NIARA

Final Project B21 Report

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ABSTRACT

After a workout you normally feel satisfied for a relatively short period of time. Niara is a design which goal is to help people extend this satisfied feeling after being physically active. It visualises the physical activity with the help of fog, which represents the breath of the person. The representation of the breath will give the user time to reflect on their daily activity.
This paper reports on the design process of Niara, where decisions were made based on user tests, related work and our own instinct as designers. The user test showed the interest in fog in combination with light, related work showed that there are very little designs with fog and our instinct as designers made Niara the design that it is now.
Working with fog turns out to be a new and abstract way of data *physicalization* which can be further studied in the design field.

Keywords

Heartrate; Activity; Reflection; Extend satisfaction

Niara: let the fog represent your breath

INTRODUCTION

A major health concern nowadays is physical inactivity [5]. Even though there is a lot of evidence supporting that having an active lifestyle has important health benefits. Some of these health benefits are a lower risk for heart diseases and diabetes, a better heart and lung condition, it helps with hypertension, better mood states, stress reduction and exercise is associated with better quality of life [2, 10, 28, , 38].

*Barriers and enablers are important in someone's motivation to exercise. Many people find it very har*d to start working out or to stay motivated to keep working out and these barriers play a role in that. This causes people to drop out of their program. There are studies about the relationship of motivation and exercise, which state that the decision depends on weighing the benefits of exercise against the barriers [9, 17, 18, 21, 30]. These barriers are lack of confidence or self-efficacy, unrealistic outcome expectations and unfavourable weather conditions. Many design research papers focus on exercise itself. However, Daphne Menheere concluded in her study that a broader perspective is needed to help overcome these barriers [H]. To narrow our target group, we will look at women only, because research states that women show more barriers than men [17, 25].

Our strategy therefor is to also look from a broader perspective, just as D. Menheere suggested in her paper. We want to influence the feeling after exercising and prolong that satisfied feeling by making a physicalization of the exercise. This is to help the motivated amateur female sporter to reflect on their day and thus helping them to adapt to a more active lifestyle or to maintain the active lifestyle they are already living. According to research, we should focus on a more abstract data representation. More abstract representations benefit task-performance and reflection, whereas the more aesthetic, playful and pleasurable data representations are more able to 'engage' people into what they are doing [19].

*To look for that abstract data repre*sentation we started with an exploring design approach, by exploring and ideating different ideas and concepts. Because looking from a broader abstract perspective to exercising motivation is fairly new, we came up with multiple concepts that could be evaluated. These evaluation and reflection in the middle of our design process helped us to come up with a final design called Niara which is in line with our goal: helping the sporter to reflect on their physical activity and make them aware about that physical activity.

Niara is a design which helps people to extend the satisfied feeling after being physically active. It visualises the physical activity with the help of fog, which represents the breath of the person. The representation of the breath will give the user time to reflect on their activity of that day and will give them an extended feeling of satisfaction when they see the fog moving. Using fog in design is not researched very broadly. So, besides the contribution of Niara to people as a way of reflection and creating awareness, Niara also contributes to an innovative way of visualizing and physicalizing data which could be further investigated in the design community.

RELATED WORK AND BENCHMARK

The problem
Many research already shows that physical inactivity is a problem that has its barriers to be solved as we have to tackle the individuals barriers to help solve this problem. [6] As already stated it is being associated with a better quality of life in many different ways. Technology can play his part in helping overcoming this problem. The challenge is to physicalize data and extend the feeling of satisfaction, but designers should be very careful with designing such devices. These devices should encourage exercising without giving too much information that de-motivates people, especially when they do not meet their expectations [15, 21]. We want to balance on that fine line between giving just enough information to extend that feeling of satisfaction but not too much that it de-motivates the user.

Ways of physicalization
There are already different designs giving feedback on someone's physical activity. A popular way most activity is currently displayed, is by putting data in the form of graphs or charts such as the Fitbit [14], or mostly using numbers like done with Strava [34]. These wearable activity trackers support people with their healthier lifestyle. People find it easy to use and because of social support, gamification and some competition, they will keep using the tracker [1, 20, 22].

An entirely different way of visualizing data is shown with SPARK [13] where they visualized step count through abstract art, which resulted in an increase in activity awareness of the users. SPARK visualizes this through a screen. Just like SPARK, Breakaway [27] also encourages people to perform physical activity. Breakaway uses a lifelike form that slouches when the user should be taking a break. Where SPARK uses abstract shapes and sizes, Breakaway uses an abstract yet lifelike form. According to their evaluation, ambient displays that make use of that lifelike form as an aesthetic might be promising for making positive behavior changes. This could be because it is, even though the abstract form, still relatable to real life.

Another way of visualization is the Healthbar [23]. The Healthbar is not as abstract as SPARK, but its goal is also to visualize data in a more interesting way. It is an ambient persuasive device that shows how long a person has been sitting in their chair and when they should take a break. It changes color from green to red, depending on the user's sitting period. It is a clearer way of communicating actual data in comparison to the abstract way of Breakaway.

*Comparing the concrete data visualization*s with the more abstract one, it is noticeable that the more abstract ones are more interesting to look at because they are aesthetic, decorative and dynamic [20, 23, 27]. On the other hand, the concrete visualizations make the data understandable for most of the people where abstract visualizations make people think more about what data it shows. So, there should be a balance to relatability and understandability, while still being abstract and aesthetically pleasurable. Each design mentioned above has one of the aspects but lacks by not having all those aspects.
Niara is different from other physical activity data displays because Niara uses fog as a representative of breath. This is, to the best of our knowledge, new in the world of data physicalization. It also is different from the previous designs because it is designed to extend the satisfied feeling after physical activity, where for example the more concrete visualizations like Fitbit focus more on tracking numbers to be able to surpass yourself.

Atmosphere and Experience

*Another related t*opic is the atmosphere and experience a design can achieve. Thinking about this experience brought us to the Efteling. We are all fascinated by the way the Efteling guides you through a fairy tale experience full of light, music, and magic. We looked into Aquanura, a show of water, light, and fire [12]. The Efteling called it a symbiosis, working together to form a whole and all elements influence each other because they cannot function without each other. That is what we are looking for in our design. We want the design to be influenced by the behavior of the user. The design will use that data to create something in the form of light that will make the user aware of its behavior and prolong the endurance of a positive feeling.

*When lookin*g for atmosphere and experience in design, a name that came up was Daan Roosegaarde [37]. Daan Roosegaarde is a Dutch artist and innovator. He connects people and technology through artworks that improve daily life, spark imagination, and fight the climate crisis. He did a project named Waterlicht [36]: the dream landscape about the power and poetry of water and van Gogh path [35]: the light emitting bicycle path which glows at night.

Roosegaarde and the Efteling use a lot of poetic, mystic and metaphorical elements in their designs. This is something that really inspires us because we believe design doesn't have to be concrete. Especially because we are working with the physicalization of data movement because the movement is very personal and everyone has different goals and limits. Who are we as designers to determine in advance what is good or bad? Performance doesn't have to be expressed in a number to have value and impact. The symbolic value is often greater than a numeric value and the effect will therefore be longer visible and sensible than when seeing a number. In addition, abstraction can have the quality of changing a mindset and shifts our cognitive state away. This means that abstraction has an effect on that state, to change the way we make decision. For example, in abstract paintings you have less recognizable spots to teel you what you are looking at. So to find the meaning, your eyes move 'globally' around the painting, causing the viewer to assign meaning, utility and value [4, 11].

Where the Efteling and Daan Roosegaarde are coming short is that their designs are more focused on entertainment of the crowd, whereas we want to focus on the individual. By making the design abstract, only that individual will understand its effects and that is the beauty of design, it's multi interpretable but the message remains the same.

DESIGN PROCESS / ITERATIONS

Ideation 1

We started off with the sketching challenge where we had to come up with 100 ideas. For this assignment, we wanted to apply a new method of brainstorming. Due to our project coach we got to know the HIT method. The HIT method includes writing down verbs and nouns, horizontally and vertically, and then combining these verbs and nouns to get one idea. We did this for quite some time and came up with 20 ideas. When looking back at these ideas, we saw that we were very much focused on tracking the process of the people that were running or doing other sports. There were also multiple ideas where there was a competition with yourself or with other people around the world. In this way, we thought of combining the process tracking with a competition. Another thing we noticed was that we were thinking very much about changing the design through the activeness of the user. The changes in the designs were often colorful, think of the 'painting on number' idea where every time you did a workout or were active, one 'number' would be filled in and you would have a full painting at the end. This is slowly changing of design, but we thought it made it way more interesting. A lot of the ideas we came up with were kind of abstract which made us think more towards the art side of design.

We were a little stuck with the HIT method, so to come up with more ideas individually. When we discussed our new ideas, we challenged ourselves to think about what you can design when you focus on the different senses. We already had a few ideas from the HIT method related to smell and we tried to come up with more serious ideas. We noticed that smell is very personal and the impact of smell can be huge, both positive and negative. Another sense we saw returning in our ideas was sight, especially in the usage of light. All three of us were inspired by lights and it releases something in us. With lights, you can go in many directions and there are also many sources of inspiration such as glow and other light events. We also had some texture related design ideas. This was quite hard for us because we haven't worked with that many materials yet so maybe we can rethink using texture in our design when we have experimented with different materials.
The data we though was most interesting and we wanted to keep working with was the heartbeat. Heartbeat is still interesting to us because it is very personal but also has certain limits. Heartbeat can be measured very easily by using a smartwatch and in this way, the design will have a lot of data to work with. To combine art, movement and heartbeat together we thought was very interesting and we wanted to keep exploring that kind of design.

