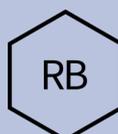


FEBRUARY 2022

# Bio Mirror Research

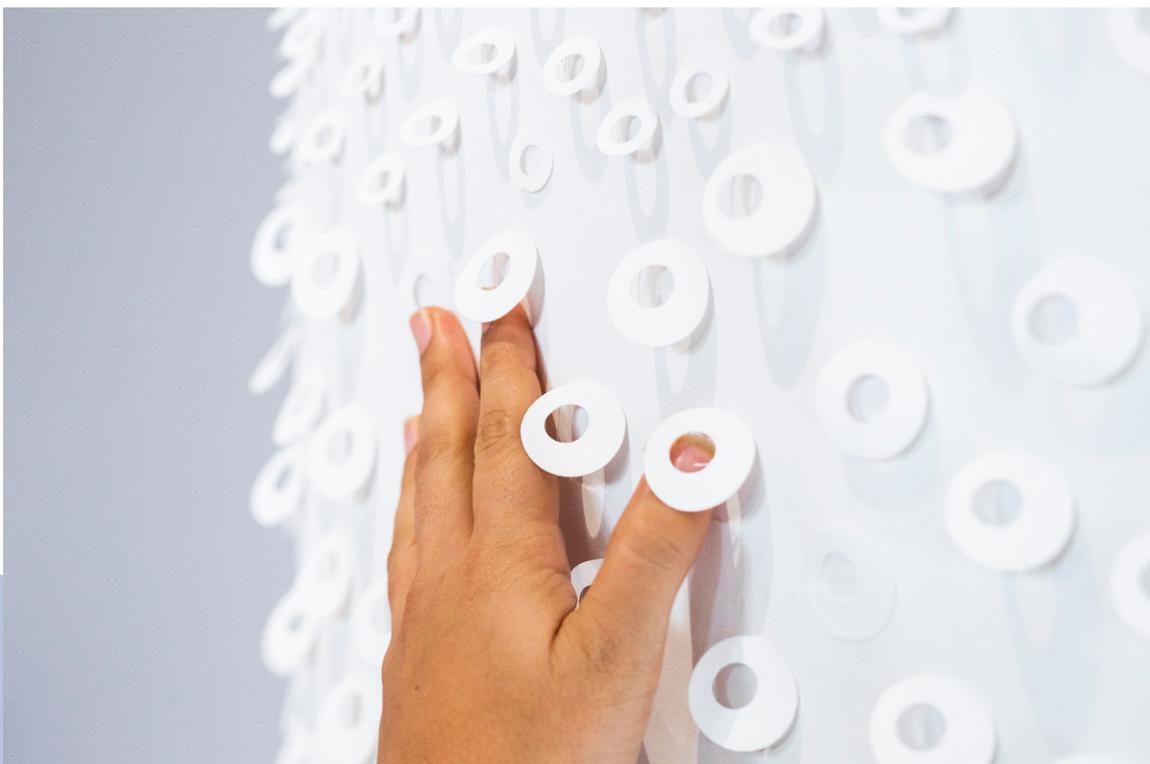
Results Pilot

By Alissa+Nienke in collaboration with Renske Bongers



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# The Pilot

With our pilot research we were able to apply the designs in a real life context.  
Creating the possibility to learn from implementing them and to discover their impact.  
The main question we want to answer in our Bio Mirror project is:

How can materials and interior products contribute to mental well being?



Based on our design questions we created two studies:

- VR
- Location based research

In the next part we will dive into these studies and the results we found.

# Two studies

## *VR study (Relaxation & stress reduction)*

In collaboration with the TUD we were able to develop the deep breathing tool in VR. The aim of the tool is to help people relax and reduce stress by using their breath as a means. As a feed forward system the tool shows a deep and slow breathing rhythm that users are able to follow consciously. We chose rhythms that are proven to induce relaxation.

The VR study contained two phases of testing:

- **Design:** what shape, size, color application and breathing rhythm appeals the most to the participants? Which one do they experience as the most relaxing? What kind of associations do they make and why? With this study we wanted to dive into the design characteristics that work best.
- **Impact:** in the second study we wanted to measure if participants were able to follow the breathing rhythm and how it influenced their HRV. We collaborated with The Institute for Applied Motions (IAM) to test their seating pad sensor.

## *Location based research (Focussing & Letting go)*

The second part of the pilot contained a location based study. Dangling Mirror, POP Coin and Surface of Sound were placed into two office environments (HNK Rotterdam and Being) to test their impact. The aim of these installations were to get people out of their work context, changing their mindset for a minute or to give them a moment to recharge.

Placed in the background, Dangling Mirror and POP Coin both worked in an unconscious manner. They were present, but it wasn't necessary to do something with these installations. Surface of Sound needed interaction. Touching the installation was necessary to get the auditory response of sounds.

By doing a study on location we gained insights in how the objects function and how people experience them. Both from a behavioral perspective as from a design perspective.

# VR Research

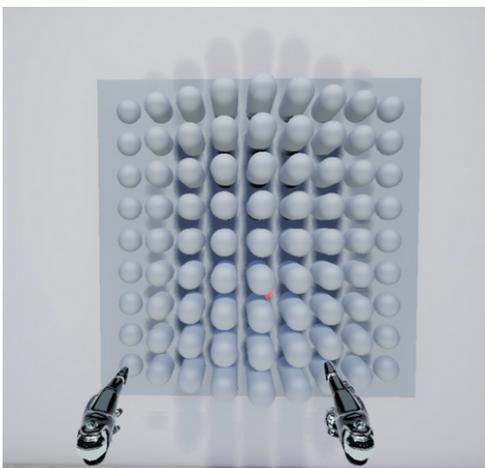
## Study 1 - Design

In the first VR study we dove into the design of the deep breathing tool. We created three different moving objects:

