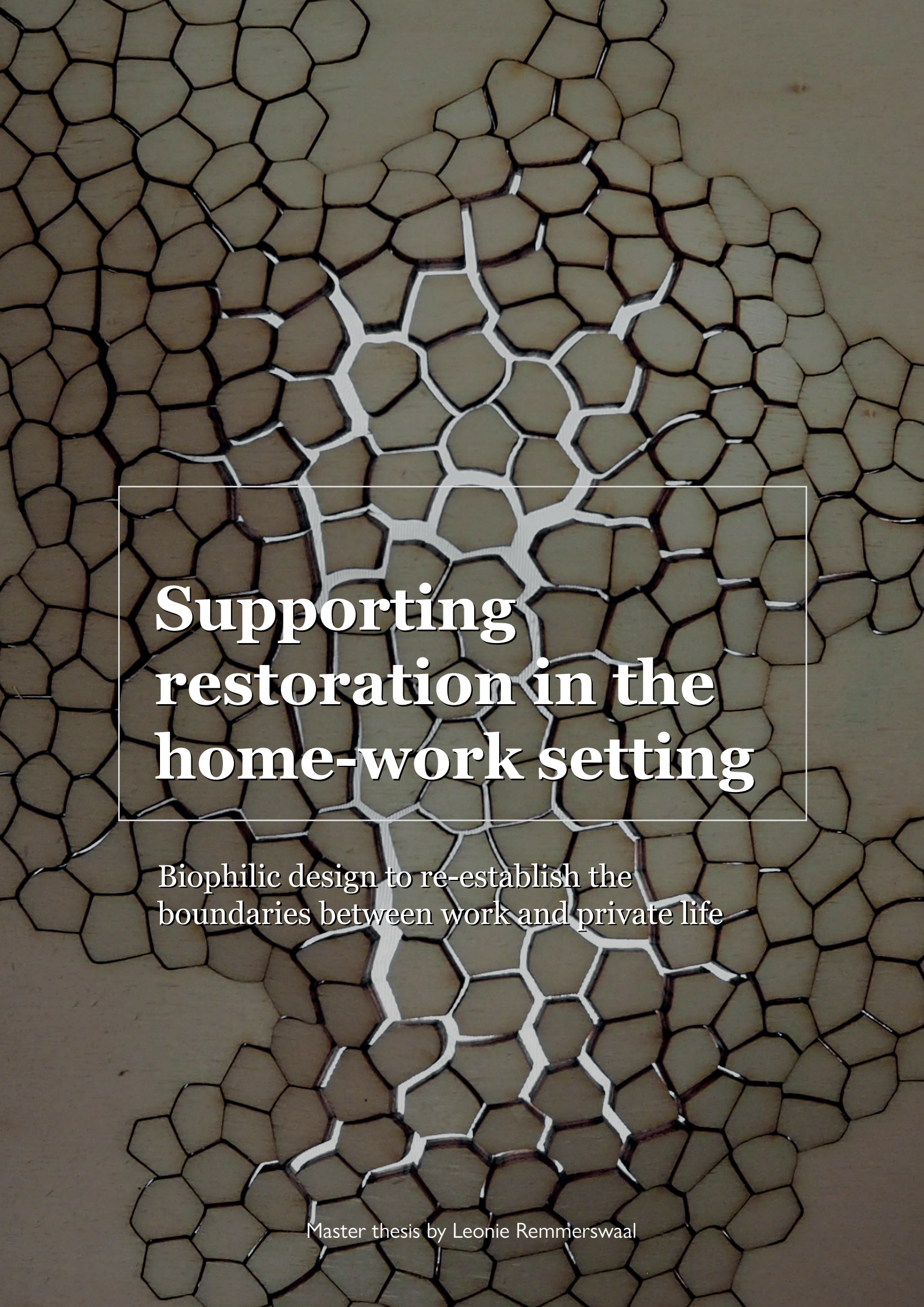

Supporting restoration in the home-work setting

Biophilic design to re-establish the boundaries between work and private life

Master thesis by Leonie Remmerswaal

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Abstract

The amount of people working from home has been increasing. However, working from home has its issues and consequences. The degree to which one experiences recovery from stress and fatigue is limited when working from home, which has consequences on motivation, performance, health, and well-being. The aim of this project was therefore to develop a product that supports restoration during working from home.

One way to achieve restoration is described by the Attention Restoration Theory, which poses that interaction with an environment can restore mental fatigue if it meets four properties: 1) a sense of being away, 2) fascination, or effortless attention, 3) extent, or a feeling of immersion, and 4) compatibility and congruence between the person and the environment. If an experience meets these properties, it can have similar restorative powers.

User research with homeworkers following the contextmapping method revealed where the opportunities for an intervention lie. This user research showed that the four properties of attention restoration were not all met in the current home-work-environment, thereby limiting the possibility for the home-work-environment to be restorative. Especially the sense of being away is limited, due to inability to distance oneself physically as well as psychologically from the workplace. A design direction was defined: re-establishing the borders between work and non-work, and making the switching moments more conscious.

Nature is particularly good in meeting the four properties of attention restoration. Besides, nature can reduce stress, and improve mood and well-being. Biophilic design takes into account these advantages of nature and translates them into guidelines for design. A red thread throughout the concepting phase of this project is therefore biophilic design.

The resulting design of this project is Ecflo, an inflatable lamp that functions as a break-reminder through dynamic light textures. Ecflo creates a liminal moment at the switching moments between work and non-work. Upon the start of a home-work-day the user inflates Ecflo, an interaction functioning as energizer. When it is time for a break, Ecflo moves and creates light effects, drawing the user's attention away from the screen, towards a moment of fascination. Ecflo creates a conscious decision at this switching moment: continue work, or take a break. This way, it helps in structuring the home-work-day and helps separate work and non-work.

Ecflo is restorative in the sense that it creates fascination through random and ephemeral patterns and movements. The design sustains interest, and thereby creates extent. The design is compatible in the sense that it is suitable for working from home and the home environment. However, evaluation study showed that the feeling of being away is limited, as Ecflo does not fully create an escape experience.

Evaluation of the concept was done using the Perceived Restorativeness for Activities Scale. However, this scale is not fully suitable for product evaluation. Development of a research method suitable for evaluation of a product's restorative potential is thus needed to evaluate Ecflo's restorative potential. For further development of the concept, a functioning model should be made and tested in the field with homeworkers.

Preface

Throughout my education on the beta student path, my interest in the 'soft' sciences have always been on the back burner. And so, for my graduation project I wanted to fire up my interests in behaviour and psychology. Thus the idea to delve into the field of environmental psychology was born.

Besides, my green thumbs also had their say in the matter subject to my final university project. Nature is the one thing that unconditionally brings me relaxation and happiness (those who know me are probably familiar with my personal inside jungle of house plants). And so I found the field of biophilic design.

This thesis is the result of merging these personal interests with the field of design. With this thesis my MSc Design for Interaction at the Delft University of Technology comes to a conclusion. Throughout the project I enjoyed going through literature, and went hand in hand with serendipity towards a design proposal.

I would like to thank Sylvia Pont and Susanne Colenberg for being my supervisory team. Your positive support, enthusiasm, encouragement, and guidance throughout research and design have been incredibly valuable. Thanks to Lennert for being my rock, and offering a listening ear for all my thoughts and ideas. Thanks to Lisa for both your input on the design, as well as being a lovely friend along the ride. Thanks to Wies and Bente for being my dear friends throughout my life as a student. Thanks to my family for their endless support. And thanks to my friends for their encouraging words whenever I needed them. And finally thanks to all the participants and respondents in my user research and fellow designers for brainstorming along.

Leonie

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image: creative nina via Shutterstock

1 Introduction

During the initiation phase of this graduation project the COVID-19 pandemic arrived in the Netherlands. Social distancing became the ground rule to limit the spread of the virus, and measures based on this principle arose. Limiting the size of group gatherings, keeping a one and a half meter distance, minimizing the amount of people you get in contact with, and therefore measures with regard to work too. In March, it was urgently requested by the government to work from home (WFH) as much as possible (Rijksoverheid, March 2020). When these regulations did not suffice to bring down the number of infected, new measures were taken. Working from home became obligated, unless absolutely impossible (Rijksoverheid, September 2020).

Thus, people stayed home, and the amount of homeworkers peaked. Before the corona outbreak 1 out of 3 employed worked from home incidentally, and approximately 6% did so full time (KiM, 2020). During the first months of the pandemic's arrival in the Netherlands the amount of incidental homeworkers increased to between 45 and 56 percent of all employed, and two thirds of all employed worked from home full time (KiM, 2020). The increase in homeworkers is most apparent in those who have a desktop job, and those who deem their job suitable for working from home (KiM, 2020).

However, the increase in homeworkers in the Netherlands is not entirely new. Where in 2005 a quarter of all employed worked from home incidentally, a third did in 2012 (CBS, 2013), and 4 out of 10 did in 2019 (CBS, 2020). These numbers indicate a steady increase, and expectations are that after the COVID-19 pandemic roughly 40 to 60 percent of homeworkers keep working from home more than they did before the pandemic (KiM, 2020).

And so, the subject of working from home, while not novel, is absolutely trending. Still in the orientation for a graduation project, this working from home subject was intriguing. Upon asking family and friends (both working and student) about their vision on WFH, they expressed having trouble motivating themselves to get to work and easily get distracted during it. They also struggle letting go of work outside work-hours, as it takes place in the same space as non-work. For many of them working from home full time was something new, and their houses were not prepared nor suitable for it. These first findings are reason enough to delve into the subject and explore: how could WFH become 'better'?

1.1 Working from home is not ideal

In order to improve working from home, it is necessary to first describe what it entails, and what its issues are. Working from home in the context of this thesis means: doing work for a profession or study from own home environment. The type of work focussed on in this thesis is desktop work, often involving a computer. Work can be individual or collaborative. The environment in which WFH takes place is expected to be a living, bedroom, or dining room (figure 1).

Working from your own home environment has its consequences. When working outside of the conventional office, employees are more vulnerable for overworking and stress (Eurofound and the International Labour Office, 2017). Then, when working from home became obligated due to COVID-19 measures, the perceived stress was amplified (Hayes et al., 2020). Stress partially derives from a lack of balance between work and private life. This balance is easily harmed when working from home, as the boundaries between work and non-work are unclear (Gajendran et al., 2007). The unclear boundaries between work and non-work facilitate a continuous preoccupation with work outside of work-hours and the inability to switch off work (Grebner, 2005).

This preoccupation with work influences the degree to which recovery is experienced. Recovery is only experienced when the stressor creating the need for recovery is gone (Sonnentag and Geurts, 2009). If the stressor remains present outside of work-hours, this is called prolonged exposure. This prolonged exposure can be present in two ways: exposure to work demands (e.g. overtime work), or the difficulty to psychologically detach from the job stressors (Geurss and Sonnentag, 2006). So, recovery when working from home is suboptimal, as the stressor (work) is present (physically as well as psychologically) in the same environment as where the recovery usually takes place (home).

If recovery is not successful, one will not restore to a base line and experience consequences on motivation, performance, health and well-being (Demerouti et al., 2009). The need for recovery is present when working from home maybe even more so than when working at location. That sparks the question: how could recovery be (re)implemented in the WFH-environment?

Figure 1: Houses are not yet adapted to working from home (image: Wallstreet Journal)

1.2 Restoration at work: when, where, and how?

This section explores at what moment recovery takes place, what the influence of the environment is on recovery, and how nature can play a significant role in recovery.

1.2.1 The importance of taking breaks

Recovery can take place in breaks throughout the day, called internal recovery, or outside of work-hours (e.g. evenings, weekends), called external recovery (Geurts & Sonnentag, 2006). Both ways of recovery have their advantages. External recovery, especially social and physical activities, has a positive effect on well-being, while doing work related activities can increase fatigue and has a negative effect on well-being (Sonnentag, 2001; Sonnentag & Zijlstra, 2006). But due to the unclear boundaries between work and non-work when WFH (Gajendran et al., 2007), it is expected that especially internal recovery is left behind, and should therefore get attention in this project. Spending break time at the workplace is made incredibly easy when working from home, for example. This happens even though the benefits of internal recovery are plentiful.

In essence, breaks function as a replenishment of resources. They can help individuals recover from negative load reactions of doing work demands (Meijman & Mulder, 1998). For example, breaks help reduce fatigue and negative affect, like sadness, irritability and anxiety, and increase positive affect like happiness and excitement (Zhu et al., 2019). Participating in any break activity that is different from the work activity enables improvement in performance to that work activity after the break (Rees et al., 2017).

A specific subcategory of breaks are micro-breaks. This term encompasses all the breaks you take that are unscheduled and short. A micro-break of only nine, five, or even one minute already shows a degree of replenishment of energy and attention (Bennett et al., 2019). Micro-breaks too can reduce fatigue and can increase well-being (Zacher et al., 2014). Engaging in relaxation or social activities in micro-breaks help reduce the end of day negative affect (Kim, 2017). In other words, taking micro-breaks during work makes you feel less bad at the end of your workday.

1.2.2 What environments can do

With the 'when' of recovery discussed, the 'where' is next. The environment in which recovery takes place can influence the degree in which one feels restored: certain environments can enable restoration. The Attention Restoration Theory (ART) poses that interaction with an environment can restore mental fatigue, if it meet the following properties (Kaplan & Kaplan, 1989; Kaplan, 1995):

- Being away;
  The sense of conceptually being in a different place, away from the usual thoughts and concerns. While distancing from the environment physically is helpful, it is not essential for restoration to take place.
- Extent;
  The environment should be rich and coherent, so it allows for immersion and engagement. There should be enough to see, experience, and think about. The environment has to take up a substantial portion of head-space.
- Fascination;
  Drawing attention effortlessly towards process (i.e. something that is going on, activity) or content (object). Interaction with the environment should not cost cognitive effort.
- Compatibility.
  A compatible environment is one where a person's intentions meet the environments demands, and where the environment provides the information needed for the person to meet their intentions. An environment is more compatible if it is responsive, gives feedback to the user's actions.

Besides restorative environments, the theory also describes micro-restorative experiences: a brief respite of one's directed attention (Kaplan, 1993). If an experience meets the four components of the ART, it can have similar restorative effects as being immersed in an environment. Kaplan (1993) describes looking out a window as an example of a micro-restorative experience, as the elements outdoors draw one's attention effortlessly and provide a sense of being somewhere else.

Another way in which environments influence the people in them, is through atmosphere. The atmosphere of an environment is the experience of the surroundings in relation to ourselves. Atmospheres have potency to change a person's affective state (Vogels, 2008). However, an atmosphere does not necessarily create a certain feeling. Vogels (2008) describes how you could still feel stressed in a relaxed environment, because of thoughts about work that arise. On the other hand, being in a stressful environment does limit the possibility to feel relaxed.

There are four dimensions by which an environment can be described: cosiness (NL: knusheid), liveliness (levendigheid), tenseness (gespannenheid) and detachment (zakelijkheid). An atmosphere can be created with lighting. Factors like intensity, colour temperature, hue and/or saturation influence the perceived atmosphere (Vogels et al., 2008). However, assessment of an atmosphere is done taking into account the whole environment. So it is expected that objects too influence the atmosphere.

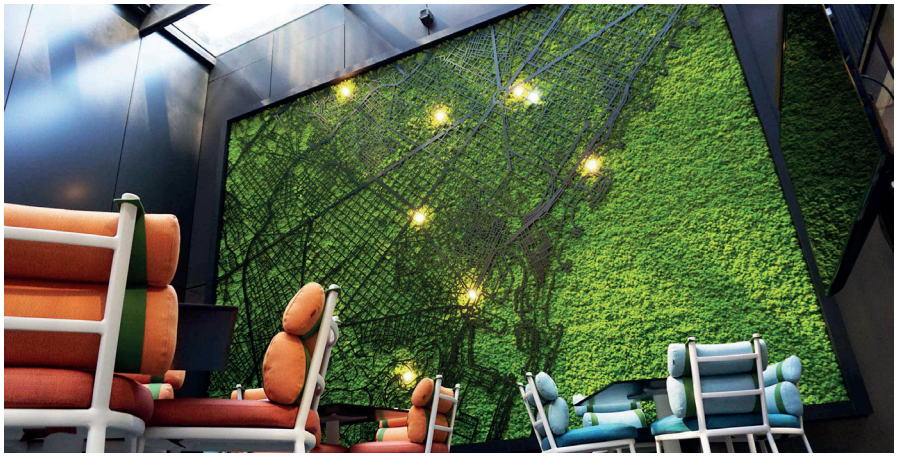


Figure 2: Moss map of Barcelona. Biophilic design element: Environmental Features. (image: Miles and Lincoln)

1.2.3 Applying the power of nature

While many environments could meet the four ART properties and thereby be restorative, one context is a particularly strong match: nature (Kaplan & Kaplan, 1989). Nature, be it a vast forest or mere backyard, provides the sense of being away. Nature provides an extent of things to experience both as a whole as well as in its fine details. Clouds, sunsets, scenery, motion by wind: nature is fascinating. And when it comes to compatibility, people and nature are inherently connected: we have a genetically determined affinity with nature, called biophilia (Kellert & Wilson, 1993).

Aside from restoring attention, nature has many more benefits for health and well-being. The Stress Recovery Theory (Ulrich, 1983) argues that perception of nature creates a positive affective response, thereby initiating reduction of stress and negative feelings (e.g. fear). An attractive natural view can create feelings of pleasantness, hold interest, and reduce or even block stressful thoughts. This way, nature allows for relaxation to take place. Other benefits from nature exposure fall in one of three categories: direct (e.g. walk in the park), indirect (e.g. view from a window), representational (e.g. poster).