Exploration

Materials

We wanted to explore with materials to find out what we could do with them and how they could interact. We decided to all bring materials we had laying around in our houses to our meeting and to experiment with them. Combining materials that you normally don't see together, can lead to interesting new combinations that are very usable . While playing with all these different materials, we found out that it would be very cool to make an interactive design. In this way it will keep being interesting to the user. We wanted to combine art with instructiveness and in this way make an aesthetically pleasing design that will be interesting to watch and to interact with.

We played around with the materials and we tried to choose 2 or 3 different materials and come up with something it could represent. Just trying out movements or interactions could help us to come up with new ideas. For example, fabric and rope to create a movement which resembles heartbeat . We were stuck with these materials because the idea that came out of this were quite obvious. The last thing we tried out was placing a tea light underneath a piece of crepe paper (figure 1). Of course we couldn't light the tea light but we brainstormed about the cool things we could do with light. Every one of us seemed to be inspired by light so we decided to focus on light for the next exploration

Figure 1; exploration with crepe paper

Light

For the light explorations we brought different materials to combine with light and different light sources. First we tried to wrap and put things on top of a light and move it to create patterns. Therefore we used an IKEA flowerpot with a nice pattern and a fruit net (figure 2). Talking about light, we were all inspired by the Christmas light cords because you can use it in so many ways. We tried to make a kind of starry sky where the distance of the centre to the light could mean something related to heartbeat. Also the reflection of this light cord was very inspiring. We also wanted to try out the effect of the reflection of light. We used aluminium foil and created different shapes to look and the different refractions of light but we found out that aluminium foil hardly reflects when you shine a light on it. We did research on it and found out that we need a mirror to get the best reflections. Someone had a water bottle of Spa with her and she accidently shined a light on it which gave a really nice effect. The bottle had some figures on the outside so we could play around with it and shake the water to see what happened. We found out that you can get really nice effects of water waves when shine a light on it. We decided we could definitely do something with water and light (see figure 2 and 3).

Figure 3; exploration light

Figure 2; exploration reflection

Conceptualization 1

In this phase we went from vague ideas about what our project should contain, to concrete ideas. During the exploration we determined our project should revolve around light. It has to be poetic, artistic and about the experience of the user. To be able to explore different light interaction, we decided to make three different concepts. These all represent a different connection to the outcomes of being active. At first, we decided what outcomes we actually want to communicate. There are a lot of different outcomes from being active, for example: your heart rate increases, more blood flows through your body and therefor more oxygen, you start to sweat and you breath faster. Things you could also look at when working out are your number of reps or sets or, when running, you speed, number of steps or number of kilometers. These are all different things we could communicate. However, we wanted to work with something that is not as fixed as for example your number of steps. We want something poetic and artistic so therefor we started to look at what happens to your body and decided we wanted to work with sweat and breath.
Each one of us made concepts and we choose the top three to realize. We all were 'in charge' of one concept.

Concept 1: Sweat

The first concept resembles the sweat of people. People usually feel a bit gross when they are sweating. We thought it would be cool to break that taboo and turn it into something positive. We choose to let actual waterdrops represent the sweat. In our exploration we saw that water and light interacted quite interesting together. After researching how to create water reflections on the wall, we decided to make a container with water and a mirror in it. A light source directly pointed at the mirror should give the desired effect. The realization of this concept will be described in 'Realization'.

Concept 2: Breath

The second concept mimics your breath. When you start working out, your muscles have to work harder. This causes you body to use more oxygen and therefor it creates more carbon dioxide. To release this, you have to breathe more. [2] This is a result of being active we thought we could be poetic with. We came up with a case in which water vapor is being blown. Together with light this creates a magical effect because the beams of light are refracted by the water vapor.

Concept 3: Patterns

The third concept was based on one of our exploration and had to do with the figures light could project on a surface when covered with something with a pattern in it (see figure 5). Two cylindrical object would cause that pattern to disappear on the wall (see figure 8 and 9). However, after careful consideration we thought this concept lacked a strong connection with working out and running in a poetic way. Therefor we decided to go in a different direction and change up our third concept into a new concept.

New concept 3: Balance

This new third concept has everything to do with the balance in your life. We believe it is important to balance your life, not just for example in your food intake but in your activeness as well. The third concept contains blocks which you can set up however you like, to give the user some interaction. Each block forms a pair with another block. These blocks influence each other through light, therefor representing the balance. A pair of blocks could represent your rest and activeness. Whenever you would be active, the light in that particular block would brighten, whereas the opposing block (the rest block) would dim.

Realization 1

This phase is all about prototyping and realizing our three concepts. These realizations will be discussed per concept.

Concept 1: Sweat

As said in 'Conceptualization 1', Sweat needs some sort of water container, a mirror and a light. Even though we made three different concepts, we wanted some correlation between the prototypes. Therefor we decided that everything is going to be black and in squares. As light is our 'aesthetic' and our focus point, we do not want the user to be distracted by their casing, therefor we chose neutral casings. We experimented with different lights from different angles (see figures 9 and 10). We wanted to manually let drops of water fall to create wrinkles in the surface, because that way we could control the drops during the midterm demo day. To do this we bought a syringe (see figure 10). However, this was now a container with water and a light and it distracted us from what was happening on the wall and distracted us from the experience. Hence we made a backside to focus the attention on the ripples projected on the wall (see figure 12).

Concept 2: Breath

To resemble breath we needed fog. That is why we bought a small water vaporizer. The vaporizer can be seen working in figure 4.
We made the container in such a way that it has three compartments. The first compartment was for the water and the vaporizer. This is where our first problem occurred. Water vapor precipitates. Therefore the water had to come in the third compartment (the front) from above. However the first compartment provided to much space and the vapor did not even reach the hole to the first compartment. So we decided to elevate the water container and push a straw through a hole in the back to manually guide the vapor into the first compartment. This way we could imitate your breathing by blowing less or more into the straw. The second compartment was intended for the electronics.

Figure 4; working vaporizor

We decided to make a ring of light to make the light refract through the vapor. We choose a ring, because we thought this would be aesthetically pleasing as P. Silvia and C. Barona already concluded in their article that people prefer round circles more than angular shapes [10]. At first we wanted all LEDs to have the same colour but due to some lose wires we saw that it would be much more mystical and interesting to deliberately let the LEDs emit different colours. The final compartment is the front, what you actually see.

Here the vapor and the light interacts with each other into a mystical atmosphere (see figure 6).

Figure 5; midterm concept breath

Concept 3: Balance

The last concept resembles balance through different pairs of blocks that influence each other through light. We made six of those blocks (figure 7) to convey three pairs in which you should find balance in your life. The blocks can be stacked in every way you like. The lights within dimmed and brightened to give a feel for how it would look. However, we did not yet focussed on receiving data so for the midterm demo day we coded those lights to brighten automatically to still convey the concept.

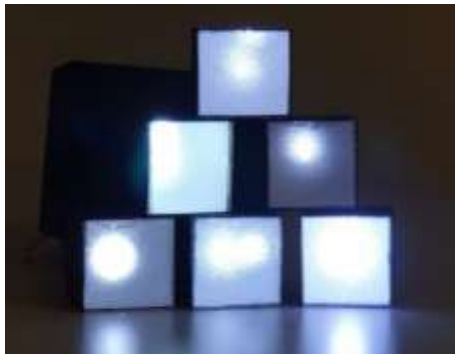

Figure 7; midterm concept balance

Midterm Demo day

Because light is our aesthetic, we wanted to make sure everyone present at the demo day could perceive it properly. So, we created a 'dark room' by hanging up garbage bags as can be seen in figure 18 and 19. We set up our three prototypes on a round table and made sure everyone in the room could see it from most angles. However, because Sweat and Breath had to be activated manually to create the desired effect, one of us needed to be in the room. To invoke curiosity the other two group members gave a pitch outside of the room with the door closed. After the pitch, the assessors went inside the room where everything was showed and explained again so people would remember Meira better (see figure 5). Afterward the assessors came back out to give feedback on the concepts.

Figure 6; midterm demo day setup

Feedback

Overall, the assessors were enthusiastic about Meira. The connection between the concepts and working out was clear and they liked that it was poetic. Resembling breath with vapor was for many assessors a clear resemblance. The idea of turning something 'gross' into something you could be proud of was also considered creative. However, some people felt that the way we portrayed that idea was not the way to do so and it could be more poetic and artistic. The same applies to Balance. Some thought the blocks were too specific and did not have any mystery to it.

Two things we want to work on next quartile were also mentioned by our assessors, which concerns Meira in general, not one concept specific. One of which is that some assessors are not convinced about the behavior change and motivating aspect of Meira. It was still too much of a showcase, whereas they felt it should use more interaction. In addition, some of the assessors were concerned about how we would get the data because Meira uses a far more personal and less easily to track data. For example: how much a person sweat is harder to detect then how much steps he took. Next quartile we are going to focus on the behavior change aspect but also on how to get the data we want to convey.