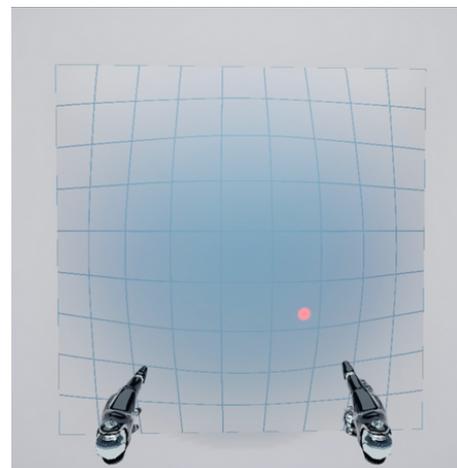
- Sprietje
- Cylinder
- Square



Sprietje



Cylinder



Square

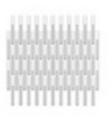
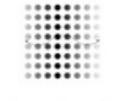
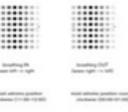
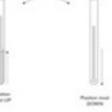
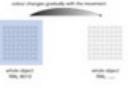
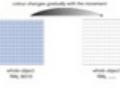
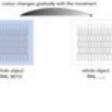
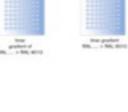
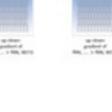
### Procedure:

The participants went into the VR where they would walk through several rooms in which the objects would hang on the wall. Every room dove into a different design aspect (shape, size, color application and breathing rhythm). During the VR experience the participants were interviewed to collect the data.

Before we went into the design preferences we wanted to learn what people thought of when they saw the objects. We started the study with a small association task, asking the participants to freely associate on the shape they saw. In the following questions every choice they made was based on which option they found most relaxing or calming. After the VR experience there was a small questionnaire to fill in about their daily experiences with stress and relaxation.

## Design aspects:

In every room the participants had to choose from three different options regarding a design aspect. The design aspects were Shape, Size, Colour application and Breathing rhythm (or pop-up height). In the following overview you see alle the options we created.

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# Study 1: Design

## Summary results

### Association task:

Regarding all shapes, the associations with organic things were the most present. Cylinder and Sprietje had associations more related to nature, where with the shape Square the associations had a more human foundation. The words used most often were:

**41 x** **Cylinder:** Ocean, water, waves, natural, organic

**14 x** **Sprietje:** Grass, animal, hairy, natural, organic

**25x** **Square:** belly, pregnant, natural

Breathing was also an association named more often. Mostly with the shape Square (13x), but a close second was Sprietje (9x).

The shape participants found most relaxing was the Cylinder and next Square. The participants found Sprietje interesting from a design perspective, the way the shape was created and how it moved, but at the same

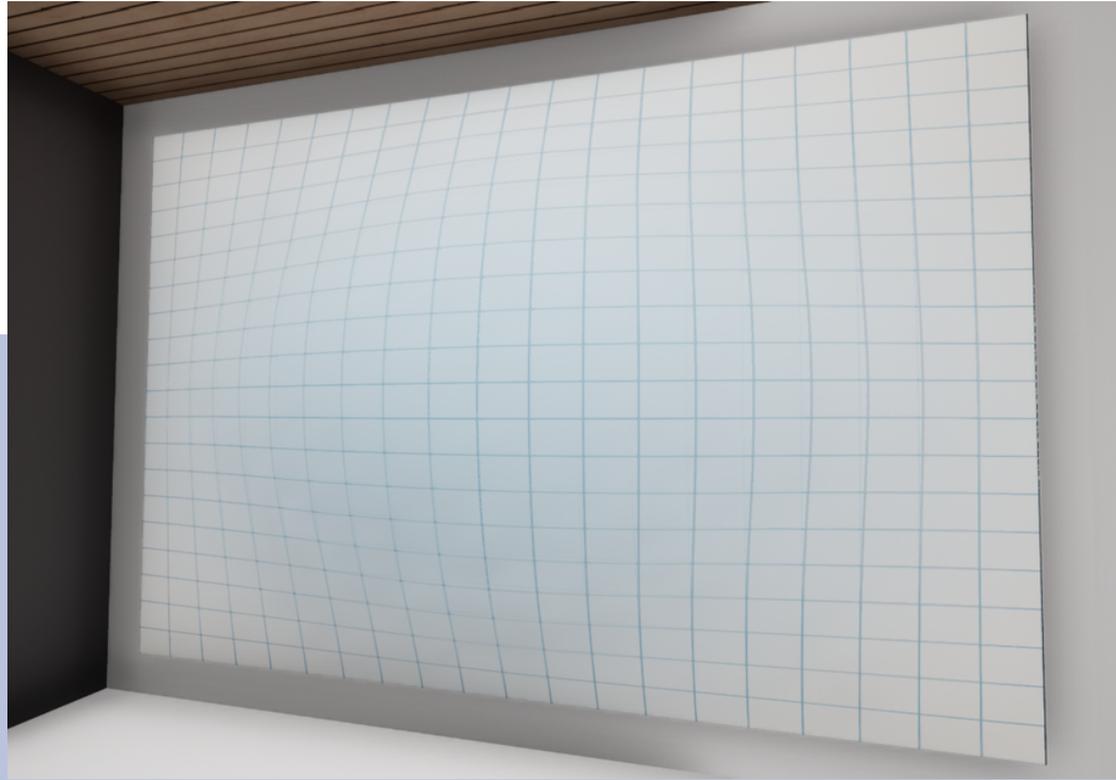
time they experienced it as too complex to be calming. It contained too much information. Square on the other hand was the least complex and was called more basic.

The size participants preferred in general was the medium size. The color application participants preferred were gradient and full color (changing from one to another color).

