

HOW DOES INTEGRATING BIOFEEDBACK TECH INTO PHOTOGRAPHY IMPACT EMOTIONAL EXPRESSION AND

● DISCOMFORT

● FACE THE EGO

● FAILURE

● PERSIST

● FEEL

● GROW

SELF-REFLECTION?

DEFINITION OF BIOFEEDBACK

"Biofeedback is a process that enables an individual to learn how to change physiological activity for the purposes of improving health and performance. Precise instruments measure physiological activity such as brainwaves, heart function, breathing, muscle activity, and skin temperature. These instruments rapidly and accurately 'feed back' information to the user. The presentation of this information—often in conjunction with changes in thinking, emotions, and behavior—supports desired physiological changes. Over time, these changes can endure without continued use of an instrument." - Association for Applied Psychophysiology and Biofeedback ^[14]

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INTRODUCTION

This project affirms the reality of emotional weight in a photograph. The focus is on the relationship between the photographer and the photograph, and what role emotions play in this relationship.

What is a photograph and how is it used.

Photography was originally used for capturing and preserving moments, documenting events, and remembering people.

These days, most people use digital cameras for the same reasons. Using smartphones or professional cameras. But there seems to be something special about 'old-school' film photography – at least to me.

What is the problem?

Digital photography revolutionized the way we look and share. We went from gifting someone a photograph to airdropping an image. In the blink of an eye, the essence of sharing memories transformed. With the speed of digital photography, sharing images has become a way to quickly consume. I believe we've become wasteful with the amount of space digital photography provides. With the rise of platforms like Snapchat and Instagram Stories, the purpose of photographs seems to have shifted from preservation to single-use moments.

Why is it important to me and others.

I've also noticed a change in behavior in the way and the reason I take photos. My photography became a service for others. And the images I took weren't mine, they became shared property with stakeholders. This

shift blurred the lines between personal expression and serving the needs of others.

Fast-Food Fast-Fashion all of these fast expressions are ruining the creative experience.

What led up to this research?

In 2022 I started dissecting an analog camera. My goal was to understand the device better, which I started to love working with. I found the artisanal qualities, such as buying the right film, understanding the grain, and the developing process charming. It resulted in a stronger context of private, intimate, and strangely true to life. That's how analog manages to capture how the scenery feels.

I was inspired by the book "[The Academy of the Senses](#)" [7] by Frans Evers, which discusses the phenomenon of synesthesia, where stimulation of one sense leads to involuntary experiences in another sense, to explore how emotional triggers could be connected to triggering of the analog camera.

INTRODUCTION

To understand Biofeedback we must first learn about Norbert Wiener and his study on 'Cybernetics'.

CYBERNETICS

Norbert Wiener popularized the term "cybernetics" in 1948 with his book titled "Cybernetics: Control and Communication in the Animal and the Machine." [22] Wiener highlighted that effective actions require good communication. He explained that control (the steps taken to reach goals) depends on communication (the exchange of information between an individual and their surroundings).

Dr Paul Pangaro who's a cybernetician explains that **"Cybernetics is about having a goal and taking action to achieve that goal."** [18]

He often uses the following analogy to illustrate idea of cybernetics: **"cybernetics comes from the greek meaning 'to steer', and when you steer you're trying to get there, but you're blown off course by wind and tide."** [16]

Knowing whether you have reached your goal (or at least are getting closer to it) requires 'feedback', a concept that was heavily studied by cybernetics. According to Norbert Wiener: **"The simplest form of feedback is the familiar situation in which the hand is withdrawn from contact with hot objects as soon as pain is felt."** [22]

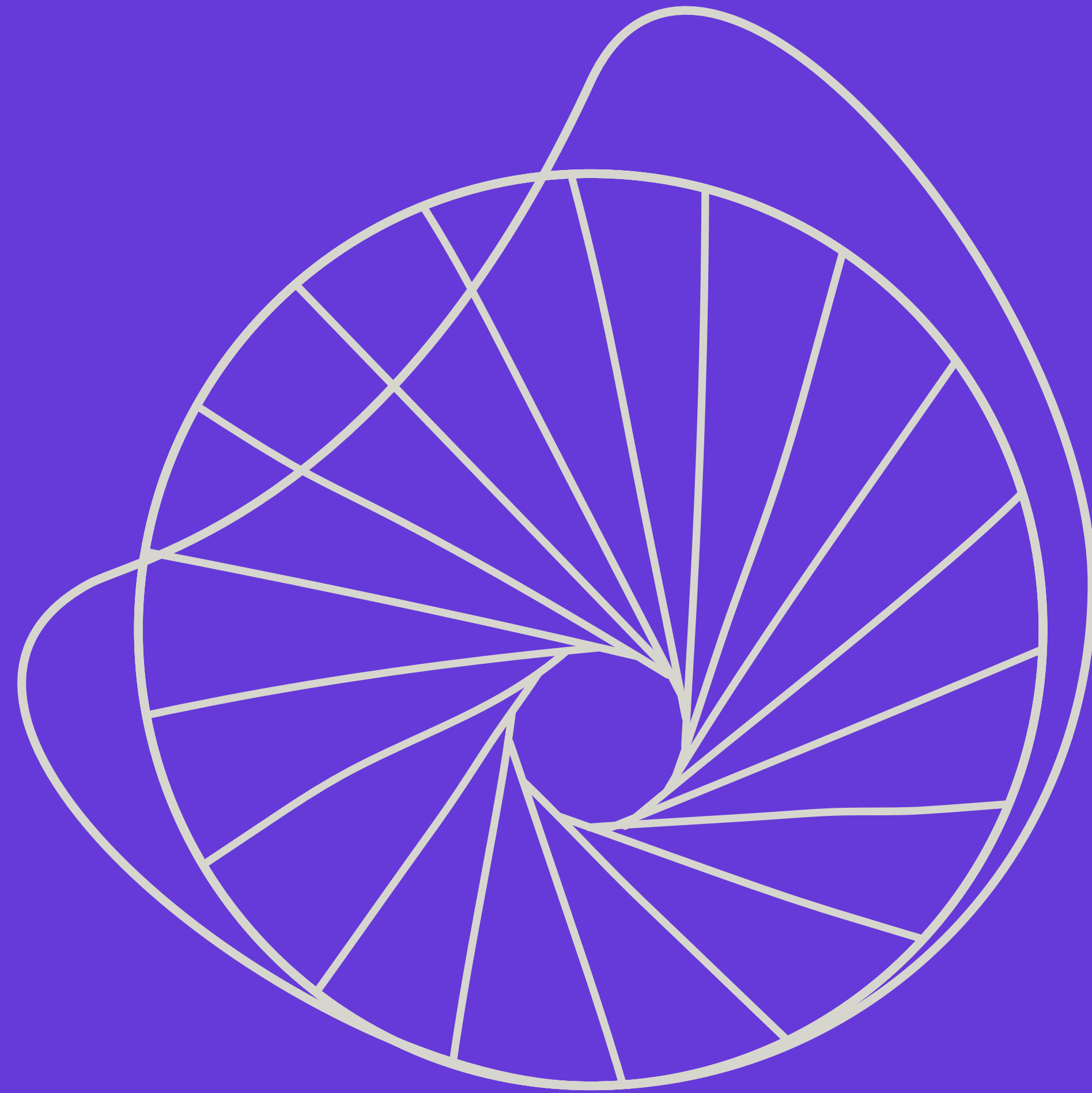
BIOFEEDBACK IN PHOTOGRAPHY

Integrating the concept of 'feedback' from Norbert Wiener into my research provides a system for understanding the significance of what I'm making. The term 'biofeedback' itself emerged later, in the 1960s, as researchers began to apply these principles specifically to biological and physiological processes. [21] What I want to know is how biofeedback will influence the way I approach photography.

I believe it will allow for a unique form of control over the creative process. Unlike traditional photography, where the photographer decides when to take a photo, biofeedback will introduce an instrument that will guide decision-making in order to improve the emotional relationship with photography. This method will add a level of unpredictability and external control based on emotional responses, resulting in a dynamic and responsive art-making process.

METHODS


To answer my research questions I'll use the methodes: Research via articles, essays, experiments and experiences. The papers that were used for this research can be found in the bibliography.



EXTENTION OF THE HEART

Facing my nightparanoia and social anxiety by doing streetphotography at night.

RESEARCH & INSPIRATION



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filmphotography.eu

Polaroid 636 Talking Camera - Learn more about this speaking camera


The Polaroid 636 Talking Camera is a talking instant camera. More information about the camera and the matching films from Polaroid...



ssbkyh.com

Shinseungback Kimyonghun

Nonfacial Mirror, 2013, facial mirror, webcam, servomotor, Arduino, computer, face detection algorithm, custom software and wooden panel, 30x30x135cm. The mirror avoids faces. One can look at his/her face in the mirror only when it is a nonface.



driesdepoorter.be

Trophy Camera, 2017-2022

'Trophy Camera' is a photo camera that can only make award winning pictures. Just take your photo and check if the camera sees your picture as award winning. This A.I. powered camera has been trained by all previous winning World Press Photo's of the ye...

MORE THAN A CAMERA

A photography camera has a clear purpose, to take photo's. What happens when you start questioning that purpose?

POLAROID 636 TALKING CAMERA. [5]

The camera has the ability to record and play back messages. Conceptually, the Polaroid 636 Talking Camera challenges the traditional boundaries of photography by questioning its purpose: Is it to capture a moment visually, or can it also encapsulate the emotions and context through sound? Ultimately, the Talking Camera makes us reflect on how the integration of different sensations can enhance the storytelling of photography.

Polaroid 636 Camera [5]

Nonfacial mirror -shinseungback [13] Trophy Camera -driesdepoorter [6]

NADIA [20]

Instead of an LCD screen, Nadia uses the 'Acquie' automatic rating engine to score your pictures. When the score is high enough, you press the shutter to take the image. This experiment critiques our growing dependence on automated technology in creative processes and raises questions about the role of subjective human judgment in art. But aesthetics are subjective, and similar to this project I critique this subjectivity. Don't conform to a general opinion. Focus and place you value on your own experience.



Nadia

The camera that thinks, so you don't have to.

Nadia by Andrew Kupresanin [20]

STEP. 1

✦ INVENT AN EMOTION DETECTING DEVICE! ✦ *Very realistic*

WHERE TO START

After opening up an analog camera, I gained a newfound appreciation for the collaboration between digital and analog inner workings of my point-and-shoot. I decided to start learning some basic Arduino code to understand its mechanics better. I chose Arduino because it's a beginner-friendly microcontroller platform. A microcontroller can perform simple tasks like activating sensors and small motors.

Additionally, Arduino has a large community that shares their project research and code, making it easier for beginners to learn.

BINGO!

Browsing projecthub.arduino.cc, I found a lie detector project^[19] inspiring me to adapt it for a camera. The lie detector worked by sensing a change in conductivity caused by a nervous sweat, when a lie is told an LED will light up. I want to replace the LED with a motor to trigger my camera when I'm emotional.