The presence of plants in an indoor environment improves mood and reduces stress levels (Bringslimark et al., 2009). Both real plants as well as posters of plants lower the experienced stress amongst patients in a hospital waiting room (Beukeboom et al., 2012). And this effect goes broader than just plants. Both relaxation in a natural (forest) environment as well as an indoor simulation of that

Figure 3: Gardening tool set copying shapes of nature. Biophilic design element: Natural shapes and forms. (image: Grow by Postfossil)

same environment facilitate stress reduction (Kjellgren & Buhrkall, 2010). Relaxation in nature was described as creating a feeling of harmony and union with nature, and a feeling of renewed energy. However, the simulation did create a longing of being in 'real' nature. A walk in nature, as opposed to a walk in an urban environment, lowers the brain activity in the prefrontal cortex, an area amongst others related to worry, and lowers the feeling of rumination (Lederbogen et al., 2011).

Not only direct and representational exposure to nature have benefits. A view of greenery from a window, indirect exposure, also has beneficial effects on wellbeing. Patients recovering from surgery that had a room with a view on green trees recovered faster and needed less pain medication than patients with a view on a brick wall (Ulrich, 1984). Though, it should be noted that not all types of nature work equally restorative. A view on trees in late fall, when they are without their green leaves, is less restorative (Felsten, 2009).

However, nature's restorative powers go beyond just vegetation. Including water (blue space) to an environment increases the perceived restorativeness and positive affect (White et al., 2010). A built environment with water is even equally rated positive as green nature without water. Other positive nature effects that are not related to green-ness, are for example the effect of sunlight, use of wood as a material, and bird sounds. Direct sunlight lowers the levels of anxiety, and indirect sunlight lowers the depressed mood (An et al., 2016). Seeing wood grain in an indoor environment reduces stress levels (Fell, 2010). And bird sounds are commonly associated with perceived restoration (Ratcliffe et al., 2013), although not all birds were perceived particularly helpful (crows and magpies were perceived unhelpful as their sounds are "raucous" and "squawking").

Not only is nature itself restorative, it also facilitates and encourages behaviours that are physically and mentally beneficial, like exercise, recreation, and social interaction (MacKerron & Mourato, 2013). And a side from restorative effects, nature can also have instorative effects for individuals who are not stressed or fatigued (Hartig, 2007). Exposure to nature can improve people affective state and mood even if they were not stressed before the nature exposure (Mayer et al., 2009).

Knowing these advantages of nature, the field of biophilic design focusses on translating the principle of biophilia (our genetically determined affinity with nature, Kellert & Wilson, 1993) to the world of design. Kellert (2008) lists an elaborate selection of attributes, each belonging to one of six biophilic design element, to be used as a foundation for creating biophilic design features. As these attributes are written from a spatial design perspective, not all are equally applicable in the industrial design field. The six biophilic design elements, and some of their attributes suitable for the industrial design field, are as follows:

- Environmental features;
  Well-recognized characteristics of the natural world. Attributes include the use of colours found in nature, water features, airflow, sunlight, presence of greenery and animals, and natural materials.
- Natural shapes and forms;
  Representations of the natural world. Attributes include motifs of flora and fauna, spirals, egg or oval shapes, avoidance of straight lines and right angles, biomorphy, and biomimicry.
- Natural patterns and processes;
  Incorporation of nature properties rather than representation or simulation of nature shapes. Attributes include sensory variability (stimulation of multiple senses), information richness (plenty to experience), change and growth, presence of a central focal point, patterned wholes and fractals.
- Light and space;
  Qualities of light and spatial relationships. Attributes include natural, filtered, and diffused light, light and shadow, light as a shape and form, spaciousness, and space as a shape and form.
- Place-based relationships;
  The connection of people and place. Attributes include geographic, historic, ecological, and cultural connection to a place, use of indigenous materials, and avoidance of placelessness.
- Evolved human-nature relationships.
  Fundamental aspects of the inherent human-nature relationship. Attributes include prospect and refuge (having security yet oversight), balance between order and complexity, change and metamorphosis, mastery and control over nature, affection and attraction to nature, and exploration.

The context of the home environment narrows down the selection of biophilic design elements applicable. *Place-based relationships*, and *Evolved human-nature relationships* seem to encompass an impact bigger than what is possible in a WFH-improving intervention. So, features of the first four elements seem more suitable. Applying the biophilic design method within this project explores the use of environmental features both literally and in shape and form, patterns and processes. Both in design of the interaction as well as in formgiving, these biophilic elements function as a foundation. A selection of biophilic product designs is shown in 2, 3, and 4.

Figure 4: Set of vases symbolising each step of a plant's growing process. Biophilic design element: Natural patterns and processes. (image: Biophilia by Stoft)

Use of light and space is also explored in this project. For light, textured light is particularly worth to mention. Textured light, or brilliance light, is described as the sparkles of chandeliers, flickering of a group of candles, sunlight reflected on a fountain (Kelly, 1954). This type of light excites the optic nerves and stimulates the spirit, creates distraction and entertainment. Brilliance light can come from shadow projections (figure 5 and 6), or the shape of the light itself (figure 7). One can argue that brilliance light is a suitable way to achieve fascination, one of four ART components, thereby working towards a restorative environment. Biophilic light textures explore the nature side of brilliance light.

When it comes to biophilic light textures, a few qualities have to be present in order for light to be perceived natural (Aan de Stegge, 2018): natural variation, natural causality, and nature dynamics. Natural variation describes that nothing in nature is repeated a second time in exactly the same way: leaves on a tree can be similar, but are never identical. Natural causality describes how light textures can never appear natural if there is nothing to make its appearance likely. And natural dynamics describes how nothing in nature is static, and thus biophilic light textures should not either.

1.3 Project aim and approach

The aim of this project is to develop a product that supports restoration during working from home. An intervention applying the knowledge of restorative environments (Kaplan & Kaplan, 1989) and the power of biophilic design (Kellert, 2008) could mediate in the struggles that we find when working from home.

The approach for this project aim, and thereby the structure of this thesis, is as follows (also see figure 8). First, user research (chapter 2) is conducted. Through contextmapping (Visser et al., 2005) the context of working from home is explored: what does the physical environment look like, how does working from home work, what are friction points and what is missing. In this research, the emphasis is put on breaks, as those allow for recovery to take place (Geurts & Sonnentag, 2006). The user research results in themes which lead to design directions: opportunities for an intervention.

After selecting the most promising design direction(s), through scenarios and low fidelity models ideas are generated and discussed with users and designers (chapter 3.1). In the concept development phase (chapter 3.2) the chosen design is developed in terms of user interaction and formgiving. Finally, the intervention undergoes an evaluation study, in which users give feedback on the concept. This feedback and future considerations are discussed, along with the final product proposal, in chapter 4. This thesis ends with a personal reflection on the project.

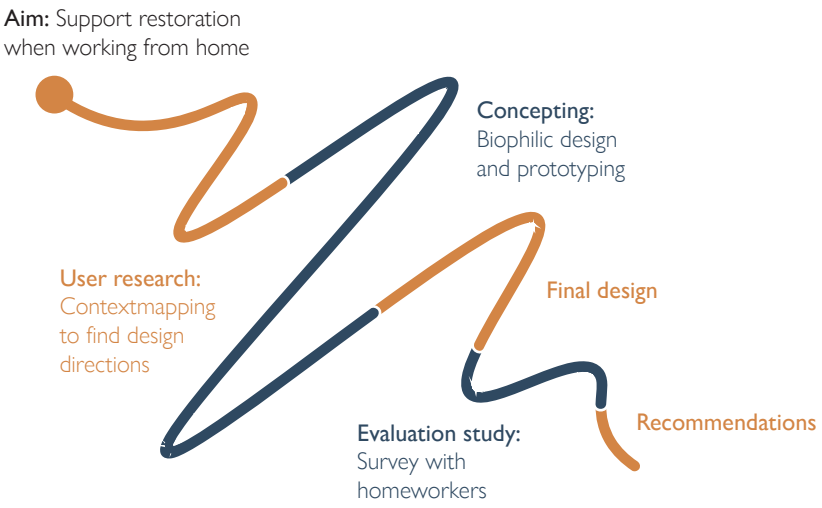


Figure 8: The project first diverges, doing user research and concepting, and then converges into a final design, evaluation, and recommendations.

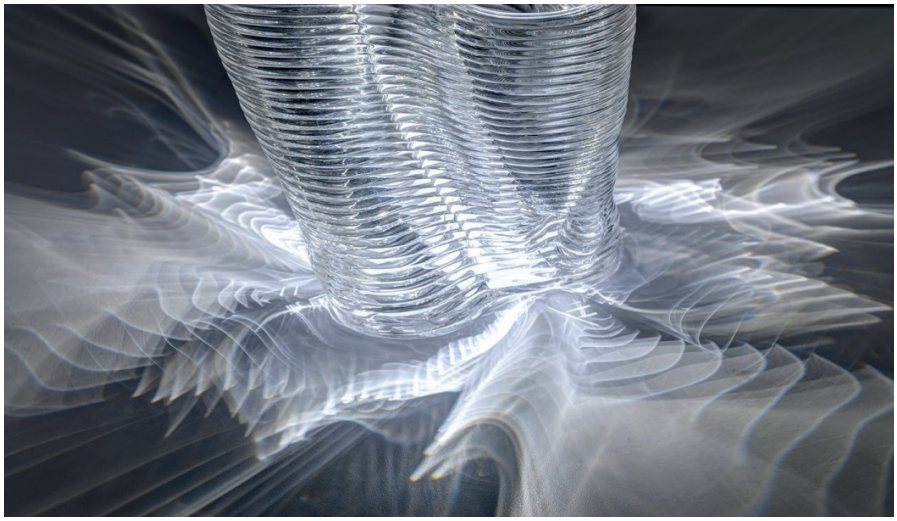


Figure 5: 3D-printed glass lamp artificially creates brilliance light. (image: MIT)

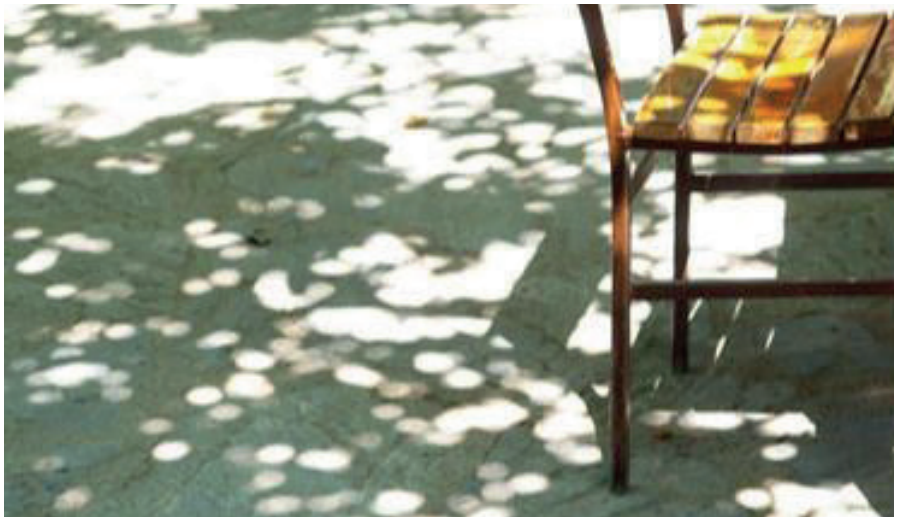


Figure 6: Sunlight through tree leaves creates brilliance light by nature. (image: michiyo on Flickr)

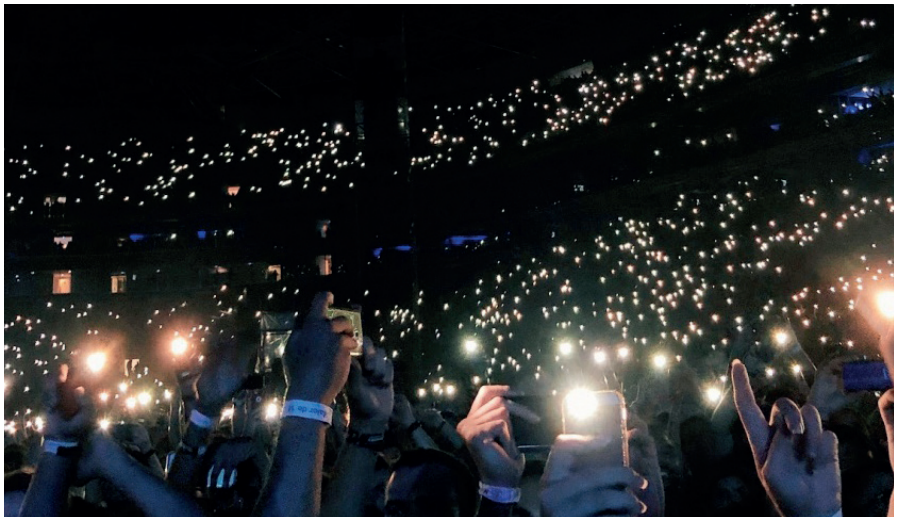


Figure 7: A sea of lighters and phone lights at a concert are brilliance light from the light source itself. (image: kari_kakau on VSCO)

2 User research

Exploring the WFH-environment and WFH-activities is done through user research. This chapter explains the purpose of this study and research questions. Then, the research method of contextmapping is explained and research materials are presented. The findings section describes the results, which are then clustered into themes in the conclusion section. From these themes a design direction is defined.

2.1 Purpose and research questions

The goal of this user research is to define design directions: themes in which opportunities for an intervention lie. By conducting user research, the needs of the actual homeworkers come to light. With this first-hand knowledge, in addition to the literature discussed in chapter 1, it can be defined what the intervention should do and at what moment. Familiarizing with the WFH-context involves research questions on multiple accounts:

1. What does the WFH-environment look like?
   Where does the work take place? What products are used? What are friction points with this place and these products? What is the atmosphere in the current environment?
2. What should the WFH-environment look like?
   What would the ideal WFH-environment be? What is missing from the current environment? What is the desired atmosphere for the environment?
3. When and how are breaks taken?
   How many breaks, how long, and when? Are breaks planned, skipped, forgotten? What are the consequences of doing so? What activities are done? What is the best way to restore energy?
4. What does a WFH-day look like?
   How does it start and end? Is there a ritual to follow?
5. What are the differences from WFH and work at location?
   What are advantages/likes and disadvantages/dislikes of WFH?

Expectations with regard to these research questions are visualised in figure 9. It is expected that work often takes place from rooms not specifically dedicated to work, like in a living room, bedroom, or at the kitchen table. Following this expectation, it is also expected that there is a mismatch between the atmosphere currently in the WFH-environment, and the one desired or optimal for working.

Besides, it is expected that there are friction points around the beginning and end of the WFH-day. These are the moments in which the unclear boundaries between work and non-work (Gajendran et al., 2007) become prominent.

Within the user research, a particular emphasis is put on the theme of breaks. It is expected that these moments of switching between work and non-work can cause friction, similar to the switching moments at the beginning and end of day. Especially throughout the workday the unclear boundaries between work and non-work are prevalent. It is therefore expected that breaks are an important factor when it comes to facilitating recovery in the WFH-setting.

2.2 Study design: contextmapping

The method followed in this user research is that of contextmapping (Visser, 2005). Visser defines a context as "all factors that influence the experience of a product use", and poses that studying the context of product use helps designers to gain empathy with the user, and to avoid fixation on pre-set assumptions about the user, product, or context. As the researcher conducting this study is working from home themselves, they have their own experiences with working from home, and are therefore particularly sensitive for fixation on pre-set assumptions. The contextmapping method allows to avoid generalising those own experiences. Research with real users, homeworkers, serves to provide a richer, more dependable view on situations in which products are or will be used (Visser, 2005).

In the contextmapping approach, user research consists of two main elements: a sensitization and a session. The sensitization triggers, encourages, and motivates the participant to think, reflect, wonder, and explore (Visser, 2005). Sensitization often comes in the form of a diary or exercise booklet that the participants fill in over the course of multiple days to weeks in their own time and environment. Doing these exercises in their free time and everyday environment makes them feel free and relaxed and allows them to put full attention to their feelings and routines (Visser, 2005). For the subject of working from home, filling in the diary or exercise booklet from the home environment is valuable, as this is the actual target context. The sensitizing exercises warm up the participant for the subject of the research, and prepare them for the second research part of the contextmapping approach: a session. A session within contextmapping traditionally involves generative exercises: creating artefacts that express thoughts, feelings, ideas. (Visser, 2005). The session in this user research also encompasses an interview, so that the sensitizing exercises can be elaborated upon.

2.2.1 Procedure

Part of the preparation phase of contextmapping is making a preliminary map (figure 9). Writing down all assumptions beforehand reduces the risk of the researcher projecting their preconceptions on the participant, and helps setting up the research as it makes distinct which facts are already known and which are to be discovered (Visser, 2005).

Aside from preparing the research materials (chapter 2.2.2), the setup of the research was as follows (see also figure 10). Acquaintances, whom were known to work from home, were contacted and asked if they were available for a user research study, with the topic of working from home. It was explained that the research consists of a booklet with exercises (to be done over the course of five days, approximately fifteen minutes each day) and a one and a half hour interview. When participants agreed to participate, they were asked for their home address and the sensitizing package was sent. The sensitizing package includes the exercise booklet, stickers for the exercises, consent form and duplicate, and pre-stamped envelope addressed to the researcher (figure 11).

Participants were asked to confirm receival of the package. The exercise of day two involved sending a picture, which functions as a checkpoint to track the participant's progress. When the participant had finished their booklet, they were asked to send it back using the pre-stamped envelope. The participants were reminded of including the filled in consent form as well.

Upon receival of the completed sensitization package, participants were contacted to plan the session. They were asked if comfortable with meeting face-to-face due to COVID-19 risks and measures, and participants were given the option of an online session too. Agreements of place and time were set, and the interview was conducted. Participants were given a thank-you-gift as a token of appreciation.