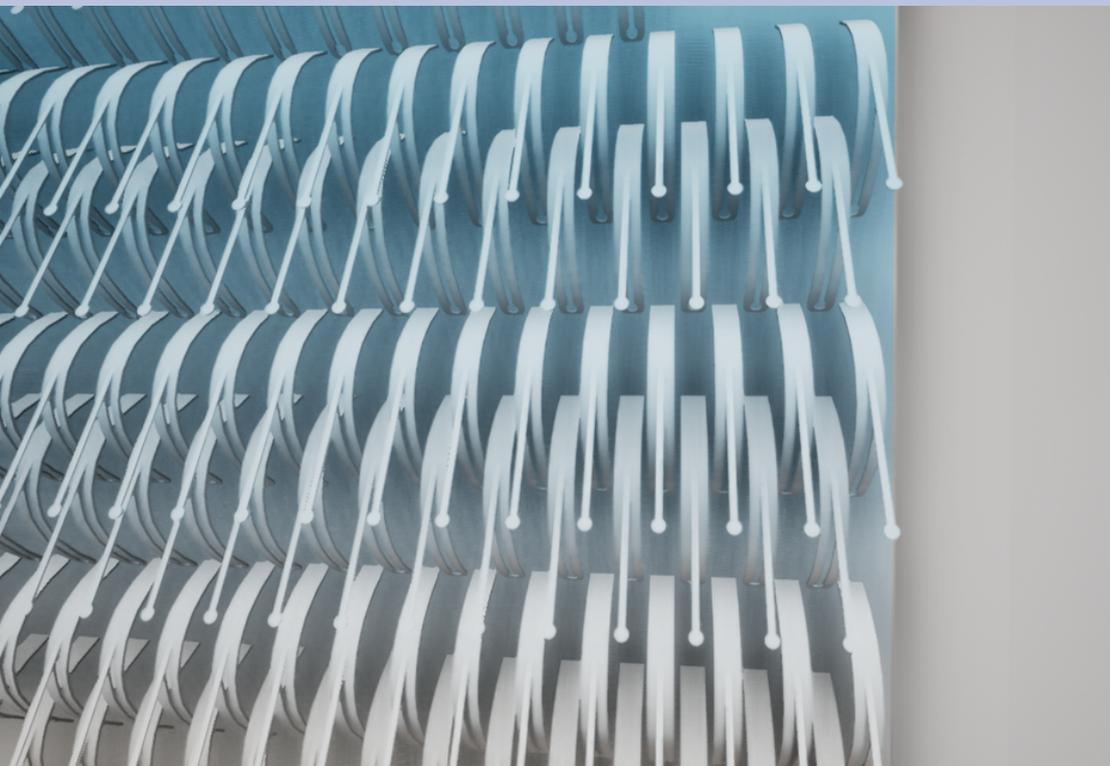
The breathing rhythm people preferred was the 3-1-6 rhythm. The least preferred was the paced breathing rhythm (4-7-8), for most of the participants this rhythm was too slow to be recognized as a breathing rhythm.



## Study 1: Design



*Least complex and basic*



*Too complex, but interesting*

# Study 2: Impact

In the second study we wanted to test how well participants could follow the rhythm and if their HRV would improve after 7 minutes of breathing in a fixed rhythm. We chose two of the options out of the first study (images on next page):

- Cylinder - with a full color application, medium size and 3-1-6- breathing rhythm
- Sprietje, - gradient color application - large size and 3-1-6 breathing rhythm.

## *Procedure:*

The participants went into the VR where they would start in a small office room to get used to the VR. After 1 minute they could walk into the second room where they would see the deep breathing tool. The participants were asked to sit in front of the deep breathing tool and follow the rhythm for 7 minutes. After that they could explore the VR for a little bit until they were done. After the VR experience there was a small questionnaire to fill in. In this study the data was collected with a seating pad sensor from the Institute for Applied Motions.