Evaluation

After the Midterm demo day, we decide to do two user tests. One user test to investigate which elements of our three midterm prototypes are the most interesting according to our target group and one user test to investigate our target group. The two studies are described in 'Methodology'. From the research about the three prototypes, we found out that the design with smoke was the most interesting. We obtained that our target group likes a design that contains smoke in combination with colored lights which intensity can be adjusted to your own preference. The design should also be manageable. In addition, the user must be able to place the design everywhere in their house. Taking the feedback from the assessors into consideration, we really wanted to make our design interactive. We also received the feedback that the assessors were not convinced about the behavior change and motivating aspect of Meira. To find out about the motivational part, we decided to do a user test to investigate our target group because we had to find out how motivated our target group is and how satisfied they already feel after being physically active. The outcome of the research can be found in 'Results'.

Ideation 2

Once we knew which requirements we wanted to implement in our design, we had to come up with new design ideas. Before the midterm, we experienced that ideating individually and discussing the ideas in the next meeting works best for us. No sooner said than done; we all thought of one idea and implemented the results of the user tests and the feedback of the experts in our ideas. We came up with three similar ideas. All the ideas consisted of a box that would be filled with fog and there would be

lights implemented in all of the boxes to see the fog and light interact with each other.

The first idea was focused on interaction with the user. The box had two rubber sides, one on the left and one on the right, and by pressing and releasing the rubber the fog in the box could be moved. One of us experiences something similar to that at a school project.
The second idea was more focused on the connection between heart rate and the movement of the fog in the box. We didn't think of how we could collect the average collected heart rate and connect a Fitbit with the box but we thought maybe we could connect a phone with the box. On an iPhone, you can see how many steps someone has taken in a day. By connecting the phone to the box via Bluetooth the box might be able to convert the number of steps into a specific amount of smoke that would be blown into the box. The interaction between the user and the device would be that the user has to connect his or her phone with the device to see how active the user has been during that day.
The third idea was based on the balance in your day. One of our midterm ideas was focused on balance and while thinking of balance we came up with a level. A level is a very interesting product and it is nice how the air bubble moves in the liquid from the left to the right. We came up with a box inspired on the level. The box would be long and narrow with fog in it instead of liquid. The box would have a left side that represents rest and a right side that represents being physically active. Once you got home and connected your phone with the box, the fog would move from the left to the right representing how active you have been on that day. To add an interactive element to the box we wanted to implement a LED-strip inside the box and the intensity of the light could be adjusted by waving your hand over it. Such a light already exists in a modern extractor hood we've seen in an advertisement.

Conceptualization 2

We decided to further develop the third idea. This idea was the most interesting and the most realizable to our own opinion. During the ideation, the ideas included a lot of different elements, so it became kind of a mess. We decided to have a look again at the most valuable elements according to our user test and decide what elements we want in our design and why. First of all, the fog is a must in the design because the participants of the user test and the assessors of the demo day were all very enthusiastic about it. We wanted to have a large and narrow box in what we wanted to make the fog move. The shape of the box is a personal design decision. The length of the box allows us to create a balancing effect, we wanted the fog to balance in the box to represent how physically active a user has been on a specific day. One side of the box represented rest and the other side represented being physically active We looked into several ways to move the fog in the box such as moving it by yourself by pressing rubber sides or implementing fans on each side of the box. We chose to use fans in the box because we can program the fans and control the fans in that way using an Arduino. It could be hard to connect the box with a Fitbit or other device so we decided that would implement a sensor at the top of the box so when you put your phone on it, the sensor recognizes the phone. From that moment, the smoke will be blown into the box and the fans will start moving. We also wanted to implement light in the box because according to our user test the participants liked the lights in the prototypes, especially colored lights. It would be nice to implement a LED trip that could be dimmed by waving over it, but it might be too hard to realize. We first wanted to focus on making the fog in the box move and once that worked, we were going to look into implementing lights in the box.

For the outside of the box, we wanted to use something that makes the box blend into the rest of the interior of the user's house. We learned from the workshop material quality and aesthetics in technological products. During the midterm demo day, we used black paint on the outside of the prototypes but now we want to use wood because it matches our prototype better and it's more aesthetically pleasing than paint.

During a cross-coaching session, we received feedback from the experts of the Vitality squad and fellow students. They asked us if we wanted to make clear what it represents when the fog moves to the left or the right. We could also decide to leave it to the user and make them think about what the movement of the fog based on their activity means. They also said that putting the phone on the box felt like a check-in moment and they didn't like that idea. The moving of the fog should grab your attention when it's happening, so it stimulates you to think about what the movement of the fog represents. The experts of the Vitality squad advised us to try to make a working connection between the Fitbit and the box if we were able to do so.

With the feedback we received from the cross-coaching session, we adjusted our design. We decided to leave out the indication of what the moving of the fog means to make people aware of their movement on a day and create a reflection moment for them. We also decided to leave out the balance idea of the moving of the fog because with moving fog we could create more things than just make it move from the left to the right. The fog should move according to the fans based on the activity of the user and it's nice that the visualization is different every day of the week.

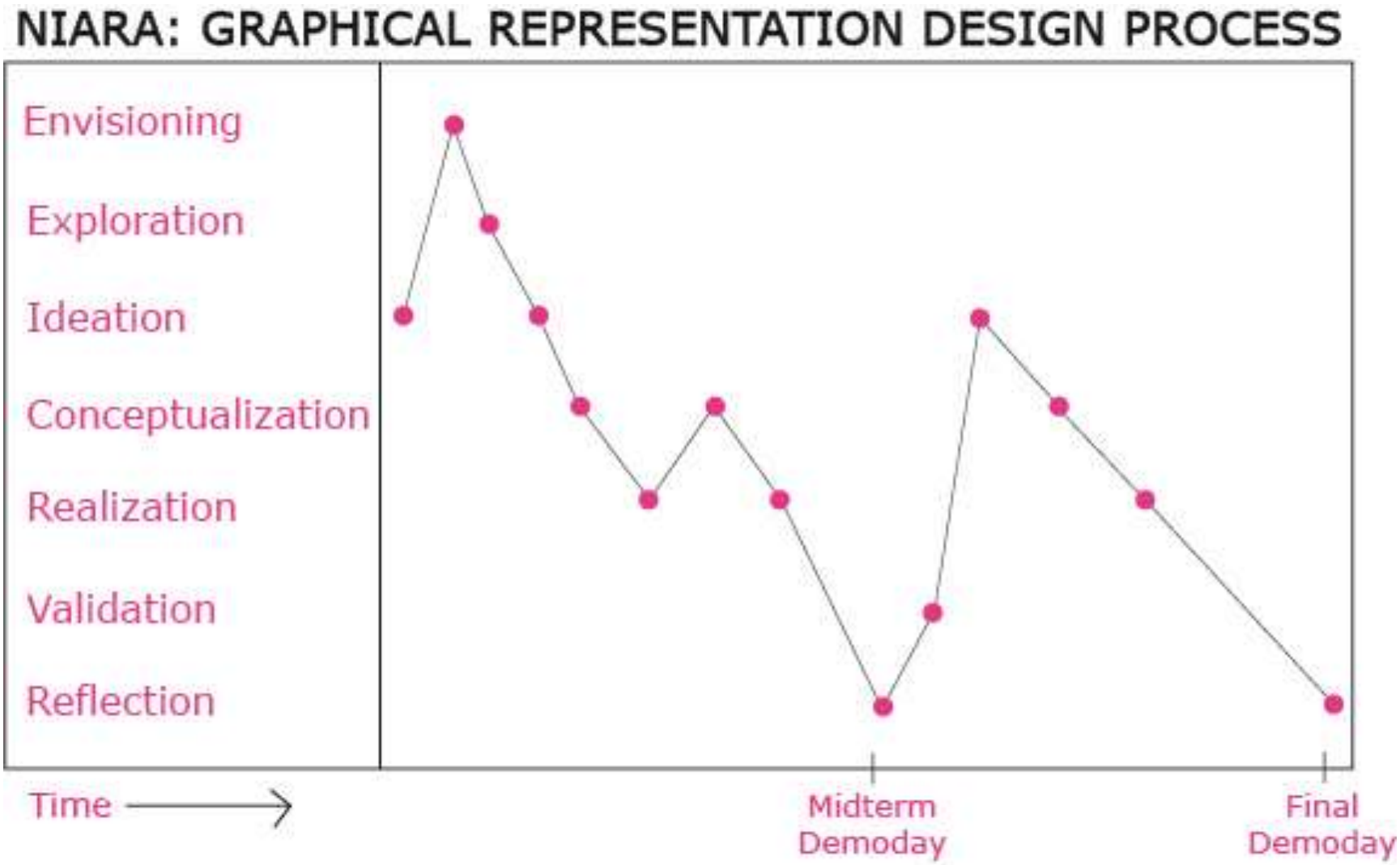

Figure 8; representation design process

NIARA: FINAL DESIGN

Design of Niara

Niara is a design that visualizes the breathing of a person with moving fog in a box with light. It focusses on women that are already motivated to sport but would like to extend their feeling of satisfaction after a workout. For now, the problem is that the satisfied feeling after sports only lasts for a short period of time, also differing per person [26]. Extending this time can be done by trying to release dopamine into the body. Dopamine is the achievement hormone which will release into the body every time the goal is visible, but most dopamine is released when achieving your goal [7]. Niara will be used so people's goal will be to see the fog moving.

