

**Æffect**

**Proposal concept for a somatically responsive garment**

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Project Repository:

<https://github.com/CLimeburner/CART360/tree/main/Everywhere%3DNowhere%3DNow>

CART 360 - Tangible Media & Physical Computing

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## Description

### Context (*Research Question 1*)

It is a scene familiar to most of us after the last year-and-a-half: you're walking through a public space, you make eye contact with someone else, and briefly you're both sharing a moment and yet nothing at all. With masks covering the majority of both faces, the shared gaze, in absence of facial expression, carries no deeper connotation, no well-wishes, no despondency, nor even hostility. Throughout the pandemic, between mask mandates and the prevailing remote methods of meeting, emotional context for interactions has been all but lost. Given the importance of these nonverbal cues, both in properly deciphering verbal communication<sup>1</sup> and in socialization<sup>2</sup>, *Effect*<sup>3</sup> aims to intervene in these interactions, reintroducing nonverbal indicators of mood where they might otherwise be absent from conversation. With this in mind, the artifact will be intended to intervene in the public sphere and to be used, conceivably, by anyone moving through that space. As a garment, *Effect* would be worn by the user, and thus follow them throughout their daily life, moving from space to space and occupying a myriad of social contexts where it would encounter just as many people, from home, to school, work, or out shopping. Beyond the user, there may also be others wearing their own copy of the garment, or those simply familiar with its function, or even those who see it only as a dynamic, wearable piece of art, but regardless of the depth with which one engages with *Effect*, the project still offers meaningful modes of interaction at every level-- aesthetic, social, reflective, and communicative.

### Dynamics (*Research Question 2*)

On its surface level, *Effect* contributes a new modality to interpersonal communication. Though grounded in the prior nonverbal cues of body language, this project combines these visible nonverbal cues with other, invisible cues, and reinterprets them to introduce a rich expression of emotional context that are not simple one-to-one correlations of "mood". The interpretive aspect of this project is not insignificant as, though reflective of biological

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<sup>1</sup> Gabrielle H Saunders, Iain R Jackson and Anisa S Visram, "Impacts of face coverings on communication: an indirect impact of COVID-19," *International Journal of Audiology* 60, no. 7 (2021): 495-506, DOI: <https://doi.org/10.1080/14992027.2020.1851401>.

<sup>2</sup> Heman Ilgen, Jacob Israwlashvili and Agneta Fischer, "Personal Nonverbal Repertoires in facial displays and their relation to individual differences in social and emotional styles," *Cognition and Emotion* 35, no. 5 (2021): 999-1008, DOI: <https://doi.org/10.1080/02699931.2021.1877118>.

<sup>3</sup> Derived from the psychological use of "affect", meaning one's mood or emotional state, and "effect", as in the consequence of something.

indicators, it itself presents new avenues for presentation and interpretation of emotional states. This affords us an opportunity to re-cast certain emotional states through our garment. Must sadness always be blue? Must anger always be red? Must either of these emotional states present an inherently negative aesthetic through our garment? The answer to all of these questions, of course, is no, and so we'd seek to build new ways for people to convey and perceive each other's emotions in everyday interactions, particularly ways that go beyond simple color association.

However, this modulation of interpersonal communication is not the only dynamic this garment offers. It can also modulate the communication between an individual and their own body. Though at times difficult to focus on and take stock of one's own body, there are a variety of benefits to emotional-somatic introspection<sup>4 5</sup>. *Effect* could help facilitate these kinds of introspective moments by expressing emotion and the accompanying somatic responses in a fashion more immediately perceptible. Indeed, as users come to associate the feedback of the garment with somatic cues from their body through this process of self-reflection and bodily introspection, they may come to develop a longer-lasting sense of mindfulness, beyond their use of the garment itself. In this way, *Effect* not only replaces the nonverbal emotional cues lost to masks, but opens up new avenues for individuals to examine themselves and reach a deeper connection with their own bodies.

### **Empowerment** (*Research Question 3*)

On one hand, as a replacement for absent nonverbal facial and emotional cues, *Effect* might be ironically considered a "psychological prosthesis" in the most literal sense. However, viewed through this lens, we see this as something of benefit that empowers the user, rather than a pejorative categorization. Indeed, just as a prosthetic hand or leg can restore kinds of physical mobility, our project would, if not restore, at the very least supplement a crucial avenue of human communication that has been largely absent throughout the ongoing pandemic. Within this framework, we see the project as an object empowering its user and facilitating a richer experience of social interaction in these challenging times.