***"Slowing the breathing rhythm down helped me to relax."***

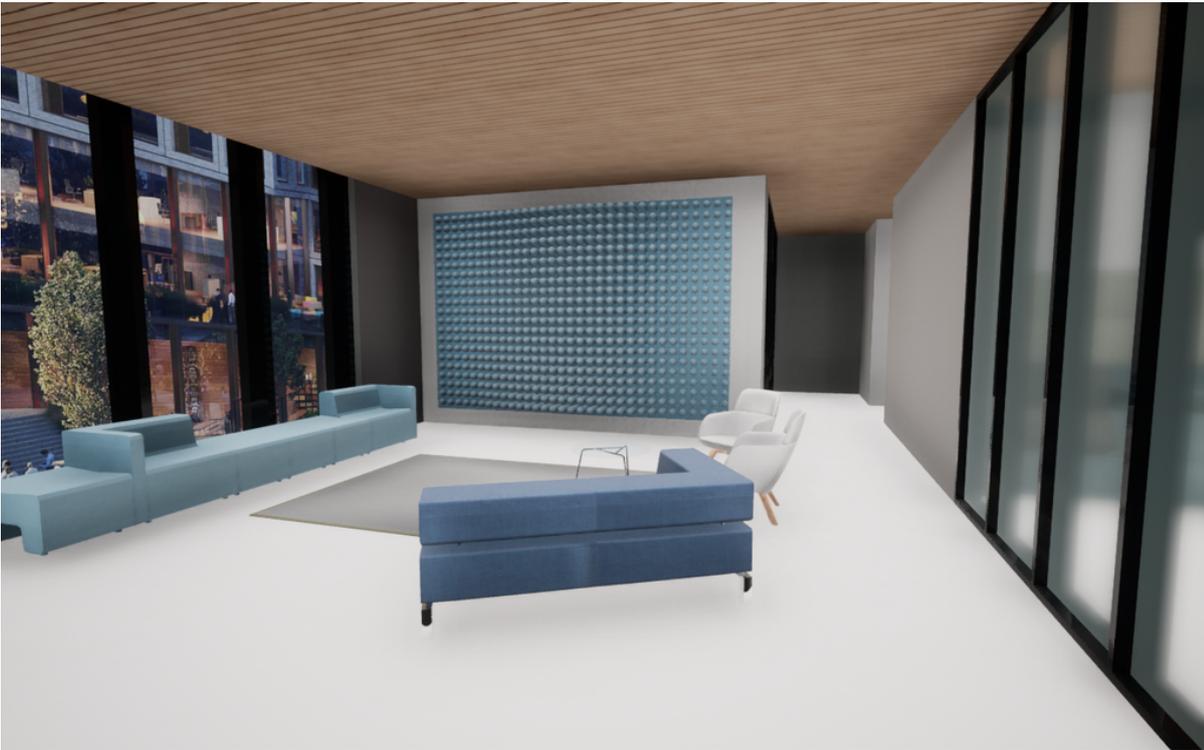
## **Results study 2:**

Due to technicalities in the sensor, there were too many outliers to analyze the data. We'll have to redo the research to gain a new data set. The results from the questionnaires gave more qualitative insights into the experience. According to the participants they were able to follow the breathing rhythm, but they had to get into it. The breathing rhythm was a bit slower than their own breathing rhythm. Especially the exhalation took a bit of time in the beginning to get into. The moving pattering of the object made it easier for them to follow when they had to inhale and when they could exhale.

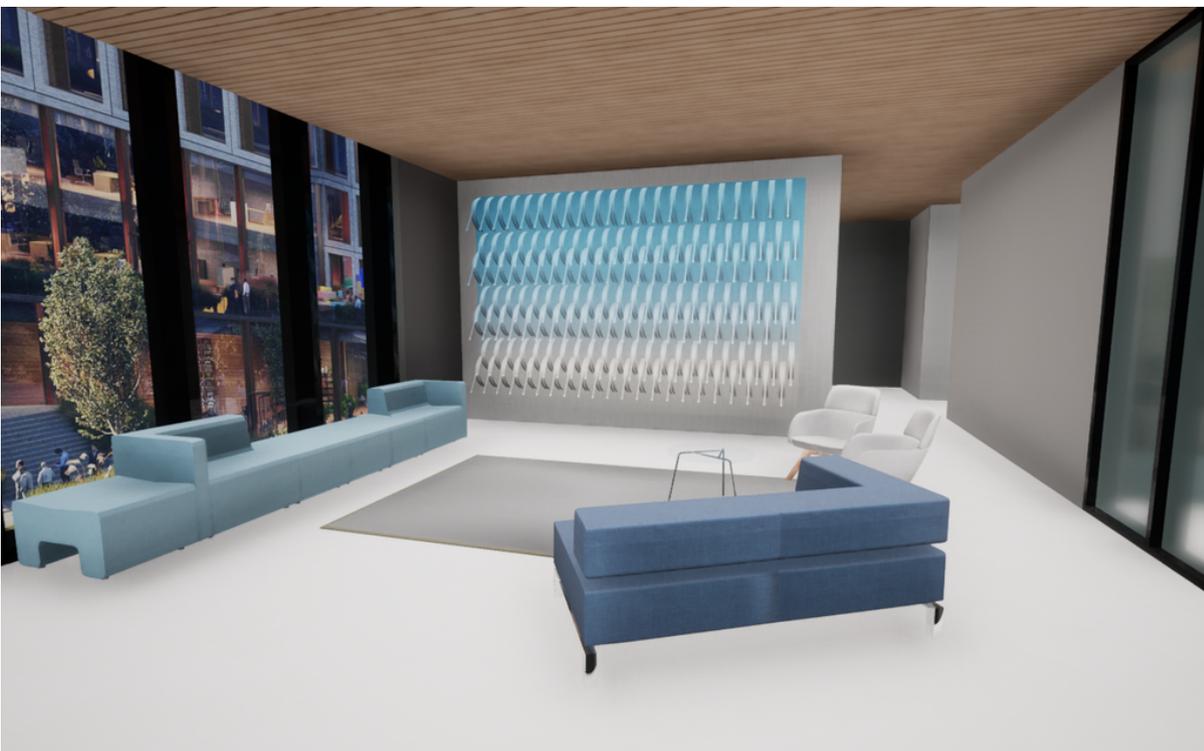
When we asked about where they would implement an object like these, the most named spaces were a focus room, a relaxation room and the coffee corner (where they would go to take a small break from work).

***"The wave-like movement helped me to follow the rhythm."***

## Study 2: Impact



*Cylinder*



*Sprietje*

# Location Based Research

The location based research gave us insights from a design perspective in how applying the different installations in an office environment worked. Next to that we studied the impact of the installations on the people working there. We used interviews as a qualitative research method. Participants were interviewed twice, before the installations were placed and after a month since they were placed.