The fog in the box will move according to the heartrate that will be tracked with a smartwatch worn by that specific person. Breathing heavy, which corresponds to having a high heartrate, will mean the fog in the box will move very fast. Breathing slowly, which means having a low heartrate, will in this case mean that the fog in the box will move very slowly. Having this was of visualizing the heartrate rewards achievements, such as doing a workout, in an abstract way that is still understandable for the user.

Ideally, Niara will visualize the average of collected heartrate data of what activities the person is doing with a slight delay. This means that if the person is working out somewhere else then at home, she cannot see what is happening in the box. This is because Niara is designed to be placed in a house at a sport where it can be seen most of the time, for example in the living room (figure 9).

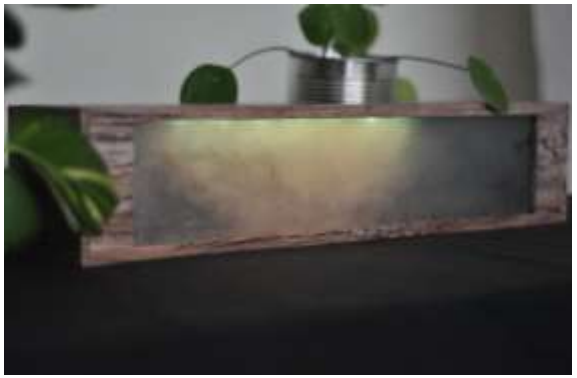

Figure 9; final design Niara

Underlying design principles

We chose for Niara to use a box that was made black on the inside. This is because we would be using carbon dioxide for the fog which is white when released. We found it important that the black box would contrast with the white fog so all people could best see what was happening in the box. Adding the light into the box was a decision based on the user test. Most people said that they thought it looked very interesting and mysterious when we used vapor and light in our midterm so that is the reason we kept that in our design.

Another decision that we made was to make our design very minimalistic looking. Because Niara should be placed in a spot in the house where it can be seen most of the time, we found it important that it would be able to blend in with almost every interior. Looking minimalistic meant for us that it had no pronounced shape or colour and all the attention could go to what was happening inside of the box.

An important trade off we made was to choose for an abstract way of visualizing instead of a clearer way. It was between implementing balance in a very clear way, where all the smoke to the left would mean little activity and all the smoke to the right would mean little activity or choosing to make the balance more abstract so the user would have to think more about the meaning of the visualisation. We chose the latter one after feedback from other students and coaches.

Technology and realization

Realization

For building the final prototype, we decided to make use of the laser cutter. This is because it was very important that no smoke could escape from the box and thus all the sides would have to fit together perfectly. When making a laser cut drawing (we used Solid Edge) all the lengths have to be typed in which makes it very precise which was exactly what we needed (figure 10).

We chose to laser cut the box out of 4 mm MDF wood so the wood would not bend when working with it. Another reason for choosing 4 mm MDF was that it would not be too bulky when working with it, which was an aesthetic choice.
Another aesthetic choice we made was to make Niara have a wooden look by using an adhesive film with a wooden look. We applied this film to the entire outside of Niara to give it a minimalistic look and for it to be able to blend in into every interior.
For getting the fog from the smoke machine into the box, the best way for us was to guide the fog through a tube. This tube was attached to the middle of the box in the back so the fog could distribute evenly through the box when the fans were not on.

Figure 10; Solid Edge drawing

Technology

To give dynamic and movement to the fog we used small fans. For the fans we used two computer coolers that were placed at the very left and very right side of out prototype. The fans were controlled through Arduino code and physical electronics. The fans need more power than the Teensy. So to modulate the current flow and not blow up the Teensy, we used a MOSFET with each fan (see figure 11). To show some smoke movement possibilities, the code was held simple (see appendix A) where the goal was to first turn on one of the fans and then turn on the other, while fan number 1 was off. The last part was building in a LED-strip. The LED strip only needed a power source, but it was of great importance to give that mystical atmosphere.

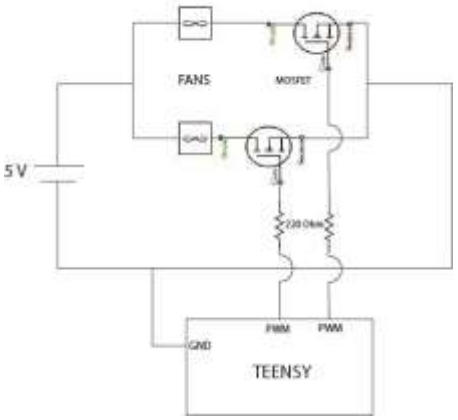

Figure 11; schematics of electronic circuit

VALUE PROPOSITION

With Niara we focussed on female sporters. However, Niara has multiple market potential. As we focussed on female sporters between the ages of 15 and 50 with already some motivation. But there also is potential with Niara for usage for females without that motivation, or females who do not even exercise at all. Niara could also help older people with their physical activity, as according to research, people exercise less when they get older [33].
These potential customers will be draw to Niara by four primary value propositions: her innovative way of displaying data, the moment of reflection where users can take at their own time, the simplicity and the aesthetic. Niara helps female sporters' reflection on their physical activity and prolonging that feeling after exercise by her innovative way of displaying data, her simplicity and aesthetic and her passive influence on your way of reflecting.

Innovative

The way Niara displays the data is through moving fog. From the literature review we know this is a relative new way of displaying data. Fog is used in the theatre to enhance the light and make the atmosphere more magical and mysterious. This is also used in Niara, which makes Niara more 'magical' and does everyone not want something magical? This feature benefits the experience of the user while using Niara.

Simplicity

Niara's simplicity comes from not having to many features. The basic feature is the movement of the fog based on the level of physical activity. To give that fog a more mystical effect, light is added. That is the basic of Niara. This simplicity makes Niara more accessible, which is an important value for users. If Niara had many different features, it would become a lot harder for the user to reflect, to enjoy the experience and therefor to subconsciously prolong the feeling of satisfaction after a workout, because of the many different stimuli.

Aesthetic

Niara is not only simplistic in its features but also in her design. The attention should go to the dynamic and the movement of the fog. In addition, Niara should be able to blend into the interior of the users. To achieve both those demands, the design of Niara was kept simple and therefore more aesthetically pleasing. She has natural tones to blend into the interior and has a basic shape to not draw too much attention from the fog.

Reflective

The last and most important value proposition has to do with the needs of the user. As motivation has to do with the whole routine around exercising, Niara helps with the time after exercising which is part of that routine. She gives the opportunity to reflection to the user whenever they want to reflect. Niara is a display that passively influences the user, without being too much actively present. The user does not have to reflect at a certain time, but every time Niara does catches the eye of the user, the feeling of satisfaction from the user prolongs. This gives the user control over their own schedule, while still prolonging that feeling of satisfaction and giving that opportunity to reflect on themselves.

ETHICAL CONSIDERATIONS

Intention

The intention of Niara is to change the outlook on someone's results from cold numbers to reflective and motivational poetical results. The goal is to prolong the feeling of satisfaction the user has after exercising. Because the feeling of satisfaction would last longer, the user would be more motivated to exercise again and thus live a healthier lifestyle. So, the positive consequences would be to improve the health and wellbeing of people. It also could help boost someone's happiness, because through exercising a body releases mood changing chemicals such as dopamine (I.e., the feel-good hormone) or serotonin [8, 31, 32, 41] which make a person feel happier. Health, well-being and happiness are all basic moral values which society feels should be strived for to lead a good life according to V.I. Poel [29].

Potential unethical situations

There are a few different stakeholders here. First and foremost is the user. The user benefits by using Niara because he will be able to reflect on his actions and his behaviour. Through this reflection his health, happiness and well-being will benefit. Secondly everyone around the user, his friends and family, will benefit, because they will become happier when they see the user happy [AH]. However, Niara did not focus that much on the privacy. As the idea of Niara would be to connect it to your smartwatch/Fitbit, it will also be in contact with your data. This means data transfers over different devices [16, 24, 40] There are a lot of different papers about the risk of privacy around those wearable devices. One of those reasons is because it uses a lot of personal data. Because Niara would be in contact with those devices and receive sensitive information, Niara should be protected. If not, everyone could access that sensitive data. This is why Niara will not work with real time heart rate data, but with the average of collected heart rate data. According to M. McGee attackers "had access to customer data, including GPS history, which shows where a person regularly runs or cycles, as well as data showing what time a person usually goes to sleep."

METHODOLOGY

In order to further develop Niara, we had to investigate what our target group thinks is important in the design of Niara, what design elements appeal to them the most and to what extend their feeling of satisfaction after being physically active could be prolonged. To investigate our target group itself and the needs of our target group, we designed an experiment which consists of a qualitative and a quantitative research. For the quantitative research we used a survey and for the qualitative research we applied the repertory grid technique in an interview.

