and focus to the running experience, which led to the idea of 'Pursuit', a product that gives runners the experience of being chased by something as they exercise (see Figure 1).

Fear emotions come in all kinds of shapes and intensities. Although the extreme variants, like fear of spiders or fear of flying, might be the first to be recalled, fear emotions often occur in small, everyday moments. For example, you might experience them when you are unsure of having locked the front door, or when you are afraid of getting your new shoes wet. When properly 'framed', fear emotions can have all sorts of pleasant varieties, like the exciting fright when riding a roller-coaster, the suspenseful anxiety when watching a thriller movie, or the invigorating nervousness before giving an important presentation.

Fear emotions can affect user experience in two main ways (Fokkinga & Desmet, 2012a). Firstly, they can directly influence a person's experience of the world. Scientific studies have shown many such effects: fear causes people to adopt a narrower field of view (Derryberry & Reed, 1998), it makes people experience time as passing more slowly (Tipples, 2011) and people more easily retrieve memories of other times when they were afraid (Bower, 1981). There is also anecdotal evidence concerning the beneficial power of fear from the art world. For example, fiction writer Karen Thompson Walker devoted her 2012 TED talk to arguing that fear has the unique ability to spark people's imagination, which is apparent in the creative fantasies that people express when they think of their worst fears ("Karen Thompson Walker: What fear can teach us – TED," 2014). Secondly, fear emotions can change the way we behave and deal with situations, which in turn affects our experience. For example, fear increases adrenaline levels, which gives people more energy to perform physical tasks (Wise, 2009). Tamir and Ford (2009) found that fearful people performed better than people who were positively excited in a game which required them to avoid an enemy. Both the direct experience effect and the behavioral effects can be beneficial for the running context: fear can help people experience their run as more interesting and thrilling, and it might help motivate them to run faster, longer and/or more often.

Obviously, just evoking fear emotions does not necessarily lead to better experiences. After all, fear is often just plain unpleasant. Apter (2007) proposed that the difference between enjoyable fear and unpleasant fear is the presence of a protective frame. Protective frames are psychological constructs that determine whether a person perceives a situation as truly threatening, or as intriguing and exciting. A simple example is a lion in a cage: most people who encounter an uncaged lion

would probably just experience terror. Conversely, encountering a caged lion from close to can change the experience into an enjoyable one. The most important idea is that the cage does not take away the arousal of encountering the lion, but that it makes that arousal enjoyable.

METHOD

According to Zimmerman and colleagues (2010), design research can be grouped into three categories: 1) Research about Design, which investigates design activities and studies how designers work, 2) Research for Design, which aims to create knowledge for designers in the form of frameworks, guidelines and design methods, often by applying or translating knowledge from other disciplines like psychology, and 3) Research through Design, which uses the act of design to iteratively discover what potential future technologies, usage scenarios, and product experiences might look like. From the perspective of this categorization, our project followed a user experience-focused research through design approach, with the ultimate aim of contributing to theory for design (Zimmerman et al., 2010, p. 313).

The research through design process used here was intended to generate knowledge on different levels of specificity. Firstly, it was expected to gain insight into designing for the experience and motivation of running. Secondly, the project aimed to gain more understanding of how negative emotions, and specifically fear emotions, might be elicited during the interaction with a functional product, in such a way that the resulting experience would be more enjoyable and engaging. Lastly, by reflecting on this process in a systematic way, the aim was to generate knowledge on the use of theory in designing concrete product interactions.

The design process and prototyping of the product consisted of two stages. In the first, the hardware prototype was designed and built. The prototype was intended to be a versatile 'platform' rather than a single product, in the sense that it afforded many different types of interaction, which could be altered by exchanging hardware components and adjusting the software. The aim of this approach was to create as large a 'canvas' of interaction options as possible, which were expected to influence the emotional experience, within the constraints of practical, technical and social feasibility. In the second design stage, these interaction options were explicitly documented as different 'variables'. An example of such a variable was the type of display that the user would carry on their wrist, which came in three varieties: a display with three numbers, a display with a row of bar lights, and a display with a half sphere on top which could display any color in the red, green and blue spectrum (see figure 2).

Examples of other variables included variants based on vibration, shock, and sound stimuli. The different variants of these variables could subsequently be combined into 'experience scenarios'. Each scenario represented a different way in which the product manifested the intended experience effect of the concept. The scenarios were subsequently programmed into the prototype and could be exchanged, and even altered, between testing sessions.