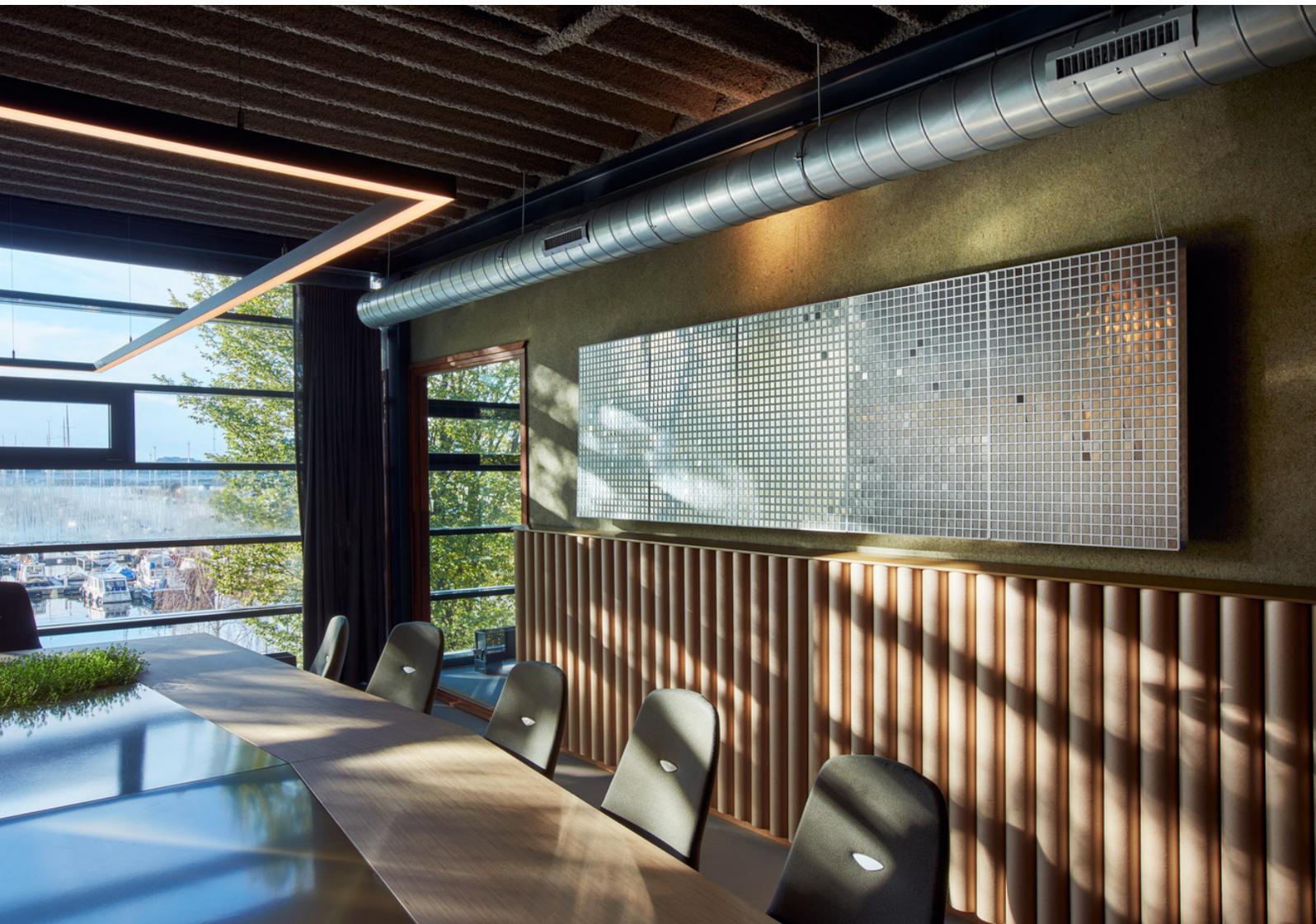
The following installations were placed in the two office environments:

- HNK - Rotterdam: Dangling Mirror and Surface of Sound
- Being - Amsterdam: Dangling Mirror, Surface of Sound, POP Coin



***"There is a lot of hidden interaction. It fascinates me and is exciting."***

# Interviews part 1



The first round of interviews we dove into stress and relaxation and the current work environment. We asked questions about the following topics:

- What do the participants relate to workload and stress?
- When was the last time you were really able to relax?
- What do you do during the day to relax?
- How do you experience the work environment?

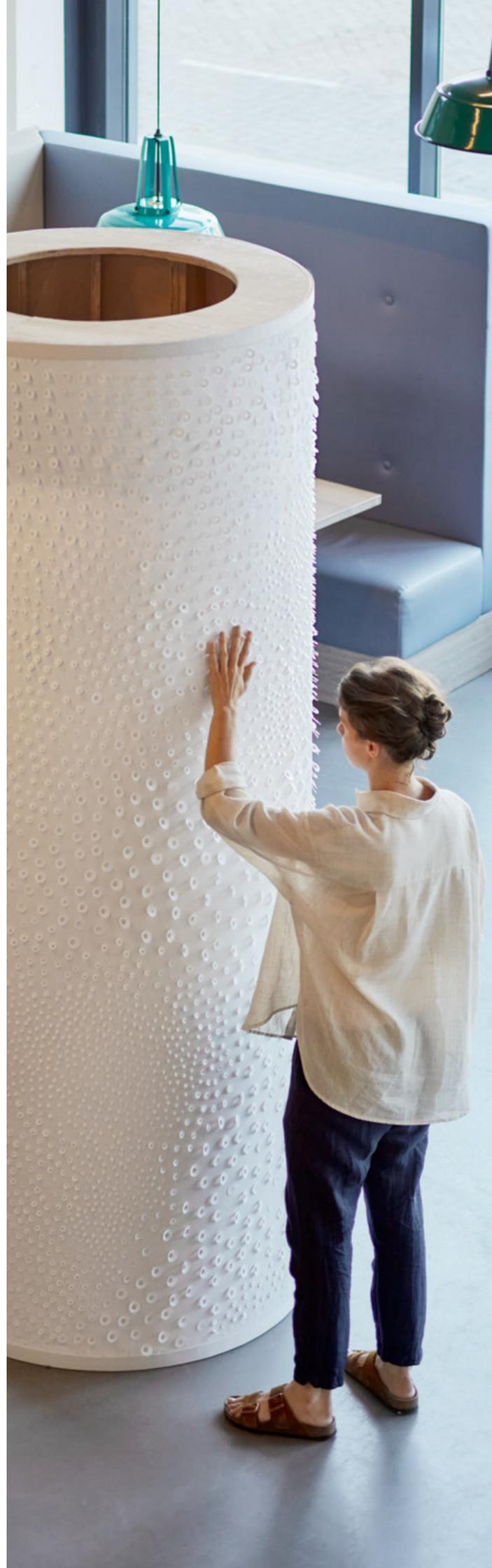
## *What do the participants relate to workload and stress?*

The results of the associations they have can be divided into four categories: mental, physical, social and pragmatic.

