

Experiencing discomfort: designing for affect from first-person perspective

Muhammad Umair*
m.umair7@lancaster.ac.uk
Lancaster University
Lancaster, United Kingdom

Miquel Alfaras*
malfaras@plux.info
PLUX Wireless Biosignals
Lisbon, Portugal
Universitat Jaume I
Castelló de la Plana, Spain

Hugo Gamboa
h.gamboa@fct.unl.pt
Departamento de Física
Faculdade de Ciências e Tecnologia
LIBPhys-UNL Universidade Nova de Lisboa
Caparica, Portugal

Corina Sas
c.sas@lancaster.ac.uk
Lancaster University
Lancaster, United Kingdom

ABSTRACT

In this paper, we describe how by embracing a first-person design perspective we engaged with the uncomfortable to successfully gain insight into the design of affective technologies. Firstly, we experience estrangement that highlights and grounds our bodies as desired in the targeted technology interaction. Secondly, we understand design preconceptions, risks and limitations of the design artifacts.

CCS CONCEPTS

• **Human-centered computing** → **Interaction design process and methods**; *Haptic devices*; • **Applied computing** → **Health informatics**.

KEYWORDS

affective technology, discomfort, biosensing, first-person design

ACM Reference Format:

Muhammad Umair, Miquel Alfaras, Hugo Gamboa, and Corina Sas. 2019. Experiencing discomfort: designing for affect from first-person perspective. In *London '19: ACM Ubiquitous Computing, Sept 09–13, 2019, London, UK*. ACM, New York, NY, USA, 4 pages. <https://doi.org/10.1145/1122445.1122456>

1 INTRODUCTION

In recent years, the design of affective health technologies has been highly promoted, thanks to the potential market that accompanies

health monitoring [1, 6]. Advances in ubiquitous computing capabilities, such as the widespread adoption of mobile technologies capable of demanding processing and monitoring tasks or the lowering of sensor costs have greatly contributed to this growth. At the same time, voices in HCI and technology design have been pointing to the limitations in affective technology deployments [7], paving the way to design approaches that can better address the ethical concerns underpinning end users' vulnerabilities. The role of designer's emotions and body in design has been previously suggested [9, 10].

In this work, we describe how our experience of using a first-person design perspective [2, 8] in an attempt to leverage the body and explore the use of biosensors for arousal representation led us to some uncomfortable experiences that allowed us to articulate some relevant design insights.

2 BACKGROUND

Supporting a healthy affective life is one of the main goals of today's mental health and well-being research agenda, given the prevalence of stress or depression. The World Health Organization [5], for instance, sets global targets (year 2020) that underline the importance of policy making to address mental well-being. Recently, Sanches et al. [7] did a systematic review of HCI and affective health research by analyzing the limitations of technology-based approaches to specific affective disorders and highlighted how ethical values are often overlooked. Other HCI work has shown how biosensors offer the opportunity to create interactions with personal technology that foregrounds affect, far from the economization of health or self-improvement, performance-based paradigms [3].

AffecTech¹ is a large interdisciplinary research project addressing the development of affective health technologies that can support people to become more emotionally aware and able to effectively regulate their emotional responses. Within the AffecTech project, in our attempt to create alternative technology-mediated interactions, we draw upon recent work that focuses on interesting representations of biosensing information [12]. In particular,

¹www.affectech.org

*Both authors contributed equally to this research.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted by ACM, provided that the copies are not made for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

Unpublished working draft. Not for distribution.
UbiComp '19, Sept 09–13, 2019, London, UK
© 2019 Association for Computing Machinery.
ACM ISBN 978-1-4503-9999-9/18/06...\$15.00
<https://doi.org/10.1145/1122445.1122456>

we take inspiration from examples such as electrodermal activity (EDA) represented in social settings [4], making use of different materials, and combine it with evocative body-centered explorations of actuators [14]. In our research we often adopt a first-person design perspective, engaging with the *felt* body as the main design resource, i.e. the body as it feels. We design *through* and *for the body*.

3 GETTING UNCOMFORTABLE: DESIGNERLY EXPLORATIONS

Below we describe our first-person account of two design approaches that use our bodies as resource for designerly explorations.