THE SIGNIFICANCE OF SWEAT

There are two different types of sweating.^[10]

1. Thermoregulatory sweat (sweat from heat)
2. Psychological sweat (sweat from emotive stimuli)

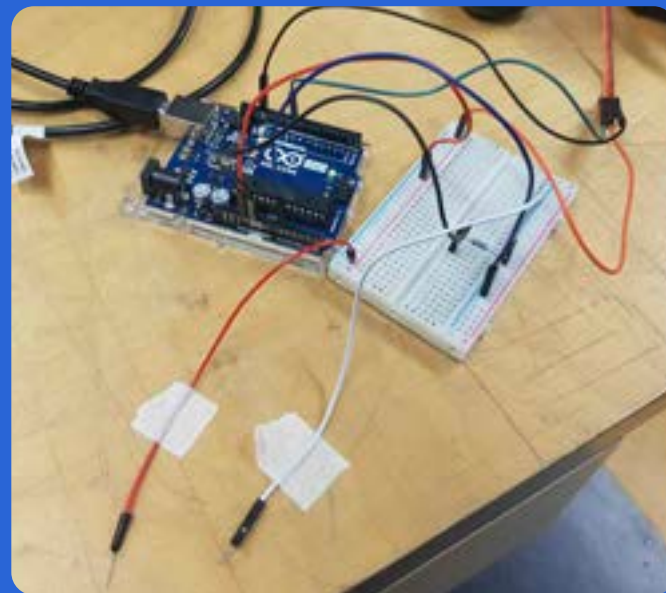
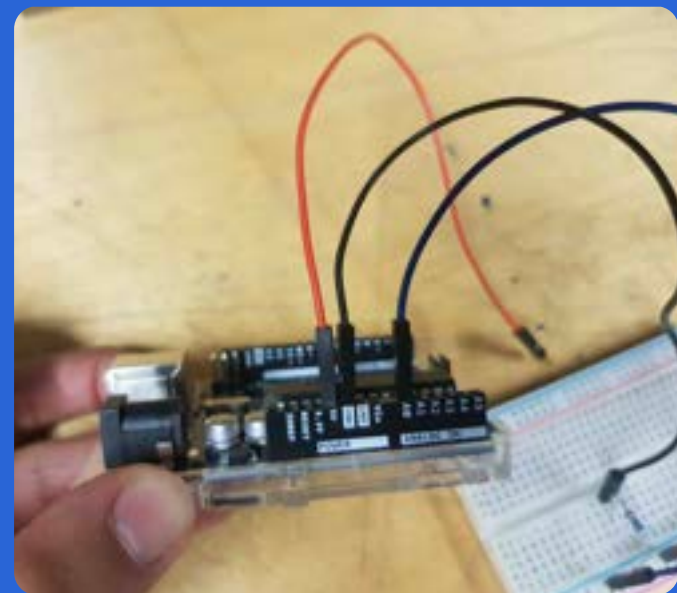
Since the first step in this project is to detect emotions, I'll be using psychological sweat as the signifier of my emotions.

“Psychological sweating in response to emotive stimuli like stress, anxiety and pain occurs over the whole body surface.”^[10]

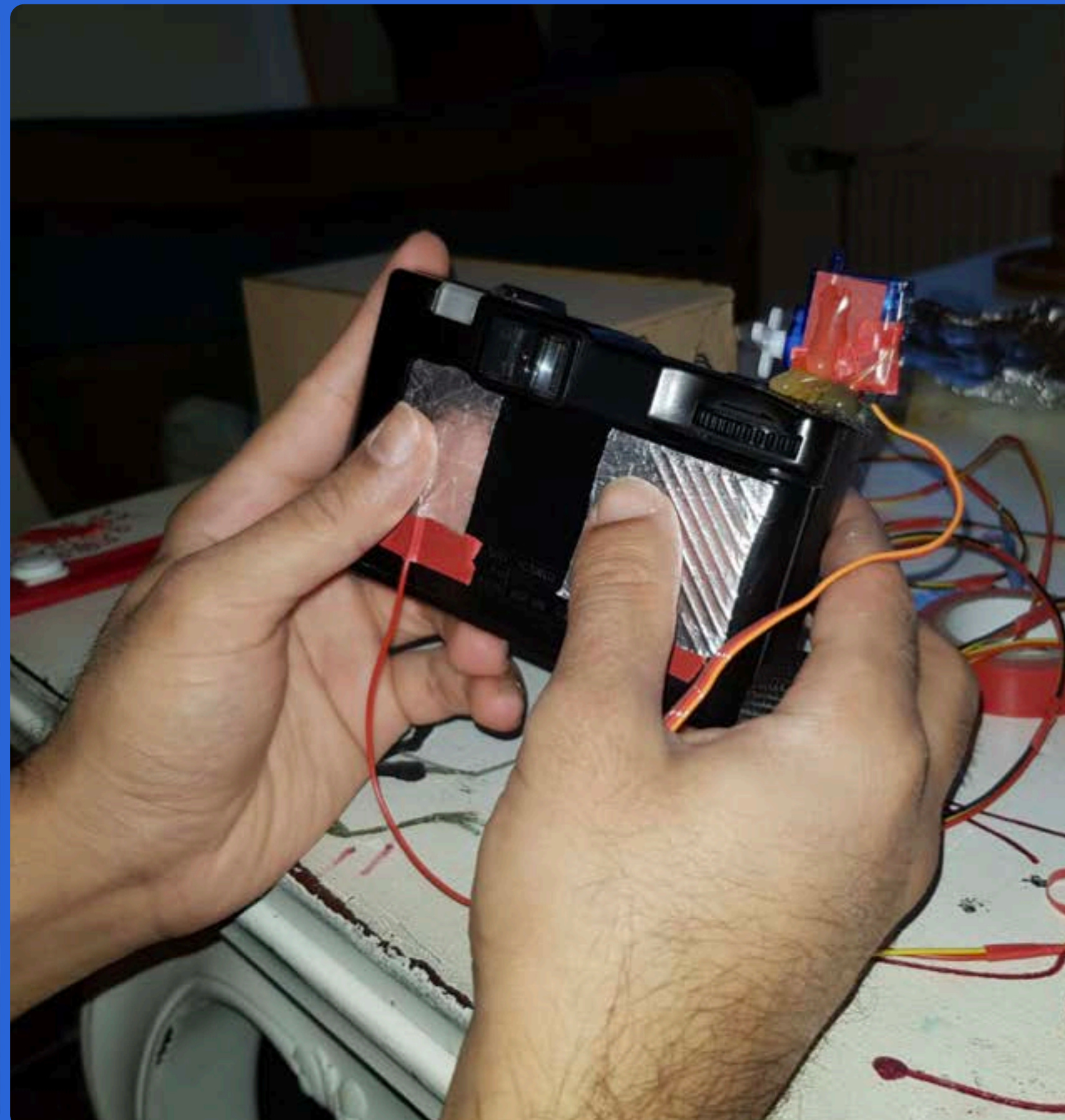
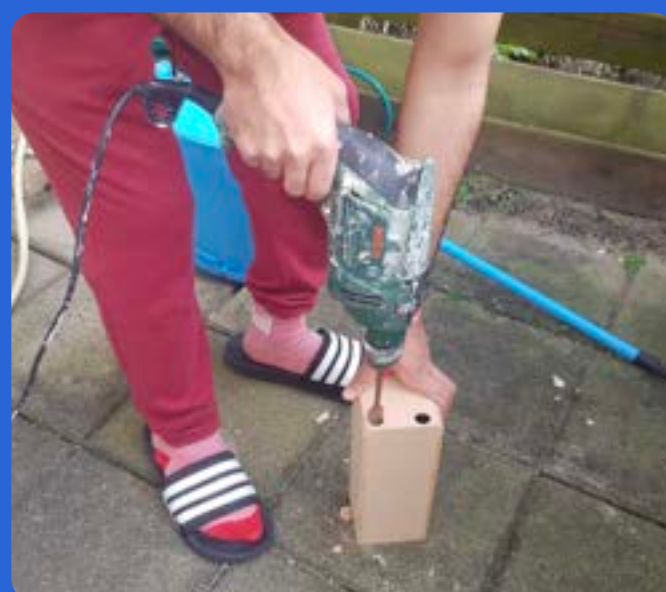


STEP. 2

✦ BUILDING AN EMOTION DETECTING DEVICE! ✦ *Very realistic*



```
void loop(){  
  if (analogRead(A0) > 4)  
  {  
    Serial.println("photo");  
    myservo.write(173);  
  }  
  if (analogRead(A0) < 4)  
  {  
    Serial.println("No photo");  
    myservo.write(97);  
  }  
}
```



HOTGLUE AND SWEAT

Tutors at the academy assisted with code changes and wiring for my first prototype. Wiring posed a bit of a challenge, resulting in a prototype that resembles a suspicious-looking device with red and black wiring... it's hard to trust the process.

The device measures the photographer's finger conductivity with two sensors attached to the camera using aluminum foil. Conductivity changes with psychological sweat, which increases when the photographer is uncomfortable. A motor, hot glued to the shutter, controls the camera's trigger and takes a photo only when the preset conductivity level is reached.

STEP. 3 Facing my nightparanoia and social anxiety by doing streetphotography at night.

Extention of *The* Heart

SEEKING DISCOMFORT

Marshall McLuhan gives the following example in *The Medium is the Massage*: "Societies have always been shaped more by the nature of the media by which men communicate than by the content of the communication."^[15]

In my project, "Extension of the Heart," I apply McLuhan's idea of media shaping society to my exploration of photography. The title of my project references McLuhan's concept of "extension of the eye," implying that media extend our senses. Rather than taking photos to please others, I use photography to capture emotions and self-explore, highlighting the medium's impact on personal expression and identity, in line with McLuhan's view.

CATHARTIC

Photography offers a creative way to express complex emotions that are hard to put into words. By capturing discomfort through images, you can externalize your feelings and explore them visually, providing a sense of relief and aiding in processing difficult experiences. Similar to how crying allows us to express and process intense emotions such as sadness, grief, or frustration.^[16]



REFLECTION

“SWEAT, IN THE END, IS MORE THAN JUST THE BODY’S AIR CONDITIONING SYSTEM. IT JUST MIGHT BE AN EMOTIONAL WEATHER VANE AS WELL, A TOOL USED FOR BROADCASTING OUR INNERMOST FEELINGS TO OUR FRIENDS AND FAMILY.”-BBC^[9]

PROOF OF CONCEPT

I discovered that I could invent and build an emotion-detecting device for my camera. I’ve adapted Arduino code from ProjectHub to create an emotion-triggered camera attachment. The photographer (me) needs to confront fear and discomfort for the camera to work, forcing self-exploration and reflection.

EMOTIONAL

Reflecting on the images I've captured, I realize that there's a common thread between the ones I find most meaningful and the ones that were the most challenging to take. Looking back on the nerve-wracking and awkward interactions I had with people at night, I find that despite the device's suspicious and slightly threatening appearance, it sparked curiosity. Strangers commended me for using this as an opportunity for personal growth, and many were enthusiastic about participating in the photographs, even though they wouldn't get to see the final result.