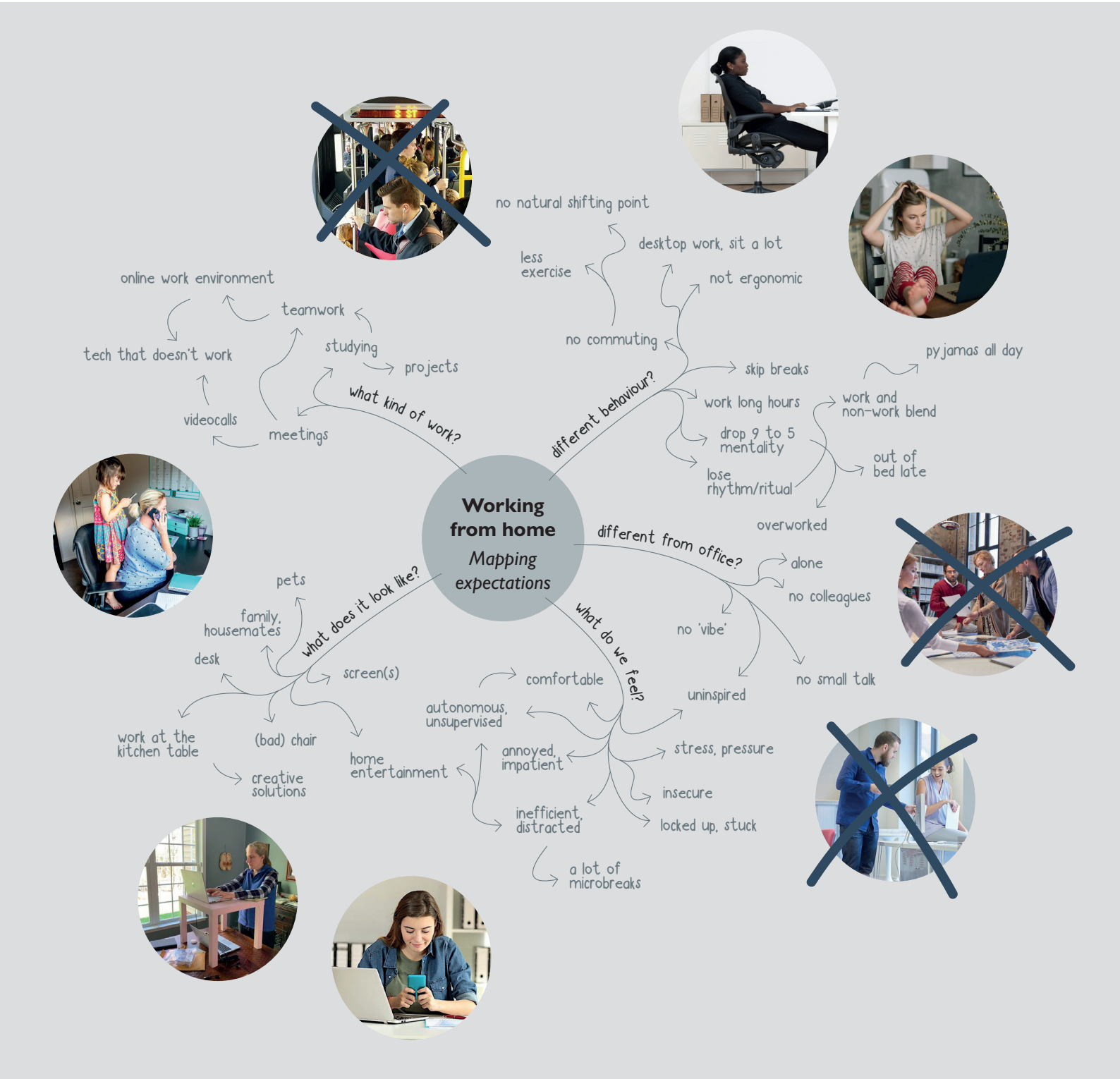


Figure 9: Mapping expectations beforehand in a preliminary map helps the designer avoid preconceptions and fixations.

2.2.2 Materials

Contextmapping consists out of two main elements: a sensitizing exercise and a session. In the sensitizing exercise the research goal is to familiarize the participant with the subject and gather initial information on the physical home environment. In the session afterwards the aim is to elaborate on the sensitizing results and, moreover, gather additional data on friction points and break-taking strategies throughout a WFH-day. In both parts of the research a selection of the research questions (chapter 2.1) were central (figure 10).

Approach possible participant
Contact acquaintances who are working from home.

Explain about booklet and interview
Booklet takes fifteen minutes every day for five days, interview takes one and a half hours.

If agreement to participate, send sensitizing package

Sensitizing booklet

Goal: familiarize participant with the subject and gather initial information on the current physical context and its pros and cons.

Research questions:

1. **What does the WFH-environment look like?**
   Where does the work take place? What products are used? What are friction points with this place and these products? What is the atmosphere in the current environment?

2. **What should the WFH-environment look like?**
   What would the ideal WFH-environment be? What is missing from the current environment? What is the desired atmosphere for the environment?

Receive back sensitizing package
Prepare follow-up questions

Plan interview
Make agreements on time and place.

Interview session

Goal: ask follow-up questions/clarifications to their homework and gather information about friction points and taking breaks.

Research questions:

3. **When and how are breaks taken?**
   How many breaks, how long, and when? Are breaks planned, skipped, forgotten? What are the consequences of doing so? What activities are done? What is the best way to restore energy?

4. **What does a WFH-day look like?**
   How does it start and end? Is there a ritual to follow?

5. **What are the differences from WFH and work at location?**
   What are advantages/likes and disadvantages/dislikes of WFH?

Figure 10: The procedure of the user research. In the sensitizing exercise an session afterwards different research questions were central.

Sensitizing package

The sensitization designed for this research consists of a booklet with daily exercises and sheets of stickers to be used in these activities (figure 11). The exercises in the booklet are centred mostly around the physical aspects of the WFH-context (also see figure 10): what does the workplace look like in terms of space, products, and people, and which problems are encountered within these categories. The exercises are divided into five themes, spread over five home-workdays. The themes are as follows: about you, about your workspace, about your work environment, about taking breaks, and about your ideal workspace, for day 1 to 5 respectively. The exercises are a mix of creative assignments in which the participant draws and uses provided stickers, and closed and open-answer questions. The booklet (in Dutch) and stickers are included in appendix 1, and the exercises are summarised below.

Day 1 elaborates on who the participant is, and what their household composition looks like. It is also asked how familiar the participant is with working from home, and how long they have been doing so. These questions provide knowledge on who the target users and people around them are.

Day 2 focuses on the workspace and the products that are used there. The participants are asked to make and send a picture of their workspace. This exercise emphasises on photographing the workspace as is, without cleaning up or tidying. An example picture of a workspace is included (figure 12). Besides, participants are asked to fill in six 'things' they have in their workspace, being their favourite, used most often, prettiest, most inspiring, most frustrating, and most disappointing thing. Day 2 provides data on what the current workplace looks like, and thus amongst which physical environment the to-be-designed intervention will be implemented.

Day 3 is about the complete work environment, rather than the workplace alone. It is emphasized that the exercises of this day do not revolve around the workspace (i.e. desk) but rather about the whole room in which the WFH takes place. The participant is asked to draw a map of their work environment, providing data on the physical environment the user works in.

The participant is also asked to rate the atmosphere of their work environment according to the four dimensions cosiness (NL: knusheid), liveliness (levendigheid), tenseness (gespannenheid) and detachment (zakelijkheid) as described by Vogels et al. (2008). Using a seven-point scale ranging from fully disagree (1) to fully agree (7), the participant rates to what extent they consider their environment cosy, lively, tense, and detached. In the follow-up interview the participant is asked whether they would prefer to change this current atmosphere rating, and if they would prefer more or less of a certain atmosphere. They are also asked what in their WFH-environment creates that current and desired atmosphere. From this data guidelines to creating a certain atmosphere could be drawn.

Day 4 revolves around taking breaks. Participants are asked to track how often they take a break throughout the day by tallying on the included Post-it. The exercise emphasizes that the participant should stick the Post-it somewhere in sight in their workspace as a reminder, and put it back in the booklet at the end of the day. Then, some questions revolving the activities and length of the breaks are asked.

Day 5 rounds of the sensitization booklet with a collaging exercise. The participants are asked to create their ideal workspace by drawing, writing, and using the material sample stickers provided. The participants are encouraged to think outside the box, and include also (visual) material from elsewhere. Some probing statements are also given. These push the participant into thinking not only about products and the physical space, but also about people, scents, sounds, and the view from the workspace to the outside world. This collaging exercise provides data on what (e.g. products, materials, company) is desired in a home-work environment.

Figure 11: The sensitizing packages consist of the exercise booklet, a set of stickers, two consent forms, and a return envelope.

Figure 12: By providing an example picture of a slightly messy workspace picture, the participants are stimulated to take the picture of their workspace as is, without tidying up.

Interview

A slight alteration to the 'traditional' session in contextmapping is made. It is usual to do a generative exercise with the participants in the session. Generative exercises within contextmapping consist of a 'make'-part and a 'say'-part, in which the participants create and elaborate their ideas respectively. The 'make'-part is done individually, without intervention of the researcher (Visser, 2005). A generative exercise often used in contextmapping sessions is collagemaking. The generative exercise in this research is split up over the sensitizing and session: the 'make'-part is moved to the sensitizing booklet (day 5), the 'say'-part remains part of the session. This way there is more time available in the interview to elaborate on the exercise results. Besides, as the sessions are largely one-on-one, the participant might feel watched by the researcher and be less able to freely work on the exercise.

The session consists of two parts. First, there is half an hour planned for follow-up questions and elaborations on the results of the participant's booklet. Then, the session takes shape of an interactive interview in which the participant is asked to make a timeline of their home-workday, using a provided template (figure 13). The goal of this timeline is not so much to document the activities that take place, but is more so a means to pinpoint which problems occur during the day. The researcher guides the participant in filling in the template by asking questions related to start and end of the workday, problems that occur, and breaks that were taken (see figure 10 for the research questions subject in the interview session). Participants are asked what activities they do in their breaks, and which activities work best to relax and restore their energy levels. For the online version of the interview, the same template was filled in through Google Jamboard. The guide with all interview questions (in Dutch) is included in appendix 2.

Data were gathered using audio recordings and note-taking (figure 14). Participants were asked for their permission to record in the consent form they had already filled in during the sensitizing, but were again asked verbally for their permission at the beginning of the interview.

2.2.3 Participants

The target group of this research is people who work from home. Working from home is defined as engaging in activities for a profession or study. Nine people of various work fields participated in the research, of which two are master students. Seven participants are in their mid-twenties, two above the age of fifty. All have the Dutch nationality, one of the participants lives in London. As all participants are Dutch, the sensitization and interviews are conducted in Dutch.

Participants were given the option for an online interview instead of meeting face-to-face, might they feel more comfortable that way due to COVID-19 risks. Two participants were interviewed through online media. The other sessions took place at either the participant's house or in public spaces.

It is usual to do contextmapping sessions in groups, so that participants can also react to each other's experiences, enriching the collected data (Visser, 2005). However, measures around COVID-19 at the time of this research advise against group gathering. Besides, due to COVID-19 risks it is assumed that participants are less comfortable with group sessions with strangers. One of the interviews was conducted in group session with three participants, as they were part of the same household. The other six interview sessions took place individually.

Benefit of doing small/individual sessions is that arrangement for place and time are easier, and the sessions can take place at the participant's home. Latter is particularly handy, as that is the environment that is target in this research. Disadvantages of individual sessions include that it is more time-consuming, and that the participant could feel inhibited because of the one-on-one questioning (Visser, 2005). Neither of these disadvantages hindered the research: the time-consumption is taken into account in project planning, and participants are acquaintances of the researcher, which should reduce the feeling of discomfort for the participant.

Figure 13: A selection of the filled in timeline templates. Participants are asked to fill in their activities on a timeline template, taking into account the degree to which they were positive or negative experiences.

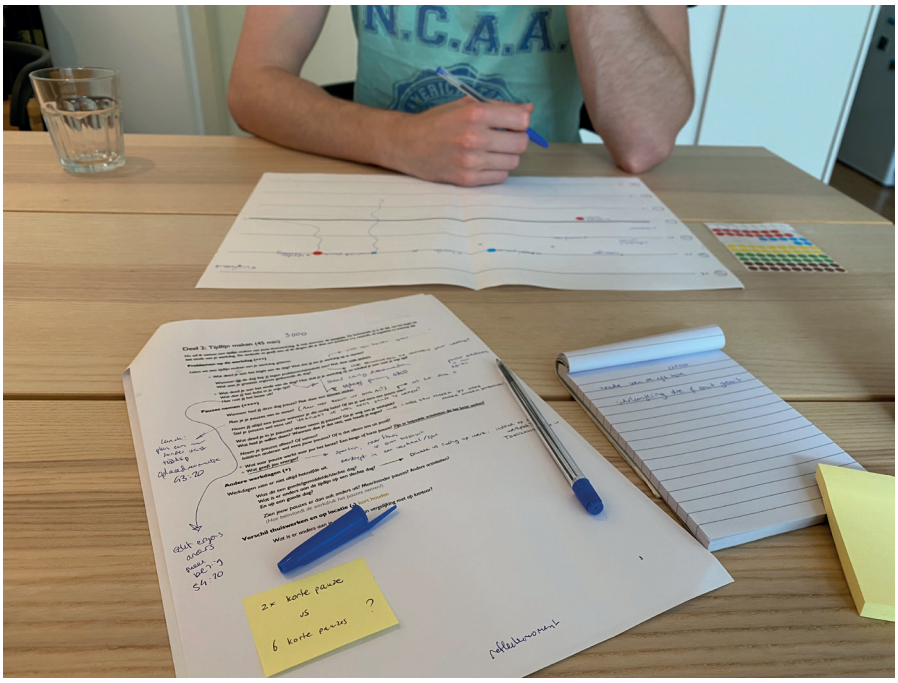


Figure 14: A guide with all interview questions and notepad were used for note-taking, and audio was recorded too.

2.3 Results

Findings from the user research are presented following the structure of research questions (chapter 2.2). For each section in this chapter, the research questions topic to that section, and data the findings are based on, are included in the margins. Each section starts with a bullet point summary.

Research question topic:
1. What does the WFH-environment look like?
   Where does the work take place? What products are used? What are friction points with this place and these products?

Source of this data:
Booklet exercise regarding current workplace (day 2), booklet exercise regarding drawing a map of the WFH-environment, and, if interview took place at the participant's house, observations during the interviews.

2.3.1 Current workplace: working at a cluttered dining table

As part of the exercise booklet participants were asked to make a photo of their workplace (figure 15).

- One of nine participants had a dedicated study room. Others worked in their bedroom (two participants), or living room or dining (six participants);
- Four participants worked at a desk, five worked at a dining table. Surfaces the work takes place on are often cluttered, containing papers, pens, cups or plates;
- All participants work on a laptop, five participants have an additional monitor;
- Four participants have desk chairs of varying qualities, one uses a fitness ball as a seat, others were seated on regular dining chairs;
- All work environments have windows, some workspaces are situated right next to a window, others further away.

The exercise also asked for the participant's favourite, used most often, prettiest, most inspiring, most frustrating, and most disappointing thing in their workplace. From the frustrating and disappointing 'things', friction points can be derived.

- Frustrating and disappointing 'things' relate to distractions, being uncomfortable, or things that are worn out or are messy;
- Pleasant 'things' (favourite, prettiest, inspiring) include plants or other forms of nature, notebooks and other things to structure work, and products that relate to hobbies.

'Things' at the workplace

The frustrating and disappointing 'things' have overlap. In both categories objects mentioned have relation to distractions, being uncomfortable, or things that are worn out or messy. Frustrating things include the surplus of cables and other clutter, computer programmes that don't work well, and noise pollution. Disappointing things that were mentioned are a lack or a good chair or desk, cold tile flooring, worn out mouse mat, dead plant, coffee stains, and a mess of paper sheets. Non-object things that were mentioned in these two categories are related to working from home, as opposed to the office: lack of commuting and colleagues, not having a designated room for working. These last two issues are described further in later sections of this chapter.

Prettiest 'things' related to either nature or personal interests/items. Nature-related 'things': a view of the garden, plenty of light, and houseplants. Plants and gardens were also mentioned as most inspiring thing: "They remind me of being outside in nature. They stand for the exact opposite of an office job, where nothing is freedom and everything is done indoors."

Notebooks and writing utensils, Post-its, and to-do lists were mentioned in the favourite and most inspiring categories. To-do lists work motivational, as when you get things done and you can cross them of the list: "It's a psychological pat on the back: good job, you're doing well. Just a few more things to do and then you're done." Same counts for Post-its: they are useful for a braindump. Emptying the mind this way makes space for new concentration.

People and pets were also mentioned. Not having colleagues around is disappointing, having someone around as a sparring partner is inspiring. Interaction with someone helps to regain structure: "A chat with a housemate, or petting a cat, empties your mind for a moment. Afterwards you're fresh to continue going." Passers-by as well as pets were referred to as a healthy distraction, bringing a bit of liveliness.

2.3.2 Ideal workplace: dedicated to work, a view on nature

Research question topic:
2. What should the WFH-environment look like?
What would the ideal WFH-environment be? What is missing from the current environment?

Source of this data:
Booklet exercise regarding ideal workplace (day 5), and follow-up questions on why the workplace described in that exercise is ideal.

The last exercise in the sensitizing booklet was to compose an ideal workplace by writing, drawing, and using stickers (included in the booklet) or other imagery. Results of this exercise are shown in figure 15. Participants were asked to also consider what kind of things they would use, with what view they would prefer to work, whether they would prefer to be alone or together, and what sounds and scents there should be.