The mental associations had a strong presence. Feeling pressure with the amount of work vs. the amount of time you have, related to the responsibilities you have lay at the base of how the workload is experienced. There is a threshold in which people are still able to find their balance between when they feel pressure or where the pressure becomes too high and people experience stress. The participants described the signals they notice when workload can turn into stress as a grey area. These signals are for example:

- Being able to have an overview
- Worrying or having many thoughts about work
- Feeling responsible, but not having any control.

The physical associations are mostly related to feeling restless and being drained of energy by work. The social associations relate to how people themselves react. Being more easily irritated or trying to micromanage their environment. Other social associations participants had were more about the object causing stress. Which was not work itself, but worries they had about family or friends. Which they could not shake of during work.



## *When was the last time you were really able to relax?*

The moments participants described can be divided into five categories: mental, physical, leisure, social and environmental.

Leisure and the environment were the most present in the descriptions. Almost every participant described their last holiday as the moment they felt completely relaxed. Being away and being in a different environment are related to it. Having other leisure activities like going out for dinner and having drinks on a terrace. The environments were richly described. The participants named being in the mountains, being near the ocean and the beach, being in a forest or near lakes. And especially having good and sunny weather. Next to the examples of the type of environments, the other denominator was experiencing calmness. Not having too many stimuli, besides those of nature and all the senses that can be triggered by nature. Being able to take a step back and find a moment of quietness made them relax. Exercising (going for walks or running) and being able to see family and friends were also named as aspects that helped them relax.

## *What do you do during the day to relax?*

Where the participants felt most relaxed when they were in a completely different environment, the things they do during a day aren't as much about going to a different environment. The answers can be divided into six categories: mental, physical, leisure, social, environmental and pragmatic.

Taking time to do something different than working is what the participants do to find a moment to relax. A moment where they do not have to use their head to think and where they are able to gain an overview of their thoughts again.

They strive for this most often by reading something different, either in a book, magazine or online. watching a video, listening to music (mostly while working) or getting some coffee or a snack. What also helps them to clear their head is having a chat with colleagues or friends. Some participants go out for a walk, to really leave the work environment, but this is not commonly shared by the majority. If they mention a physical activity it's more often about exercising before or after work, but not during a work day.

## *How do you experience the work environment?*

With this question we found a division between what works for their benefit and what is distracting them. Next to that there was a division between working in the office and working from home. Due to the Covid-measures, the participants were asked to work from home more often during the pilot.

The answers were divided into six categories: mental, physical, leisure, social, environmental and pragmatic.

The main two topics that came across in the answers related to the work environment were: being able to focus and being able to have (or not have) social interaction. The pros and cons for working at the office or working from home are intertwined. Depending on how big the office is, how many people are working there, what the culture is and what the type of work is that needs to be done, the answers can be different for different organizations. We can state that mostly office work requires thinking and being able to focus.

***"The environment had a bigger influence than I imagined."***



### **Focussing:**

When their work required some focus participants found it more difficult to be in an environment with distractions. The biggest distraction they named was actually people themselves. Noise in general, but especially people talking and chatting is something we find very difficult to ignore. The coping mechanism they used was most often working from home, to be able to do the work they needed to focus on. If possible they would try to find an empty room to work from in the office building (which was not always possible and not always meant for individual focussed working). A third sign they used was putting on their headphones with music. It was mentioned as a sign to other colleagues that they would not like to be bothered with questions for the time being. The work environment is perceived as less optimal when it comes to focussed working. Having a quiet space with no distractions is what they need. Which is currently found at home more often.

### ***Social interaction:***

The other way goes around for social interaction. Where social interaction can be a distraction for the need to focus, it's also seen as a benefit for working in the office. The main reason the participants want to be in the office is to have the possibility to socially interact with their colleagues. Which can be a social non-work related chat or the ability to work together and ask questions. Working in the office makes this a lot easier. You're able to run into each other, take a moment in between working or meetings to have a chat. It's the downside of working from home. Where it might be less distracting and great to focus, working from home also means having little to no interaction. The moments in between participants use to let go of their work for a minute. Where social interaction can be seen as a distraction it's also a means to let go and blow off some steam. Taking a moment to relax.