During this stage, iterations were made between several activities:

- Studying literature about the elicitation of different (fear) emotions
- Personal exploration of the possible ways of evoking (fear) emotions
- Design experimentation that explored possible ways of linking (combinations of) concrete interactions to psychological variables

The resulting prototype consisted of two parts. The first part was a small box that runners would put in their pockets, which contained an Arduino system, an accelerometer that measured the runner's speed, and a battery. All the interactions between the runner and the prototype took place through the second part, which runners wore on their wrists. This part provided feedback to the runner through a display, a speaker or headphones, a vibration motor under the wrist, a shock element on top of the wrist (which could administer small electric shocks, far below safety limits), an mp3-module, a synthesizer module, and a large button that could be placed against the runner's body.

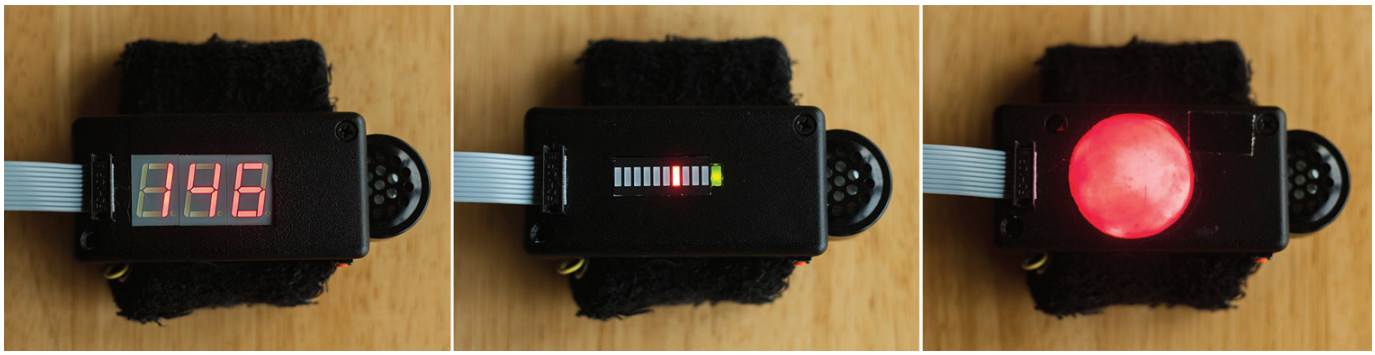

Figure 2 - Three display types for the Pursuit prototype

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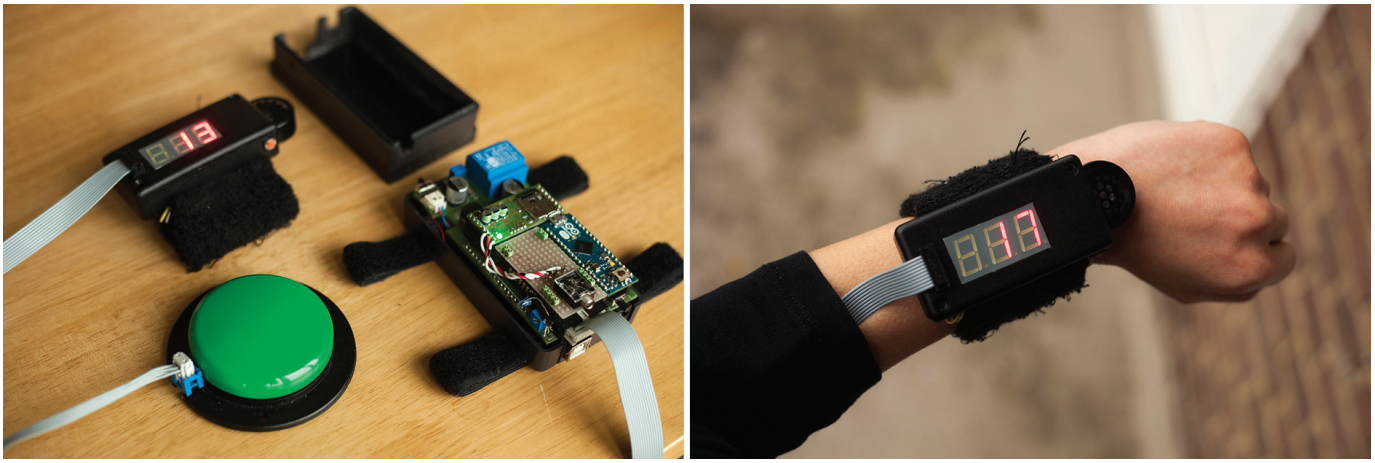