- An ideal environment is generally spacious and tidy, separated away from where the other daily activities take place, or a space that at least does not resemble a workplace in non-work hours. A dedicated space for work alone makes the separation between work and non-work easier, and creates a more concentrated environment without distractions;
- Interaction with others should only occur on own terms, so initiated by yourself. Otherwise the presence of others can be distracting. However, passers-by and murmuring are preferred by some;
- The ideal environment has calm colours, warm and natural materials like wood. A view out the window on nature is preferred. Plenty of daylight, or warm artificial light, are ideal.

Characteristics of the space, importance of tidiness

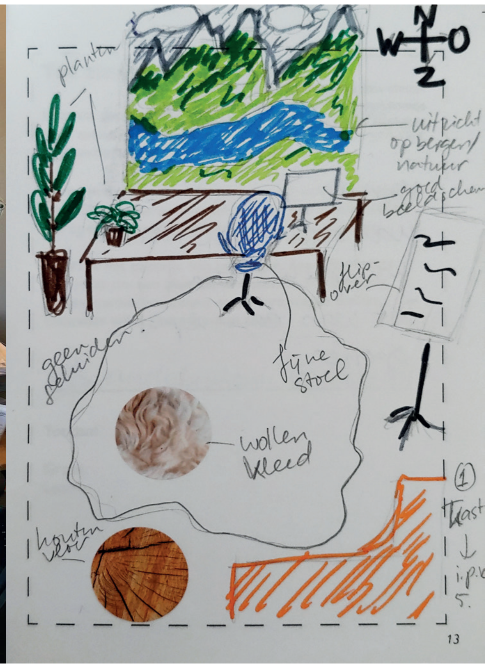
Some criteria for the actual spatial environment were mentioned. The room should be spacious to avoid a feeling of being locked up. An open space is generally preferred, optionally with a high ceiling. The importance of facing this open space was also mentioned, but not all participants agree: participants would either prefer sitting with their back close to a wall, or in the centre of the room. A general agreement however is that facing a blank wall is least inspiring.

Ideally the workplace is in a separate space, away from where other daily activities take place, or it should at least "not look like my home-work environment outside of workhours". Having a space dedicated to work is expected to make the separation of work and non-work easier. The switching moments between work and non-work are clearer, as it involves a physical move to or away from the workplace. The association of work and a workplace, and non-work and other areas of the house is something that participants now miss: "My living room is also my workspace. So when I'm done working at the end of the day, I close my laptop, move two metres, and sit down on the couch. But that laptop is there the whole evening. I can't really relax."

Besides making switching easier, a designated workspace is expected to also help in being more concentrated. One participant described how they tried working on the couch sometimes: "But then I'm not in work-mode, I'll just end up chilling. It just doesn't work. It's my living room after all."

The workspace room as well as the desk itself should ideally be tidy without clutter. However, having some decoration around is pleasant. Decorations that were mentioned include (abstract) art and pictures of friends and family. Also, the importance of plants should not go unnoticed: "They are nature, living things that you can't control. They grow their own way. It isn't just aesthetically pleasing." Except for one participant, all stated that they would want plants in their ideal workplace.

uitzicht op zee,
natuurlijke kleuren
Prikkel-arme omgeving



planten
W O N Z
uitzicht op bergen/ natuur
flip-over
geen geluiden
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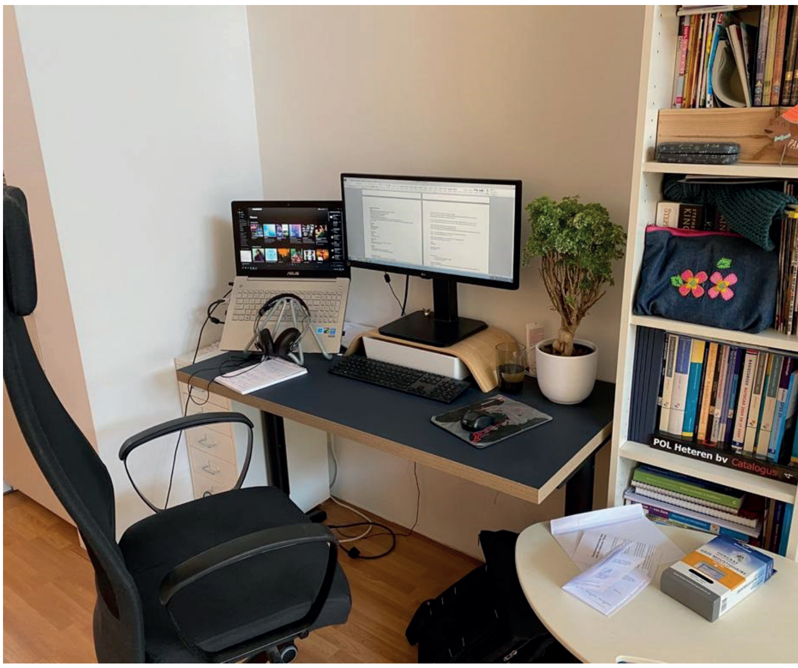
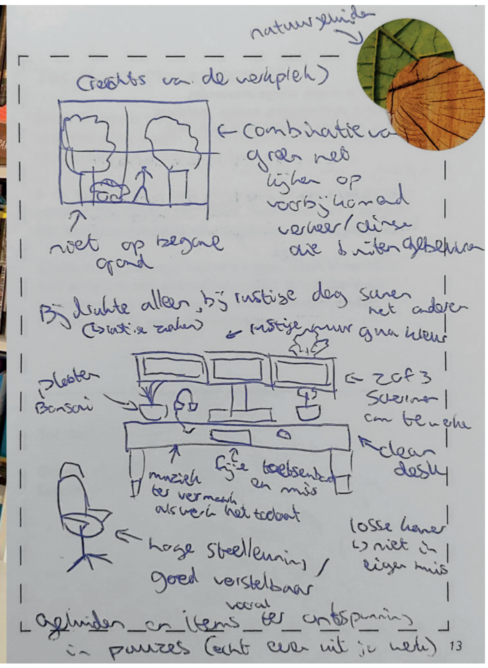
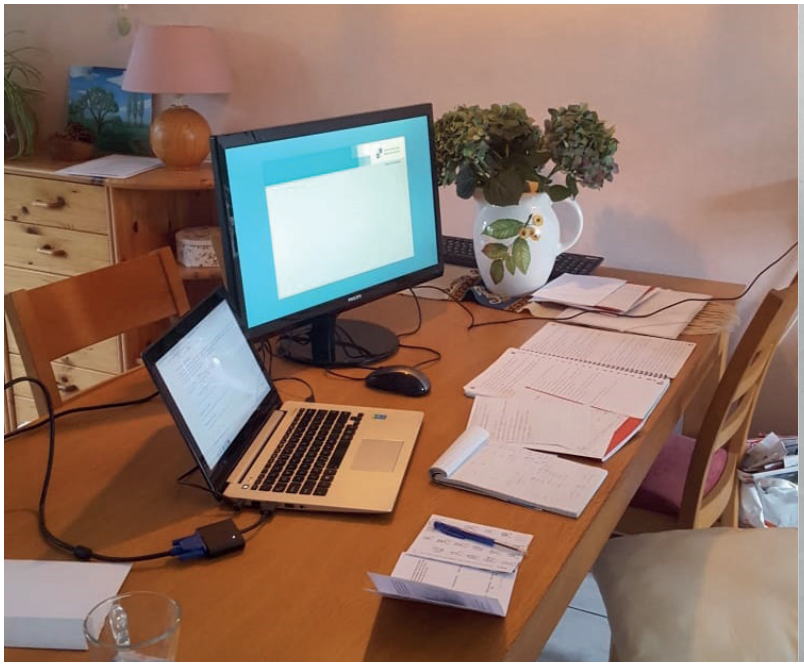
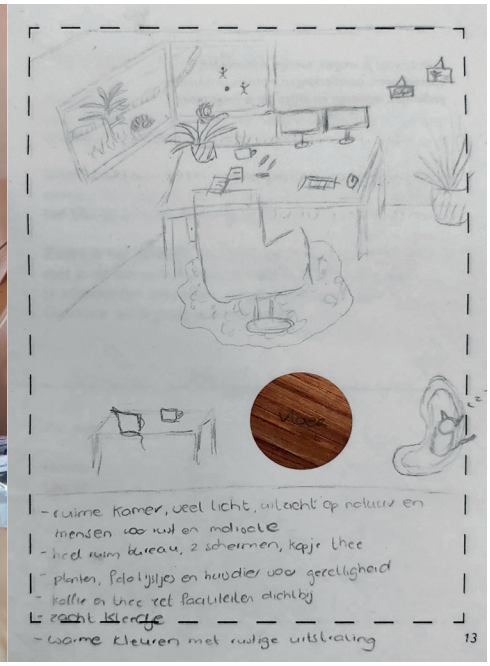




natuur geluiden
(rechts van de werkplek)
← combinatie van groen met kijken op voorbijkomend verkeer/ dingen die buiten gebeuren
niet op begane grond
Bij drukte alleen, bij rustige dag samen met anderen
plastic bonsai
← 2 of 3 schermen
clean desk
fijne toetsenbord en muis
muziek ter vermaak als werk het toelaat
← hoge stoelleuning / goed verstelbaar
losse kamer niet in eigen huis
geluiden en items ter ontspanning in pauzes
13





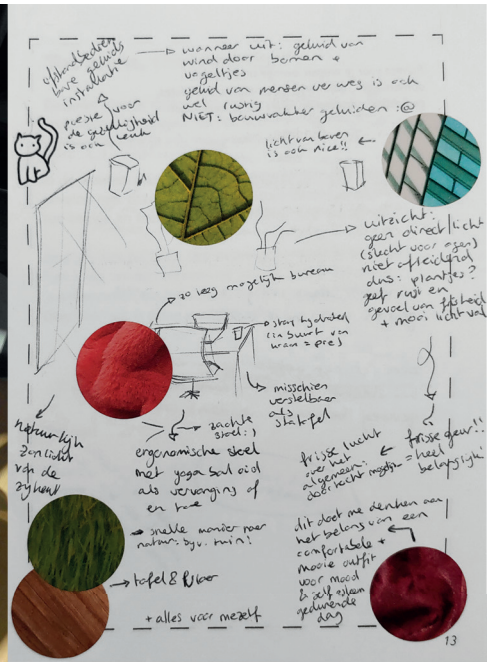


Figure 15: Selection of photos of participants' current workplace, and drawings of their ideal workplace.

Being alone or having company

Although the ideal environment is preferred to be spacious, there is a division on whether there should be others in the space as well. Both being alone as well as having company has its pros and cons. When working alone there are no distractions from others and you can freely follow your own preferred schedule throughout the day. However, working alone can also be too silent: "If you're working home alone, and you don't make any sound, then there's no sounds at all. That's kind of scary. That doesn't feel comfortable either."

An advantage of having company is that there is someone to talk to, be it as a wailing wall, as a sparring partner, or for a chitchat. Participants mention that having others around can work motivational and stimulating. Besides, having someone around can help to get follow a workday rhythm, which some participants mention is more difficult when working from home.

It seems as though the common ground is an individual workplace with the possibility to interact with others on your own terms. It was mentioned that whether someone else should be present depends on the kind of work that has to be done. Work that requires full attention leaves less room for interaction with others.

Warmth in temperature, materials, and colours

Regarding materials there is a strong preference for natural materials. Mainly wooden floors or desks were mentioned, sometimes leather was named as a material for the desk chair. This preference is mainly with regard to its looks, but these materials are also warm to the touch. Besides, also a preference for soft materials and textures was named plenty of times, mainly visualised in the booklet as a fluffy, organically shaped rug (see figure 15). One participant said material selection is especially important for the things they touch most often.

Calm colours, lack of 'busy' patterns, and natural tints like earthy or rusty tones are preferred as they are not distracting from work. Besides, warmer colours like soft pinks were also selected from the sticker set. The stickers participants used in their booklets are represented in figure 16. The size of the textures in this figure relates to how many participants used that texture. The wood textures and greenery were used most often.

An aversion for metals was expressed by multiple participants, due to it being cold-to-touch and creating a cold (NL: kil) atmosphere. Temperature was mentioned several other times as well. One participant also mentioned that the cold tile floor made her uncomfortable. They also stated that they liked how they could feel the warmth of their ceramic teamug, as opposed to the paper cups they have at work. Other participants describe how the room temperature should be 'right', either too warm or too cold disrupts the workflow. Another participant explains how the direct sunlight falling through the window on their skin in the early morning warms them up before work, creating comfort and delight.

Nature view, passers-by, and role of light

The view from the ideal workplace was often described as a nature setting, one with passers-by, or a combination of both. A view on green nature was drawn most often (figure 15): both untouched nature (forests) and cultivated nature (garden or park). The presence of water (streams or rivers) was mentioned a few times. One participant preferred a view of the beach and sea: "Water is where I can be zen. The sound of the rippling of the waves, I can listen to it for hours."

A few times the importance to have access to interact with the nature view was mentioned. Interaction with the view would either be during a break (actually going outside), or when daydreaming away during work. It doesn't seem to be a conscious choice to look outside: "Briefly sinking in what is going on outside. That works well as a microbreak."

Figure 16: This figure represents which stickers were used in the sensitizing booklets. Participants used the stickers to represent preference for material or colour, and references to nature. The bigger the texture in this visual, the more often that texture was used in the sensitizing booklets.

The view on passers-by was mentioned several times as well. A view on people outside doing their own thing gives a feeling of liveliness: the daily activities of others, the buzz, things happening in the world around you. It can help to avoid feeling alone: "[People outside] are kind of a replacement for what you'd normally have with colleagues walking by." However, while there is a preference for being able to see outside, it was deemed important to remain anonymous and unseen while doing so. A feeling of being watched can be distracting, or even create stress and tension when outsiders have the possibility to see your screen and what you're doing.

Preferences for warm light were expressed, as well as a dislike for tubelights with their cold (NL: kil) white light. A lack of natural daylight was describe to add to a feeling of being locked up.

Nature sounds, music, and (lack of) voices

For sound there is a partial preference for silence, especially audible chatter of others is deemed annoying. But, when talking is more muffled and words are not easily distinguished (NL: geroezemoes) it is again referred to as relaxing. Another type of relaxing audio that was mentioned, are sounds of nature: wind through the trees, birds chirping, rain and stormy weather, rustling of grass.

Listening to music was also mentioned. It can work as a background noise that "doesn't really register", or to listen to consciously. Some participants mention how certain types of music help remove the noise (NL: ruis) from their mind, or help regain excitement and energy. These participants refer to rock music for this function.

Some participants describe how listening to radio as a background noise works well for them. It breaks the silence and diminishes the feeling of being alone: "Alternating between chatter of the radio DJs and songs, otherwise it's so boring and quiet."

Neutral or nature scents

Not a lot of preferences were expressed when it comes to scents. The baseline is that it shouldn't be penetrative or foul. Where there were preferences expressed, they relate to fresh air (airing out the room) and smells of nature like forests, wet grass and rain.

2.3.3 Atmosphere: what creates an atmosphere and how should it be?

Research question topic:
1. What does the WFH-environment look like?
   What is the atmosphere in the current environment?

2. What should the WFH-environment look like?
   What is the desired atmosphere for the environment?

Source of this data:
Booklet exercise regarding rating the atmosphere of the WFH-environment (day 3), follow-up questions on what (e.g. products, spatial features, materials) causes this atmosphere, and questions on what the desired atmosphere would be.

Following the atmosphere metrics by Vogels (2008), the four descriptive terms, cosy, lively, tense, and detached, were discussed.

- The current WFH-environment is often more cosy, as work takes place spaces that have an association with non-work (e.g. bedroom, living room);
- However, this atmosphere is not particularly preferred for working. There is a clash between the desired atmosphere during work, and during non-work hours: the same environment should be homely (more cosy) yet office-like (more detached);
- Besides, preference for a particular atmosphere for the WFH-environment differs from one person to another, varies throughout the day, and differs between the multiple types of work one has to perform. Concentrated work allows for less liveliness than creative work, for example;
- Products, special features, and materials make or break an atmosphere.

Cosy: a cluttered space that has an association with free time

The function and size of a room influence the experienced cosiness. A smaller, full and more cluttered room is considered cosy, and working in a room that is associated with non-work related matter (e.g. living room or bedroom) is more cosy.

Cosiness is also associated with being comfortable and a feeling of homeliness. Plants, pictures of friends or relatives, and pets add to this homeliness: "Before, when our neighbours cat would stop by, I felt calm when I saw her sleeping. It radiates a certain tranquillity." This also shows in the preference for soft and warm materials (e.g. woods) and warm (day)light.

On the opposite side, a big open space with hard materials and stark white light is considered not cosy, as it creates a certain sterility. Electronics, or as one participant called it, "the hard things", and interaction with those things are considered not cosy: "I'm looking at my screen the whole day, which is in and of itself not cosy."

Cosy:

- Working in a bedroom or living room: association with non-work hours and informalities;
- Full, cluttered: not tidy;
- Small room size;
- Soft and warm materials, woods: create comfort;
- Warm (day)light (colour temperature);
- Plants;
- Pets;
- Pictures of friends or relatives.

Not cosy:

- Big open space;
- Electronics;
- Hard materials, metals and stone;
- Tube lights, white light.

Lively: when things are happening and plants are present

Liveliness occurs when "something's happening". The role of other people seems important when it comes to creating liveliness. Whether it is seeing someone pass by or hearing people murmuring (NL: geroezemoes) or other sounds from the outside world: "Our balcony overlooks a high street, which means I'm working opposite from all the bakeries, coffeeshops, restaurants. There's a lot of sounds [coming from there], that make my workplace lively." Having someone present in the room also adds to the liveliness, but can be distracting at the same time.