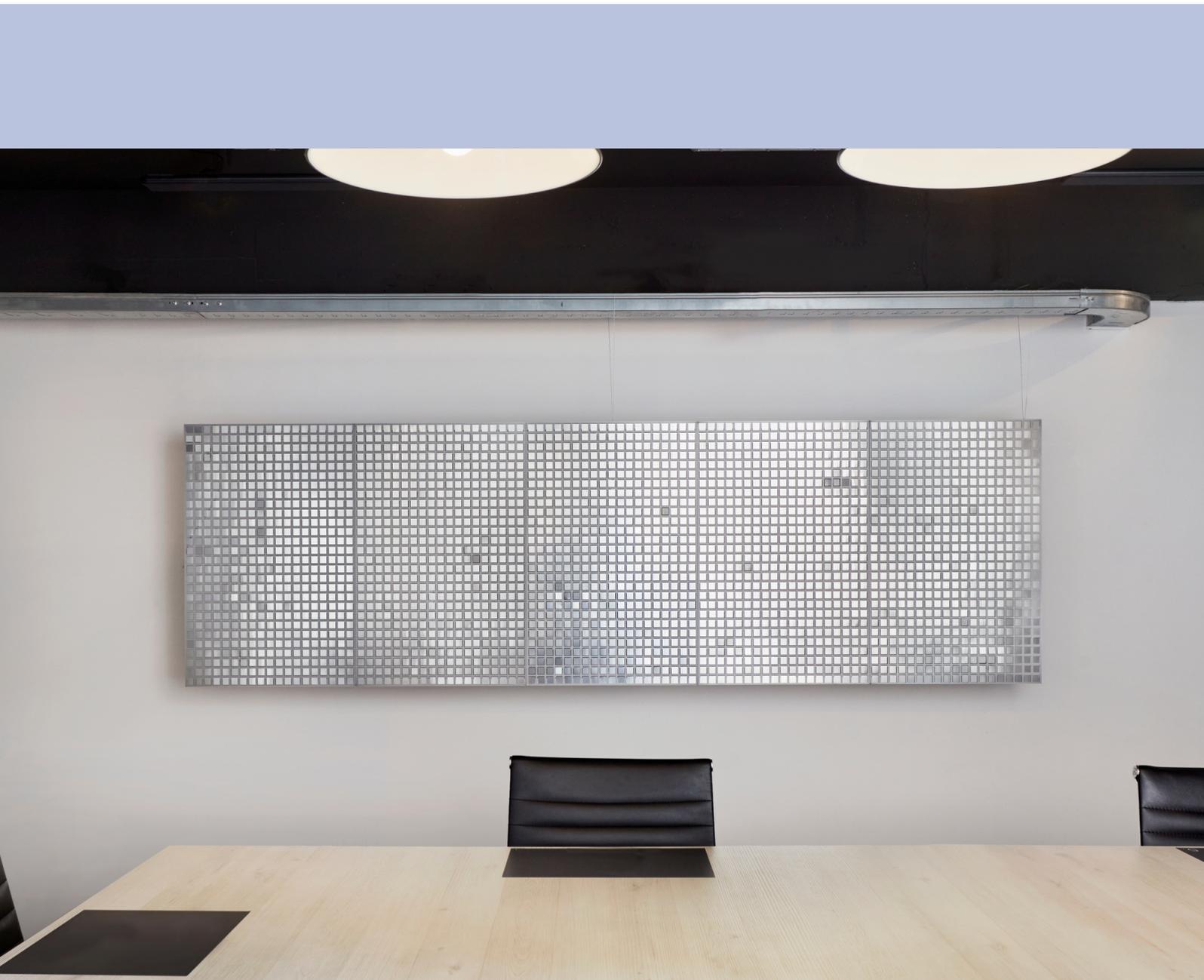
Based on these two principles we could say that the workplace as a default needs a base layout in which people have the possibility to work separately and privately to be able to focus and at the same time have spaces that stimulate social interaction.

***"Being able to chat with colleagues is the main reason to go to the office."***



# Interviews part 2

In the second round of interviews we dove into the experiences with the installations. What did the participants notice and think of? What kind of associations do they have with what they see? What other ways of applicability do they think of?



## Experience with the installations



***"It reminds me of the ocean and the flickering reflections of the water"***

***~ POP Coins***

### ***Dangling Mirror:***

Associations: Water ripples, Wind, High tech

Dangling Mirror was experienced as surprising. The sudden movements of the small mirrors by a breeze of air made it alive. The participants could interact with this installation without any effort. It gave them the opportunity to explore. How does it work? How can we apply it?. Because of its location in a meeting room it was often used as a conversation starter.

### ***POP Coins***

Associations: Glitter & sequins, shimmers in the water, ocean and octopus

POP Coins was mostly seen as an aesthetic experience. Its shape, changing colors and shimmering reflections of the metal were just simply stated as beautiful. It grasps your attention for a moment. It makes you observe what you're seeing. This object doesn't contain any interactive or moving elements, which makes it more static than the others. On the one hand it creates more calmness. The shimmering reflections are enough stimuli. On the other hand some participants did miss the elements moving and the effortless interaction (mentioned mostly by the group of respondents who seemingly need a bit more stimuli to function).

## ***Surface of Sound***

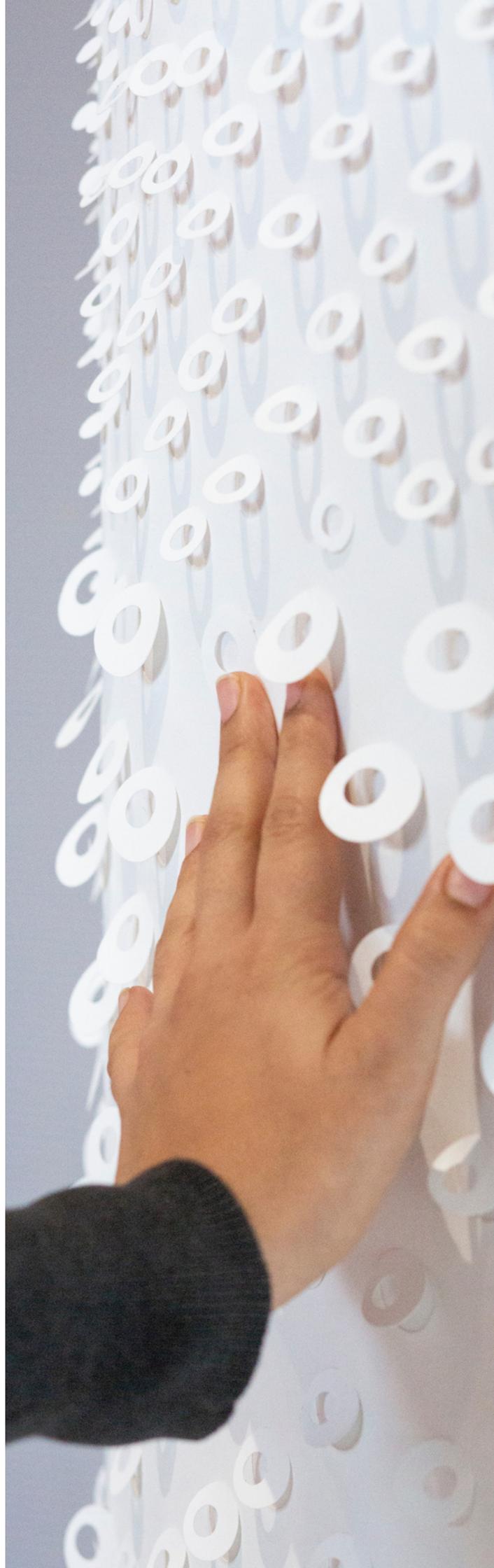
Associations: Trees, ocean, advertising column

Surface of Sound was mostly used in context to exploring together. The installation needs to be touched in order to receive the sounds, so it needs more effort to use it. If you didn't know you could touch it, you wouldn't touch it, according to the participants. Because of its white material on the outer layer, it looked more fragile than it was. One of the reasons, it was used less often by the participants. When a colleague talked about it or mentioned it, they went over to try the installation, but on their own they wouldn't go as quickly.