Figure 3 – the Pursuit prototype

The prototype was tested in two-hour sessions with individual participants. Participants (N = 11, 5 female, average age 25.7) were recruited through the university network. In each session, the participant first filled in a short questionnaire about their running style and their motivation for running. After a quick explanation, participants ran with the prototype that was programmed with one of the available scenarios. In most sessions, participants tried multiple scenarios (7 participants tested 3 scenarios, 1 participant tested 2 scenarios, and 3 participants tested 1 scenario). The distance of the runs differed between 2 and 3 km; runs lasted about 10 to 20 minutes, depending on the speed of the runner. During the run, participants wore a cap with an attached video camera that recorded the video and audio of the run from a first-person-perspective (see Figures 4 and 5). Directly after they had finished their last scenario, participants were interviewed about their experiences. During the interview, parts of the recorded videos were watched while the participants retold their experiences, helping them to recall their experiences and compare the different scenarios. This procedure was based on recommendations from the emotion measurement research of Laurans (2011), who found it to offer the best compromise between capturing accurate and rich reports of experiences while intervening as little as possible in the experience itself.

RESULTS AND DISCUSSION

The following sections report findings and insights obtained from the research through design process, in which different combinations of interactions were designed and tested using the versatile prototype. Even though the process was iterative, the results are presented in a thematic rather than a chronological fashion, in which each theme represents a constellation of insights. Ten main insight themes are reported, in three loosely defined clusters: (1) lessons learned from the process of developing manifestations of experience; (2) lessons learned from the process of testing manifestations of experience; and (3) additional (general) lessons learned that are relevant for experience design approaches.

Lessons learned from the process of developing manifestations of experience

Emotional granularity

When designing specific emotional interactions for the prototype, one of the first findings was the importance of considering emotions in a high level of 'granularity'. Emotional granularity refers to the amount of detail with which emotions

Figure 4 - The camera cap

Figure 5 - Image captured by the cap during a run

are distinguished (Lindquist & Barrett, 2008). For example, the emotions that are evoked when thinking of a financial problem, when preparing for an exam, or when someone suddenly stands behind you, could all be called 'fear', but might be described with more nuance as 'worry', 'nervousness' and 'startlement', respectively. In that sense, the word 'fear' describes a range of emotions, or an 'emotion family', rather than a single emotion itself (Ekman, 1992). Table 1 provides an overview of the specific fear emotions that were used in the development of the prototype.

These emotions were gathered from several scientific sources (Ben-Ze'ev, 2000; Frijda, 1986; Lazarus, 1991; Ortony, Clore, & Collins, 1988; Wierzbicka, 1999, among others), and selected with the highest amount of granularity that still made sense for designing different interactions. For example, the differences between worry and anxiety (as illustrated in Table 1) were judged as meaningful, and were expected to lead to differently designed interactions. In contrast, although there are also differences between emotions like worry and concern, these were judged to be too insignificant to have an influence on the design strategy – in which case 'worry' was selected to represent both.

Working with the emotions in Table 1 was helpful in three ways. Firstly, their more specific nature was found to be a greater source of inspiration for coming up with concrete interactions. Secondly, they offered a more focused evaluation of the different modes of interaction. For instance, it turned out that certain fear emotions were less effective than others in making the experience enjoyable and that the preference of one fear emotion over another depended on personal preferences. Thirdly, during the design process it was found that, although they belong to the same emotion family, the type of event that elicited them was sometimes very different; indeed, they might even oppose each other. For instance, worry is characterized by long periods of pondering about something that might go wrong, whereas startlement is a very short, visceral reaction to something unexpected. Additionally, nervousness means someone has a certain amount of personal influence over the outcome of a situation, whereas being afraid or anxious means that someone has little or no control. The descriptions in Table 1 were the starting point for the creative process, but were along the way complemented by examples of personal experiences with these emotions, as well as several exercises to find how a product could be altered in order to pass from eliciting one specific emotion to another, which produced additional useful information about these emotions.