Pets and plants were mentioned as liveliness factors as well: "They make the house feel alive, like it is breathing." The way sunlight interacts with plants is described as lively as well: "The sunlight shines through my plants, creating shadows." Sunlight itself, changing position during the day, creates liveliness too.

Lively:

- Interaction with the world outside (seeing passers-by, hearing voices or other noises);
- Being (closely) together with others;
- Pets;
- Plants;
- Clutter: evidence of the daily life;
- Dynamic sunlight.

Not lively:

- Electronics;
- Lack of clutter.

Tense: an environment dedicated to work, where stressful activities take place

The function of the room and activities occurring in it mainly influence tenseness. A room that is dedicated to work has an association with work and is therefore considered more tense, while a room that relates to non-work activities is less tense. Working itself, as well as having stressful people around, or having a feeling of being watched all influence the tenseness of the atmosphere.

Physical things that create tenseness include loud noises, and sterility and coldness of materials and colours. The atmosphere becomes less tense when a space is open, warmly lit, and decorated. This that are designed to relax with, like a television, sofa, or reading books, add to this feeling of comfort and therefore lessen tenseness..

Tense:

- Working in a dedicated study room: association with work;
- Working itself: stressful activities;
- Being around stressful people;
- Feeling of being watched;
- Noise pollution: distractions cause stress;
- Sterile and cold (NL: kil) materials and colours.

Not tense:

- Working in a bedroom or living room: association with non-work hours and informalities;
- Big open space: freedom of movement and comfort;
- Warm (day)light (colour temperature);
- Decorations like plants and art.

Detached: organised and containing electronics dedicated to work

A detached atmosphere is present when the environment is tidy, organised, and dedicated to work: “In a businesslike environment there are no products that aren’t work related.” Electronics, mainly screens, and a good desk and office chair make the workplace more detached, as well as colours that are monotonous or greys. These things give an association with working in an office.

On the other hand, non-professional equipment and clutter create a not-detached atmosphere. Also, using the same electronics for work as for non-work activities lowers the level of detachedness. Not having colleagues around allows for less detachedness: “I only see my colleagues through Zoom, so if I would want to, I could attend meetings in my pyjama pants.” Dressing comfortably as well as listening to music make the experienced atmosphere less detached.

Detached:

- Tidy and organised;
- Working in a dedicated study room: association with work;
- Electronics, mainly screens or monitors;
- Professional-looking desk and chair
- Stark, whites, greys, dreary and monotonous colours

Not detached:

- Working in a bedroom or living room: association with non-work hours and informalities;
- Being casually dressed;
- Clutter;
- Music;
- Non-professional equipment;
- Using same electronics for non-work activities.

Preferences in atmosphere (or not?)

Note that these factors creating or counteracting the atmospheres are not necessarily desired. Participants were asked whether they would prefer more or less of these four atmospheres. There is no general consensus on a particularly desired type of atmosphere. Preference for a particular atmosphere differs from one person to another, varies throughout the day, and differs between the multiple types of work one has to perform. For example, concentrated work like writing allows for less liveliness than creative work, early mornings are preferred to be more cosy and welcoming, as opposed to the rest of the day, and while one person likes a bit of tenseness for their concentration, another cannot function in a tense environment.

One participant prefers to make their workplace more cosy and more homely, but is uncertain on how to achieve that: "I would prefer less of those hard things. But those are the ones you have to work with.". However, another participants would like a decrease: "[Cosiness] creates a tendency to just sit down on the sofa and do nothing."

It was mentioned several times that an increase in cosiness creates a decrease in detachedness and tenseness. There seems to be a clash within the home-work place: there is a preference for the house to be cosy, and for the workplace to be detached, but in the home-work environment, house and workplace are one.

For one participant liveliness causes distraction. For them a workplace should be efficient, and they see liveliness as something that often contradicts working efficiently. For them a lively environment is more suitable for non-work activities. However, other participants describe how liveliness is particularly important to their workplace, as it is a healthy distraction: "Otherwise I drown in my own thoughts." Though these preferences seem contradictory, there is agreement in the sense that in breaks or outside work-hours liveliness is a good thing. Liveliness could create conviviality (NL: gezelligheid), and draws the attention away from work.

The desired degree of liveliness also depends on the type of work and workload. One participant describes how a lower workload allows for more liveliness, as distractions are not as disrupting as they would when workload (and thus stress) is higher.

A bit of tenseness is both preferred and despised. One participant describes tenseness as a driving force that stimulates productivity: "Sometimes I need a bit of tenseness. Otherwise I don't get anything done. You need a bit of stress and tenseness to get somewhere." Another states that working in a tense environment is never pleasant: "I think tenseness never helps in getting work done."

Most agreement is on the presence of a detached atmosphere. Almost all participants desire more detachedness, for varying reasons. A detached environment allows for more concentration, and works more efficiently. A detached atmosphere creates an association with work, making the difference between workplace and the other parts of the house stronger. Participants state that this would make switching between work and non-work easier. "[Detachedness] creates an association with being at work, rather than being at your home and working from your living room."

Participants were asked to rate the atmosphere of the work environment (i.e. the complete room in which their desk is located). However, it was mentioned that during work the focus is on the workplace and its atmosphere alone: "The rest of the room is blocked in my mind." It seems that from the environment the workplace catches attention, but the other way around, from the workplace the bigger environment isn't part of the scope: "If I look away [from my screen], I see my living room, which is more lively and cosy. But when I am working, my focus is only [on my screen]." A criterium stated by one of the participants is therefore that increasing the detachedness should not harm the cosiness of the room. This refers to the fact that most of the participants work in their living room or bedroom, a space which should not become less cosy for the sake of the workplace.

Research question topic:
3. When and how are breaks taken? How many breaks, how long, and when? Are breaks planned, skipped, forgotten? What are the consequences of doing so? What activities are done? What is the best way to restore energy?

Source of this data:
Booklet exercise regarding breaks (day 4), and follow-up interview questions, and statements made during the timeline exercise.

2.3.4 Breaks

The timeline exercise resulted in the when and how of taking breaks.

- With regard to the amount of breaks, no exact answer can be stated: some participants did not see micro-breaks as proper breaks, and therefore left them out of their count, while others did count them. However, a lunch break and several other nutritional breaks are always present;
- Some medium and long breaks are planned beforehand (especially lunch break), though often not scheduled in exact timestamps. Micro-breaks are unplanned, and in some cases also unwanted, as they make the workday feel less productive;
- Sometimes breaks are postponed or skipped. This has to do with either a drive or obligation to finish work. Participants do mention that they are aware of the consequences (feeling depleted at the end of the day);
- Activities done in breaks include checking phone for social media or entertainment, going outdoors, doing household chores or groceries. Going for a walk or going outdoors (more often) is most desired, however there is not always the time to do so, nor does it always feel worth the time. Desired activities are offline and off-screen, as opposed to the current activities;
- When asked for their 'best way' to rest and recharge, activities most mentioned include physical exercise, being outside, social interactions, or a combination of those. Not all of these activities are suitable for breaks. Relaxing by watching a movie or series is also mentioned, though participants mention that they do need to feel like they deserve doing so.

Planning breaks creates structure

From the booklets and the interview, some things can be said about planning breaks. Lunch break had always been mentioned as a long break, and was often the only break longer than thirty minutes. Lunch break is planned, although the exact time may differ from day to day. Additionally, some people plan (coffee)breaks in the morning and/or afternoon. For others these breaks do take place, but they are not planned beforehand.

Planning breaks can give structure to the workday, whereas not planning breaks could create a feeling of disorganisation. Micro-breaks are never mentioned to be planned, which is why for some people they fit in the latter category, which makes the workday feel less productive: "I'd rather not take these micro-breaks. So I'd rather not plan them, because that way I make myself believe I don't have them."

Micro-breaks are therefore sometimes seen as mere unwanted distractions from work, rather than the valuable energy and attention replenishing breaks that they can be (Bennet, Gabriel, Calderwood, 2019). Sometimes they aren't seen as a break at all, as they for example take place at the workplace: "Nothing changes. I'm still looking at the same screen, sitting at the same desk, in the same focus."

Postponing breaks: difficulty to recognise when attentional fatigue strikes

Sometimes a break is postponed, often because there's a drive to finish up something before taking a break. When postponing a break the signals that a break is needed are ignored. The signals mentioned by participants revolve around a lack of concentration, sometimes due to being hungry and often after videocall meetings. Lack of concentration is a signal of attentional fatigue, and attention restoration theory (Kaplan & Kaplan, 1989) suggests that when attention is fatigued rest is needed to recharge. It was mentioned that it is difficult to recognize these signals and to know when a break is needed: "Is my concentration gone or am I just being lazy and should I push through?"

Skipping breaks has consequences, but that realisation comes too late

Aside from postponing breaks, sometimes they are also completely skipped. Reasons for this mentioned in the interviews were either that they were 'in the flow' and didn't want to get pulled out of focus and productivity, or that there were meetings scheduled back-to-back and there was just no time to take a break.

Consequences of skipping breaks mentioned in the interviews are all related to a feeling of complete depletion at the end of the workday: "Sometimes I think I wear myself out by not taking breaks," and "I tend to work for too long consecutively, then I short circuit," and "I know that I won't go through the day as efficiently if I skip my [coffee] breaks."

Not only does this feeling of depletion influence the productivity throughout the day, it can also bleed to the after-work hours. Switching from work to spare time is more difficult and relaxing in the evening has less effect: "If I only take a lunchbreak and barely any microbreaks, then I am drained at the end of the day. I am very aware that, if I don't succeed at taking breaks, it influences my energy levels for the rest of the afternoon and the evening."

By skipping breaks the signals of attentional fatigue are suppressed. In a break attention can be restored to a certain degree, depending on which activities are undertaken (Kaplan & Kaplan, 1989). When breaks are skipped, restoration cannot take place throughout the workday, resulting in a feeling of exhaustion at the end of the day. Whereas there is an awareness that taking breaks is important, and that skipping them has negative effects on work and non-work areas, this awareness often comes too late. It is often in hindsight that there is a realisation that there were too few breaks taken that day.

One participant solved the issue of feeling depleted by following the Pomodoro-method for taking breaks. Pomodoro follows a schedule of 25 minutes work and 5 minutes break (Cirillo, 2006). "I do have to switch my mindset to follow pomodoro, but I notice that in the evening I am less tired. My head isn't as full and I feel more relaxed."

Activities: an unfulfilled desire to leave the workspace and go outdoors

Aside from the expected drinking coffee or tea and eating a snack or lunch, some other break-activities are mentioned in the list below, in order of most to least mentioned. Also listed are activities that were mentioned as desired, but aren't realized (enough). The number between brackets indicates the amount of participants mentioning the activity.

A list of break-activities

- Checking mobile phone for social media or news, or play a game (5);
- Going outside to either a balcony or garden (4);
- Watching a series or video's (3);
- Household chores (2);
- Groceries (2);
- Take a walk through the house (2);
- Go for a walk outside (1);
- Exercise (1);
- Make pictures (1);
- Puzzles (1).

A list of desired break-activities:

- Going for a walk outside (5);
- Going outside to either a balcony or garden (more often) (3);
- Going away from screens in general (2);
- Going away from the workplace instead of bringing drink/food there (1);
- Doodling (1);
- Exercise (1).

Break activities that involve going away from home (i.e. go for a walk, groceries, exercise) are done in lunchbreaks, as these activities take more time than fits in a brief 'coffee'-break. For those who do not go for a walk or go outside eventhough that is desired, the lack of time is to blame. Besides, sometimes going for a walk doesn't feel worth the time: "I don't want to be gone [for a walk] for too long. I'm not going away for an hour because that's just a waste of time."

Another reason for not going for a walk outside is that the environment doesn't allow for a short walk, or doesn't meet expectations of a 'good' walk. Latter counts for two participants that live in a big city: the urban environment is "less suitable" for a walk, and a walk "through my own neighbourhood" does not satisfy. Compatibility is one of four components for attention restoration (Kaplan & Kaplan, 1995). The fact that the outdoor environment is not compatible for a walk to these participants, counteracts the potential attention restoration that a walk outdoors might bring.

The desired activities that were mentioned in the interviews are all offline, and the activities mentioned most are related to going outside. Going outside (e.g. balcony or garden) is currently done both in the long lunch break as well as in the medium-length 'coffee'-breaks. But not all who desired going outside did so, and those who did would prefer to do it more frequently.

In all breaks the mobile phone is involved, but in micro-breaks it is the main focal point. Note how using the mobile phone is not mentioned in desired activities, but done most: "The shorter the break, the easier to just grab your phone and stare at it until you get back to work. Afterwards I always wonder: was this actually relaxing?" Moreover, there is a desire to go away from screens in general.

Activities in medium-length breaks include watching series or video's, making pictures in or around the house, doing (sudoku) puzzles, and doing household chores. All these and most other activities mentioned are done individually. While this has the benefit of being independent in deciding when to take breaks and what to do in them, some participants prefer taking breaks together. The social aspect of taking breaks together helps to mentally step away from your own thoughts: "Before [COVID-19 measures] we would work for two hours and then have a small break together. In that break we would just chit-chat about anything and everything."

Some participants mentioned initiatives from their employers for scheduled digital breaks. This way the employees can 'see' each other in a videocall. This doesn't meet expectations through. Not everyone has the need nor time for a break at the same moment: synching breaks with colleagues while working from home isn't as easy as it is at the office. Also, it is preferred to be away from the screen during a break, and a videocall break counteracts that. Not only are videocalls mentioned to be tiresome, spending your break with colleagues in a videocall just doesn't fully feel like a break: "It's just a physical break, but not a mental one, because I'm still in a meeting with my colleagues."

The best way of recharging is not always suitable for breaks

With a scope wider than breaks (referring to evenings or weekends), participants were asked what their best way of resting and regaining energy is. Most mentioned were activities involving physical exercise, being outside, social encounters, or a combination of these three. Physical activities mentioned are going for a walk or other forms of exercising like fitness, cycling, yoga, swimming. Social activities span from a brief talk with a housemate, to going out for dinner or meeting up with friends.

Other activities mentioned to help rest and regain energy are watching a film or series, playing a videogame, or creative hobbies like a scrapbook, drawing, or making music. About watching a film or series, some participants mentioned that they do have to 'deserve' said activity: resting and regaining energy only works for them if they have felt productive throughout the day already.

Not all of these activities are suitable for breaks due to time or location constraints. Most of the physical activities are restricted to free time outside of work, and the same counts for most of the face-to-face social activities. While these activities are considered most often as the best way of resting and regaining energy, they are limited to the end of day or week.

As one participant described that the best way of recharging is when they are "somewhere different with all your senses." This resembles the effortless attention that Kaplan & Kaplan (1995) describe as fascination, one of four components in their attention restoration theory.

2.3.5 The course of a WFH-day

Research question topic:
4. What does a WFH-day look like? How does it start and end? Is there a ritual to follow?

Source of this data:
Statements made during timeline exercise, and timelines themselves.

Frictions points with regards to separating work and non-work are present throughout a WFH-day.

- While attempts to keep to a 'regular' workday rhythm are made, not all participants are able to keep a strict boundary between work and non-work in the morning. For some, the clear-cut switch towards work has become smeared out over the morning and breakfast ritual. Putting your mind into work-mode is more difficult when working from home;
- During the day, issues with concentration and distraction are mentioned. These moments were marked as negative experiences. Positive experiences included being able to work effectively, breaks, and being done with work at the end of the day;
- The end of the day is a more clear-cut line. However, thoughts about work tend to reoccur during non-work hours.

Blurry mornings or regular rhythms

Switching to work-mode is difficult for some of the participants. As commuting is not necessary, some participants spend that extra time by sleeping in. As they are working from home anyway, the morning ritual becomes shorter, and is for some participants also spread out over a longer period of time. Where the switch between non-work and work was a clear border defined by commuting before, it has become blurry with WFH. Some participants eat breakfast while starting work, or delay brushing their teeth or styling their hair to a moment later in the morning. Some participants blend their morning routine with starting up work: they go back and forth between getting themselves and their workplace ready. One participant describes how this makes his morning ritual and breakfast less relaxing: "If I get out of bed late I get agitated afterwards. I would see my workplace and get the drive to still start at nine."

Other participants try to keep to a 'regular' workday rhythm by following their ritual as if they would go to the office. They first get ready and only then go to work: "Only then I feel ready to get started." Multiple participants emphasize the importance of getting dressed in the morning: "It's difficult to end the day and consider work done. I need something to make the difference [between work and free time] for myself."

A few participants go for a walk before they start their workday, to replace the lack of commuting and being outside: "If I get out of bed and sit down at my computer immediately, I don't leave the house at all. Before I get to work, I like to have been outside and have done something physical."

Highs and lows throughout the day

While making the timeline participants were asked to describe friction points, or things that were problems or caused frustration. Getting started in the morning is one of these friction points for a few participants. Putting your mind in work-mode when working from home is more difficult than when working in an office.

Another major friction point is the inability to focus, a lack of concentration, or being distracted by others or other things. In this case, micro-breaks happen more often, but aren't necessarily helpful as they are (as said by some participants) done in the 'wrong' way: "I spend my time scrolling on social media, while I don't even feel like doing so. But it's just a reflex."

Other friction points are postponing breaks when they are actually needed, or having a full agenda and a lot of work ahead.

Breaks were often marked as a positive experience. Other moments marked as most positive were the end of the workday with the prospect of have time for yourself and your hobbies: "The end of the day is a pleasant moment. Clicking away all my programs and think: what am I going to do now?"

Another positive moment is being able to work effectively and having plenty of concentration. Latter reflects in the description of a 'good' day multiple participants agreed on: feeling productive and having few distractions.

Work is done. Or is it?

For most participants the end of the workday is a clear switching moment. Closing the laptop defines the moment that the workday is done. Making a braindump list or to-do list beforehand helps in finishing up the workday. However, it could also create stress, as there are often a lot of new things to do and no time to get started with it right away.