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<sup>4</sup> Michael Usher, Amy Spatz, Claire Copland, Andrew Nicolaou, Abbey Cargill, Nina Amini-Tabrizi and Lance M McCracken, "Immediate effects of brief mindfulness-based body scan on patients with chronic pain," *Journal of Behavioural Medicine* 37 (2014): 127-134, DOI: <https://doi.org/10.1007/s10865-012-9466-5>.

<sup>5</sup> Rachel Martin, Ivanka Prichard, Amanda D Hutchinson and Carlene Wilson, "The Role of Body Awareness and Mindfulness in the Relationship Between Exercise and Eating Behaviour," *Journal of Sports & Exercise Psychology* 35 (2013): 655-660.

Furthermore, as alluded to above, we anticipate that use of our garment can help stimulate a more observant relationship with one's own body, not wholly dissimilar from meditative exercises and bodily introspection. Under this consideration, our project takes a step beyond merely supplementing existing interactions that may be suffering during the pandemic and pushes into a domain of self-reflection and self-improvement. Indeed, it is for this reason that we would explore novel ways of translating somatic data into visible modalities, because the intent of the garment is not to serve as a biomedical readout of explicit mood, but rather an evocative presentation to prompt reflection upon the underlying causes. Our hope is to motivate individuals into finding their own interpretation in the artifact's dynamics, knowing only that generally the garment is responsive to their mood— the specific response of the garment is less important than the fact that the garment is emotionally responsive.

#### **Interaction** (*Research Question 4*)

As a garment that must be actively donned by a user, *Æffect* has the distinct advantage of being able to presume the user has some basic level of familiarity with the artifact's general function, either through word of mouth, or a user manual. That said, the specific mechanism by which the garment translates biometrics into visible indicators of mood is less crucial to the value of the project than one might initially assume. For example, addressing the above examination of *Æffect* as a tool for introspection, the exact correlation between mood and visible expression is not so important as the garment's dynamics prompting the wearer to consider their own internal mood or feelings. Under this consideration, the garment's behaviour itself is not the meaningful interaction, but rather a prompt to engage in the meaningful self-interaction of bodily introspection. Regarding the case of interpersonal interactions, it is again less intended that another person is able to "read" the exact emotion of the user, so much as the garment provokes a broad sense of there being some kind of internal dynamic to the user's emotions.

In both these circumstances the intended interaction is not one of explicit communication, but instead of thought-provocation. Consequently, we will be exploring means of stimulating curiosity and closer examination. To do so, we feel the crucial factors are that 1) the garment noticeably changes in some way over time and 2) that the changes are seemingly purposeful and responsive to immediate circumstances. It is not necessary that the precise purpose be discernable, but it should be clear to the user and surrounding individuals that the garment can be actively influenced in some way. This might be done by varying the timescale of the garment

changes we implement to make it clear changes are prompt and in direct response to something in the garments environment. This will also have to consider the natural rate at which bodily metrics respond to psychological dynamics and so this process of calibrating a *noticeably* responsive garment will be one of ongoing tests and adjustments to reach an expressivity that we feel is appropriate for the project's goals.

## Methods

Input affordances for *Effect* will largely consist of biometric sensors gathering data that correlates to mood and emotion via behaviour of the autonomic nervous system. This might include metrics of body heat, heart rate, respiratory rate and depth, breath humidity, skin conductivity, and other modalities, however this list is neither prescriptive nor exhaustive. Our goal is to gather a complex system of biometrics for which we can provide an artistic interpretation algorithmically. By involving multiple metrics, this will permit us to create a more robust and complex expression of mood that isn't simply reducible to a measurement of a single bodily function.