In conclusion, these differences between emotions proved to be a fruitful basis for finding answers to more practical questions, such as: Which emotion would be most effective at what point in the interaction? How much control should the user be granted over the interaction? How long should certain episodes last?

Elicitation of fear emotions

Three main ways were found to elicit fear emotions in the user. Firstly, theory suggested that there are certain stimuli which are psychologically '*hard-wired*' to evoke fear emotions. Such stimuli included sudden, loud noises, electric shock, frantically blinking lights and 'unreal' noises. Several such stimuli were incorporated into the prototype. Secondly, product interactions could evoke *associations* with real or imaginary fear-inducing things. Interaction elements that made use of associations included angry dog sounds, heartbeat vibrations on the wrist, and supernatural running behavior in the pursuer. Thirdly, interaction elements could be designed using the specific appraisal components of fear emotions. Appraisal components are specific aspects of situations that evoke a certain emotion (Smith & Lazarus, 1993). For example, 'suddenness' is an appraisal component underlying the emotion of startlement. Examples of appraisal components that were useful in the design of the prototype were: (un)expectedness of information, (im)possibility of avoiding certain events, (in)consistency of information, and (in)congruity between interaction elements.

Interaction variables and experience scenarios

These theoretical insights into emotional granularity and the elicitation of emotion (constrained by the technical possibilities of the prototype and the contextual possibilities of running) led to the identification of a number of interaction variables that were expected to have different beneficial effects on the user experience. Figure 6 shows a visual representation of the variables as they were used at the start of the first testing iteration. The squares of the same color represent

Emotion	Definition	Example of an eliciting event
Afraidness	Knowing that a specific bad thing is going to happen	Being afraid of the drill while being at the dentist
Worry	Getting indications of and thinking about something bad that seems likely to happen in the (near) future	Thinking you don't have enough money to last until the end of the month
Nervousness	Feeling that you have to perform well to avert a danger, now or in the near future	Having to do a difficult exam
Startlement	Suddenly being scared by something that wasn't there before	Seeing a pedestrian suddenly step out in front of your car
Confusion	Having the feeling that something is wrong, but not being sure what is happening	Being lost in an big city
Anxiety	The unsettling feeling when things happen that cannot be rationally explained	Hearing an inexplicable noise while alone in the dark

Table 1. – Defintions and examples of specific fear emotions

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the different variants of a single variable, such as the type of sound, the mode of the vibration feedback, or the strategy of the pursuer.

Using these variables, 'experience scenarios' were created. These were creatively constructed combinations of variables that were expected to evoke a certain emotional experience, or stimulate a different kind of motivation for running. See Table 2 for the four scenarios that were tested in the first round of studies, and Figures 7 and 8 for visual representations of the first two scenarios as combinations of variables. In the tests, small variations were sometimes made to these scenarios in order to test the influence of single variables (e.g. the worry scenario with a beeping sound instead of the voice).

Lessons learned from the process of testing manifestations of experience

Rich experience success criteria

For the user, a rich experience can be defined on the basis of three necessary conditions: a) the experience has to involve at least one negative and one positive emotion, b) the person has to subjectively judge that the experience as a whole has been pleasant or worthwhile and c) the negative emotion has to be felt as a necessary ingredient in that evaluation (as opposed to being an undesired side-effect) (Fokkinga & Desmet, 2012b).