Methodology- Quantitative research

Within this quantitative research we wanted to investigate our target group. In order to design a device to extend their feeling of satisfaction after being physically active, we first had to find out how motivated our target group is and how satisfied they already feel after being physically active.

Participants

For the survey we recruited 32 female participants from the Netherlands. The participants were all women that are regularly physically active and were recruited within inclusion of the age limits (15-50 years old). The survey had been sent to physically active woman we know from our own sports or acquaintances. It took around 5 minutes to complete the survey. The participants had to fill in the survey after they gave consent.

Materials

We wanted to do a quantitative research to support our literature research and make sure there is a need to extend the satisfied feeling after a workout within our target group. With this quantitative research in the form of a survey, we want to collect data that can be visualized in a clear way so it can be analyzed to find patterns, trends, and correlations. The survey was an effective way to gain information from a lot of people without physical contact during Covid-19. In the survey we used multiple-choice questions and open-ended question. The multiple-choice questions were useful to create clear visuals that can be analyzed to find correlations and trends that can support our research. The open-ended questions were useful to ask for a more detailed explanation of the multiple-choice answer and gain more knowledge of the thoughts behind a yes or a no as answer.

To ensure the validity and reliability of our results we made sure the questions were clear for our participants so they could answer accurately. We only asked questions that were directly relevant for the purpose of the survey. We made sure the multiple chose questions covered all choice possibilities.

Procedure

The participants had to fill in a survey made in Google Forms. The survey consisted of eight questions including four open questions and four multiple choice questions. In the first question they had to select their age. There were nine options from 15-50 with an age range of five years. The age of the participant is useful to see if there is a relation between age and how motivated or satisfied a woman feels after being physically active and according to that we can make design decisions or decide our target group again.

The second question was a multiple-choice question where the participant had to say how often she works out in a week. This is important for us because we might see a relation between how often a person works out and how motivated and satisfied she feels after being physically active. With that information we can adjust the time the product should interact with the user.

The third, fourth and fifth question were about the motivation of the participant. In a multiple-choice question, they had to say if they find it hard to get motivated to work out and, in the follow-up open questions they had to explain why they find it hard to get motivated and what motivates them to go working out. These questions were open questions to give the participant the freedom to say whatever she wanted to say. By using open questions, we can gain new insights we had not thought of ourselves. By gaining knowledge about the cause of lack of motivation it can help to tackle the cause, create something that makes the cause less powerful or turn the cause into something positive. Once we know what de-motivates the participants to work out and what does motivate them to work out, we can make sure to exclude the elements that have a negative influence on their motivation and enlarge the elements that have a positive influence on their motivation.

The sixth, seventh and eight question were about the satisfied feeling of the participant after a workout. First, we asked the participant if she feels satisfied after a workout. For us as designers it is important to know if our target already feel satisfied after working out so we can think of a way to prolong that feeling or that our target groups does not feel satisfied at all after working out. The follow-up questions were for how long they feel satisfied after a workout and how they think the satisfied feeling could be extended. According to how long the participants feel satisfied after a workout, we must decide when our design needs to take action to extend the satisfied feeling. With the second question it was interesting to see what the participants come up with to extend the satisfied feeling after their workout. We learn more from our participants when they come up with something or nothing then when we give them a solution and ask them if they like it or not.

Data Analysis

For analyzing the data of the survey, we used Google Forms with the corresponding obtained graphs. For the open questions we listed and categorized the answers and counted the frequency of each answer.

Methodology - Qualitative

Within this qualitative research we wanted to investigate which elements of our three midterm prototypes are the most interesting according to our target group. With the results of the repertory grid technique we used in a short interview, we want to combine the most interesting elements of the three prototypes to combine them in one new prototype.

Participants

For the repertory grid technique, we recruited 4 female participants from the Netherlands. The participants were all people that are regularly physically active and were recruited within inclusion of the age limits (15-50 years old). The participants were asked to meet with us online or in real life according to their own preferences. The interview took around 10-15 minutes. Before the interview using the repertory grid technique started, the participants had given consent.

Materials

We wanted to do a qualitative research to understand the thought of our target group. The qualitative research will be in the form of the repertory grid technique combined with an interview and to analyze the outcome we will categorize the results of the interview. The interview was an effective way to gain insights in the wants and needs of our target group. For the repertory grid technique, we prepared a PowerPoint presentation including one picture of each prototype and the video of the midterm demo day (figure 12). The repertory grid technique is useful for supporting our design decision for the final design because with this technique we can elicit and evaluate people's subjective experience with our prototypes. The method covers both emotionally based constructs and rational-based constructs. We think it's important to include both to trigger someone. To write down the answers of the interview we prepared a form with a clear set up to note the answers of the interview.

Figure 12; The picture used for the RGT

Procedure
The participants had to look at the pictures of out three different midterm prototypes. We did not provide them with information about the thoughts behind the prototypes or how they work, it was just the pictures. Once they had seen the three pictures, we asked them to choose two pictures that had something in common and explain why, and thereby explain why, they are different from the third picture. We as researchers wrote down which similarities and difference the participant named in the prepared form. These steps have been repeated several times until the participant could not name any differences or similarities anymore. After the repertory grid technique, we asked the participants which of the three designs they like the most and why. Then we showed the participants the midterm demo day video we made to give them an idea of what the three prototypes represent, how they work and what the thought is behind the prototype. We also explained each prototype and the participants were free to ask questions or give comments. At the end of the interview, we asked them if the preference of design has changed after they saw the video in combination with a full explanation of the prototypes.

Data Analysis
To analyze the data of the interview, we made an overview of the comparisons and differences we wrote down in the form and listed the given answered in order to compare them.

RESULTS

Results - Quantitative Research

According to the results of the survey, in the age range (15-50) every participant feels satisfied after being physically active. Most of the participants find it hard to find motivation to work out. The main causes for lack of motivation are that the participants are busy with school or work, they find it hard to get off the couch or change clothes or they don't want to go working out by themselves. The most things that motivate the participants to go working out are that they want to stay healthy, get stronger, lose weight and that it's motivating to sport together or with a team. Although all the participants have a satisfied feeling after a workout, they have no idea how to extend this feeling after a workout. The satisfied feeling of the participants lasts on average for 1-3 hours after the workout. Their own suggestions for extending this feeling are staying active, eating healthy and learning how to appreciate working out.
Because we now know every participant already feels satisfied after a workout, we can extend the satisfied feeling 1-3 hours after the workout. The reason why the participants are motivated and the solutions they came up with to extend the satisfied feeling are not things we can implement in the design. Extending the satisfied feeling 1-3 hours after a workout by showing the participant how physically active they have been can be a new motivation to go working out again. To activate people to reflect on their own learning activities can make them more aware of the satisfied feeling and how to use that as new.

Results- Qualitative Research

According to the interviews of the repertory grid technique we found out that all the participants liked the design with the smoke the most. They liked the design because they have never seen something with smoke before and the smoke is very cool and mysterious according to their opinion. It's very aesthetically pleasing, and the smoke in combination with the light is a nice way to visualize your duration of being physically active throughout the day. The participants also liked elements of the other designs so finding a way to combine two or three design would be way to create the final design.

Looking at the results of the interview we find some interesting elements that our participants really like. The participants made clear that they like colored lights in the design rather than normal white light. Besides the color of the light, the participants find it important that there are a lot of lights inside the design. Lights make the design playful, but the lights shouldn't be too bright because that can be distracting. The participants thought the cubes were the easiest design to put somewhere in your house.

Also, the shape of the deign with the cubes and the design with the smoke are the most loved by the participants. Just like the design with the smoke, the cubes are an independent design that does not dependent on where you place it in the house so it's nice when the design is independent from where you place it.
Based on the participants opinion, it's important that the final design includes smoke in combination with colored lights which intensity can be adjusted to your own preference. The design should also be manageable, and the user must be able to place it everywhere in their house.

DISCUSSION

Our design challenge is to extend the satisfied feeling after sports. We will do this, as earlier explained, by letting the users reflect on their activities and make them feel proud of their own accomplishments. These accomplishments can as simple as going for a walk or a more challenging such as doing a high intensity workout.

The findings we have within our study are mostly based on our user test that we did halfway through the project and the feedback from the expects from our project squad that we got at the final presentation. This could be improved by setting up a final user test where the people could interact with the final prototype.

The findings we have based on the user test are positive but sometimes hesitant. The hesitation was mainly because the people we did the user test with have not seen such a product before and they do not know if it will have our wanted effect. The positive reactions we had were mainly on the interaction between the light and the fog. The user test we did could have been done with more people, we decided not to do this because every interviewee ended up with the same result and we thought conducting more interviews would not have much added value. We also had the feedback from midterm demo day where there was also most interest in the design with the fog.
As could be seen in our methodology, we worked with two methods to get the best results. The results from our quantitative research show what we expected and also what we read in the literature [26]. This means that the result was that all women who filled in the survey do actually feel satisfied after sports, but most of them do not know how to extend this satisfied feeling.

What actually was a surprising result that came out of the quantitative research is that only two of the 32 women answered 'feeling good after the workout' to the question of what motivates them to work out. Most other women responded with something like 'getting fitter' but we think this also has to do with feeling satisfied with yourself.
The other method was the qualitative method. The results of this method confirmed our hypothesis that the interviewees would find the design with the fog the most interesting. A result that was surprising is that two of the four interviewees found our design with balance most interesting at the start of the user test. After explaining how every design worked and what they stood for, they also thought the design with fog was most interesting. Their reasons for switching to the fog design was that it was very innovative to work with fog, they liked the mysteriousness and they thought the meaning behind the moving fog was very well thought of.