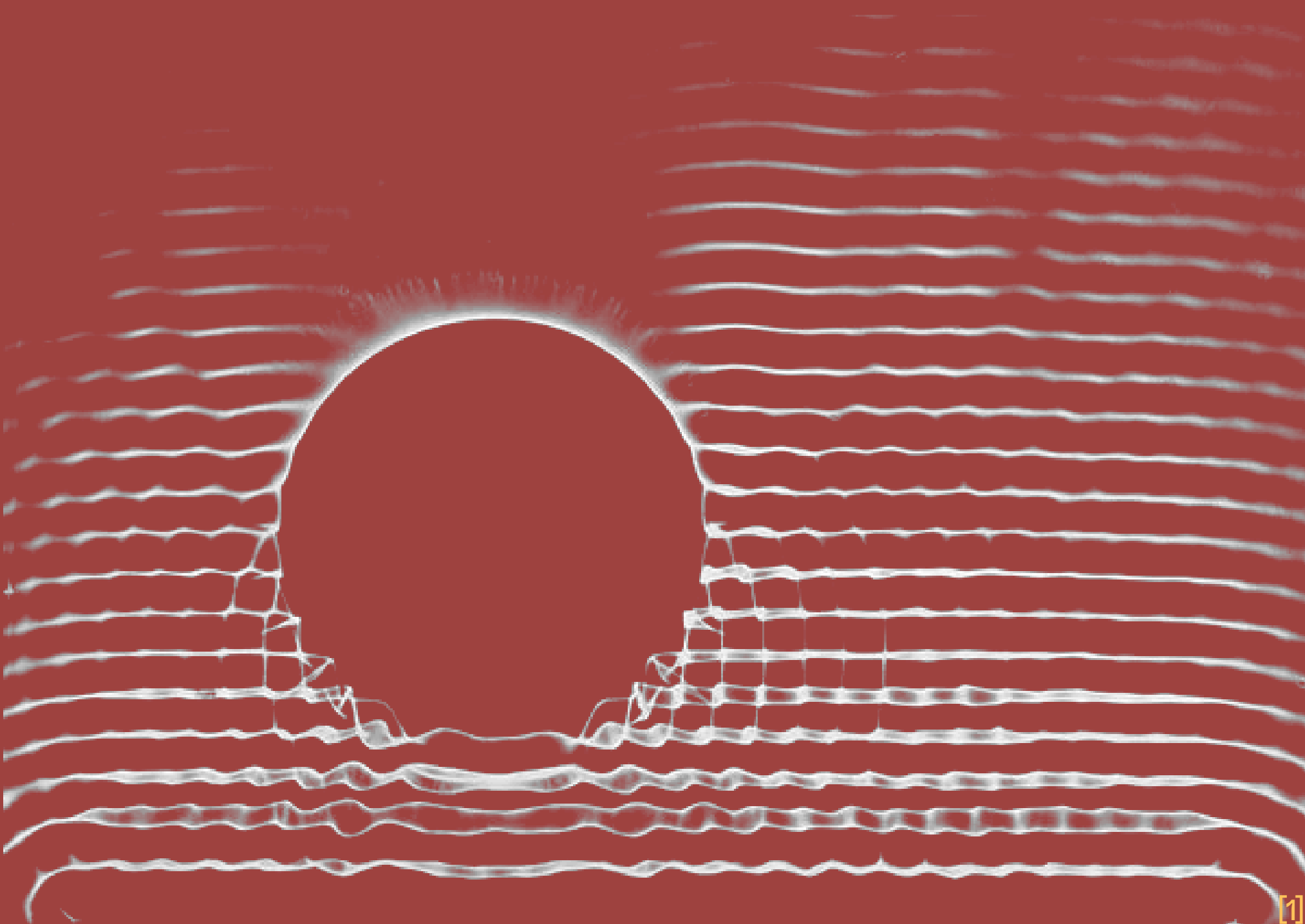
QUESTION

Can I improve the usability of the device?
How can the use of discomfort threshold change behavior?
What’s the social significance of this device?

Discomfort-zones & Triggers

EMOVERE

THE WORD 'EMOTION' COMES FROM THE LATIN, EMOVERE, REFERRING TO 'TO MOVE, TO MOVE OUT'. OF COURSE, EMOTIONS ARE NOT ONLY ABOUT MOVEMENT, THEY ARE ALSO ABOUT ATTACHMENTS OR ABOUT WHAT CONNECTS US TO THIS OR THAT. THE RELATIONSHIP BETWEEN MOVEMENT AND ATTACHMENT IS INSTRUCTIVE. WHAT MOVES US, WHAT MAKES US FEEL, IS ALSO THAT WHICH HOLDS US IN PLACE, OR GIVES US A DWELLING PLACE.^[3]



CAPTURING EMOTIONS
IN A PHOTOGRAPH

STATING INTENTIONS

I've always taken a supporting role, but now I'm the focus. This shift is challenging, so I'm beginning this new chapter with interviews and conversations.

MARVIN KUNZ

Marvin Kunz is a Behavioral and Data scientist, Co-founder of the Probono TechLabs, and someone who writes language-based AI's.

Marvin told me; Emotions can either be felt first, followed by a bodily reaction, or vice versa. When we talk about connecting emotions to technology, we're delving into a realm that extends beyond mere functionality. It touches on the very essence of what it means to be human and how we interact with the world around us. By integrating emotions into technology, we're essentially blurring the lines between the organic and the artificial, raising profound questions about the nature of emotional expression and human-machine interaction.

He emphasized the importance of considering the relationship between my emotions, the sensor, and the subject. He stressed the need to deeply analyze how these elements interact and influence each other to ensure the effectiveness and authenticity of my project.

JASPER KAMPHUIS

During an interview with Jasper Kamphuis, an Alumni of WdKa advertising and founder of Studio Coat, we discussed various aspects of working on code-based projects without prior coding knowledge and collaborating with AI. Jasper highlighted that using tools like Teachable Machine or Lobe.ai allows individuals to train AI models without coding experience, enabling them to recognize images, sounds, and postures. Additionally, we explored the possibility of using facial recognition as an alternative to sensing sweat, which could change the project's direction significantly. Moreover, he suggested that if I want to collaborate on the project, it's essential to clarify the device's purpose, define clear goals, and document the challenges I've faced.

CONCLUSION

After my conversation with Marvin and Jasper urging me to refine the message and direction of my project, I delved deeper into research. Hoping to find sources to help me steer into the direction I want to take this project. I also need to start exploring the different use cases of discomfort.

MOVEMENT AND ATTACHMENT

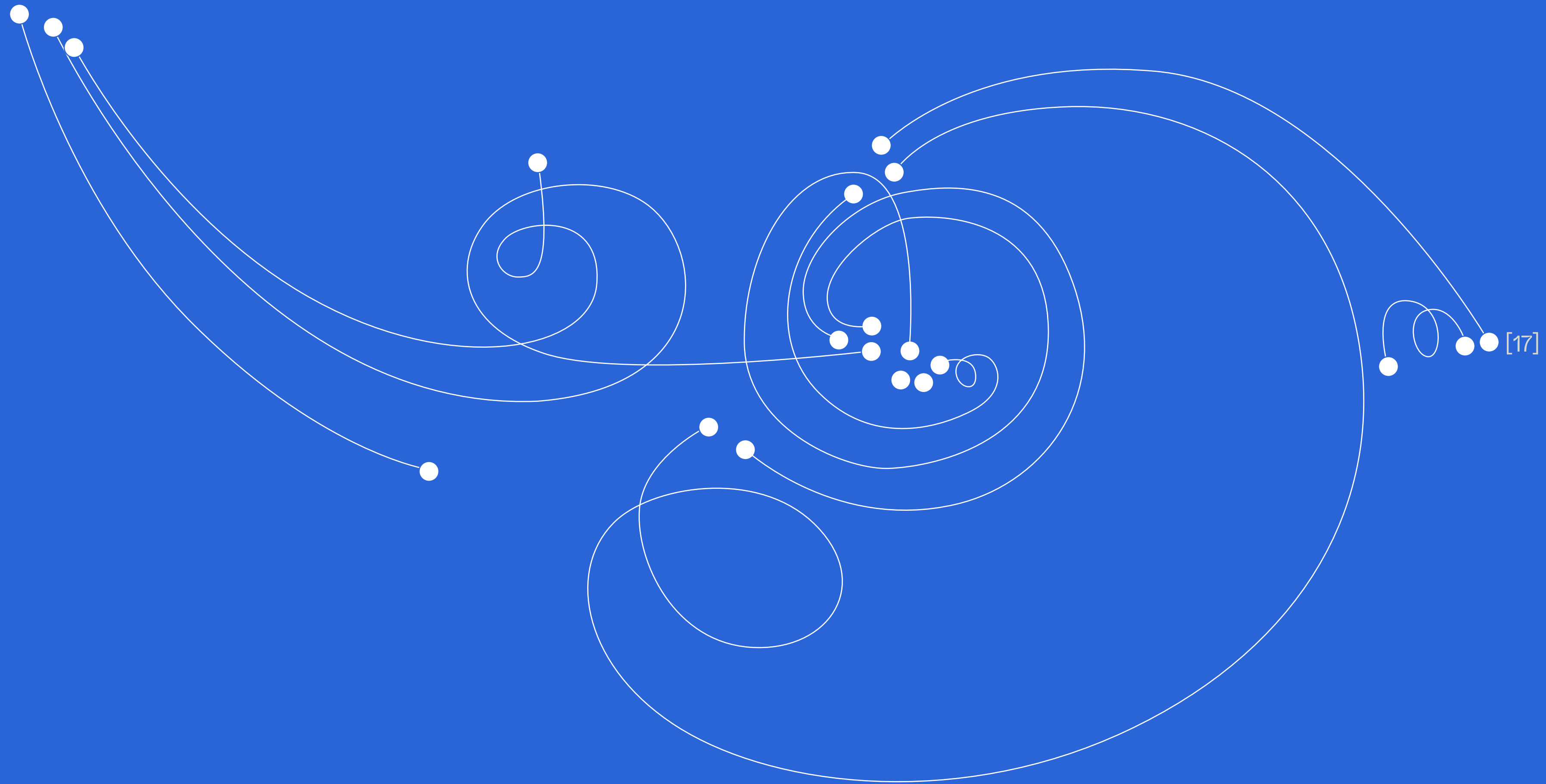
Ahmed Sarah asserts in *The Cultural Politics of Emotions* “We should note that the word 'emotion' comes from the Latin, *emovere*, referring to 'to move, to move out'. Of course, emotions are not only about movement, they are also about attachments or about what connects us to this or that.” [3]

Understanding that emotions are inherently dynamic and involve connections to people, places, and experiences gives me a clue on how to enhance the design of my device. A certain environment might initially be confrontational, but the way I move in that space can change how I feel about it. It would be useful for this device to be able to change its trigger threshold with a dial. Meaning, that you'll be able to change the intensity of discomfort needed before you can take a picture with the device.

“The relationship between movement and attachment is instructive. What moves us, what makes us feel, is also that which holds us in place, or gives us a dwelling place.” Movement “connects bodies to other bodies: attachment takes place through movement, through being moved by the proximity of others.” [3]

This text captures the motivation of my project. I aim to create an ‘Emotional (camera) Attachment’ for exploring one's emotions and surroundings. I'm placing this attachment on a camera to guide the user through different places and respond to their emotional state through the proximity of strong emotive stimuli. Creating an emotional attachment between the user, the camera, and the subjects, and using this tool as a way to inspire creativity and movement.

THE RELATIONSHIP BETWEEN MOVEMENT AND ATTACHMENT IS INSTRUCTIVE.