Some participants close all work-related programmes. Then, if they use the same laptop in their free time, they don't get reminded of work. Some participants put away all their work stuff, so they do not remind them of work outside of work-hours: "So it doesn't look like an office anymore."

Still, sometimes there's the tendency do something for work in the evening. Whether it is doing some small activity or checking email: "I just wonder: what am I going to encounter tomorrow?"

2.3.6 Differences between WFH and office

Research question topic:
5. What are the differences from WFH and work at location?
What are advantages/likes and disadvantages/dislikes of WFH?

Source of this data:
Interview answers regarding differences between WFH and on location, and statements made during timeline exercise.

Both working from home and in an office have their pros and cons.

- Whereas for some people working from home gives more freedom, for others it mainly brings along things that continuously remind you of work, even outside work-hours;
- Where some participants describe working from home as more productive, others experience the exact opposite outcome.
- Lack of commuting has its pros (saves time) and cons (no natural switching point);
- Contact with colleagues is different, both formal (more tiresome) and informal (there is a lack of it).

Lack of commuting: a blessing and a curse

A day working from home differs clearly from an office-day in the sense that there is no need for commuting. This both has positive as well as negative effects. On one side there is more time available for other activities, spent on sleeping in or hobbies for example. On the other hand, commuting is a reason for going outside and being physically active, like cycling. That's something some participants mention to miss: "Now I just sit on the same chair for eight hours a day."

Besides, another downside of not commuting is that this natural switching moment between work and non-work is gone. Traveling allows to empty the mind: "Drive for a bit, doing something else for a while. It feels like a fresh start."

Even though commuting is missed, when asked if they would do it voluntarily anyway, most participants respond negatively. They see it as a waste of time: "It would be something I would enjoy, but then I again I tend to think it's nonsense. I'll just start working right away." And they explain that the effects are different: "You literally drive away from work. With working from home, you don't. I can go for a drive for the sake of it, but then I'll still see my workplace. It would feel like I'm trying to fool myself."

One participant describes how they replaced their commuting at the end of the day with a phone call with a relative. This fulfils the need of emptying the mind as well, but through a different manner.

Colleagues: no distractions, but also no smalltalk

Both formal and informal contact with colleagues differs when working from home. Work-related communication is laborious. There is no possibility to simple tap your colleague on their shoulder and ask them something. Contact is through online chats or videocalls. Even though these meetings are experienced as more efficient, they are also more tiring: "It's more straight to the point but it also takes a lot more concentration." One participant described how a day working from home is even more tiring in general.

Participants mentioned that they miss the possibility to chitchat with colleagues: "You speak with your colleagues in meetings, but the chitchat at the coffee machine, that doesn't really happen now." Participants explain that a chat with colleagues helps to make the day more positive, it breaks up the daily grind. Seeing others face-to-face seems important when it comes to chitchat. Doing small talk over chat or phone call does not suffice: "It's all so impersonal. The people are very abstract."

Working at the office is described as more fun (NL: gezelliger). Even though colleagues can be distracting, this distraction is deemed different from a chat with a housemate or relative. Chatting with colleagues has an association with work indefinitely. "Colleagues distract you too, but it does bring a lot of job satisfaction."

"When working from home you have to find a balance between being a sponge and Teflon. Sometimes you have to embrace work, but you also have to teach yourself to take distance from it."

2.4 Conclusions

From the results several possible design directions can be defined. These are described, and a selection is made. A design vision and interaction vision are created, defining what the intervention should achieve, and how the interaction with it should be.

2.4.1 Themes: possible design directions

The goal of this user research was to define design directions: themes in which opportunities for an intervention lie. A bottom-up strategy was followed. Following to the analysis phases as described by Visser (2005), data was clustered into recurrent and/or striking themes. Six themes were found, each describing a potential design direction.

Taking breaks the 'right' way

This theme aims at emphasizing the importance of taking (micro)breaks and providing tools for how to take breaks the 'right' way. Participants know that they need to take breaks, describe clearly what works best for them to relax and re-energize, and know what the effects are if breaks are not done 'correctly'. Yet, they still struggle in break-taking effectively. Participants mention that it is difficult to know when a break is needed, and sometimes feel like they do not yet deserve a break. Breaks are sometimes consciously skipped, even though the energy- and attention-draining effects of that are known. However, this realisation is often in hindsight. By making homeworkers conscious about how to take breaks the correct way, restoration could be stimulated.

Stimulate changing the workplace

This theme aims to stimulate an active attitude in homeworkers when it comes to improving their workplace setup. This theme is based on the things participants mention as disappointing or frustrating (e.g. clutter or mess, uncomfortable chair or cold flooring). These things are often easy to solve, yet aren't. This theme focuses on pushing homeworkers over that barrier with the idea of to just 'do something with it!', and thereby diminishing the disappointing, frustrating, distracting things from the workplace.

Toggling work-mode

A prevalent theme emerging from the research is the struggle following a workday routine when WFH. The boundaries between work and non-work are not as black and white as they are when working on location. Participants describe how these blurry boundaries make letting go of work during evenings or weekends more difficult. There is no commuting when WFH, and therefore a natural switching point from and towards work-mode is missing. Also, non-work and work activities blend, whereas they were more strictly separated before. Besides, there is often no dedicated workplace when WFH. This theme revolves around reviving the boundaries, clarifying the border between work and non-work.

Nature at home

Nature is proven to have a prominent role in attention restoration and stress reduction. The user research results also show elements of nature to be desired by the homeworkers. Biophilic design could therefore be a fruitful means to create restorativeness in the WFH-environment.

It is important to note that nature is multisensory, and so biophilic design is as well. Some multisensory preferences that were mentioned in the research, and which fit this theme: (sun)light creating liveliness through patterns and/or movement, tactile- and environment temperature influencing (dis)comfort or sparking moments of delight (e.g. warm sunlight in the early morning), nature sounds (e.g. rustling, chirping, rippling), neutral or nature scents (e.g. forest, grass, rain), and fresh air, feeling a breeze of wind, or airing out a room.

Involving people

WFH is often done alone, which is a blessing and curse. On one hand there are no distractions, but on the other hand, the advantages of having someone around for a chitchat or sparring moment, are missing (chapter 2.3.6). This theme aims to reintroduce the social aspect of colleagues into WFH.

An important side note is that some participants mention that their employers have tried initiatives to connect colleagues for the informal social contact (e.g. videocall breaks), but that these initiatives do not work (e.g. breaks are not on the same schedule) nor satisfy (e.g. videocall feels like a meeting instead of a break).

Customized atmospheres

This theme focuses on the idea that changing the atmosphere of a space can change the association people have with it. An overarching determinant in atmosphere rating is the association of the space: its function and activities that take place in it influence the atmosphere.

The research also shows what other factors participants see as influencing the atmosphere. Using this knowledge, a difference in atmosphere could be designed for the workplace during versus outside of working hours, with the effect that the separation between work and non-work becomes clearer. A workplace situated within a living room can then for example be tuned to a more detached atmosphere during work-hours, and a more cosy atmosphere during evenings or weekends. It should be taken into account that the desired atmosphere differs from one person to another, and depends on time of day, location in the house, and type of work activity.

2.4.2 Design vision: re-established borders and conscious switching

Initial goal, from design brief:
Find out how to make (a product that creates) a restorative environment or experience within the home setting.

Design direction, from user research:
Re-establishng the borders between work and non-work, and making the switching moments more conscious.

From the outset, the aim for this project is to develop a product that supports restoration during working from home. The Attention Restoration Theory (ART) (Kaplan, 1995) describes four key components that an environment has to meet in order to be experienced as restorative:1) a sense of being away, 2) fascination, or effortless attention, 3) extent, or a feeling of immersion, and 4) compatibility and congruence between the person and the environment. This user research has shown that these four components are not all met in the current WFH-environment, thereby limiting the possibility for the WFH-environment to be restorative. The theme 'toggling work-mode' describes how especially the sense of being away is limited: the boundaries between work and non-work have become blurry when WFH. This phenomenon was already described in chapter 1, and again found as prevalent result in the user research. The design direction is therefore focused on re-establishing the borders between work and non-work, and making the switching moments more conscious.

2.4.3 Interaction vision: what should the character of the interactions be?

Interaction vision:
Two-sided. Switch towards work should feel like doing a warming up before exercise: 'here we go', energizing, activating. And switch away from work should feel like finding a scenic spot during a hike: exploratory, marvel, enchanting.

Where the design vision describes what the intervention should achieve, an interaction vision helps understand how the interaction with the intervention should be. Interaction visions are used as analogies, describing the intended character of interaction with the design. The toggling between work and non-work as described before is two-sided: from work to non-work, and vice versa. The character of the interaction with the design should be different for these two situations. Toggling towards work requires to zoom in, a switch toward being focussed (figure 17 and video 1). Toggling towards non-work is more about zooming out and re-broadening your view (figure 18 and video 2). The characteristics of these interactions are useful in designing the desired feeling when interacting with the design.

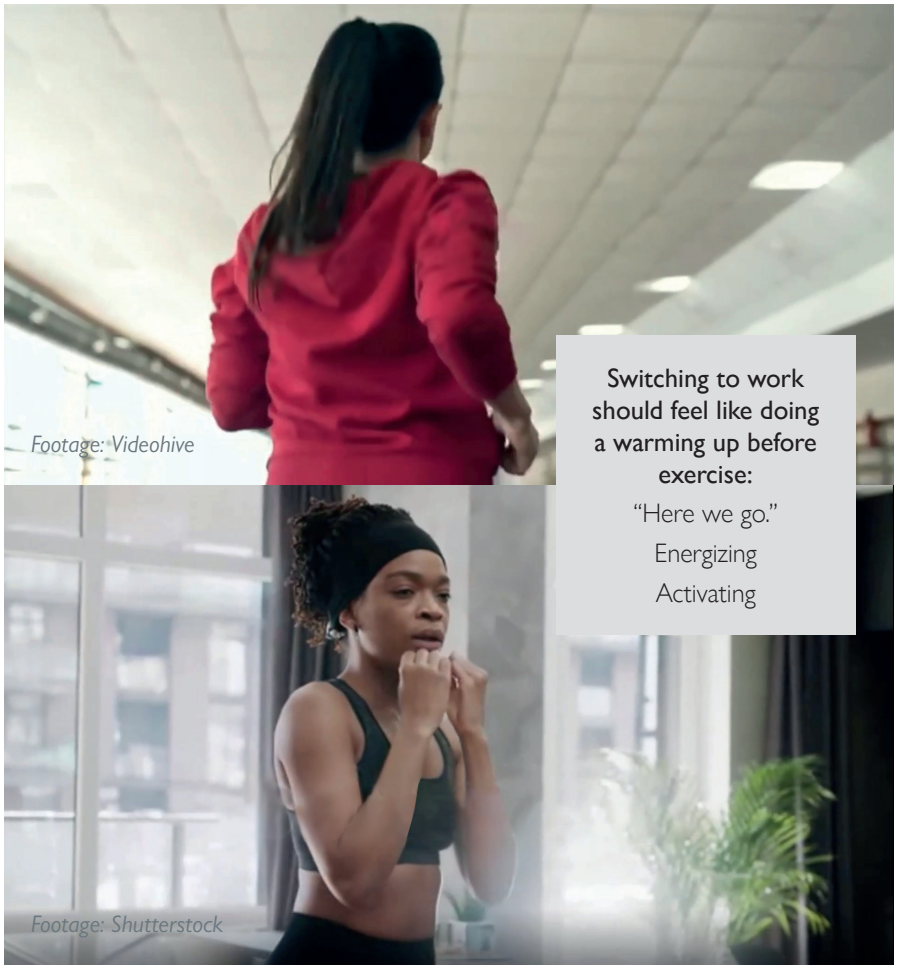
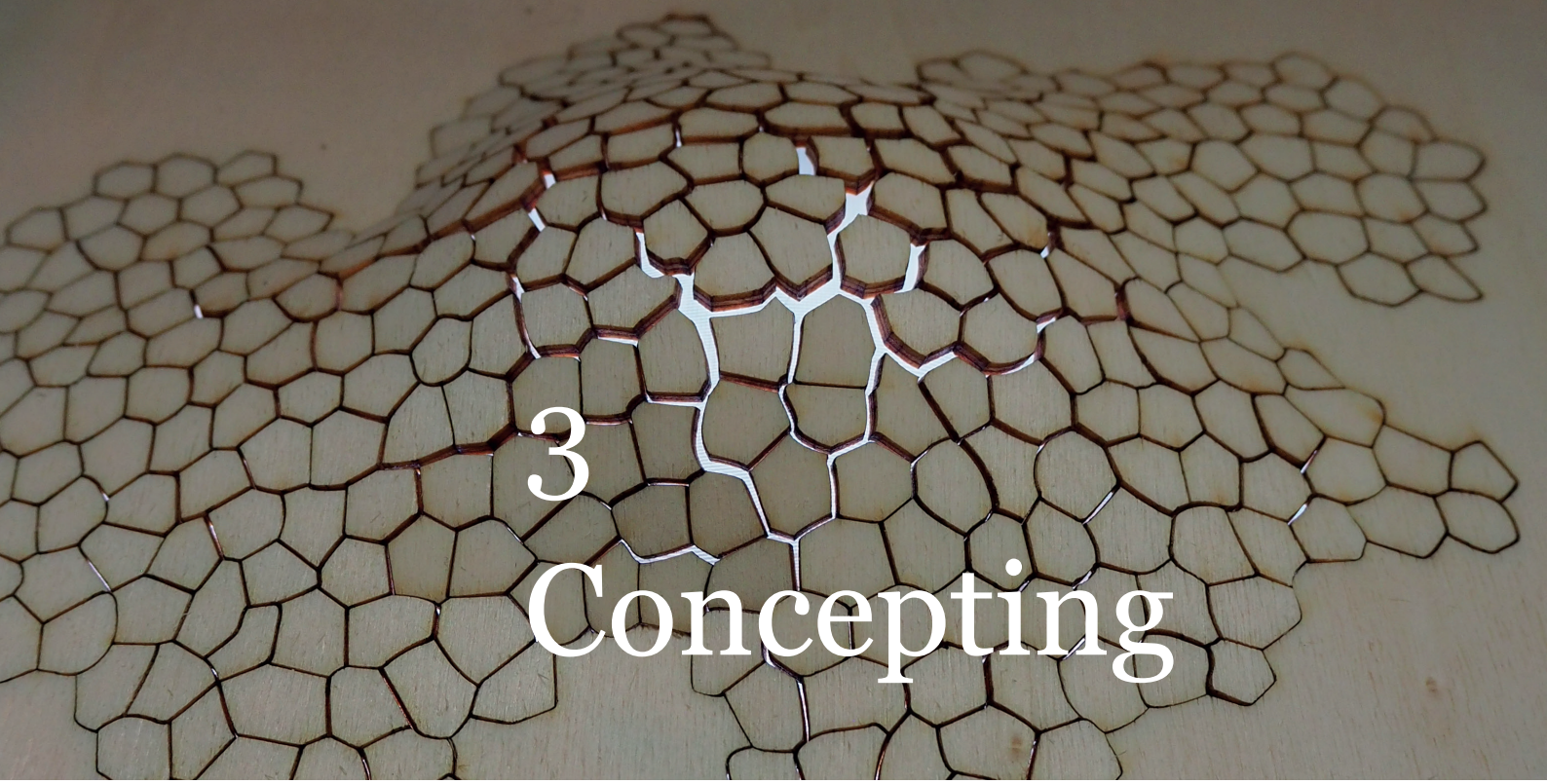


Figure 17: Switching to work should feel like doing a warming up before exercise. Also see video 1.

Figure 18: Switching to non-work should feel like finding a scenic spot during a hike. Also see video 2.



3 Concepting

From the outset, the aim for this project is to develop a product that supports restoration during working from home. The user research in chapter 2 describes that it is important to re-establish the borders between work and non-work, in order to create such a restorative environment. Making the switching moments towards and away from work more conscious can help create a feeling of being away from work outside of work-hours. This feeling of being away is one of the four key components to create a restorative experience (Kaplan, 1995), and also the component most harmed when working from home.

With this design vision in mind, the concepting phase was initiated. The reader will notice a particular attention for lighting, light effects, and light textures. As argued in chapter 1.2.3, the use of (biophilic) light textures, also called brilliance light, is a suitable means to create fascination, one of the four key components to create a restorative experience. While the goal from the outset is not to design a lamp, the inclusion of light is a red thread throughout chapter 3.

The process from design vision to concept choice consists of multiple iterations (figure 19). The first half of this chapter describes the process of ideation towards a concept choice. The second half elaborates on the development to a final concept. The chapter ends with a concept evaluation study. Throughout the chapter take-aways are summarized in the margins.