Our primary output effectors remain less clear for the time being. Given our desire to render somatic data through a mode that's more immediately noticeable, it makes sense to explore visual cues, and so we will endeavour to explore a variety of non-traditional materials integrated into traditional textiles. This includes woven fiber optics, thermochromic and potentiometric dyes, and even mechanical manipulations carried out by motors embedded within the garment. As the specific form of the garment currently remains open to exploration and iteration, so too does the exact method of output. As alluded to above, the actual output of these modalities would explore algorithmic solutions for integrating sensor data into dynamic patterns of form, color, and movement that, while evocative of emotions, are not simple correlations of sweaty palms to nervousness to the color green. In this way we hope to promote a more developed consideration of the emotional cues our garment provides, that go beyond the traditional associations of a mood ring.

For a speculative journey map of our artifact's usage, please refer to Appendix A.

## Background

### **EighthSense<sup>6</sup>**

The organic looking jacket created by UK fashion studio The Unseen was built around the idea of showcasing brain and emotional stimuli in the form of an ever changing chromatic pattern. The jacket is in fact connected to an electroencephalogram monitor that reads and transmits electrical activity from the wearer's brain through their cell phone, and finally to their wearable in four possible color combinations. The headdress containing the EEG monitor and jacket are both eccentric looking couture pieces meant to be used as art installations only.

Alchemist and founder of The Unseen studio, Lauren Bowker, also lent her "signature chameleonic ink which changes colour via electrical conductivity"<sup>7</sup> to the project, making the outermost reptile looking surface of the jacket change color in real time based solely on electrical activity transmitted from the EEG monitor. The scale looking elements are therefore able to change independently from one another, in an attempt to recreate as closely as possible the pattern of activity from the brain in real-time. Bowker goes as far as stating that "everyone who has interacted with the piece has shown different patterns and colours in diverse places upon the garment", furthering the intimacy created between wearer and wearable.

Interestingly enough, the creator's main personal intentions when initiating the project were centered around being able to visualize her own pain levels and other "connections between humans and how they can drain or enthuse one another"<sup>8</sup>. Indeed, this device was not only meant as an aesthetically pleasing way to showcase our emotions to the world, but rather to realize the impact of our somatic experiences on our brain and mind.

### **GER Mood Sweater<sup>9</sup>**

The GER Mood Sweater, by design studio Sensoree, makes use of galvanic skin response sensors to detect changes in skin conductivity across a pair of hand-mounted straps. Skin conductivity, particularly of the hands, is a classic correlate of emotional state (famously measured in polygraph tests and used in literary references to "sweaty palms") and thus provides a readily accessible biometric parameter for measurement with a sensor. These sensors then

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<sup>6</sup> "Innovate UK", The Unseen, accessed Sept.29, 2021, <https://seetheunseen.co.uk/project/innovate-uk>.

<sup>7</sup> "The Unseen creates "coded couture" to read wearers' auras", Dezeen, accessed Sept.29, 2021, <https://www.dezeen.com/2015/02/17/the-unseen-coded-couture-auras-jacket-london-fashion-week/>.

<sup>8</sup> Ibid.

<sup>9</sup> "GER Mood Sweater," Sensoree, accessed Sept. 28, 2021, <https://www.sensoree.com/artifacts/ger-mood-sweater/>.

connect to the main body of the sweater, where the skin conductivity data is cross-referenced with a predetermined schema of emotional states, which are then expressed as colored light around the collar of the sweater. Using only skin conductivity as their metric, the designers construct a scale loosely summarized as an axis of “excitement”, with bluer hues indicating a calmer state of mind, and reds and yellows indicating agitation or excitement.

As the designers remark<sup>10</sup>, having the lights built into the neck of the sweater has the particular advantage of projecting light up onto the user’s face, where it both provides the user immediate feedback of the sweater’s behavior, as well as bathing their face in the color. This placement therefore serves excellently to foster a relationship both between the wearer and the garment, as well as the wearer and others via the manifestation of the garment’s light. The projection onto the face also raises an interesting consideration regarding the boundary between the user and the artifact, as the body itself becomes a canvas for the luminous extension of the garment.

### **Hexoskin<sup>11</sup>**

While not strictly an art piece, Hexoskin, produced by Montreal company Carré Technologies, is a paired hardware/software solution for biometric monitoring. It consists primarily of a headband and vest which monitor a variety of bodily functions and provide a digital read-out and record of those collected metrics. It lists the ability to continually monitor heart rate via a three-lead electrocardiogram, respiratory rate, blood oxygenation, blood pressure, and skin temperature, as well as offering a three-axis accelerometer capable of tracking things such as step count and general gait information.