WHAT MOVES, WHAT MAKES US FEEL, IS ALSO THAT WHICH HOLDS US IN PLACE, OR GIVES US A DWELLING PLACE.^[3]



Abramovic, Marina. *The Artist Is Present*, Performance. 2010. [2]

WHAT DISCOMFORT DOES TO SOME BODY

Marina Abramović, famous for her performance art, challenges audiences to confront their own boundaries and beliefs. The trade-off for Abramović is often personal risk and vulnerability. She exposes herself to physical discomfort, emotional pain, and the scrutiny of her audience in pursuit of artistic truth and connection. However, she also gains a sense of catharsis from breaking down barriers between herself, her art, and her audience.

Inspired by Marina Abramović's willingness to embrace discomfort and vulnerability, I aim for my photography project to have similar elements of risk and emotional stakes. Like Abramović, I recognize the importance of exposing myself to human connections, particularly with those I value and have relationships with, in order to capture genuine emotions in my images. By pushing past my fears and embracing vulnerability, I hope to create a performance through photography that resonates with emotional depth and authenticity, allowing viewers to engage with the rawness of human experience.

GROEPIJN

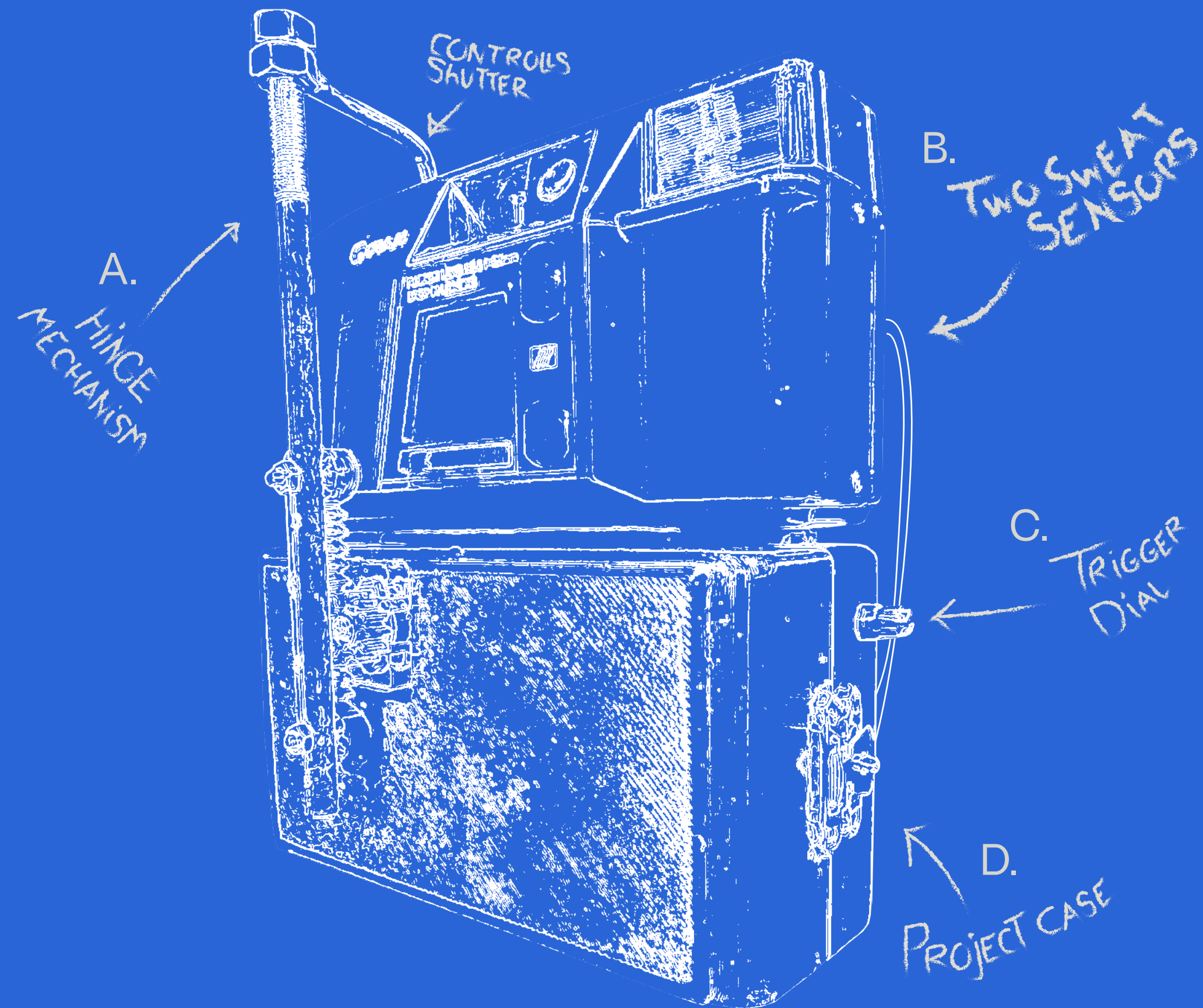
The Dutch term 'groeipijn' means 'growing pains' in English, referring to physical discomfort during growth and, metaphorically, to emotional or psychological discomfort during personal development.

In a key scene from *Fight Club*, the protagonist's hand is burned with chemicals. He's told that "This is your pain. This is your burning hand. It's right here. Look at it." [8] The goal is to not numb yourself away from the problem, have a good look at it, and reflect on what your instinctual resolutions are to fix it. Don't replace a feeling of discomfort with meaningless distraction.

The burning symbolizing the pressures and stress of society. This makes them reflect on the emptiness of chasing material goods in order to solve a problem, and instead of fixing the problem, conforming to societal norms. The burning hand serves as a wake-up call to look beyond material things and find true meaning in life.

Groeipijn, and the burning hand scene from *Fight Club*, highlight the importance of understanding societal influences on individual thinking. In photography, platforms prioritize fast content production for blind consumption, growing a cycle of seeking approval. These platforms condition users to tailor content for more 'likes', restricting reach if they don't comply. My goal is to shift the focus from seeking external validation to growing a deeper connection with one's own images, allowing for more authentic expression.