We cannot say for sure that we fulfilled the promises set out in the introduction because of our lack of final user test. We can base on literature [13, 23] that physicalizations do help with motivation. We do not know for sure if it will help with prolonging the feeling but according to other research [7, 8] looking at your goal, in this case moving the fog, will release dopamine which does give a satisfied feeling.

A great lesson that we have learned during this project is that it was very useful to have multiple prototypes at our midterm presentation. This helped us to gain a great amount of knowledge about our prototypes. This knowledge was gained because we invited everybody into our 'dark room' where we explained what every prototype represented and what was innovative about them. Our 'dark room' also was part of the experience that we created during our midterm presentation to be able to show the prototypes best because they all involved light.
As stated earlier in our discussion, we have not conducted a final user test. This means that we cannot conclude that Niara will achieve its goal. This is a weakness within our project that we could have solved by conducting a final user test. We made the trade off to make a fully functioning final prototype instead of doing a final user test with a not fully functioning prototype. Also, to see if Niara really achieves its goal we would have to user test with Niara for a longer period of time and we did not have that time.

Another weakness lays within our final design. That weakness is that we currently have a relatively big smoke machine attached to the final prototype. This could be solved by redesigning Niara and using CO_2 capsules instead of the smoke machine. Physicalizing breath in a way we did is very new which is why we did not experiment much with other ways of representing the data.

We conducted our user test with people that we know, we sport together with them or they are family. This has influence on the validity of our findings because it is possible that they would have a more positive response to our questions. This is mostly the case in our qualitative research because we were asking question directly to the interviewee. There is a chance that the interviewees did not want to speak negative about our project when talking to us.

The findings of our study can be important for the world of design because, as explained before, working with fog is very new. Fog is especially new in the world of data physicalization but we see great potential in using fog as a representative for breath. Further research can be done to other ways of using fog as a data physicalization tool, it can be used to represent things other than breath. The design could also be further developed by starting with a user test of our final prototype. Going from the results from that user test, a lot of great design decisions can be made and Niara could turn into a real product.

Conclusion

The challenge for Niara was to create a design that looks at the broader perspective of The Runner's Journey [9], specifically how to extend the feeling of satisfaction through physicalization after exercising. This is important because research shows that continuing to exercise does not only come from exercising itself but also the rituals connected to exercising, before and after being physically active.

To approach this challenge, user tests were conducted halfway through our process to reflect and validate the concept we were working on. These user tests were based on our literature review to see if the results match with the research. Through the user tests, the exploration and the literature review, we came up with one concept as solution, Niara.
While working on Niara, we came up with a way of presenting data that has not yet been explored very broadly. This was done by using fog, a mystical poetic way of displaying. This finding is a contribution to the design world because it brings a new way of displaying into the world of design that could have a lot of potential, if you know how to control it. Working/designing with fog is worth looking into and asks for further research.

Another finding is that the quantitative research people do not know how to extend that feeling of satisfaction. From our literature review we know that there has not been done much research on the extension of a satisfied feeling and the whole routine around exercising. There are not many devices for the individual on the market. Niara can help prolong the feeling of satisfaction.
This need for such devices is of importance for society, because healthy and happy individual means a healthy and happy community. More people feeling happier after working, results in more people exercising, which means more healthy people.

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CONTRIBUTION OF TEAMMEMBERS

What?	**Who?**
Midterm idea – brainstorm	All
Midterm idea – technical drawings	Robin & Nikki
Midterm prototype - sweat	Nikki
Midterm prototype - balance	Charlotte
Midterm prototype – breath	Robin
Midterm report	All
Final idea – brainstorm	All
User test	Nikki & Charlotte
Prototype – technical prototype	Robin
Prototype – design box	Nikki
Prototype – aesthetics	All
Prototype – fog	All
Presentation – pitch	Nikki
Presentation – pictures and videos	Charlotte & Nikki
Presentation – editing video	Charlotte
Presentation – making poster	Nikki & Robin
Final report	
Abstract	Nikki
Keywords	Nikki
Introduction	Robin
Related work and benchmarks	Robin & Nikki
Design process before midterm	Charlotte & Robin
Design process after midterm	Charlotte
Final design	
Design of Niara	Nikki
Underlaying design principles	Nikki
Technology and realization	Nikki & Robin
Value propositions	Robin
Ethical consideration	Robin
Methodology	Charlotte
Results	Charlotte
Discussion	Nikki
Conclusion	Robin
Acknowledgements	Robin
References	Robin
Contribution of team members	Nikki
Schematic electronics	Robin
Appendices	Robin & Charlotte

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APPENDICES

Appendix A: Code

```
/* Final Demo Day Project 2
  Technical Prototype part 1: Breathing fans
  Made by Robin van Overbeek at 1-12-2020
*/

#define fan1 13
#define fan2 15

void setup() {
          // define motor pin as an output
          pinMode(fan1, OUTPUT);
          pinMode(fan2, OUTPUT);
           //turning fan off
 }

void loop() {
           delay (5000);
          analogWrite(fan1, 0);
          analogWrite(fan2, 255);
          //set the fan speed

          delay(5000);
          analogWrite(fan1, 255);
          analogWrite(fan2, 0);
}
```

Appendix B1: User test survey

For the survey we recruited 32 participants. Looking at the data we obtained from the survey, the first visualization we have is a pie chart that shows the ages of the participants. Most participants had an age 15-36; there were nine participants with an age 15-20, nine participants with an age 21-25 and nine participants with an age 31-35. Besides that, one participant had an age 26-30, one participant 36-40, one participant 41-45 and two participants were more than 50 years old.

Looking at the pie chart of how often the participants work out in a week, most of the participants work out 1-4 times a week. Thirteen participants seem to work out 1-2 times a week, thirteen participants half 3-4 times a week, five participants work out 5-6 times a week and one participant less than one time a week.

Looking at the pie chart that visualizes if people find it hard to find motivation to work out, most of the participants answered with 'Yes.' There were twenty participants saying they find it hard to find motivation to work out, eight participants saying they sometimes find it hard to find motivation to work out and four participants did not find it hard to find motivation to work out.

The follow-up question was an open-ended question and the participants had to explain why they find it hard to find motivation. Most of the participants (9) said they are too busy with work or school or too tired afterwards, so they do not go work out. Seven participants find it hard to start because they must change clothes or must leave the couch and five participants said they are not motivated to go by themselves instead of sporting together or in a team.

In the next follow-up question we asked an open question again and we wanted the participants to explain what motivates them to workout. Most participants (21) work out to stay healthy, become stronger, lose weight, to stay fit or to relax. Seven participants work out because they work out together or play a team sport.

Looking at the pie chart that visualizes if the participants feel satisfied after their workout, all the participants answered this question with 'Yes.'

When we asked people in the questionnaire how long the satisfied feeling lasts after a workout using an open question, we got many different answers. One participant said the feeling lasts for 5 minutes, one said it lasts for 20 minutes, one said it lasts for 30 minutes, five participants said it lasts for 1 hour, five participants said it lasts for 1-3 hours, two participants said it lasts for 2 hours, five participants said it lasts for 3 hours, four participants said it lasts for a few hours, six participants said it lasts for one day and two participants said it lasts for two days. So, for most participants the satisfied feeling lasts for 1-3 hours.

The question asking how the participants thought the satisfied feeling could be extended was also an open-ended question. Most of the participants (10) answered they had no idea how they could extend the feeling of satisfaction. Five participants said that staying active could help to extend the satisfied feeling, three said that eating healthy can help you because it reminds you that when you eat healthy you did not work out for nothing, three participants said it can help if you gain more insights why workout out is good for you, the other participants suggested things like learning to keep the satisfied feeling, receiving an award after a workout, walking in nature, and cooling down.