3.1 Bodily interactions to design for the body

In order to inform the design of novel, more embodied interactions and artifacts, we borrowed ideas from design practices which suggest that body-centered exercises can potentially inform this process. These exercises are accompanied by pre- and post- sessions in which participants reflect on the experienced qualities felt during the exercises and how they can inform the targeted technology interaction. To inspire our designs, we, in groups, engaged in two bodily exercises described below. These exercises were led by professional instructors, who stressed the need to stay in a non-judgmental state, just accepting the perceptions that arise.

- (1) **Contact Improvisation:** Contact improvisation dance [11] is a form of partner dance that highlights the properties of touch, weight sharing and fosters the use of contact points to create movement improvisation centered in the present. This is a practice that we included in our design process involving participants of both genders and with different design expertise. By means of movement exercises we explored non-verbal negotiations on what is allowed, what one's movement limitations are, and how our body or bare contact is used to inform the interlocutors about one's current intentions. When being in the middle of a contact improvisation performance, we found ourselves interacting with other people. It was not until that precise moment that we realized how clumsy our movements were. The hands, the touching points we used, were more sweaty and shakier than we would expect. Although gaze and eye contact keep us attached to the dance partner, the communication of decisions such as changes of speed during the dance practice or the intention to move arms in a broader range were hard to achieve. As the exercise flows, discomfort gives way to agreements. Slowly, you realize what your own body is capable of, as well as your partner's. In some occasions, such close interactions raised our insecurities related to gender dynamics and intricate hierarchies ruling our interpersonal relationships. This discomfort, in turn, highlighted even more communication challenges.

- (2) **Yoga:** Yoga, the ancient tradition aiming to bring physical awareness to the body, can provide valuable tools for the designers to focus on proprioception and the felt body. By engaging in a yoga exercise in a group setting along with other researchers, we started following the movements of the

instructor. We were doing yoga for the first time. However, some of the participants were regulars and were very comfortable following the movements. We, instead, were falling down, often looking at the instructor trying to correct our postures, sweating and even laughing at our mistakes and at other participants'. The whole session lasted for about 45 minutes and at the end, we were extremely exhausted. After struggling with physically demanding postures, we were left with uncomfortable aches, heightened awareness of the involved body parts, and with a vivid notion of the body barriers we had stumbled upon. The use of yoga exercises is for us a means of understanding how our body responds to our commands, and how our assumptions of its limitations are actually confirmed or challenged through direct experience.

3.2 EDA to vibrotactile exploration

Affect is often measured in terms of arousal by using the intensity (high or low) and valence (positive or negative) of an emotion. Existing research on affective technologies uses a variety of biosensory data to measure these two dimensions of affect. The most common of these are electrodermal activity (EDA) sensors to estimate levels of arousal and heart rate sensors to infer stress levels. EDA is a simple measure of changes in skin conductance that uses two detachable electrodes to help users determine the level of physiological arousal. Another common measure is heart rate assessment used to determine stress. This measure requires assessment of heart rate variability (HRV), requiring computationally demanding processing and access to reliable electrocardiography or pulse sensors that need to be worn over long periods. With the growing HCI interest in materials and materiality [13], increasing research has started exploring novel ways of representing biosensory data by testing different actuator-based technology [3, 4, 12, 14]. Following this material trend, we started connecting actuators and biosensors to represent biosensory data in daily life settings. Since we target the design of technologies that feel close to the body, our goal was to place the actuators on the body. Therefore, we wanted to consider lightweight actuators that can be easily placed on different body parts. Vibrotactile feedback in the form of small vibrating discs stood out, as these motors are very small in size, requiring very low power to operate and being easily controlled through common prototyping platforms such as Arduino.