EMOTIONAL ATTACHMENT

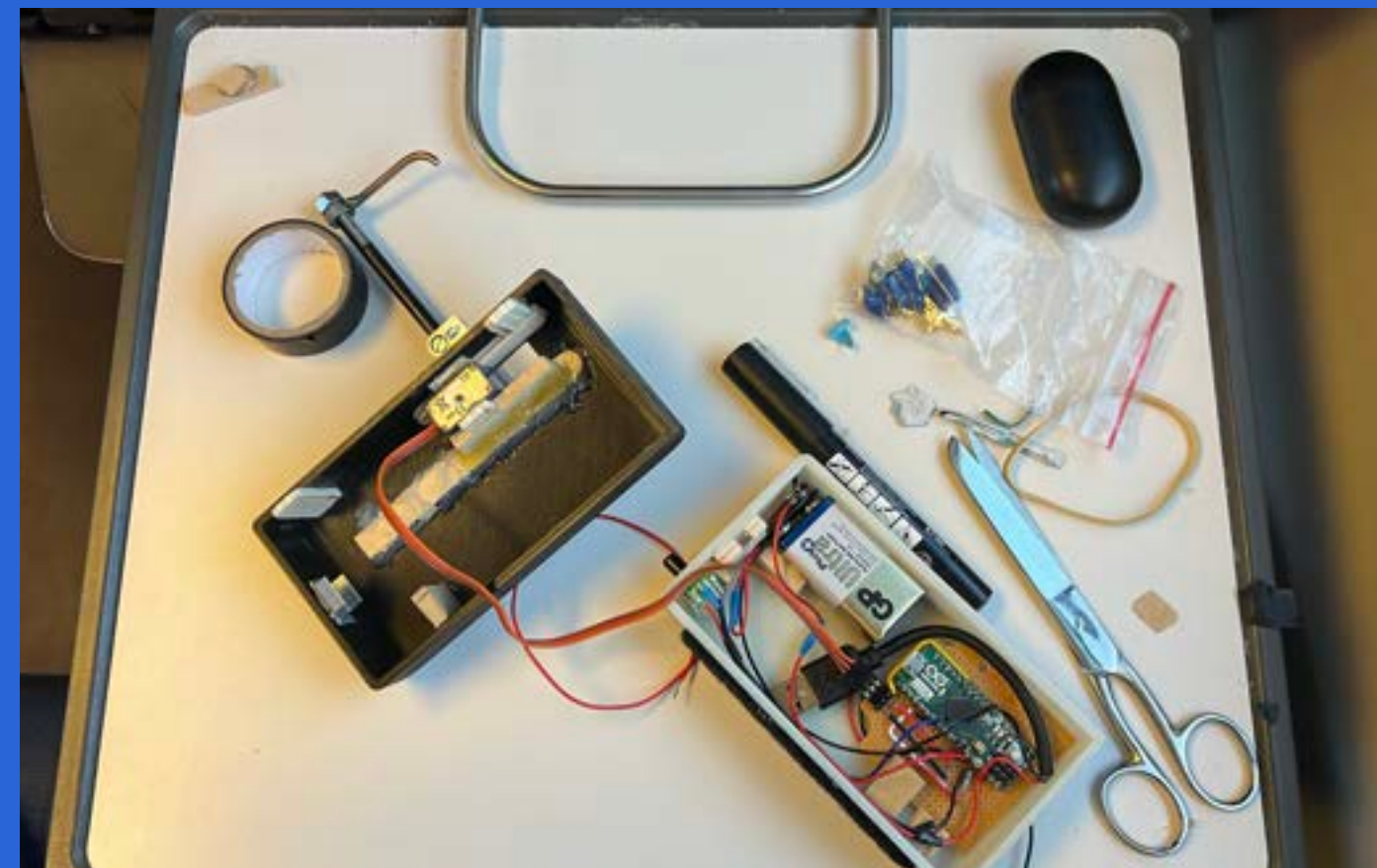
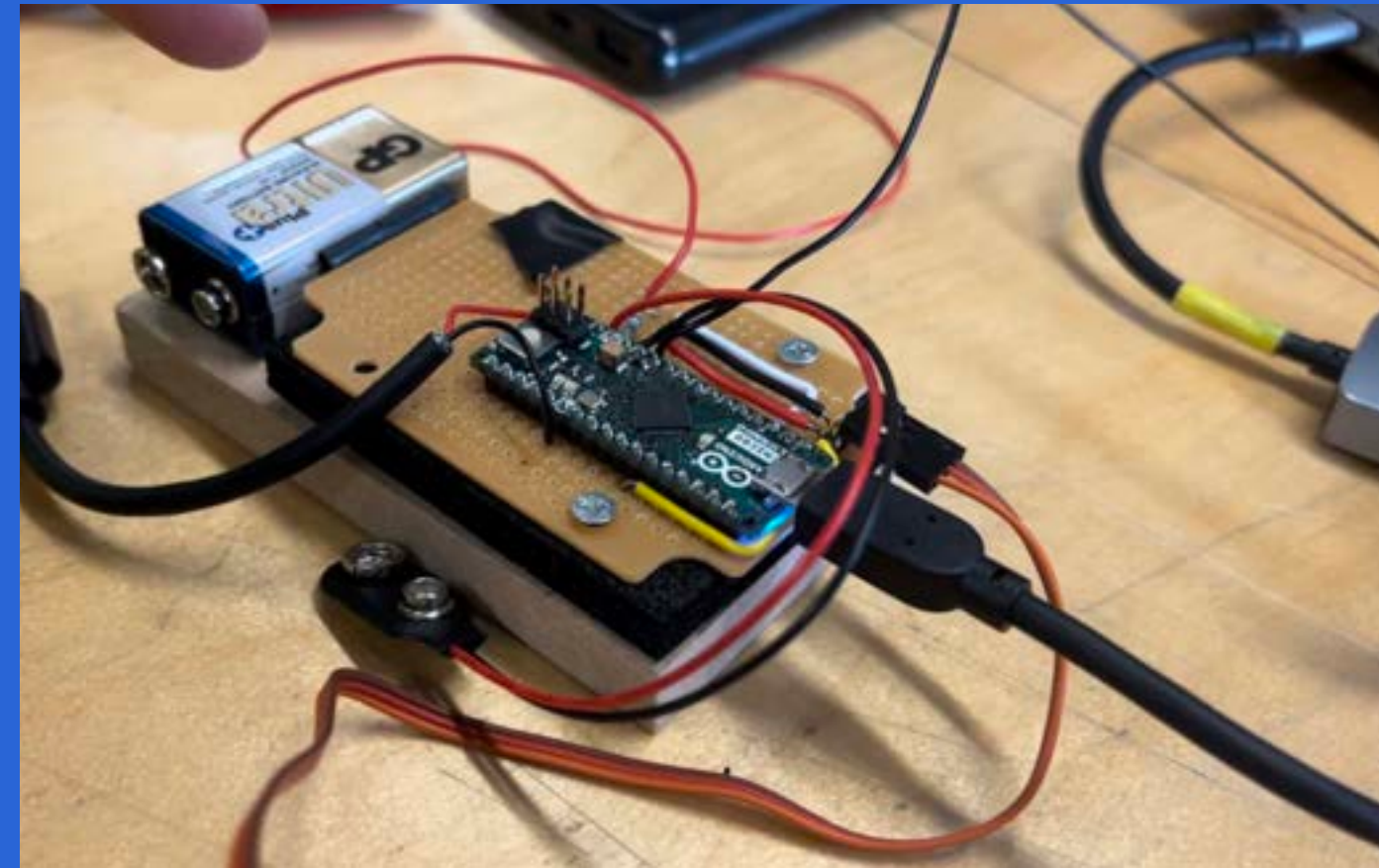
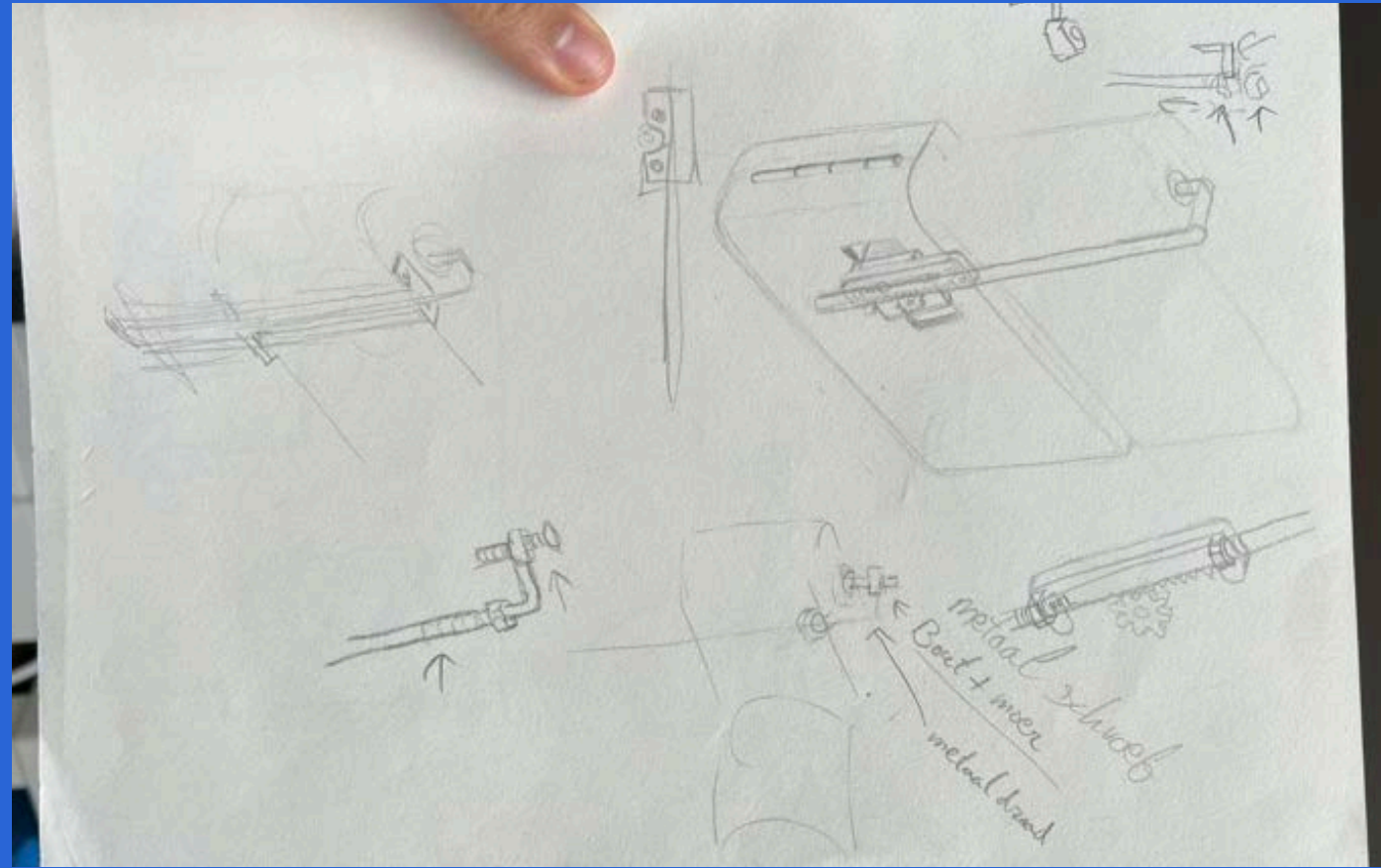


PROTOTYPE 2.0

With the insights gained from my research I build a new prototype. I call this new prototype the 'Emotional Attachment' based on the idea that emotions move us and cause us to make new attachments to what we value.

- A. The mechanical hinge takes over the shutter button, it presses down when triggered. An improvement on the previous hotglued motor.
- B. Two sweat sensors coming out of the attachment will be stuck on the analog camera of choice. These measure the emotions through the conductivity change of the photographer once faced with discomfort.
- C. The dial allows the user to change the trigger threshold.
- D. A compact and portable case, with replacable batteries making an attachment by adding valcro on the top.

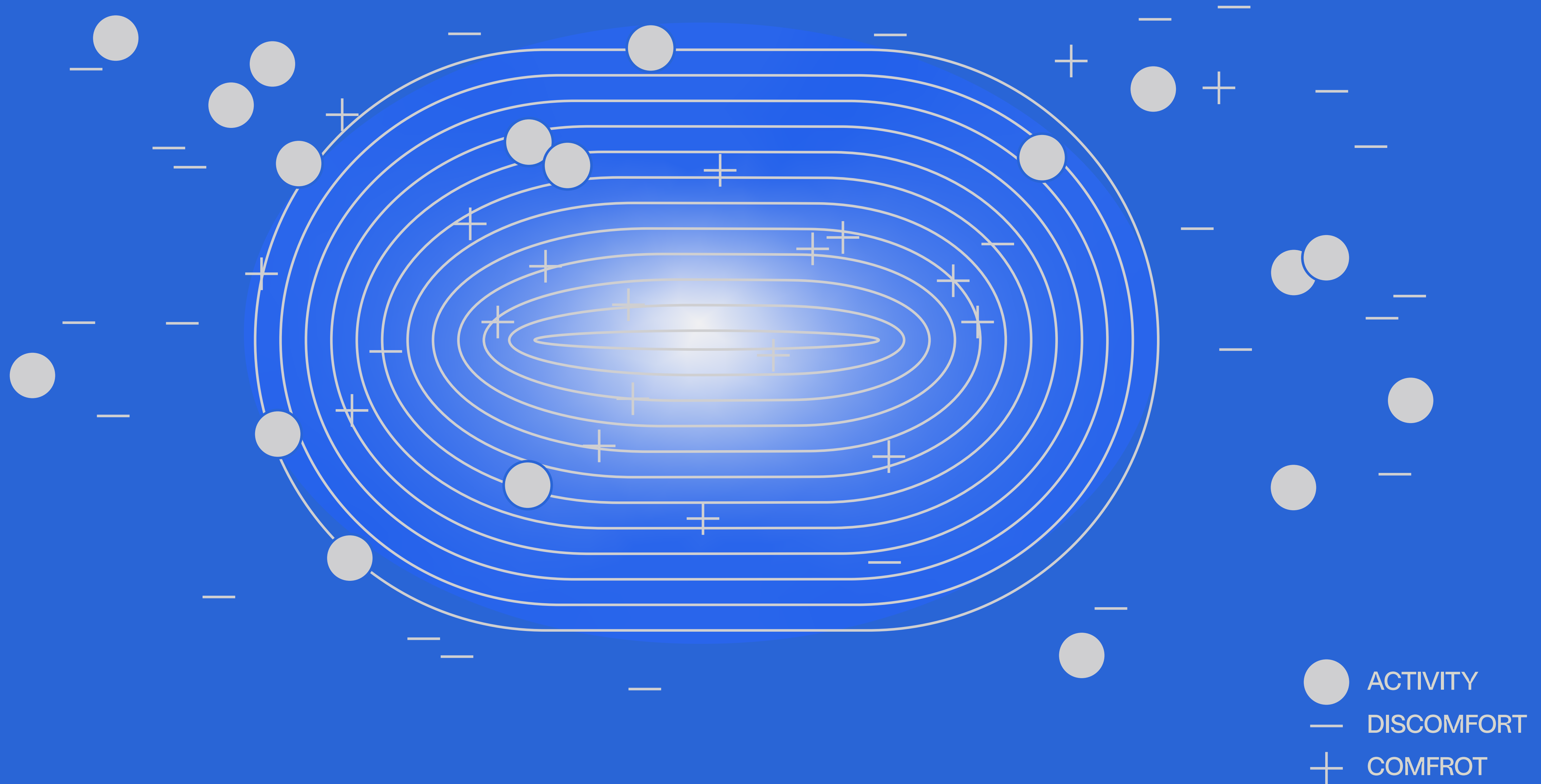
PROCESS





The Book of Hearts

“THE MORE YOU ENGAGE IN MEANINGFUL ACTIVITIES, THE MORE LIKELY YOU ARE TO EXPERIENCE DISCOMFORT.” [1]