Appendix B2: User test Interview

Comparison between the prototype with the Drops and the Cubes

Drops & Cubes	**Conclusion**
These two had no color in the lights, the one with the smoke did had color in the lights	I like the colored lights more than normal light
These two had the same sort of light, the one with the smoke hada more color in it	Colors in the prototype are nicer
These two had more a black and white contrast, the other one had more colors	Colors are prettier
These two had no color, the other one did have color	Colors are restless, I prefer light without color

Comparison between the prototype with the Smoke and the Cubes

Smoke & Cubes	**Conclusion**
These had more lights and consisted of big and small squares, the other one didn't	The smoke and cube one are more fun to watch
These had more lights in it than the other one	More lights make it more playful to watch
These had more lights in it than the other one	More lights are nicer to watch
The two are self-contained, with the drops there is something projected	I prefer the smoke and cubes because for the one with the drops you need a wall so you can't put it everywhere
With these two there is coming light out of the thing itself and the other one has a projection	I like it more when the light comes out of the design itself then when the light shines om something in order to see what it presents
These two are darker than the other one	I think darker is more interesting

Comparison between the Drops and the Smoke

Drops & Smoke	**Conclusion**
These are bigger than the cubes	I think the cubes are more interesting to watch and more practical to place in your house
The drops and smoke are more related to sports because of water and steam	The cubes don't link to sports for me and the balance is wouldn't motivate me
These two both have something circular	I like the shape of the cubes more
The light intensity of these two is nicer than the intensity of the light of the cubes	I don't like to watch the cubes because it's so bright, I like the intensity of the others more

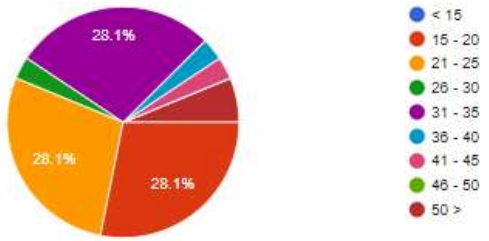
Design preference before and after explaining the three designs

Before	**After**
Smoke is very nice and mysterious, I also really like the variation in the color of the lights and it's a nice visualisation.	I still think the one with smoke is the most interesting one, it's very cool and I think it would be nice if you could combine the three prototypes.
The one with the smoke is very nice because of the colors, it's also unique I have never seen this before and this prototype is the most interactive one, there is a lot going on inside	This one is just very beautiful, it's a real rewarding to look at if you did a workout or something. I also like the one with the cubes because that way I can see how much I did in a day so I would like a combination of the two
Cubes Just because it has no color in it and the light comes out of the design itself	Smoke This one is the most interesting one because it has a physiological aspect.
Cubes Just because of the cubes are small and therefor easier to put in your house	Smoke You see a visualisation of your whole day that is created by smoke and that's very nice and also the colors make it look very nice

Appendix C1: Raw Data Survey

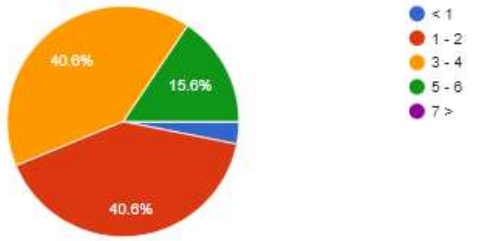
What is your age?

32 responses



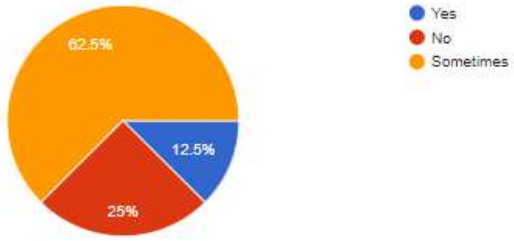
How often do you work out a week on average?

32 responses



Do you find it hard to get motivated to work out?

32 responses



If yes/sometimes; why do you find it hard to find motivation?

24 responses

It is hard to start, but once started the motivation comes
Busy with work and hard to plan workout at different times of the day
Now I find it very hard to motivate just myself, without being part of a team or training towards a goal
because i have to get up from the couch
Het er naar toe gaan, of sporten in een (onbekende) groep
Bad weather, not enough time
I don't find it hard to motivate myself when I have team practice, but I find it really hard to find motivation for doing workouts by myself. This is mostly because I don't find it comfortable to workout in a gym by myself (due to insecurity). Also I wouldn't go out for a run easily because I simply haven't done that often so I don't really know where to start.
Sometimes I have to go a distance to work out. the drive in the car is what hold me back.
Afraid to not meet my own standards
Sometimes I just are to busy with other stuff and want to relax
Voldoende tijd vinden om het in te plannen. Als ik even niets hoef is de verleiding groot om mijn tijd aan andere zaken dan beweging te spenderen.
Too much work
Because I have to change into sportclothes
Tired after work, don't want to work out alone, don't know what to do
Because it's easier to just watch Netflix on the couch
Make time and go
Als ik geen structuur of een team heb om mee te trainen vind ik het heel erg moeilijk om te gaan sporten.
Long day at work or tired
Having to get dressed en getting your stuff takes time. Sometimes it is easier just to stay in the couch
There is so much to do already, if there is no time slot for doing sports fitting in the schedule, then it is easily skipped
School takes up a lot of my time so it is hard to get up after studying for 3/4th of the day
Most of the time because I'm tired

What motivates you to work out? (think of rituals/goals/etc.)

32 responses

Fotos/video's van anderen in de sportschool en mijn eigen wil om sterker te worden

Goals and the fulfilled feeling afterwards

To be fit and able to do my job

Feeling good/satisfied

Flexibility, use my body. Stay a bit fit.

Ontspannend na werk, leuk om te doen

schedule

De voldoening daarna en het fitte/gezonde gevoel (van je lichaam)

Working out with others, competitions, nice weather, work-outs that are fun

I just really really reallyyyyy like sports

Team sport really motivates me to work out, because then I am not only responsible for my own fitness en skills, but I also have the responsibility to be there for my team. Goals would also help me, and in particular knowing which exercises are needed to achieve my goals.

getting fitter, stronger, and doing it for the team

Having to go out for my work out, rythm in the week with workung out

The fact that i'm playing a teamsport so i'm not only doing it for myself

Being fit, having a good body

Een vast moment in de week en mensen om samen mee te sporten.

Conditie fit voelen

My health, social contact, fresh air, fitness watch, structure

Teamsports, working with goals

My work out partner I barely work out alone

Exercise stress away, feel stronger, fun sport

Physical health like losing weight. Also endorfins are awesome

Relaxation and health

Ik wordt er sterker van. En voel me een stuk beter als ik wel sport. En het helpt me om met andere mensen te sporten.

Stay and gain strength and fit

Goal to get a nicer body

Strengthening my body to reduce pains and injuries

Dopamine!!!!

After working out I feel better but starting to work out can sometimes be hard

How long does that satisfied feeling last after a workout?

32 responses

How do you think that feeling can be extended?

32 responses

Door vaker te gaan fitnessen wel

A reward or compliment

To learn how to keep that feeling.

Not to drink alcohol after work out

Don't know, would be nice

Geen idee

not a clue

Als je meer inzicht krijgt in hoe goed het voor je is geweest

Drugs? I dunno... Maybe by seeing change in my body? Like looking toned?

To live a healthy lifestyle. For me this satisfied feeling isn't only caused by just my workouts. I have this satisfied feeling because I eat healthy, I'm always being positive and happy (mental health) and then there are the workouts. These 3 main factors are in a good balance. I also think that it helps for me that I'm a very active person. I'm always doing something physically. I think it's harder for lazy people to extent this satisfied feeling.

I don't know actually. Maybe by eating consciously (the days) after your workouts so you don't have the feeling that you worked out for nothing ;-)

I think it is not necessary to extend the feeling but to get the "reminder" of that feeling to take it towards the next workout

A well thought cool down or stretches

I don't know

I dont know

Geen idee.

In de natuur lopen

Fresh water, social contact, smoothies

If I eat healthy afterwards

Continue to do things that are healthy

Don't know

By staying active, like walking after a workout

Higher intensity workout

Vaker minder licht sporten en zwaar sporten afwisselen zodat ik mijn spieren blijf voelen en mij sterk voel

Reminding yourself that you did a great job

I think not, it is the dopamine you have after your workout

That feeling could be extended by working out a little everyday. So do not 2x 2-hour sessions, but for example 2x 1-hour and 4x half an hour, or something like that

By living my best life

No idea

Appendix C2: Raw Data Interview

Usertest Participant 1

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Druppels en blokjes: soort licht het zelfde, middelste meer kleur

Wat maakt deze overeenkomst interessant?

Kleurtjes spreken mij meer aan, kleureffect van rook is mooier

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Hoeveelheid licht, meer lampjes in rook en blokje, ipv in water daar maar 1 lamp

Wat maakt deze overeenkomst interessant?

Opvalt om tellen, meer lichtjes interresanter.
Rechter speelser want losse lampen en middelste 1 ding met.
Linker vanwege 1 lichtbron een beetje eentonig. Meerdere lichtjes want speelser

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

1e wordt echt geprojecteerd en heft iets buiten het object nodig, rest staat op zichzelf

Wat maakt deze overeenkomst interessant?

Op zichzelf staat is
wat handiger want makkelijker te gebruiken.

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Allemaal gecombi met sporten. Combi met water en stoom is meer een resultaat van jouw sporten en de blokjes niet

Wat maakt deze overeenkomst interessant?

Resultaat van sporten interessanter want meer nudging. Balans minder motiveren. Andere
is resultaat van sporten dus beter motiverend.

Welk van de 3 designs vind je het leukst/mooist/interessantst en waarom?

Druppels
Rook
Blokjes
Rook het tofst want door rook
en variatie in kleur en meerderheid speelser en mystrieuze r en minder basic ivm gewoon waardes. Mooie visualisation van progress

Video laten zien en korte uitleg geven
https://youtu.be/Qjx7KIab8Ko

Is het antwoord op bovenstaande vraag veranderd en waarom wel/niet?

Nee niet veranderd. Zou iets meer linken want dan alle drie kunnen gebruiken. Maar
combi zou vet zijn maybe.

Usertest Participant 2

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Iets met rondjes, derde niet

Wat maakt deze overeenkomst interessant?

Blokjes mooier

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Geen kleur in gebruik

Wat maakt deze overeenkomst interessant?