A design decision was then to couple EDA data to vibrotactile actuations on a wearable wristband (Figure 1) to create emotional awareness. We used an EDA sensor which works by attaching two electrodes on the fingers on one hand. To explore how the sensor behaves in real-life settings, we (the designers) decided to use the sensor and actuator on our wrist and go about in our daily lives for 2 days. The reason for this was to analyze skin conductance changes through vibrotactile actuation, as well as wearability and comfort, in daily life settings. On the first day, we wore the sensor on fingers which was linked to a vibrotactile band on the wrist. However, after using it for just 20 minutes, the fingers started to feel tightened and felt as if the blood flow stopped. This was because electrodes were too tight around the fingers. After spending some time to loosen the strap around the electrodes, we wore the sensor again and this



Figure 1: EDA electrodes on fingers (left) and on the wrist (right) coupled with vibrotactile feedback

time it felt a little better. Later in the day, one of the researchers had to type something on the computer, he felt that it was difficult to bend the fingers with sensor wrapped around. As soon as the fingers bent, the vibration motors started to actuate because of the movement artifacts produced by the electrodes against the fingers. Being unable to work, he felt quite frustrated and decided to go to gym. While opening the door of the gym, the wearable started to actuate, which was very confusing in the beginning. However, he quickly realized that the vibration motors always actuate whenever he touches some metal surface because of changes in skin resistance. This meant that as soon as there was a contact with any metal equipment, the vibrations appeared and did not stop. So, he ended up spending the whole gym session with vibrotactile sensations on the wrist until the battery went out which felt very uncomfortable and annoying. On the second day, the same researcher went to the supermarket. However, he quickly realized that people were staring at the device probably because of its low-fidelity nature and the device itself being something different. This invited several people questioning him what the device is and what exactly it does. In turn, this got him very uncomfortable and self-conscious, ultimately avoiding to wear the device in public for the rest of the day.

4 DISCUSSION

We would like to highlight that our design explorations never targeted experiencing discomfort. Experiencing the uncomfortable is something we came across during our design research, which led to important observations.

Interestingly enough, what our research taught us is that when engaging with the first-person design perspective, discomfort is a recurrent topic in our research path. Far from discouraging it, discomfort emerged as an indicator towards aspects that we, as designers, overlook when crafting a particular interaction. By engaging with the uncomfortable, i.e. by experiencing the affordances of the embodied interactions that we are designing for, together with the exploration of our body boundaries, we came to important insight for the design of affective technology.

By letting our bodies go into unknown interactions, we became aware of our own body limits and how the technology behaves during different bodily interactions. It is only by spending time exploiting the touch in contact improvisation dance, or by attempting to achieve physically demanding yoga postures, that we understood to what extent our body can be used to drive interactions. By wearing an EDA-based, vibrotactile wristband, we realize that potential ethical issues are embedded in our technology and its use in social

contexts. Experiencing uncomfortable aspects attached to the experiences was crucial in order to leave a strong and long-lasting imprint of what limitations our technology brings up.

What we believe these recounts show is how the uncomfortable connected with the first-person perspective to inform our design process. These reflections also allowed us to reconsider with fresh eyes the ethical concerns, use-case scenarios, and design limitations. As nicely shown in the Soma Design Manifesto [14], "we disrupt the habitual to engage with the familiar". We definitely can link the experience of being uncomfortable with "disrupting the habitual". Moreover, we believe discomfort is something so painfully vivid, that insights gained from it are more powerful and long-lasting. The current work, being part of the ongoing broader work on affective and self-reflection technology design, should be seen as a call for action. We call for engaging in first-person design and experiencing the uncomfortable to, as we depicted here, unveil the design preconceptions and enhance the role of our body in mediating technology interactions.

CONFLICT OF INTEREST

Author Miquel Alfaras is employed by PLUX Wireless Biosignals S.A. All other authors declare no competing interests.

ACKNOWLEDGMENTS

This work has been supported by AffecTech: Personal Technologies for Affective Health, by the H2020 Marie Skłodowska-Curie GA No 722022.