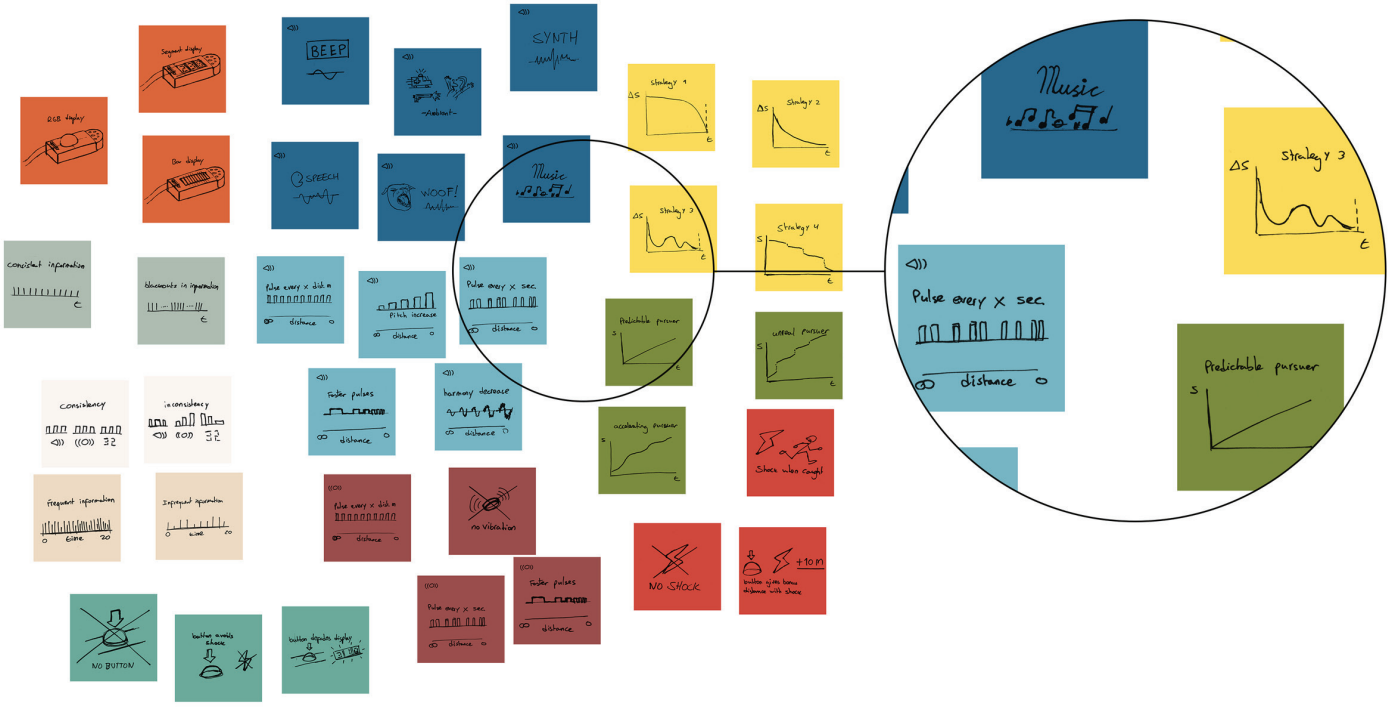

Figure 6 - The interaction variables used in the first iteration

Experience scenario	Manifestation
Worry scenario	The pursuer starts relatively far behind, but is constantly drawing closer, and threatens to catch the runner at the end of the run. The runner gets clear information about this prospect through voice information and the numbered display.
Nervousness scenario	The pursuer is relatively close, and during the run makes several attempts to catch the runner in short sprints which the runner has to be quick enough to avoid. These sprints are announced shortly beforehand. If the runner is caught during one of these sprints, he gets a small shock. The pursuer is represented by dog sounds; the display shows a visual representation of the runner and the distance to the pursuer.
Confusion / Insecurity scenario	The runner only gets very little information, in the form of a beeping sound that becomes increasingly distressing when the pursuer comes closer. There is no visual or tactile information.
Anxiety / Startlement scenario	The pursuer displays unexpected and superhuman behavior, by defying the laws of physics – e.g. being able to run very fast, skipping distances, disappearing and reappearing. At certain times, the pursuer pops up unexpectedly just behind the runner, and the runner has to briefly sprint to outrun it. The runner hears eerie music most of the time and very intense music during the startle moments.