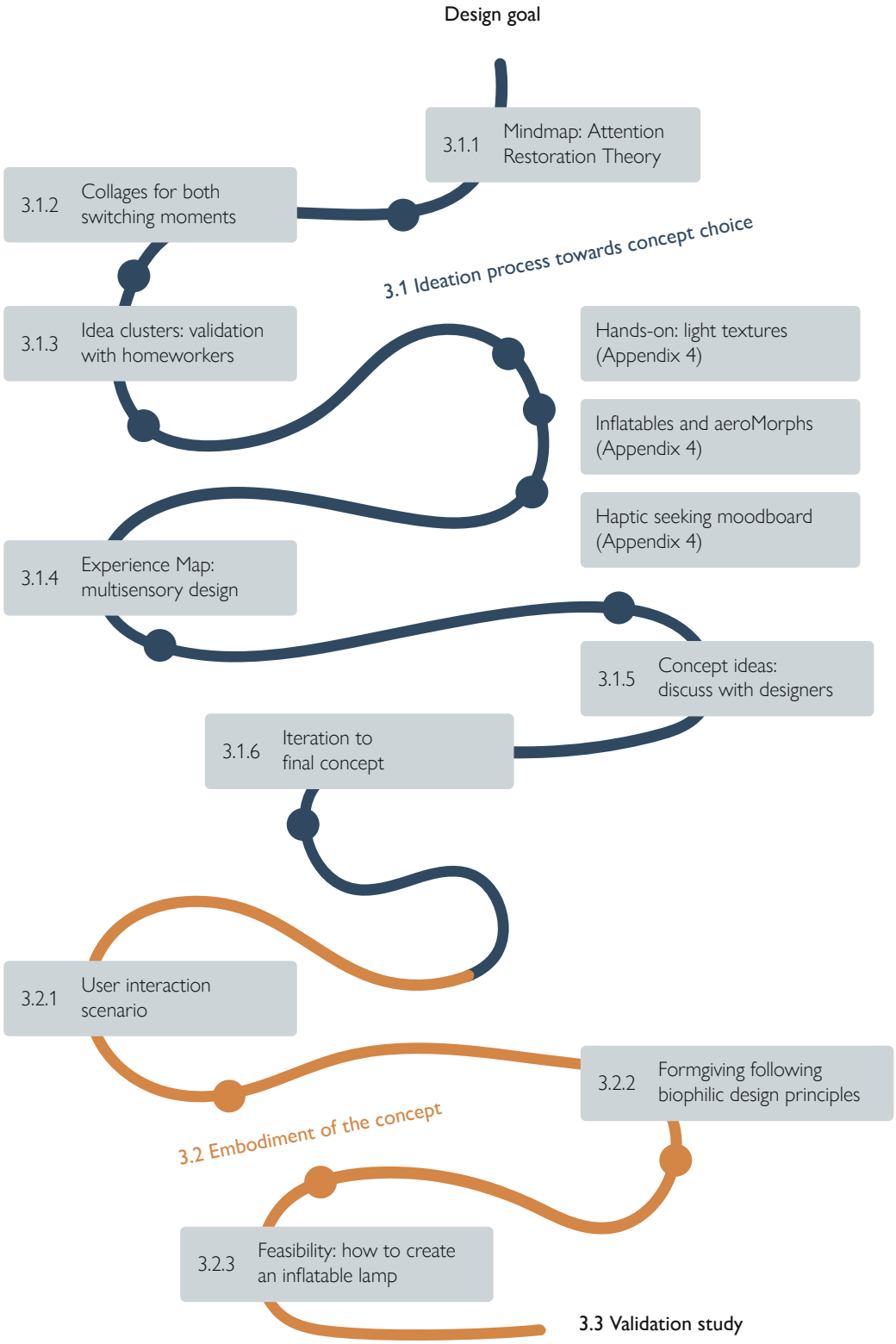


Figure 19: The concepting phase followed a process of diverging and converging.

3.1 Ideation process towards concept choice

This section elaborates on what these activities were done for ideation, why they are done, and what take-aways they bring for the design of the intervention. The take-aways and design process are briefly summarised in the margins.

3.1.1 Mindmap: Attention Restoration Theory

Take-aways for ideation:
- Fascination in shape or interaction;
- Fascination through patterns and movement;
- Fascination through dynamic light textures;
- Fascination through curiosity, ephemerality, enchantment;
- Being away through occupying one's mind.

Criteria for intervention:
- Intervention suitable for the WFH-environment in size, material, placement;
- Intervention should be interactive, responsive (to create compatibility);
- Intervention should be ever changing (to create extent), but not overstimulating or distracting.

From the outset, the aim for this project is to create a restorative environment or experience within the WFH-setting. In order to be restorative, an environment or experience has to meet four key components (Kaplan, 1995): 1) a sense of being away, 2) fascination, or effortless attention, 3) extent, or a feeling of immersion, and 4) compatibility and congruence between the person and the environment (also see chapter 1.2.2). For these component a mindmap was made (figure 20). Using a 'how to'-statement (Tassoul, 2008) the four components were elaborated into design criteria.

Findings and take-aways

The criterion fascination describes effortless attention for an object or activity. Creating an intervention for the WFH-environment could therefore be fascinating in shape and/or in interaction. Examples of effortless attention-grabbing are patterns and movement. One way to create fascination is through light textures, as was argued in chapter 1.2.3. The combination of light textures and movement (a.k.a. dynamic light textures) therefore seems a fruitful direction. The mindmap also describes some other examples of how something can grab attention: sparking curiosity, being ephemeral, or creating a feeling of enchantment.

Being away can either be literally distancing oneself, or by being away with your mind. Daydreaming is an example of being away psychologically. For an intervention in the WFH-environment, occupying one's mind is a particularly important method to achieve a sense of being away, as physically distancing from the workplace is limited.

The criterion compatibility describes that the intervention should be suitable for the WFH-environment in both its interaction and formgiving. That means parameters like size, material, and placement of the intervention in the environment are to be taken into account. The compatibility criterion also describes how the environment should be responsive. The intervention should therefore be interactive.

Achieving extent is done when the environment (i.e. experience) is rich with enough to see and think about. The intervention should be ever changing, yet not highly stimulating or distracting.

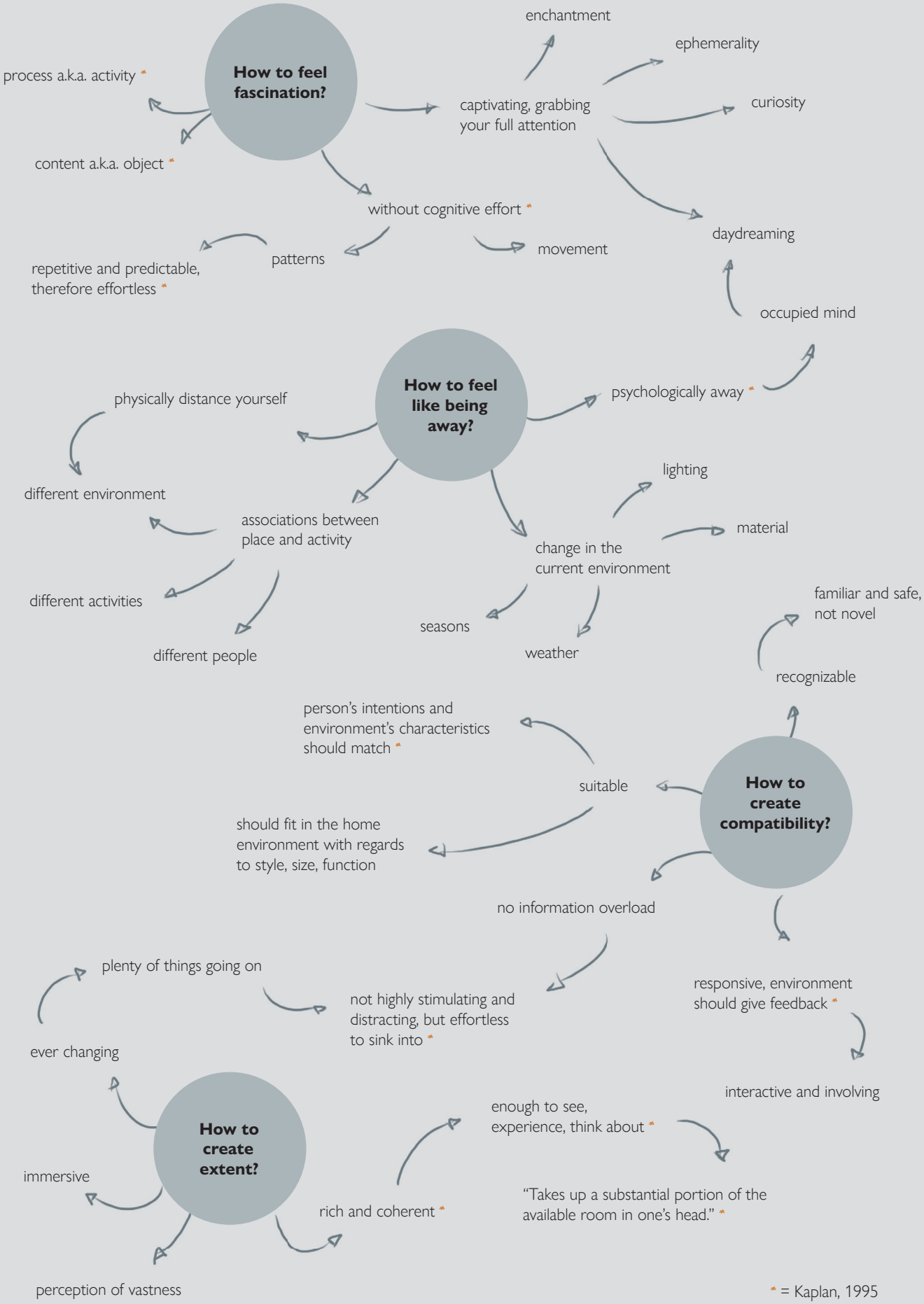


Figure 20: In a mindmap the four components of the Attention Restoration Theory were explored. Knowledge from literature, marked with an asterisk, was also included.

Criteria for intervention:

- Intervention should both draw attention towards work, as well as pull attention away from it;
- Switch towards work should feel energizing, refreshing, encouraging, prepared/ready;
- Switch away from work should feel fascinating, explorative, enchanting, teasing.

3.1.2 Collages for both switching moments: what should the interaction feel like?

The interaction visions in chapter 2.4.3 describe how the interaction is two-sided: the switch towards work and the switch away from it require different characters. Collages were made for both of these switching moments. Where the interaction visions describe an initial how of the product interaction, these collages elaborate about the desired feel of both switching moments. The collages consist of images and video material, and involve audio fragments as well. Figure 21 and 22 show static captures of the collages. However, the collages are best experienced through video 3 and 4.

When switching towards work (figure 21, and video 3) the intervention should activate work mood. As there is no transitional moment now when working from home, the intervention should create a brief energizer between the non-work and work phases. Becoming energized resembles freshness, maybe even coldness. The collage shows images of water, cold breath, getting ready to go for a run, the wind through your hair. The switch towards work should feel energizing, refreshing, encouraging, prepared or ready.

When switching away from work (figure 22, and video 4) the intervention should draw attention to a liminal moment. The focus should not instantly go from work to non-work, but the user should be pulled into a moment of fascination first. As the mindmap of chapter 3.1.1 showed, fascination can go hand in hand with curiosity, enchantment, and ephemerality. The collage therefore shows images of light and shadow-play, focus light yet brilliance, sheer curtains and fabrics, fog and discovery. From this collage it can be concluded that the switch away from work should feel fascinating, explorative, enchanting, teasing.

Findings and take-aways

The switch towards work should feel energizing, refreshing, encouraging, prepared/ready. And the switch away from work should feel fascinating, explorative, enchanting, teasing. Where the switch towards work shifts the attention from broad to focus, the switch away from work should pull you back to that broad view. The intervention should thus be two-sided: both drawing the user towards work, as well as pulling them out of it.

Figure 21: The collage for the switch towards work represents feeling energized, refreshed, encouraged, and a feeling being prepared or ready. The collage is best experienced through video 3.

Figure 22: The collage for the switch away from work represents fascination, exploration, enchantment, and tease. The collage is best experienced through video 4.

Take-aways for ideation:

- Inclusion of a timer, break reminder system;
- Inclusion of audio (signals);
- Change in physical appearance of the intervention supports feeling of being away.

Criteria for intervention:

- Intervention involving light should be positioned in peripheral vision, as that avoids overstimulation from the light;
- Intervention should not be place on the desk.

3.1.3 Idea clusters: evaluation with homeworkers

Brainstorming was done taking into account the collages and mindmap as described before. The ideas were grouped into four clusters (figure 23). Two preferred clusters were chosen, iterated and developed into animated scenarios, suitable for evaluation with potential users.

Cluster 1 (fascination desk lamp) and cluster 4 (atmosphere machine) were chosen, as their foundation is directly connected to one of the Attention Restoration Theory components, fascination and being away, respectively. As part of the goal to make the switching moments more conscious, it is important to create an interactive product. Cluster 3 (daily routine 'clock') therefore seems to be a less fitting solution. Cluster 2 (break reminder) is also not chosen for user evaluation, as break reminders (e.g. pomodoro method, Cirillo, 2006) already exist, and are proven to work for some people. It therefore feels less important to verify this idea with users.

These two clusters were presented using visuals and written explanation (figure 24 and video 5, figure 25 and video 6) in an online questionnaire form (appendix 3, in Dutch only). Participants were asked to critically review the two ideas, answering open-answer questions about what they thought was good and bad about them, what they would change, add, or remove, and to what degree they would use it. The questionnaire was sent to the participants of the initial user study, as well as some additional home-working design graduates. Twelve responses were received.

Findings and take-aways

Bringing together the (dis)likes and suggestions of both scenarios, some points for consideration in further ideation are as follows.

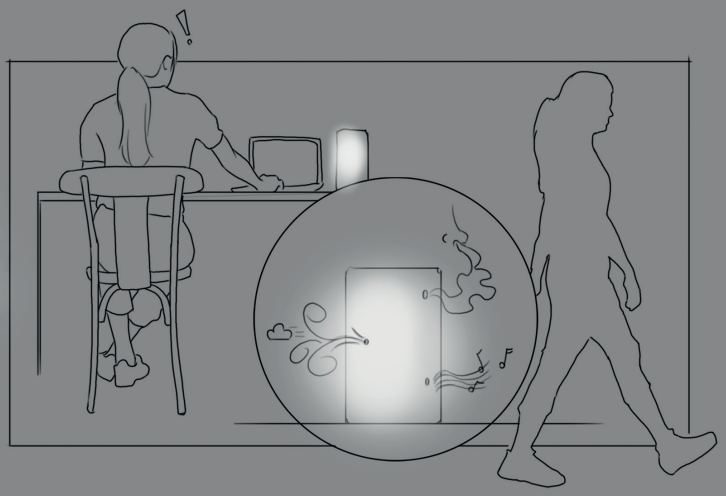
There is an interesting opportunity for positioning the intervention in the peripheral vision from the workplace perspective. This could draw the user away from their workplace, tempting them to spend their breaks elsewhere. Besides, it would also save desk space. Distancing the intervention from the workplace could also help in making the intervention not yet another light impulse clashing with the items (e.g. laptop) used for working.

Though it was not selected as a cluster to verify with the user, the idea of a break reminder was nevertheless suggested by the participants. Including a timer in the design would create an extrinsic motivator to switch away from and towards work. That way the interaction with the intervention does not depend on intrinsic motivation alone.

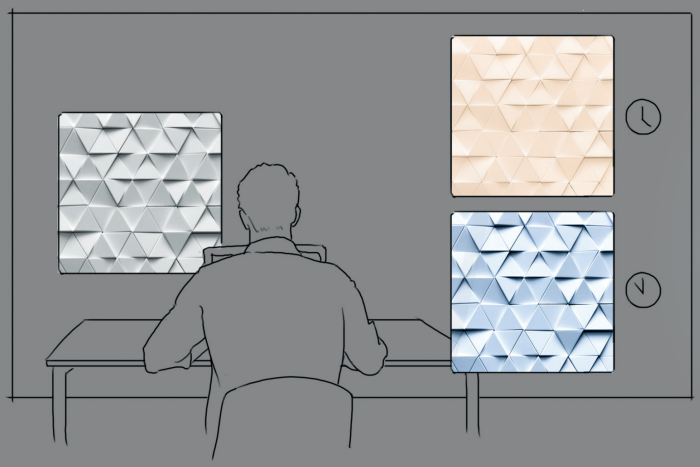
The inclusion of audio was received positively in cluster 4, and suggested as addition for cluster 1. Along with that suggestion were plenty requests for customisation options (e.g. type of music, toggling on or off, possibly using the design as a speaker). Preferences for music or sound are very personal, many parameters decide whether we like or dislike it, and whether it helps your work or clashes with it. Including all these customizable parameters in the design does not seem to be the logical nor necessary path to go down when it comes to achieving the design goal of creating a restorative experience. However, combining the idea of audio with the suggestion of a timer could result in short and simple audio signals in a break reminder concept. For the type of audio signals nature sounds could be used, as these were suggested in the questionnaire, and suit the principles of biophilic design.

With regard to interaction and formgiving of the intervention there are two take-aways. One participant describes how flipping the lamp to work-mode (cluster 1) also flips themselves to work-mode. This finding is in line with the design vision of making the switching moments between work and non-work more conscious. Besides, it was liked how the lamp (cluster 4) changes in formgiving between the different work- and non-work modes. This change in the appearance of the design could add to the feeling of distancing yourself from work outside of work-hours.

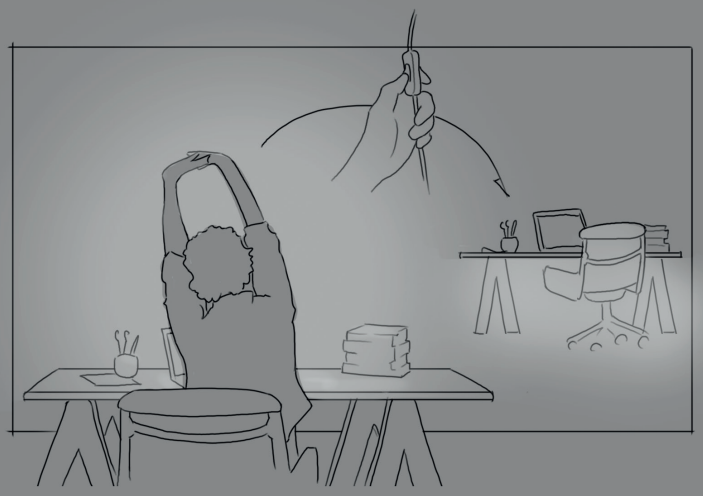
Cluster 1: Fascination desk lamp
The lamp functions as a regular desk lamp during work-hours. Then, the user chooses to take a break. They switch the lamp to non-work mode. Aim of this idea is to create a moment of liminality, in which dynamic light textures trigger a feeling of fascination. Interaction with the product is brief, but the effect afterwards is elaborate and thereby creates a conscious moment of switching between work and non-work.