REFERENCES

- [1] EMPATICA. 2015. E4 Wristband. Retrieved June, 2019 from <https://www.empatica.com/research/e4/>
- [2] Kristina Höök, Baptiste Caramiaux, Cumhur Erkut, Jodi Forlizzi, Nassrin Hajinejad, Michael Haller, Caroline Hummels, Katherine Isbister, Martin Jonsson, George Khut, Lian Loke, Danielle Lottridge, Patrizia Marti, Edward Melcer, Florian Müller, Marianne Petersen, Thecla Schiphorst, Elena Segura, Anna Ståhl, Dag Svanæs, Jakob Tholander, and Helena Tobiasson. 2018. Embracing First-Person Perspectives in Soma-Based Design. *Informatics* 5, 1 (Feb. 2018), 8. <https://doi.org/10.3390/informatics5010008>
- [3] Noura Howell, John Chuang, Abigail De Kosnik, Greg Niemeyer, and Kimiko Ryokai. 2018. Emotional Biosensing. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (Nov. 2018), 1–25. <https://doi.org/10.1145/3274338>
- [4] Noura Howell, Laura Devendorf, Rundong (Kevin) Tian, Tomás Vega Galvez, Nan-Wei Gong, Ivan Poupyrev, Eric Paulos, and Kimiko Ryokai. 2016. Biosignals as Social Cues. In *Proceedings of the 2016 ACM Conference on Designing Interactive Systems - DIS '16*. ACM Press. <https://doi.org/10.1145/2901790.2901850>
- [5] World Health Organization. 2013. Mental Health Action Plan 2013–2020. Retrieved May, 2019 from https://www.who.int/mental_health/publications/action_plan/en/
- [6] Samsung. 2016. Gear S3. Retrieved May, 2019 from <https://www.samsung.com/us/explore/gear-s3>
- [7] Pedro Sanches, Kristina Höök, Corina Sas, Axel Janson, Pavel Karpashevich, Camille Nadal, Chengcheng Qu, Claudia Daudén Roquet, Muhammad Umair, Charles Windlin, and Gavin Doherty. 2019. HCI and Affective Health. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI '19*. ACM Press. <https://doi.org/10.1145/3290605.3300475>
- [8] Corina Sas. 2019. First person HCI research: Tapping into designers' tacit experiences. In *ACM Conference on Designing Interactive Systems - DIS '19: Workshop on 1st Person Research Methods in HCI*. [http://www.research.lancs.ac.uk/portal/en/publications/-\(9b5b9b52-364a-4d21-9dbc-9c20bef07315\).html](http://www.research.lancs.ac.uk/portal/en/publications/-(9b5b9b52-364a-4d21-9dbc-9c20bef07315).html)
- [9] Corina Sas and Chenyan Zhang. 2010. Do emotions matter in creative design?. In *Proceedings of the 8th ACM Conference on Designing Interactive Systems - DIS '10*. ACM Press. <https://doi.org/10.1145/1858171.1858241>
- [10] Corina Sas and Chenyan Zhang. 2010. Investigating Emotions in Creative Design. In *Proceedings of the 1st DESIRE Network Conference on Creativity and Innovation in Design (DESIRE '10)*. Desire Network, 138–149. <http://dl.acm.org/citation.cfm?id=1854969.1854990>

<p>393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450</p>	<p>[11] Nancy Stark Smith and David Koteen. 2019. <i>Caught Falling: The Confluence of Contact Improvisation, Nancy Stark Smith, and Other Moving Ideas</i>. Contact Quarterly. https://www.xarg.org/ref/a/0937645095/</p> <p>[12] Muhammad Umair, Corina Sas, and Muhammad Hamza Latif. 2019. Towards Affective Chronometry: Exploring Smart Materials and Actuators for Real-time Representations of Changes in Arousal. In <i>Proceedings of the 2019 ACM Conference on Designing Interactive Systems - DIS '19</i>. ACM Press. https://doi.org/10.1145/3322276.3322367</p>	<p>[13] Mikael Wiberg. 2013. Methodology for materiality: interaction design research through a material lens. <i>Personal and Ubiquitous Computing</i> 18, 3 (May 2013), 625–636. https://doi.org/10.1007/s00779-013-0686-7</p> <p>[14] Charles Windlin, Anna Ståhl, Pedro Sanches, Vasiliki Tsaknaki, Pavel Karpashevich, Madeline Balaam, and Kristina Höök. 2019. Soma Bits: Mediating technology to orchestrate bodily experiences. (Apr 2019). https://doi.org/10.6084/m9.figshare.7855799.v1</p>	<p>451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530</p>
--	---	--	--

Unpublished working draft.
Not for distribution.