Embodied Emotion: designing interactive products for a person's emotional being-in-the-world

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ABSTRACT
In this paper we present a new perspective on how one can design interactive products in a way that they will become a meaningful and mediating part in a person's emotional being-in-the-world. In an ongoing participatory design project, a concept of an assistive and interactive wearable is currently designed with the aim to empower people with an autism spectrum disorder by supporting them in their process of emotion regulation. We reflect on this case study by contrasting embodiment theory with our design insights, offering a new perspective of what it means to design embodied interactive products for emotion regulation. This can be used by designers, offering them an embodied perspective as a guidance when making decisions during the design process. We speculate that our embodied perspective on emotion regulation enables the design of products that integrate better into a person's lifeworld and are therefore less likely to be abandoned.

Author Keywords
Embodiment; emotion regulation; empowerment; assistive technology; interaction design

INTRODUCTION
For many years, a distinct division has been recognized between the mind and body, called the Cartesian split, which is driven by classical ideas of cognition [1]. Recently, alternative embodied theories are based on the idea of an interplay between the body, mind, and world, and explain how people are embodied beings, who make sense of things through skillful, integrated interactions between people and the world [2]. According to Hummels and Van Dijk (2015), these embodied couplings contain physical, social, sensory, and action aspects, and they all form part of the self-organizing dynamic that creates the coupling.

From this perspective, we are especially interested in the role of emotion as it is not prominently placed within the framework of Hummels and Van Dijk (ibid). In mainstream emotion theory, emotion is divided by the same Cartesian split with clear separations between appraisal, arousal, and action [1, 2]. When viewing emotion in an embodied perspective, meaning, experience, and emotion are entangled and created by, or enacted through, the continuous loop of acting, sensing, experiencing and being in a social context [1, 3]. In order to be able to design embodied interactions for emotion-related design cases, we need a better grip on what we mean by 'embodied emotion'. The concept of embodied emotion developed in this paper draws from the theories of enactive emotion [1], implicit emotion regulation [4], distributed emotions, situated affectivity [2] and the scaffolding of affectivity [5].

In the following sections we will further elaborate on the role of emotion within embodiment theory, contrasting our design insights from a case-study with the theoretical notion of embodied emotion, thereby adding to the concept of what it means to design for embodied interactive products for a person's emotional being-in-the-world.

CASE STUDY
In an ongoing participatory design project that started in the end of 2016, a concept of an interactive wearable is being designed with the aim to empower people with an autism spectrum disorder by supporting them in their process of emotion regulation. This concept is created by using embodiment theory and insights from two clients, Willem and Els (not their real names), and their caretaker by involving them in the design process. This case study explores the question of how a product can make people with an autism spectrum disorder feel more empowered in their emotional being-in-the-world.

Dynamic Balance
People with an autism spectrum disorder can experience difficulties in regulating their emotions [7-9] because of the impairments in processing and placing stimuli within their context [10]. This makes stimuli from outside as well as inside very absolute, which makes it difficult to put them into perspective [8, 9]. As a result, their world can be very overwhelming at times [6]. As described by Lawson (2005): "throughout my life I have been unable to identify, understand and express my emotions,

and so have always felt misunderstood and alienated from those around me" [6]. Extreme emotions can cause someone to become stuck, as Williams (1996) recalls: "a suffocating and frightening experience of helplessness… I found myself physically stuck and physically disconnected" [7]. It is important to maintain an optimal level of arousal by modulating the intensity and timing of both positive and negative response to fit the situation. People with autism have difficulty to do so, which not only appears to result in increased negative affect, but also rapid escalation and meltdowns which in general can be quite impairing [8]. As it seems, extreme emotions can make one become disembodied, may it be regarding the body and mind, or regarding the outside world. When their stress level gets too high, the caretaker as well as the clients note that it is best for them to step out of the moment. However, people with autism often do not recognize these situations in time [6, 9]. When they do, they might find themselves flooded with emotion, which constrains them to act upon their regulation strategies [9].

The concept "Dynamic Balance" is an attempt to support these difficulties and consists of a band around the user's wrist and an app on his phone. The wristband will measure the stress level of the user. Stress is seen as the intensity of an emotion [10], transitioning from a calm to an aroused state [11-13]. People with autism often get overstimulated by the things that are perceived as too much of a demand of them, e.g. sensory stimuli, social interactions, or cognitive load. By measuring stress, the wristband detects the degree in which situations can potentially be too much for a person.