Table 2. – Examples of four experience scenarios and their manifestations

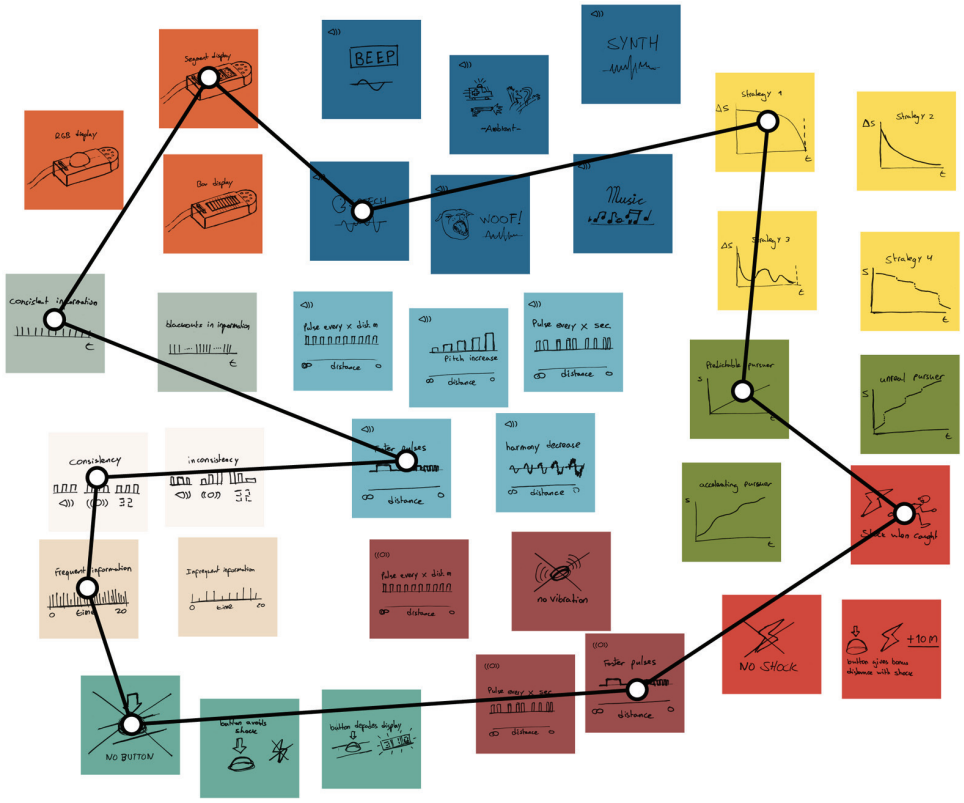

Figure 7 - Combination of variables for the worry scenario

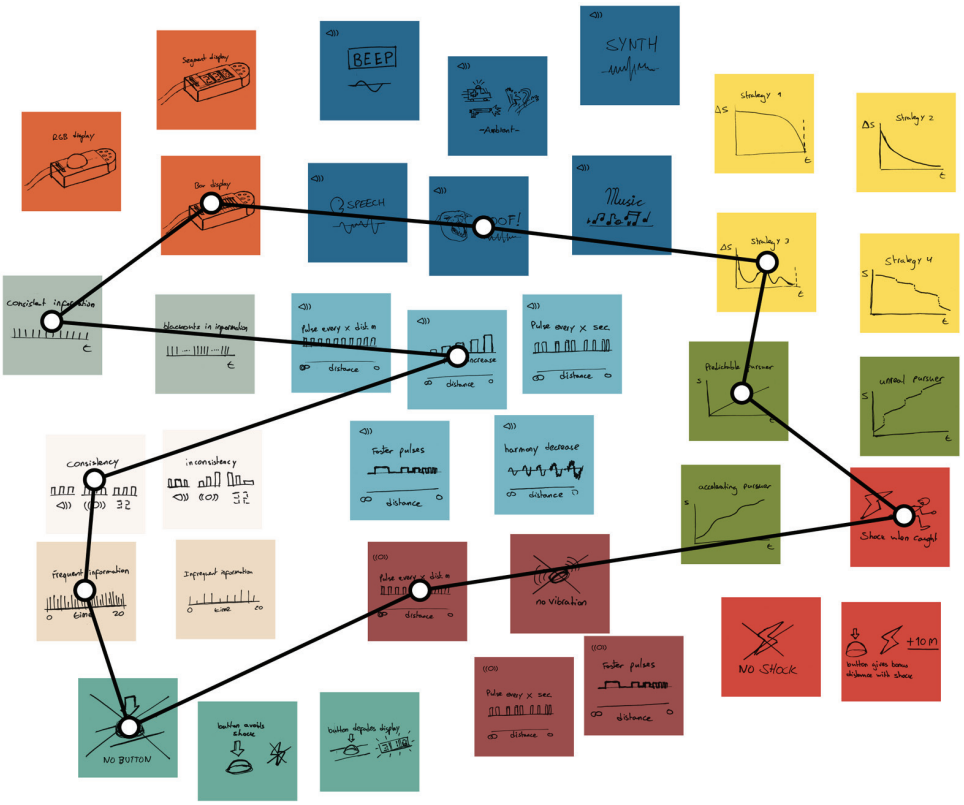

Figure 8 - Combination of variables for the nervousness scenario

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In the tests, different factors emerged that determined whether the prototype was successful in eliciting a rich experience in the user and whether it was successful in motivating them. These factors seemed to work as successive criteria: the prototype succeeded only when all criteriawere met. If a certain criterion was not met, the ones succeeding it became irrelevant. First of all, some participants did not accept the basic premise of the concept. In other words, the hypothesized principle of enjoying negative emotions did not apply to them. People in this group sometimes asked whether it was not possible to develop the same co ncept, but with a more 'positive goal', like chasing something yourself. There were also people who did not want to have their emotions influenced by a product at all. Three (of 11) participants fell into this group. Secondly, some of the participants who did accept the basic premise, sometimes did not like the specific emotions that were evoked for a given sce nario. For instance, two participants expressed a liking for the nervousness scenario, but found the emotions evoked in the confusion scenario very unpleasant. In some cases there was also a discrepancy between the effect the emotions had on the experience and the motivation of the runner: one participant said that the worry scenario was the most effective in motivating her to run but that she would not pick it if she had the choice. Thirdly, participants who liked both the concept and the scenario sometimes felt the specific sensory stimuli were unpleasant or did not work. For example, some people found the beeping sound disturbing or frightening, whereas they liked the scenario overall. When each of the three conditions were met, participants expressed a liking for the experience and felt more motivated to run.

Influence of personal running style

Another important factor that determined the effectiveness of the prototype was the personal running styles of different participants, as well as the meaning they attributed to running. Among the participants, roughly three groups emerged. One group of participants (4 of 11) ran mostly to relax or clear their minds, and wanted to be able to run at their own pace. People in this group most often did not use any tools, apps or music during running and were mostly uncharmed by the prototype, or preferred to have a minimal version of it. A second group of participants (3 of 11) ran mostly to improve their performance or to keep fit. People in this group mostly commented on how specific interactions and emotions could help them to improve their performance. A third group of participants (4 of 11) were mostly looking to enjoy a more engaging running experience, and wanted to have more motivation to run. People in this group were most favorable to the prototype, and pointed out that variety in the experience was important to them. Overall, the most insights were obtained from the second group ('functional fear') and the third group ('fear in order to enjoy').