Kleurtjes zijn druk, liever zonder kleur

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Kleur komt uit het object

Wat maakt deze overeenkomst interessant?

Uit het object interessant

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Donker is interessanter

Wat maakt deze overeenkomst interessant?

-

Welk van de 3 designs vind je het leukst/mooist/interessantst en waarom?

Druppels
Rook
Blokjes

Welke was het interessants

derde. blokjes

Video laten zien en korte uitleg geven
https://youtu.be/Qjx7KIab8Ko

Welke was het interessants

middelste

Is het antwoord op bovenstaande vraag veranderd en waarom wel/niet?

Ja, is interessant want fysologisch aspect.
De derde, ja nou die vond ik leuk en ziet er mooi uit. En vind balans tof en het meest waardevol. Niet voor 1 type.

Usertest participant 3

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

Meer lichtjes, groot vierkant en kleine vierkantjes
Wat maakt deze overeenkomst interessant?
Meer leuke dingen om naar te kijken

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook
Blokjes

Welke overeenkomst is dit en hoe is de derde anders?

groot vierkant
derde is anders omdat het kleine zijn

Wat maakt deze overeenkomst interessant?

Derde interessanter/leuker omdat er meer te zien is in huis is derde minder praktisch

Welke 2 hebben een overeenkomst die de derde niet heeft?

Druppels
Rook

Blokjes
Welke overeenkomst is dit en hoe is de derde anders?
Intensiteit van licht lijkt meer uit te maken
meer uitgespreid licht, niet maar 1 lichtpuntje
meer gediffused
Wat maakt deze overeenkomst interessant?
daardoor minder intens licht, fijner om naar de kijken
Welke 2 hebben een overeenkomst die de derde niet heeft?
Druppels
Rook
Blokjes
Welke overeenkomst is dit en hoe is de derde anders?
Kleurtjes!!
Wat maakt deze overeenkomst interessant?
Kleurtjes zijn leuker
Welk van de 3 designs vind je het leukst/mooist/interessantst en waarom?
Druppels
Rook
Blokjes

Video laten zien en korte uitleg geven
https://youtu.be/Qjx7KIab8Ko

Is het antwoord op bovenstaande vraag veranderd en waarom wel/niet?
Daarin kan je je hele dag zien samengevat worden. Hiervoor was adem het interessants. De rook en kleur waren het meest interessant.
Thuis gebruiken?
Rook en druppels niet omdat de gegevens die worden weergegeven al te zien zijn op de smartwatch. Balans wel omdat je in 1 oogopslag ziet hoe je dag was, stuk zelfreflectie.
De blokjes meer als motivatie en de andere meer om het satisfied feeling te verlengen

Usertest Participant 4
Welke 2 hebben een overeenkomst die de derde niet heeft?
Druppels
Rook
Blokjes
Welke overeenkomst is dit en hoe is de derde anders?
Overeenkomst: zwart wit, 3e heeft veel leuke kleurtjes
Wat maakt deze overeenkomst interessant?
De twee met zwart wit zijn eigenlijk een beetje saai, de middelste met kleurtjes valt hierdoor juist op
Welke 2 hebben een overeenkomst die de derde niet heeft?
Druppels
Rook
Blokjes
Welke overeenkomst is dit en hoe is de derde anders?
Overeenkomst: de rook en blokjes hebben beiden felle lampen en dus veel licht
De 3e heeft niet echt fel licht van zichzelf , meer licht op de muur
Wat maakt deze overeenkomst interessant?
Het vele licht vind ik leuk en maakt het ook echt interessant, er gebeurt meer door het lichtspel

Welke 2 hebben een overeenkomst die de derde niet heeft?
Druppels
Rook
Blokjes
Welke overeenkomst is dit en hoe is de derde anders?
De druppels en rook hebben niet echt een concrete vorm, wat er gebeurt is niet statisch
De 3e heeft een concrete vorm
Wat maakt deze overeenkomst interessant?
De concrete vorm vind ik wel rustgevend en fijn maar de middelste is concreet en interessant
Welk van de 3 designs vind je het leukst/mooist/interessantst en waarom?
Druppels
Rook
Blokjes
Deze heeft veel leuke kleurtjes en dat maakt het uniek, ook gebeurt er het meeste

Video laten zien en korte uitleg geven
https://youtu.be/Qjx7KIab8Ko

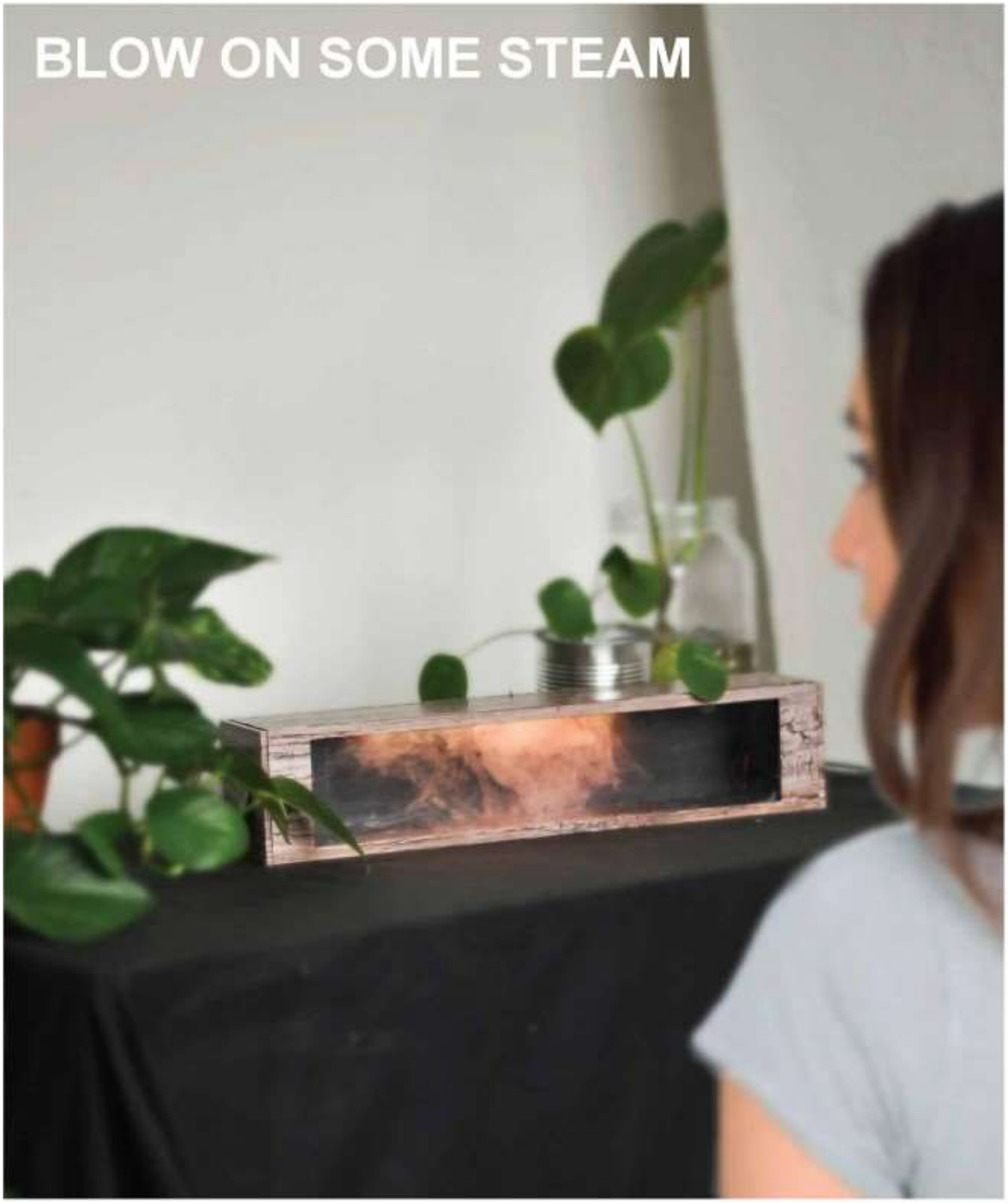
Is het antwoord op bovenstaande vraag veranderd en waarom wel/niet?

Nee, de middelste is nog steeds het vetste, echt een beloning om zoiets moois te zien. De blokjes vind ik als 2e het leukst want vind het leuk om te kunnen zien hoeveel ik heb gedaan. Balans tussen toch concrete vorm maar ook abstract zou leuk zijn.

Appendix D: Demoday Deliverables

Video Link

Niara B2.21



LET'S GET DATA PHYSICAL

NIARA

STUDENT NAMES:
CHARLOTTE MEERTENS
NIKKI OKKELS
ROBIN VAN OVERBEEK

COACH:
DAPHNE MENHEERE

SEMESTER:
B21

Do you remember the satisfying feeling you have after working out? Usually, it only lasts for a short period of time but what if we could make it not as temporary?
Niara is an interactive ambient display that triggers an extended feeling of satisfaction after being physically active, giving you the time and space to reflect on your activities. The movement of the steam into the box represents your own breath: the slower the breathing, the more subtle the movement.
Take a moment for yourself, think inside of the box for once, and feel proud and motivated for your next workout.

Photos