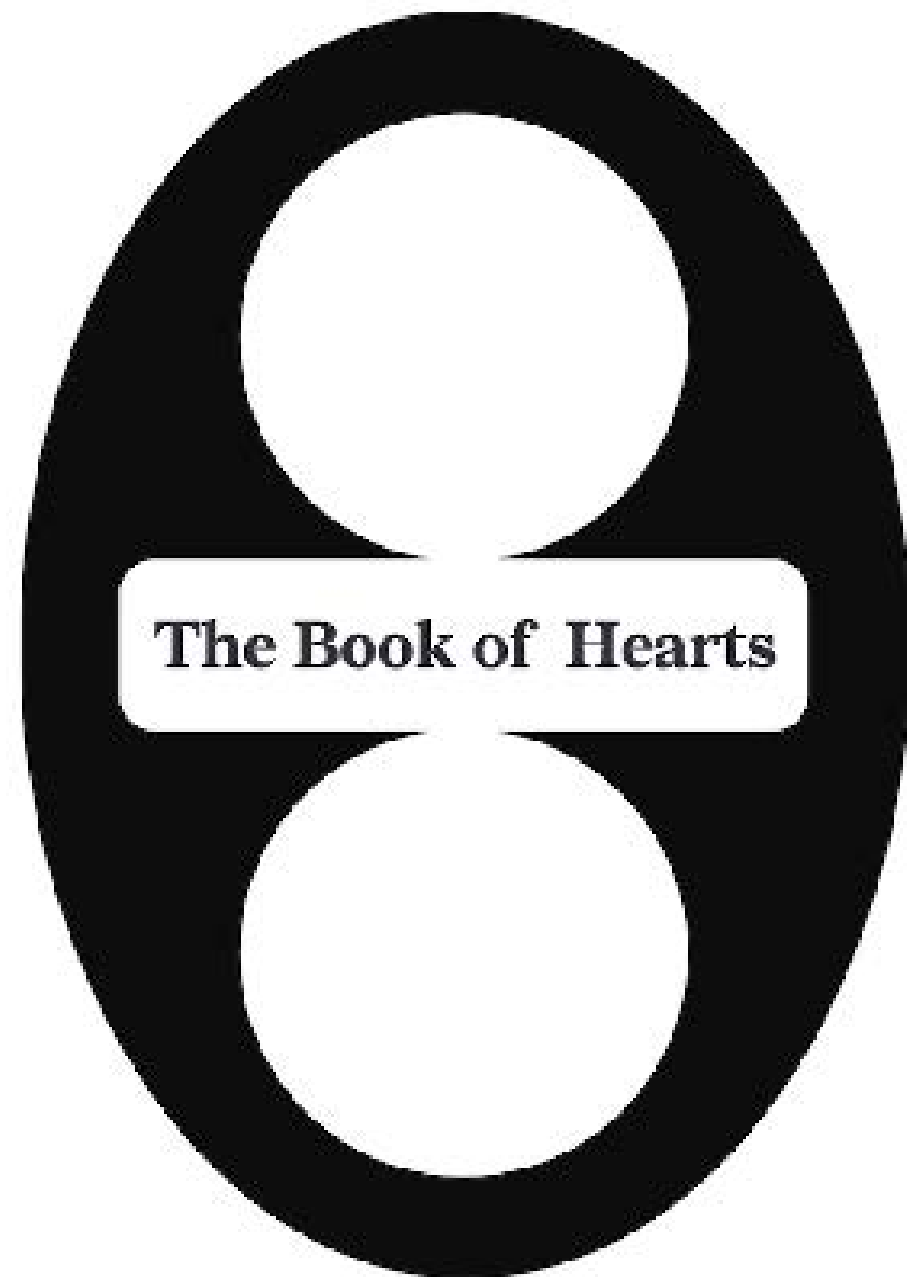




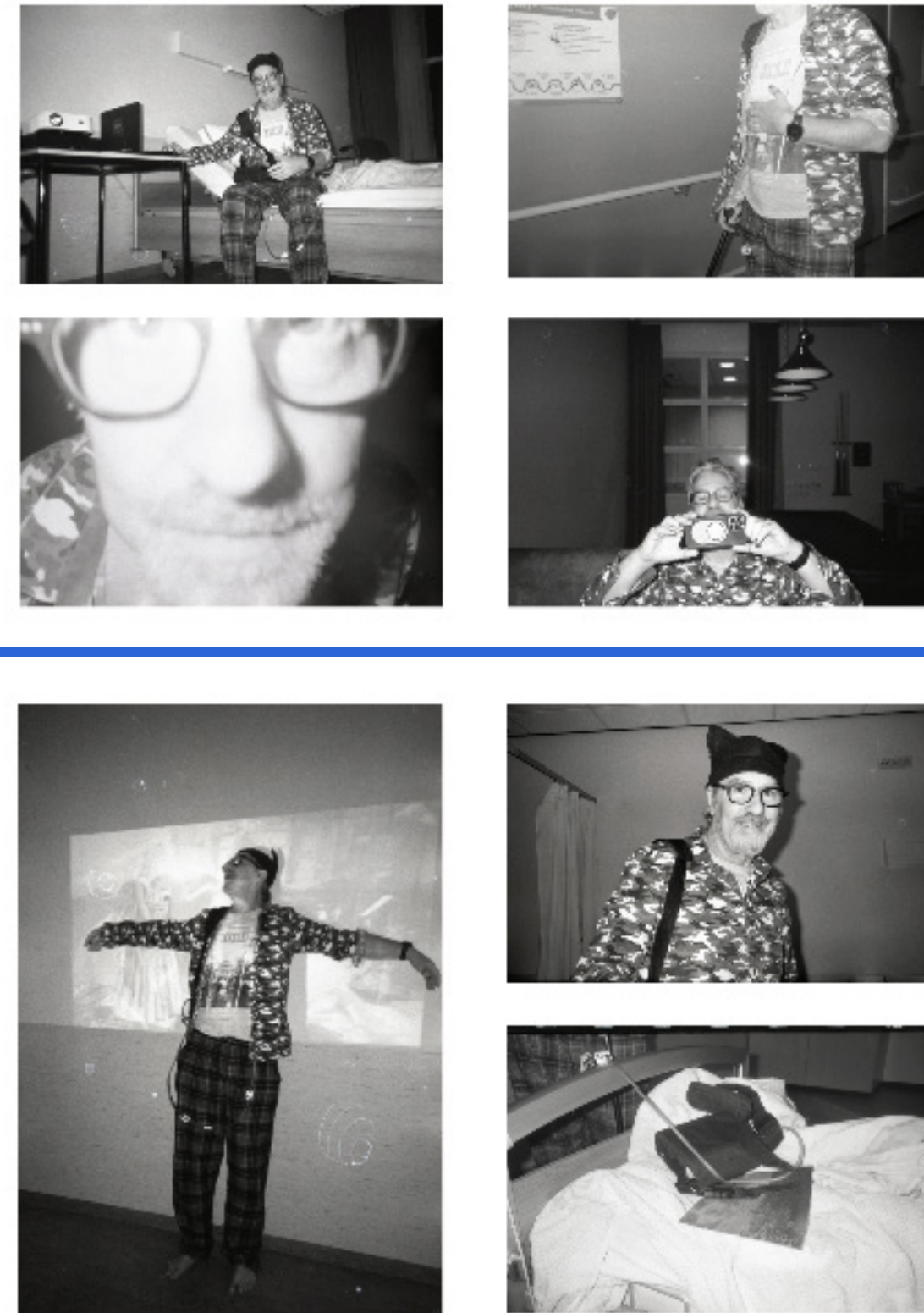
FATE IS NOT WITHOUT A SENSE OF IRONY

In this experiment, I visited a hospitalized friend—an artist recovering from open-heart surgery in a sterile white room. Before visiting him, I had sent him some images I had taken to hang up on the walls. He called me back, telling me that these images had served as the strongest painkillers he has had since being at the hospital. So I decided that I wanted to create even stronger "painkillers" by taking pictures with my emotions, directly from the heart. I went to visit him and spent the night taking photos. This was a huge challenge for me, as I have spent a lot of time in the hospital with my grandpa and a friend who tried to end their lives. I knew it would be triggering to see him there with his chest cut open, but this challenge was necessary for to take highly emotional photos.

PHOTOSERIES



Zaid Murtaza



HEALING PROCESS

Arriving at the hospital, I was instantly hit with a feeling of anxiety. After greeting my friend and showing him my device. We started immediately taking photos. I experimented with pushing the trigger dial's difficulty level to its limit, ranging from 0 to 10, where 0 is total comfort and 10 is extreme discomfort. While attempting to take photos throughout the night, setbacks would occasionally occur, initially disappointing me. However, I came to realize that these setbacks signaled a need to push myself further.

Sometimes, when my artist friend tried to guide the image-taking process, the attachment wouldn't cooperate. Initially frustrating, again I realized that the device protected my emotions by prioritizing them over the subject's preferences. It allowed my heart to directly engage with the environment without interference. Overall this unpleasant situation turned into a valuable memory, with unique, to the moment, photographs.

Afterward, I printed and developed the analog film roll myself, and sent the printed results to my friend, Phill. The images were hung on his wall and continued to serve their purpose as strong 'painkillers'.

TOOLS OF INTERFERENCE EXPO



DEBUT EXPO

Tools of interference expo was my first experience with sharing my art, in this case photography, in a public setting. This expo was held in the Sodafabriek Schiedam, organized by WdKA students.

Conclusion:

I received great feedback from the visitors; many engaged with the device and asked questions about how it works and whether it's 'real'. This is a huge compliment, as it suggests that some people find it almost unbelievable that this device could work. There's one problem. Despite changing the Trigger Threshold throughout this project, the measurements weren't visible.

Question:

How can I visualize measurements in photography?
How do you interpret results?

FAMILY FRIENDLY

Finding which family members triggers me the most.



FULL CIRCLE

EID-AL-FITR

A religious festival marking the end of a month of fasting in Islam. On this day, my family gathers at our home, and it becomes a joyfull and chaotic day as we try to engage with everyone and ensure they are well-fed and entertained.