Effectiveness of different emotion elicitations

In the design stage, three different ways were found to elicit fear emotions in the user: hard-wired stimuli, association, and appraisal components. The effectiveness of these different strategies was also found to depend to a great extent on personal differences. Some participants had strong mental associations with the different stimuli, most notably with the sounds that were used. Several said that the dog sounds not only evoked visual images of dogs, but also stimulated them to construct mental stories that explained why the dogs were chasing them. The abstract beeps evoked widely varying explanations: a mosquito, a ticking clock, a UFO, and the 'sound of darkness'. Other participants had little or no associations with the stimuli, and approached them more functionally. The appraisal components proved more consistent in influencing the experience, although their effectiveness largely depended on the tension between the functional value (see next section) and combinations with other variables (see later section). For instance, the predictability of the pursuer (high in the worry scenario, lower in the nervousness scenario, lowest in the confusion scenario) made a salient difference to the emotions reported by the participants. The hard-wired effects were least successful, with the exception of the shock element, which became an important factor for many participants, one of whom said: 'Although the shock did not feel that bad at all, the idea of being shocked makes a big difference.' The other stimuli -sound, vibration and visuals- were not successful in scaring the user directly.

The tension between functional interactions and engaging experiences

The aim of the design process was to create a product that would evoke certain experiences, but which also had a clear functional aim – to support the user in their running. Three aspects were found during the design and research iterations that made the running experience more engaging but hindered the runner from performing well, and vice versa. All these aspects were in some way related to the control the user had over the product or the experience. Firstly, there was the degree to which the runner had *enough information* to understand what was happening during the run. Especially in the confusion scenario, an important experience factor was to leave the runner relatively in the dark about the whereabouts of the pursuer. For some participants this was effective, and they ran faster as a result. For other participants, not getting enough information was a reason to stop interacting with the prototype altogether, rendering it useless. Secondly, there was the degree to which the runner could *predict* what the pursuer was going to do. A high level of predictability helped runners to plan their run and divide their energy but at the same time it made the experience less novel and engaging. Thirdly, there was the degree to which the runner could *influence* the behavior of the pursuer. Some participants requested the ability to determine when the pursuer was going to sprint. However, the same participants recognized this would also make the experience less effective.