The location played a part in it as well. It was further away from the workplace and not in a walking route. Also the installation was placed in front of a window. The participants felt like they were being watched and observed from the outside if they would use the installation. Which is an interesting discovery. Does using this installation and exploring it feel more intimate? Something you want to keep to yourself? And not be seen by others how you use it? What makes them prefer anonymity? Questions to research in the future!

***"It looks like the white coral and you can find it underwater."***

***~ Surface of Sound***



## *Which sensory experience appeals the most to you?*

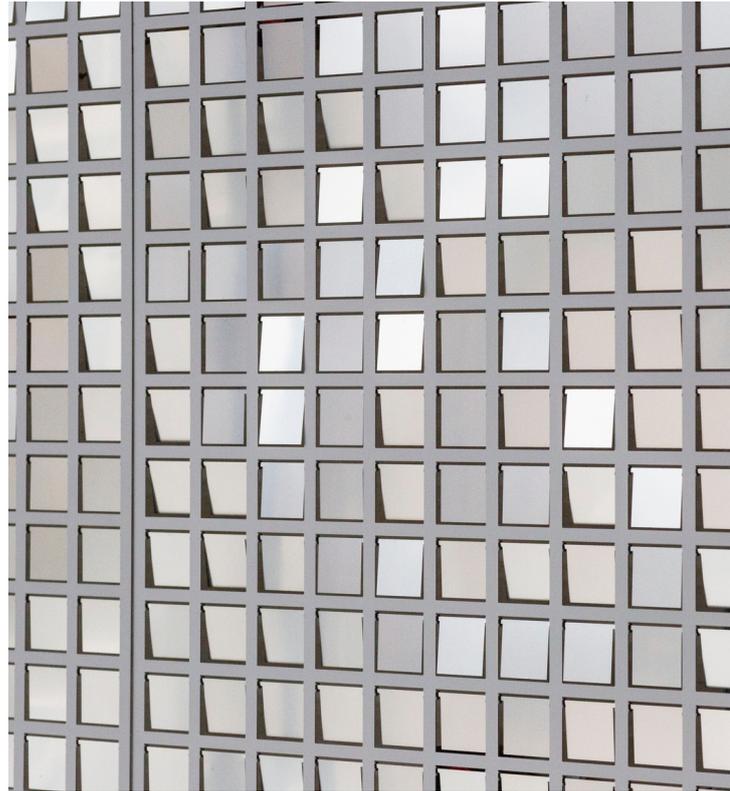
Appealing the most is the visual sense. It's the most common and dominant sense we have. Next to that the participants chose the auditory sense and the olfactory sense. Although in the last two the opinions were divided. Both auditory and olfactory were said to have personal preferences. The scent one person likes, another might dislike.

Also sounds that are unexpected is the one thing humans find difficult to exclude out of their perception. Especially when they're not able to control it.

This raises the question if the top three senses were chosen because of the ability to control them and flexibility to change them? We can more easily change what we're looking at by changing our position. We can choose to put on music or wear (noise canceling) headphones to exclude sounds and often we choose to spread a scent indoors. The tactile sense was mentioned only a few times.

***"It looks like two waves are colliding. A beautiful phenomenon in physics."***

***~ Dangling Mirror***



*Other comments that were made regarding the senses are:*

- The senses can be perfectly used to create an ambiance. In which more of the senses could be stimulated with setting this ambiance than currently is done.
- There are individual differences that will always play a part
- There is also a relation between ambiance and the task at hand. For some tasks you need a different ambiance. Can there be a match between the two and can they differ within an office space or home office?
- In general the senses are underestimated in offices. There is more that can be done to play with them, use them and apply them.

## *Which added value do the installations have regarding an office environment?*

The participants mentioned they can shift your attention for a moment. Take your mind off things, away from the task you're working on. Another thing the installations can do is to create a moment of change. Breaking patterns you normally have. For example you see something moving in the background, which you normally wouldn't see. Changing elements in the environment can break patterns.

The participants also mentioned that the installations do help you relax for a moment. It's almost meditative. In which they can be applied specifically to take a moment to relax. An example they named was placing them in a meditation room. They help you recharge or regenerate for a moment. In which you can regain some energy.

## *What (other) kind of applications do you think of after experiencing these installations?*

The installations can be applied as something to focus on. A point of reference that induces relaxation or calmness. Which could be placed in the work environment closer to their desks. The participants mentioned that changing the scale or shape of the installations could be interesting. Making it for example even bigger by covering a whole wall. Some of the installations were more static.

The moving aspect of for example Dangling Mirror got their attention. In that case, making the installations more interactive was an option they mentioned. It worked for the participants.

Regarding the question about the senses, they see possibilities in using other senses as well. Making it a multisensory experience. The one thing that needs to remain though is finding the balance between the amount of stimulation, the task at hand and the individual preferences.

# Want to learn more?



This research was our first step in the ongoing development of our Bio Mirror concept. Made possible by the Impulsgelden of Kunstloc Brabant.

If you have any questions about the research or our next steps. Or if you have ideas you would like to share, feel free to get in touch with us!

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or Renske Bongers by [renske@renskebongers.nl](mailto:renske@renskebongers.nl)