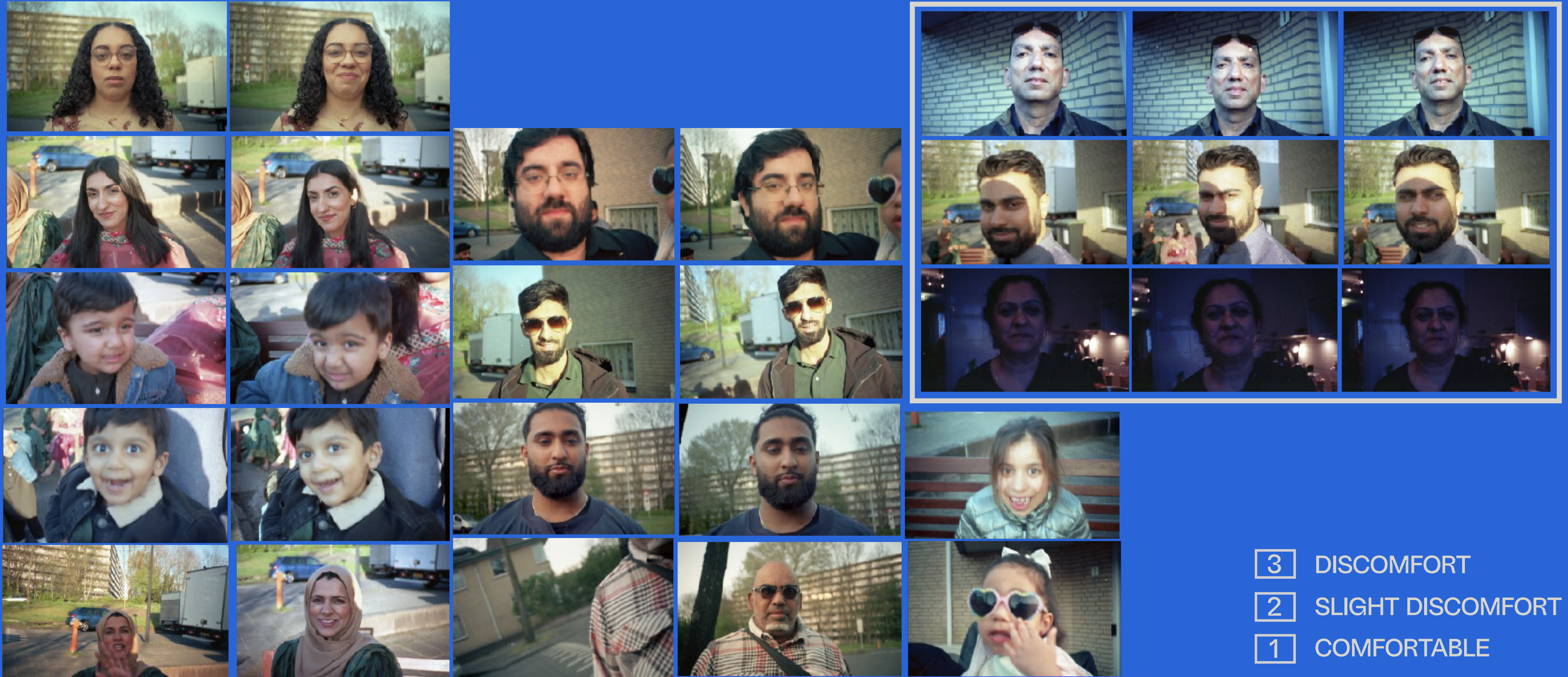
Even though I love all of my family members, there's a difference in how comfortable I am with each of them. On days like this, I'm usually asked to take photos for people. This time however, it won't be for them but rather for my self.

Drawing inspiration from the concept of "groeipijn," I set out to explore the nuances of discomfort within the intimate context of my family dynamics. In my recent project, "Family Friendly". I aimed to visualize and understand which family members triggered me the most. The irony lies in the fact that while people are giving me their best smiles, I'm determining who makes me uncomfortable.

Methode

I used a simple approach, setting a low "trigger threshold" and capturing images. I gradually increased the difficulty with each image I managed to take of the same person. Certain family members cause stronger emotional reactions from me, this will reflect in the number of photos I'm able to take of the person. Since the 'Emotional Attachment' will keep allowing me to take photo's as long as I'm triggered enough. If I'm only capable of taking 1 image, that'll mean I'm comfortable with the person. 2 images will mean slight discomfort. 3 images means discomfort. 4 images would mean high discomfort.

RESULTS



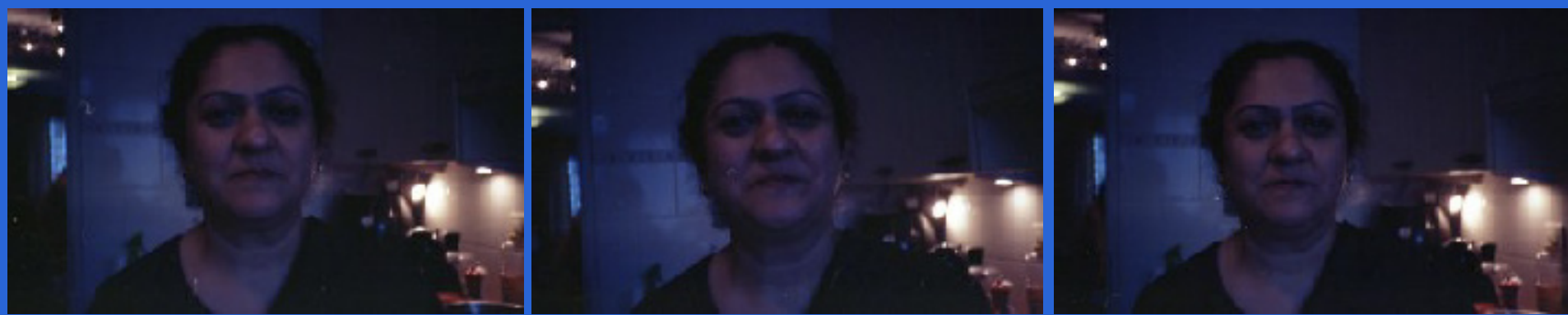
UNCLE



BROTHER



MOTHER



EXPECTATIONS

Two out of the three people I managed to take most photo's of are male family members that I expected to be more triggered by, however one person, my mother, I did not expect to be triggered by since our relationship is a gentle one. So let's figure out what these results mean. To do this I set up a system. See image .

The only differences were:

- Type of emotional responses.

- Uncle: Anxiety, Fear
- Brother: Anxiety
- Mother: Panic, Shame

- Situational Context

- Uncle: Group, Public
- Brother: Group, Public
- Mother: Solo, Private

Looking back, everyone was photographed in the same location except my mother. She's busiest on Eid-al-Fitr, managing the kitchen and day's responsibilities. She simply didn't have time to take part of this experiment, but with little day-light to spare, I reluctantly stopped her in her tracks and took the three photos. In normal circumstances, I would've never bothered her. But in this case, I chose my feelings over hers.

This experiment showcases the ability to visualize an emotional landscape with the use of this attachment. This landscape can be used as a visual indication of whom you might need to practice photographing, in order to reduce discomfort around them.

SYSTEM TO INTERPRET RESULTS

Number of Photos Taken:

- High Number of Photos:
 - Indicates a strong emotional reaction to that person.
 - Could signify unresolved issues, deeper connections, or significant past experiences with that person.
- Low Number of Photos:
 - Indicates comfort and ease around that person.
 - Reflects a stable and non-triggering relationship.

Intensity of Emotional Response:

- High Intensity (high trigger threshold needed):
 - Suggests that interactions with this person provoke strong emotions, requiring a higher level of discomfort to be felt.
- Low Intensity (low trigger threshold needed):
 - Implies that interactions with this person can trigger you, indicating a light sensitivity to their presence or actions.

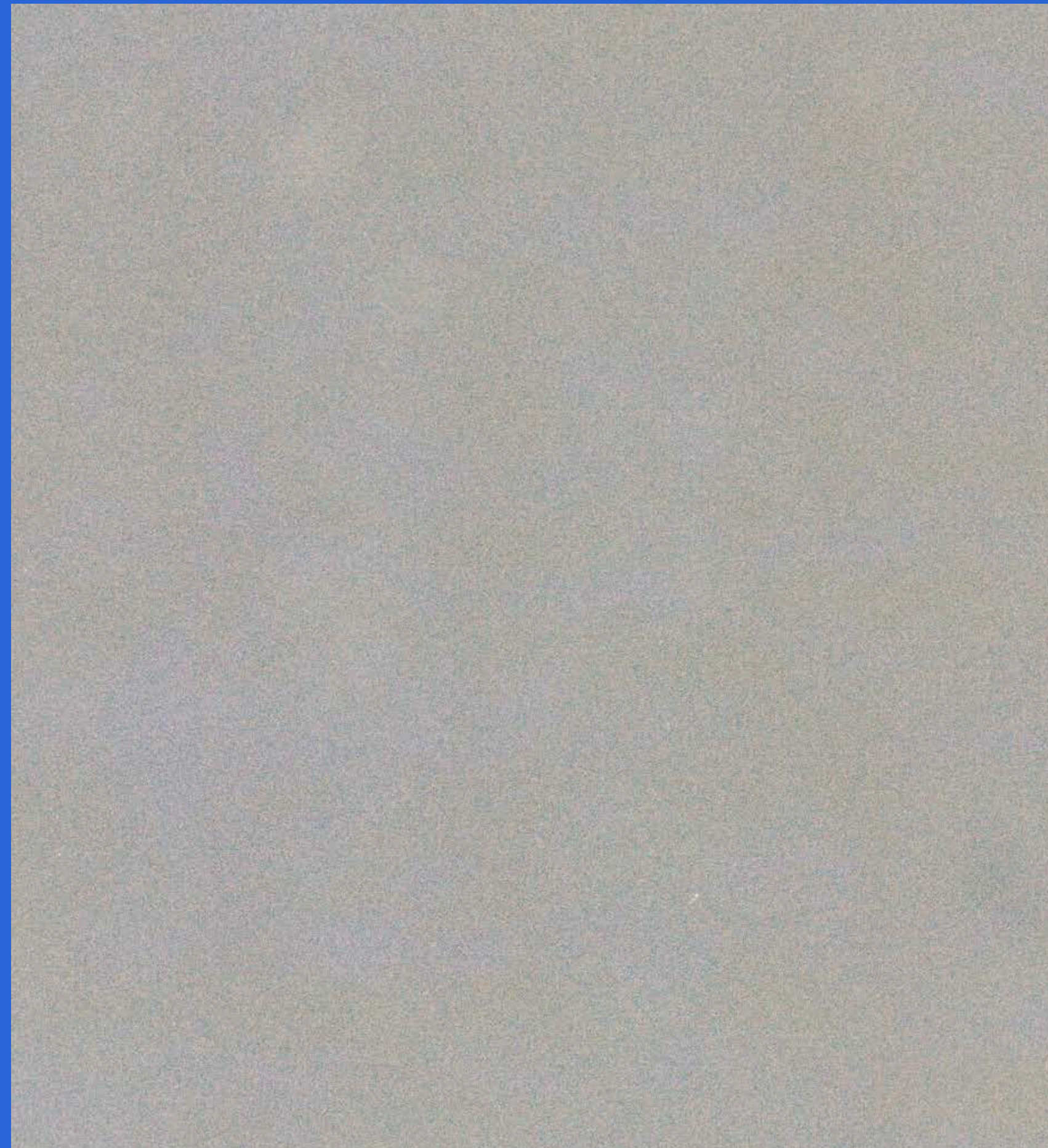
Type of Emotional Response:

- Negative Responses (anger, sadness, anxiety, fear, pain, panic):
 - Can point to conflicts, misunderstandings, or stress-related aspects of your relationship.