Figure 1, interaction with the wristband

Wristband

The wristband measures the stress level via the galvanic skin response of the user, and maps this to the size of a circle with the colors blue (relaxed) to orange (stressed) in the interface (figure 1). The circle grows, shrinks and gradually changes colors according to the stress level detected. In order to know when the user is stressed and when a maximum level is reached, machine learning needs to be applied which maps the measurements according to your being, increasing the accuracy in time. In addition to the circle interface, one can lock how one feels at the moment by setting a reference circle. This circle is placed around the current state of the moving circle. By using this tool, one can always see how stressed one is in comparison to the reference circle of that specific moment, and therefore see how different situations affect him. In order to get the user's attention at important moments, the wristband uses subtle haptic feedback when moving up and down the reference circle. This way, one can 'flow along' between boundaries, without losing balance as their attention will be drawn at important moments. As seen in figure 1, the interface has also a danger zone as outer circle. When the moving circle reaches this zone, the user will feel a stronger haptic feedback as a notification that he is potentially losing his balance. When a person's stress level is definitely too high as one loses balance, the moving circle will reach the outer circle. At this point, the user will be pulled out of the moment, which will be explained in the next section.

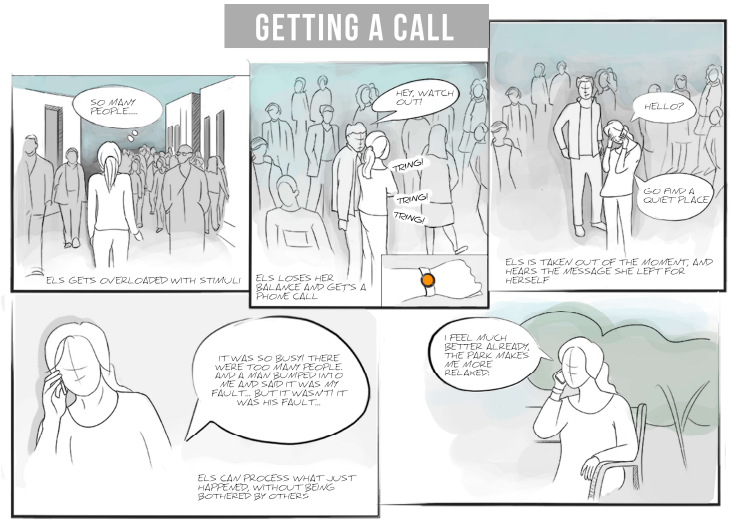

Figure 2, a scenario in which Els receives a call from herself

App

The concept includes an app in addition to the interactive wristband. Using this app, the user can record a message to himself and make a picture of what he thinks would help him in moments of high stress. This can for example be a picture of a happy memory or a reminder to seek a quiet space. When one's stress level is too high and the moving circle reaches the outside

line of the danger zone, the user gets a call from himself. As the user picks up, he will hear his own message and see the picture. This scenario in figure 2 has several advantages: not only does the ringing of the phone take a person out of the moment, it also allows him to (maybe even automatically) physically step out of the moment by quitting a conversation, turning his back to someone and walking away in order to hear his message. In addition, people will not bother the user while he is on his phone, as this type of interactions seems to be socially accepted and will not disturb the current social practices. These insights came when Willem said that he liked to talk to himself out loud, for example when he is waiting for the train to come. However, he knows that people would find it weird, so he would get his phone and pretended to call someone. This type of interaction does not only provide an easy getaway, it also allows the user to talk back. This will help a person to process and reflect on what is happening at the moment. In addition, what they say will in return be recorded as well, which provides material for reflection afterwards. These recordings will be available in the app, together with a graph of the person's stress levels of the day. While reflecting, one might find that their current regulation strategy is not working. Then, a new message and picture can be created.

INSIGHTS FROM THE CASE STUDY

Mirroring the concept of 'Dynamic Balance' back to the embodied theory provides a better understanding of how this concept adds to someone's emotional being-in-the-world. This concept aims to help people to create a better grip on their emotional world in the following manner:

1. The watch aims to help people with autism by providing insights such as whether they are in the right state to start a new activity, how situations affect them and when to step out of a moment, through reflective practice in and on the moment [14]. While interacting actively with the product in order to make the information more valuable and appropriate to their situation, skillful action-perception couplings [15] may appear over time through learning by doing [14]. Eventually, these couplings will make it easier for a person to 'float along'. In this process, emotion regulation will become more implicit and more of an habit [4, 16]. Gaining more physical and mental control over situations through this process might change one's appraisal of these situations and might alter one's actions as well.
2. In this concept, we use 'distributed emotion' by placing scaffolds into the world to alter our affective state [2, 5]. When comparing distributed emotion to distributed cognition, the environment provides tools for feeling as well as tools for thinking [2]. An example of this is the recording of a message to oneself, in which one places a scaffold into the world with the intention to work as an affordance for enacting a certain emotion regulation strategy or by creating a different affective state. Knowing that one will get a call when one is very stressed might form a safety net. According to Colombetti and Krueger (2015), trust is an important aspect for this affective scaffolding in the sense that one is confident that a resource will have a certain effect on his affective state. In addition, the more we trust, the more individualized and transparent the product becomes and vice versa [5, 17]. In order to strengthen this, one can also set-up a safety net for themselves by preparing a call to oneself in advance. For example, someone is going to a party and knows that generally in about an hour he needs some time alone. Social situations can be difficult for people with autism, and in the moment they might not know how to take a step back. Using a phone call (which someone can also activate on the spot), gives them an easy way out, which is one less thing to stress about when they are overloaded with stimuli.
3. Supporting this process of emotion regulation in their own way by using their own recorded messages and pictures, aims to help people with autism to find what works best for them. What this 'best' is, is different for every person. As emotion regulation is situated, just as social practices and cognition [18, 19], it is not possible for a designer to define this process in advance within a product. Emotion regulation can be seen as a learning process, in which users over time find their right fit with the product according to their lifeworld. This might eventually result in a better understanding of one's self in which specific ways of being-in-the-world of the user are highlighted and strengthened by the product.

DISCUSSION

In this section, we draw our insights together into a larger perspective in order to get to what it means to design for a person's emotional being-in-the-world. We suggest that interactions such as skills according to sensory-motor couplings, social interactions between people in socially

situated practices, as well as the content of the product which has a strong relation to the emotional couplings that emerge, together create the embodied experience of a product. Figure 3 shows an example of this regarding the case study in this paper. However, this is just a simplified representation as all these elements of skills, social practices and emotional couplings are intertwined. For example, we always act according to a social background, and in our actions such as turning away from someone when you are receiving the (designed) "phone call", lies the emotional content.

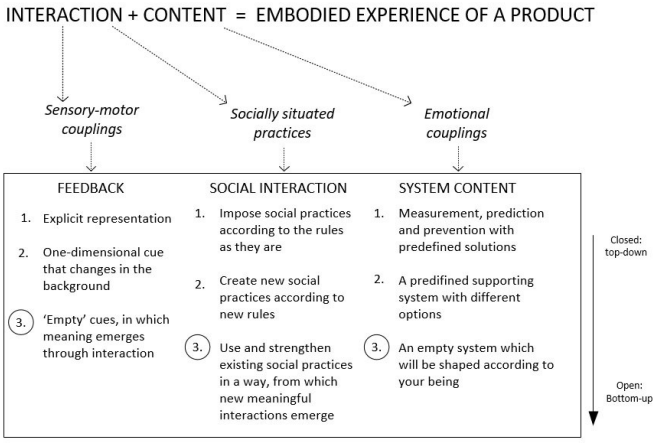

Figure 3, sketch of a framework for designing for embodied emotion regulation

In order to support the desired embodied emotion, the product should always give the user the opportunity to give their own meaning to the product, allowing interaction from both sides and letting the user create a type of use that fits into their lifeworld. Therefore, the product can in fact be 'empty' (in terms of content) when given to a person. Over time, the product will acquire its contents according to a person's being, instead of a product that imposes a way of being, for example through the literal application of an existing therapeutic intervention. We speculate that our embodied perspective on emotion regulation enables the design of products that integrate better into a person's lifeworld and are therefore less likely to be abandoned.

CONCLUSION AND FUTURE WORK

In this paper, we explored what it means to design for someone's emotional being-in-the-world. By contrasting the insights of an ongoing design case called 'Dynamic Balance' with embodied theory, we speculate that skills, social practices, and emotion are fields that need to be considered when designing for someone's emotional being-in-the-world. Then, skillful and social interactions as well as the emotional couplings which emerge by, among others, the content of the product, together create the embodied experience of a product. However, the fields of skills, social practices, and emotions are intertwined. Therefore, we propose this perspective as a guidance for designers when making decisions during the design process instead of providing a set of rules, as designers themselves need to decide how to apply this view to their context.

As the design project of 'Dynamic Balance' is still ongoing, these insights are based on the stage the concept is currently in. It will be interesting to see how people with an autism spectrum disorder will experience this concept. Therefore, we are planning to test this concept with a Wizard of Oz prototype. However, in order to truly say something about how the concept can add to someone's embodied being, they will need to experience it during a longer period of time. We suggest that the insights gained from such a long-term test will add great value to what it means to design for someone's emotional 'being- in – the- world'.

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