Despite not being an art piece, the Hexoskin product presents valuable insight into ways to mount low-profile sensors on the body in a way that also allows for a diversity of metrics to be recorded. The company that produces it similarly reflects on the flexibility of the model it’s created, citing multiple avenues along which any given metric might be used to study different physiological phenomena<sup>12</sup>, though within this framework, each avenue is seemingly restricted to a single sensor, rather than a complex integration of the gamut. Hexoskin is designed primarily for healthcare and fitness applications, and yet the general model of a headband and vest might

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<sup>10</sup> Ibid.

<sup>11</sup> “Home”, Hexoskin, accessed Sept. 28, 2021, <https://www.hexoskin.com/>.

<sup>12</sup> “Astroskin”, Hexoskin, accessed Sept. 28, 2021, <https://www.hexoskin.com/pages/astroskin-vital-signs-monitoring-platform-for-advanced-research>.

prove useful in any exploration of body-mounted sensors within a wearable garment, particularly for applications that make use of multiple sensor tracking differing biometric parameters. For these reasons, we feel this product is a suitable point of comparison for what our project will endeavor to do with similar arrangements of sensors monitoring biometric input, though translated to a more artistic context.

### **Comparison**

A key commonality that is immediately apparent between the Eighthsense and GER Mood Sweater projects is the obvious fact that each makes use of a single bodily metric (EEG in the case of Eighthsense and skin conductivity in the case of GER Mood Sweater). Though these metrics are both known to correlate with mood and emotion, they each remain one dimensional observations of the phenomenon. Our project would involve multiple metrics and integrate them so as to provide a fuller picture of emotional state. What's more, while Hexoskin offers an example of a project that measures multiple dimensions of biometric data, it still records and reports these metrics as discrete values independent of each other. *Effect* would take the plurality of monitored data and integrate them to achieve our resultant output, creating holistic expressions of emotional state that aren't readily parsable into, for example, a heart rate or body temperature component. In this way, we seek to transcend these prior projects that become bogged down by the medical discretization of bodily information, reintegrating these metrics in the visible displays of our garment.

Furthermore, while other projects, particularly Eighthsense, occupy a space of haute couture, we conceive of our project as being a more practical and low-profile design, suitable to quotidian usage. This guides our design towards more practical form factors, greater comfort for longer wearability, and accessible tech interface at the level of immediate interaction between our user and the garment. Our project is not intended to require a technical degree to operate, and so would also eschew highly technical solutions with strict requirements of sensor placement and setup.



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# //Appendix A

## Putting on the device

Meant to feel as natural as donning a conventional garment or accessory, it is meant to be worn as a second skin or protection from the outside environment, creating an intimate relation with the wearer

## Going about one's day

The device more or less resembles conventional clothing/accessory, and so the wearable is used seamlessly. The user goes about their day as anticipated.

## Somatic reactions to external events

Somatic reactions to everyday event will start impacting the wearable ever so slightly. Soon, the reaction will be noticeable. This is an invitation for the wearer to explore what has changed in their environment and how their senses were affected by said change

## acknowledgement of the other

Æffect is meant to be used in a network of users interacting with themselves but also others all around them.

## Introspection about the self

User starts questioning how their environment stimulates their somatic responses. Is this positive? negative? neither? Has the wearable ever reacted similarly? What was happening then?

## presentation of the self to others

Changes in visual cues from the wearable, however abstract in meaning, are not only visible for the user but the public around them. Others, regardless of their familiarity with the device, will notice that a change is occurring in the wearable.

## presentation of others to the self

The user might experience discomfort and/or curiosity towards the changes happening on a third party's device, however abstract in meaning. This could come from a sudden change when in their presence, or other unrelated events.

## Reinterpretation of social dynamics and daily personal experiences

By observing the device's ever-changing response to their somatic reactions and that of others, the user is not only able to be more mindful on their own experiences but also their dynamic with other Æffect wearers, and even people unfamiliar with the device that have paid attention to the user's device.

## Introspection of the realities of others vs the self

Interpretation of the co-existence of a number of different Æffect devices together. User is brought to question unspoken and invisible social dynamics that are made clearer, even in an abstract sense, by Æffect.