Situational Context:

- During Group Interactions:
 - How you feel about someone in a group setting versus one-on-one can vary. Note if the emotional responses change in different contexts. Surrounding may still play a role
- During One-on-One Interactions:
 - Provides more insight into your direct relationship with the person without the influence of others. Surrounding may still play a role

MISSING PICTURE



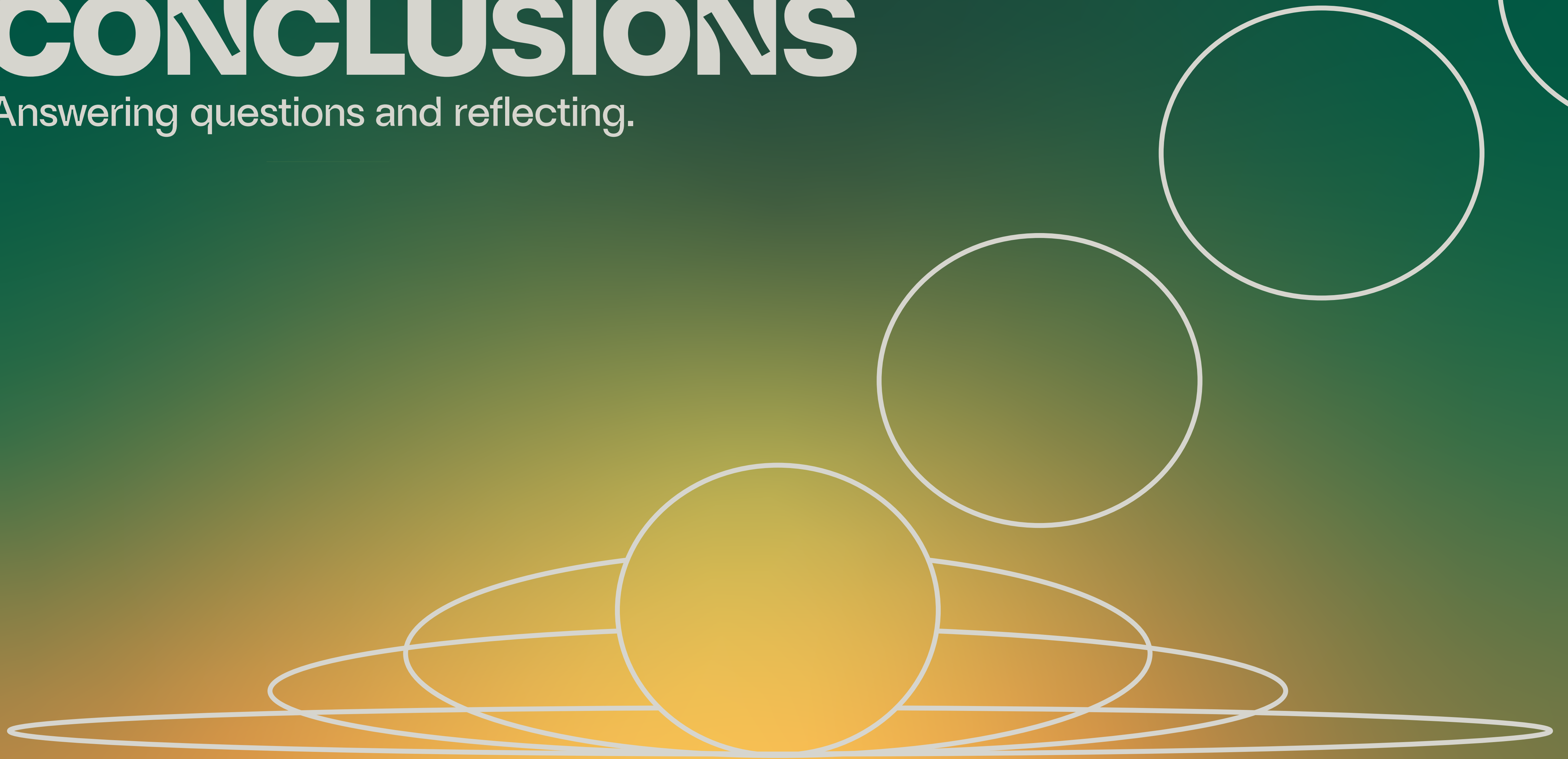
FATHER

One important person is missing from those family photos. And that person is my father. My relationship with him is complex; he has always supported my passion for photography, but he has always disliked my photographs. He doesn't like being in images, and on that day, he too was busy keeping the other husbands entertained. My father can be intimidating and quickly irritated. I knew that if I were to photograph him, I would most likely trigger me the most and make my point the best with this experiment. But I simply didn't manage to do it. This highlights one of the challenges while using my device, a device meant to force you to challenge yourself, cannot force you to act.

I've overcome my social anxiety with 'Extension of the Heart.' I've overcome part of trauma with 'The Book of Hearts,' but somehow, I can't take a photo of my dad on a busy day."

CONCLUSIONS

Answering questions and reflecting.

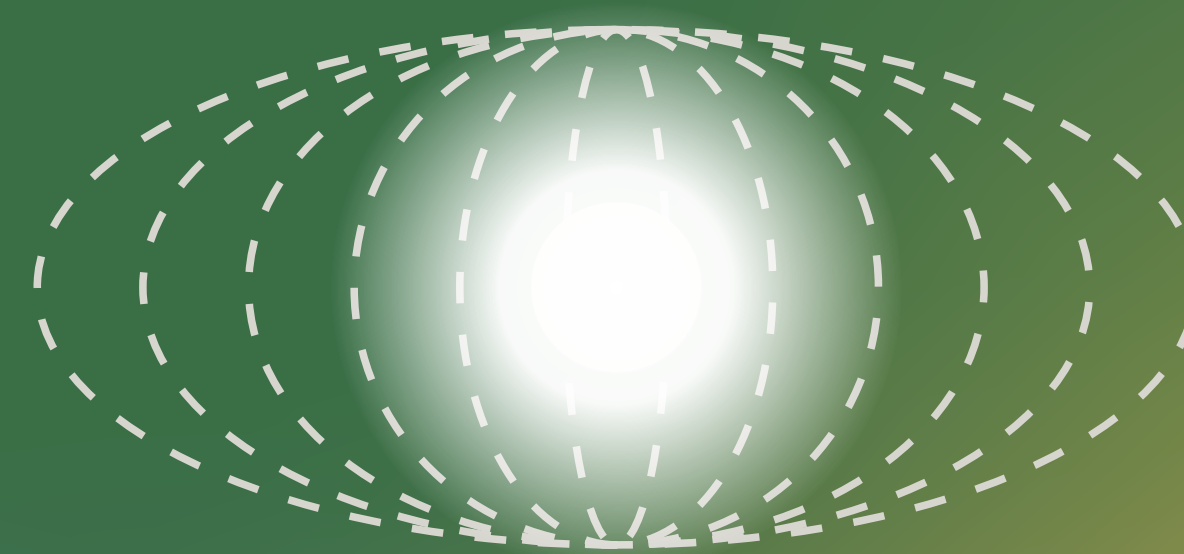


KEY DIFFERENCES BETWEEN *Emotion Mood Feeling*

A. Emotions are brief, lasting anywhere from a matter of seconds to minutes, at most.



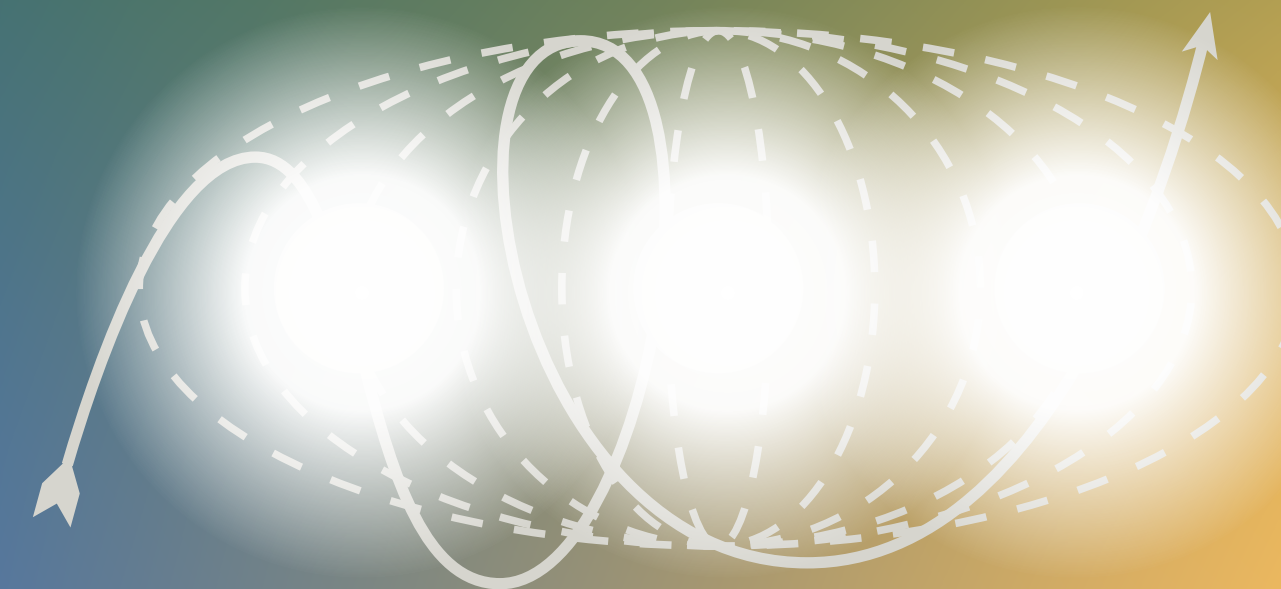
B. Moods, however, can last for hours, sometimes even days.



C. In a mood you can find yourself feeling angry, sad, and anxious.



D. Feelings are influenced by our emotions but are generated from our mental thoughts. They are more like opinions. [4]



HOW DO EMOTIONS INFLUENCE THE RELATIONSHIP BETWEEN THE PHOTOGRAPHER AND THE PHOTOGRAPH?

Each photographer's relationship with their work is unique, but using the 'Emotional Attachment' device creates a clear, bond of mutual respect. This device captures images only when the photographer experiences a significant emotional reaction, making each photo a true representation of their feelings at that moment. This selective process forms a powerful connection between the photographer and the images, giving them a certain emotional weight. This is exemplified by 'The Book of Hearts,' where my deeply emotional photos served as strong 'painkillers' for my hospitalized friend. This method emphasizes the authenticity and emotional depth of each photograph, transforming them into intimate pieces of art.

HOW DOES INTEGRATING BIOFEEDBACK TECH INTO PHOTOGRAPHY IMPACT EMOTIONAL EXPRESSION AND SELF REFLECTION

To break free from external feedback loops, we need consistency and motivation, enduring 'groeipijn'. "The motivation required to accept this active role may contribute to the effectiveness of biofeedback."^[21] I've learned that "the more you engage in meaningful activities, the more likely you are to experience discomfort."^[11] This insight guided my project 'The Book of Hearts,' where I faced old trauma to capture truly meaningful moments.

While anyone can take photos of discomfort, biofeedback helps identify the essence of what makes us uncomfortable. According to Paul Ekman, "Moods can last for hours while emotions last anywhere from seconds to minutes. This is why it's typically easier to identify emotional triggers but difficult to pinpoint the trigger for our moods."^[4] Biofeedback helps pinpoint exact moments of discomfort. In 'Extension of the Heart,' I confronted my night paranoia and social anxiety. However, most images captured social anxiety, likely because night paranoia is more of a mood, while social anxiety is an immediate response. In 'Family Friendly,' I anticipated high tension, which became measurable by changing tactics and adding a new feature to the device. By focusing on a specific family member and adjusting the threshold, I measured triggers by the number of photos taken.

REFLECTIONS

I am very proud and looking back at the project of how deep research has explored, and valuable lessons my experiments have taught me. It turned into a project that's about identity, self-exploration, growth and most importantly, a newfound appreciation for medium of photography

When I look critically at some of the experiments that I've done, I feel often there's one step missing, the physical manifestation of these photos. The only project that explored this was 'the book of hearts' in which the physical form served a function similar to painkillers. I still look critically at the final executions or manifestations of the other two experiments. If I could start over again, I would change how I made my photoseries. I would base experiments on visual inspiration from artists that have done similar projects. To make my process go smoother, I would divided the project into seperate catagories. The person, the device, the subject, and the image. Each of these subjects should get individual attention which I'm looking forward to use in my next project.

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