Additional lessons relevant for experience driven design approaches

Holistic combinations of variables

Although too few trials have as yet been carried out to draw a decisive conclusion, it seemed that there was no direct

correlation between single variables and psychological effects. Specific variables, such as sensory stimuli (e.g. beeps) or appraisal components (e.g. ambiguity of information) did not appear, on their own, to influence the type of emotion or experiences. Rather, different *combinations* of variables changed people's experiences with the prototype. For example, participants found the 'worry scenario' quite comforting during the first two thirds of the run if it was combined with a voice announcing the distances run or yet to run, whereas they found the same scenario very 'pressurizing' when it was instead combined with beeps of increasing pitch. In other scenarios, these stimuli had different effects.

Dosage of stimuli

One finding that emerged, which was not fully anticipated in the design phase, was the importance of the proper 'dosage' of certain stimuli over time. For example, vibration was found to have a much more powerful effect on the experience when it was applied moderately (only in the most intense moments) than if it was applied throughout the run. For sound, this dosage seemed to depend mostly on personal taste. Participants who preferred to run without music or aids favored the scenarios that had the least sound, whereas participants who wanted to be entertained while running were conversely annoyed by long silences.

Variation of experience

Another emerging observation was that most people will not have the same (emotional) experience over time if the interaction is not changed. After a while, the same stimuli are less capable of creating the same intensity of experience in the user. For example, a pursuer who is just behind you may be scary during the first minute, but this effect will be lost if it stays at the same distance for the remaining 20 minutes of the run. Two scenarios (worry and nervousness) implicitly remedied this problem in different ways. The worry scenario was relatively static and predictable, but because the pursuer was constantly getting closer, and thus the stimulus became more intense, this scenario was (most of the time) effective until the end. The nervousness scenario, on the other hand, worked because different emotions succeeded each other in time: users first felt nervous anticipation (when they were told the dogs would be approaching soon), then distress (when the dogs were in pursuit), and finally relief (when they had managed momentarily to shake them off), after which the cycle was repeated.

CONCLUSION

This project adopted a research through design approach with the aim of investigating how theory-driven approaches could be useful in the manifestation phase of designing. The approach was a) to use theory to create concrete interactions and b) to design and test explicit combinations of these variables in 'experience scenarios'. This approach was intended to combine the explicit treatment of variables and the clarity of documentation that characterizes research activities with the ability to make holistic sense of a great number of variables in a creative task, which is typical of design activities.

The outcomes of this approach are promising, although it is still too early to determine whether this type of research will successfully lead to theory-driven approaches that help designers to create concrete interactions. We are currently setting up a second round of design and research activities that follow up on these results. One important, yet difficult, question is to what extent the insights obtained in this study are generalizable. For instance, the study was specifically about fear emotions in the context of running. Are the results also relevant for designers who want to evoke the same type of emotions in completely different user contexts? Or, even more generally, do the results provide useful insights for designers who want to evoke different types of emotions in a different context? More studies in different contexts will have to be carried out to answer these questions. At least one factor that we strongly believe in – but which would have to be confirmed in other studies – is the use of clear and granular descriptions of emotions, motivations and behavior when designing for concrete interactions. We think that specificity and rigor in thinking both have a strong positive impact on the design process and outcome.

We believe that current theory-driven approaches are very valuable for the development of concepts that offer new functions, serve new purposes, or even represent entirely new product categories. However, these approaches offer very few guidelines that assist in choosing a material or in designing a specific interface interaction. There are several reasons why it could be beneficial for theory-driven approaches also to provide knowledge and guidelines for the manifestation phase of design. First of all, many theory-driven product ideas are promising in the conceptual phase but fail to deliver their intended experiences effectively. Although there are obviously many reasons why a promising concept might not turn into a successful product, a mismatch between the experiences that are meant to be evoked by the product concept as such and the concrete design interactions is certainly one of them. Secondly, designers who use experience-driven approaches may become frustrated if they cannot find ways to manifest their concepts successfully, and may end up abandoning such approaches altogether. Thirdly, most consumer products that are developed for the market are not intended to be conceptually novel in their purpose or functions, just incrementally innovative. For the development of such products, designers could benefit from theory that guides them in eliciting certain experiences and emotions through concrete interactions.

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