Cluster 2: Break reminder
This device provides an extrinsic motivation for the user to take their breaks. The product draws attention with changes in lighting, sounds, scents, and/or airflow. The message it declares: time for a switch between work and non-work. Aim of this device is to create an awareness for breaks.

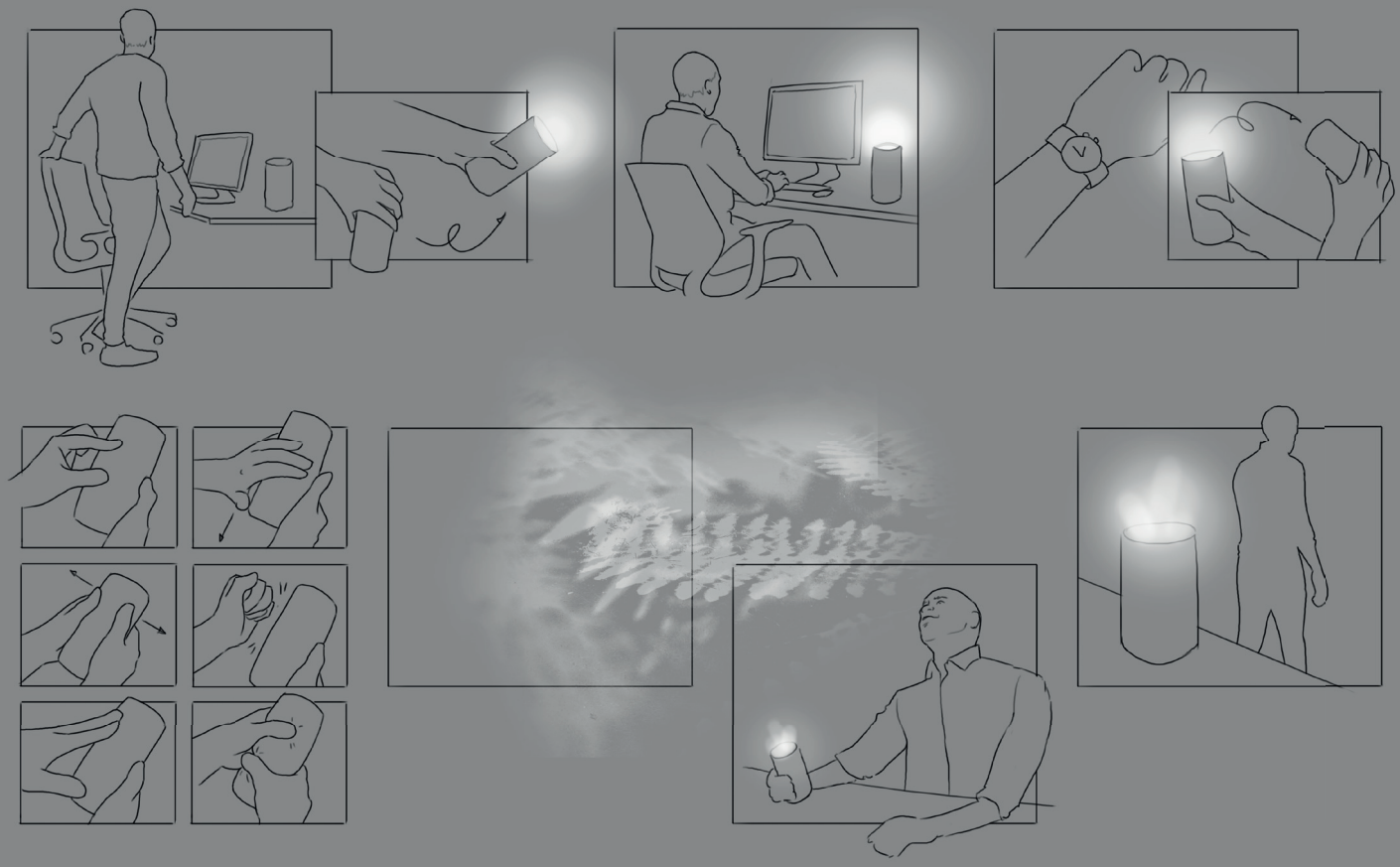


Cluster 3: Daily routine 'clock'
A textured panel is lit from different angles, with different colours and varying brightness throughout the day. Simulating the circadian rhythm supports the user in structuring their day, and reminds them of the world beyond their computer screen. The interaction is passive: the user only experiences it by looking.



Cluster 4: Atmosphere machine
Through different lighting pre-sets different atmospheres are simulated for the different modes of working. During concentrated work, lighting is more bright and detached, and during non-work hours the atmosphere becomes more cosy and homely. Aim is to create a feeling of being away, creating an association between the type of light (detached or cosy) and activity (work or non-work, respectively).

Figure 23: Ideas were grouped into four clusters, two of which (1 and 4) were further elaborated into scenarios and presented to users for feedback.

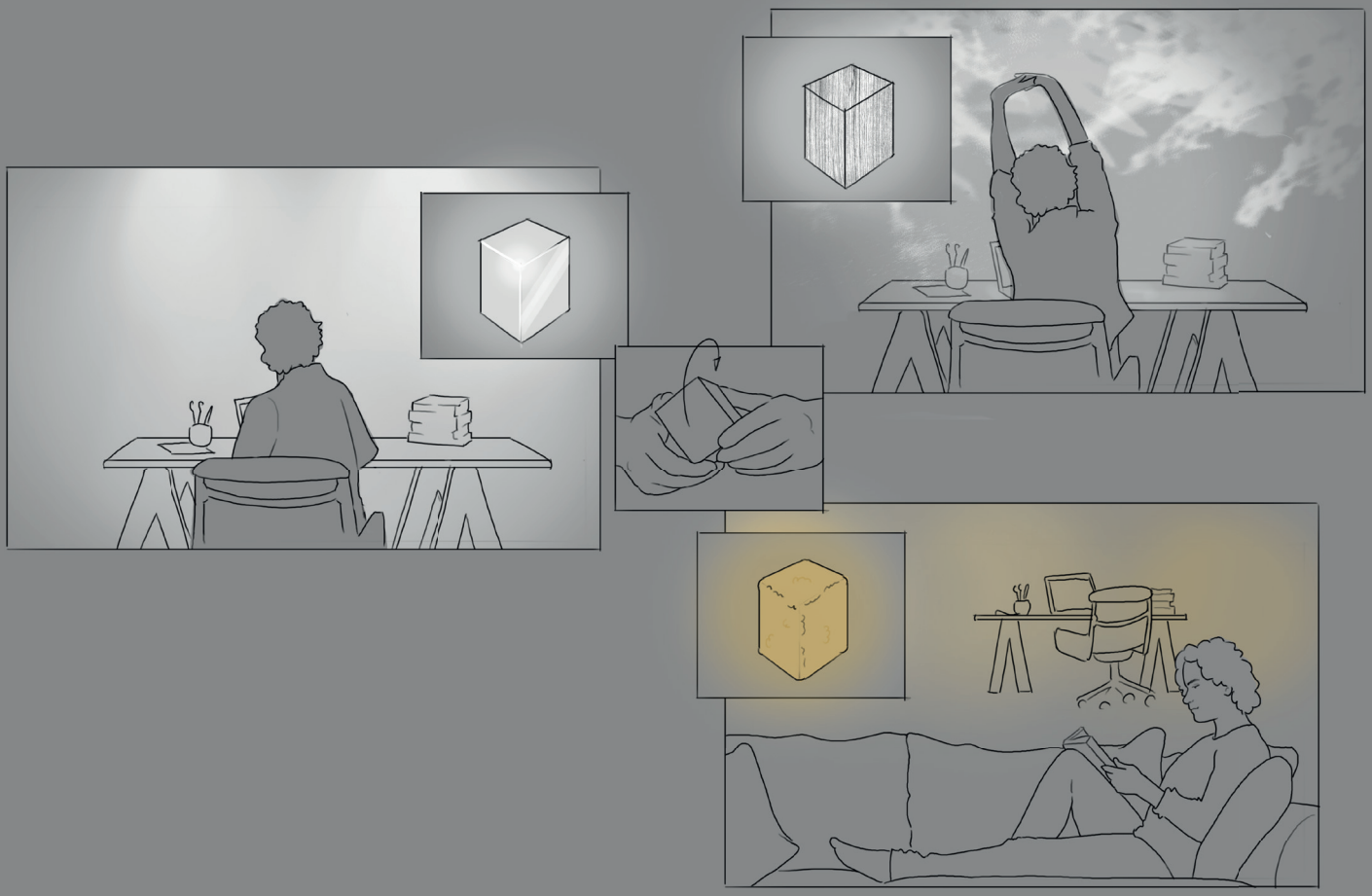


User scenario cluster 1: Fascination desk lamp
When you start working, you flip the lamp, thereby turning it on. During work the lamp functions as a usual desk lamp: the lamp is in work-mode.

When it's time for break, which you initiate yourself, you flip the lamp back. That activates the lamp's free-time-mode. Through gestures, like the ones you use on your phone, you activate and manipulate the dynamic light textures. You do this as long as you desire: look at it as a mixture of a stress ball and a kaleidoscope.

Done with playing? You put the lamp away and take your break like you would normally do. The lamp dims until turned off. Then, when you come back from your break, the cycle repeats. This way, you take a brief moment to be conscious about switching between work and free time.

Figure 24: The scenario of cluster 1 shows a lamp designed for fascination in breaks. The scenario is best experienced through video 5.



User scenario cluster 4: Atmosphere machine
This product has three different modes, two for during work and one for free time. You pick a mode by rotating the product to the side corresponding to your preference. Through light and material the product creates a suitable atmosphere for during work and during free time.

In hard-work-mode the light is brighter and colder in colour temperature, creating an association with office and work. The product itself has a colder and more sterile aesthetic in this mode as well. During this mode you don't get interrupted by the product, until you decide you want to.

In soft-work-mode the product creates a more lively atmosphere. Through dynamic light, audio (think: birds, distant chattering) and haptics (a soft breeze of wind) the product carefully draws your attention. A friendly reminder that the outside world still exists. The product has a more natural aesthetic in this mode, a wood texture for example.

Then when it's break time, or when the day is over, you switch to non-work-mode. The light turns to a cosier and warmer tint. In this mode the product has a softer material as well, blending into the rest of your home environment.

This way you get a stronger association with work during work-hours, and in work-hours only. It makes the workplace a place for work only in the hours that it is supposed to.

Figure 25: The scenario of cluster 4 shows a lamp that creates different atmospheres for different moments throughout the day. The scenario is best experienced through video 6.

Take-aways for ideation:

- Include haptics (texture, tactility, airflow);
- Include following visual qualities: glistening, transparency, glossiness, change of shape, organic and balanced shape, movement of object and light.

3.1.4 Experience Map: translating abstract character to tangible product qualities

With the take-aways from the first iteration cycle, second wave of iteration starts with broadening again. The collages of 3.1.2 describe how the switch towards work should feel energizing, refreshing, encouraging, prepared/ready, and the switch away from work should feel fascinating, explorative, enchanting, teasing. To create concrete intervention ideas, translating these vague descriptors into tangible product characteristics would help. A method to achieve such a translation is the Experience Map (Camere et al., 2015).

The Experience Map tool describes a step by step approach from an abstract product vision, all the way to product characteristics in visual, tactile, auditory, and olfactory categories. By distinguishing between these multiple senses, the tool aims to bring attention to the importance of each of them. That way, deliberate decisions on the inclusion of multiple senses is stimulated (Camere et al., 2015).

The importance of multisensory design was also found from the biophilic design principles. Natural environments integrate information from all sense: sensory richness is described as an abundance of visual patterns, haptic sensations, smells, sounds, and tastes (Heerwagen & Gregory, 2008). Looking alone is not enough when it comes to biophilic design: it lacks action-reaction, which is fundamental for experience of not only nature, but biophilic designs (Bloomer, 2008).

For both switching moments, an Experience Map was created (figure 26, and figure 27). The centre of the circle is the starting point of the tool. It is the most abstract level: the vision statement and conceptual exploration, using the collage imagery with its characteristics (chapter 3.1.2).

Then, moving outward, the characteristics are each connected to sensory properties. Not all characteristics are achieved through each sensory property, therefore some sensory properties are not relevant. For example: no characteristic is expected to be achieved through the use of olfactory properties in the switch away from work (figure 27), so those areas are not further explored. One category of sensory properties was added to existing ten of described by Camere et al (2015): experience of temperature, airflow, and humidity was not fitting within any of the ten existing categories and was therefore added to the tool as the category 'changes in climate', in agreement with Schifferstein, co-writer of Camere et al, 2015.

After the selection of sensory properties is made, the sensory exploration again includes imagery. These images should represent in a more tangible way the expression of the product, how it must look or feel (Camere et al., 2015). The outer most layer is the least abstract step of the tool: in the sensory analysis a selection of product qualities is rated to how much that quality is relevant to describe the characteristic.

This is then an example of how the graphic can be read. For the switch away from work, the vision statement (layer 1) is that the product should draw attention to a liminal moment. The conceptual exploration (2) shows imagery from the collage in chapter 3.1.2. Surrounding these images are four characteristics: enchanting, explorative, fascinating, and teasing. For this example, we will further look at the characteristic 'fascinating', the orange one. The sensory properties selected (3) for this characteristic are: visual, shaping, texture, auditory, and visual change. We will further look at the property 'texture'. The sensory exploration (4) of 'texture' shows a 3D-printed soft surface texture. Then, the sensory analysis (5) of 'fascinating' in the 'texture' property, shows that 'irregularity' is especially relevant to describe fascination.

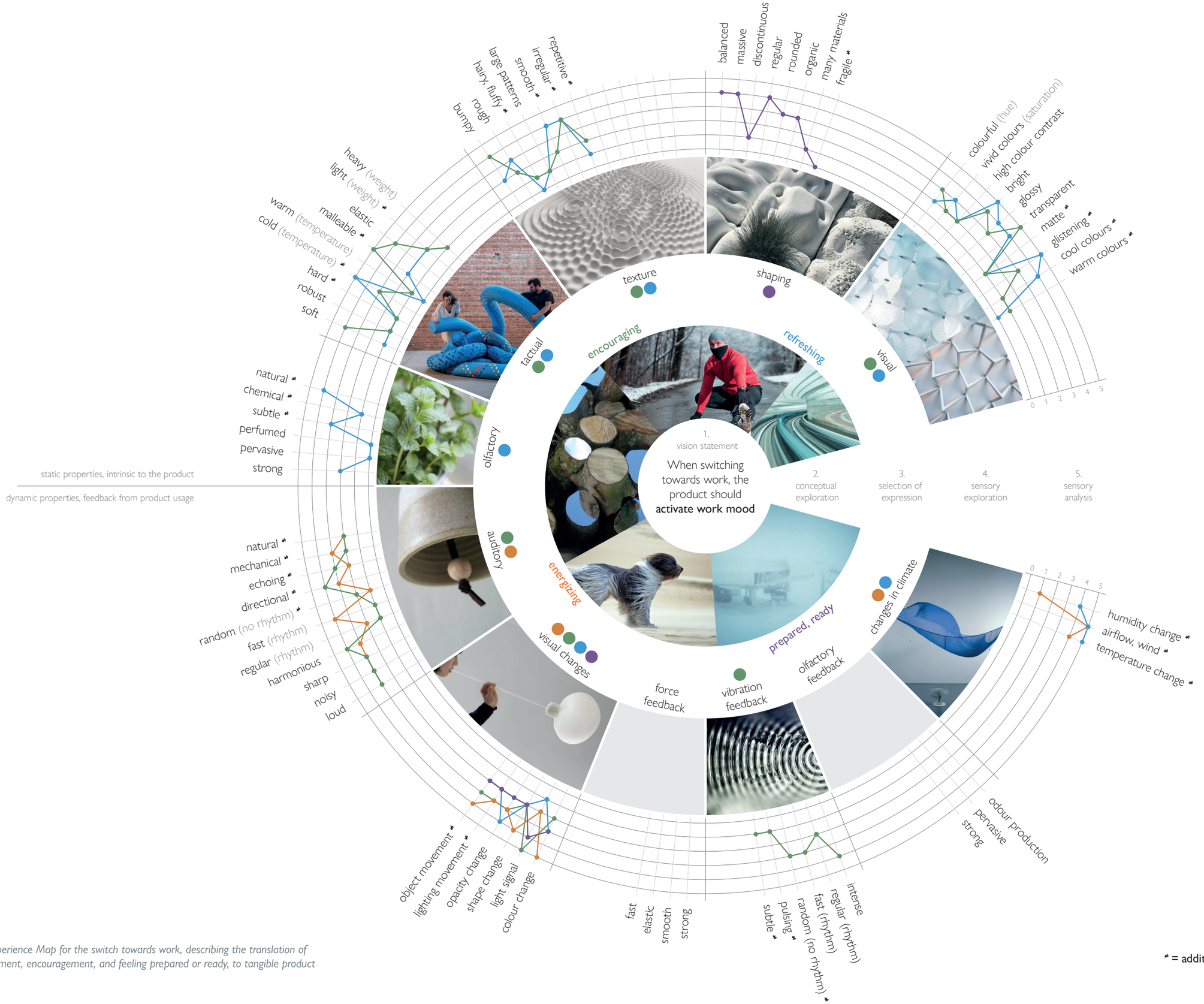


Figure 26: The Experience Map for the switch towards work, describing the translation of energizing, refreshment, encouragement, and feeling prepared or ready, to tangible product qualities.

* = addition for thesis subject

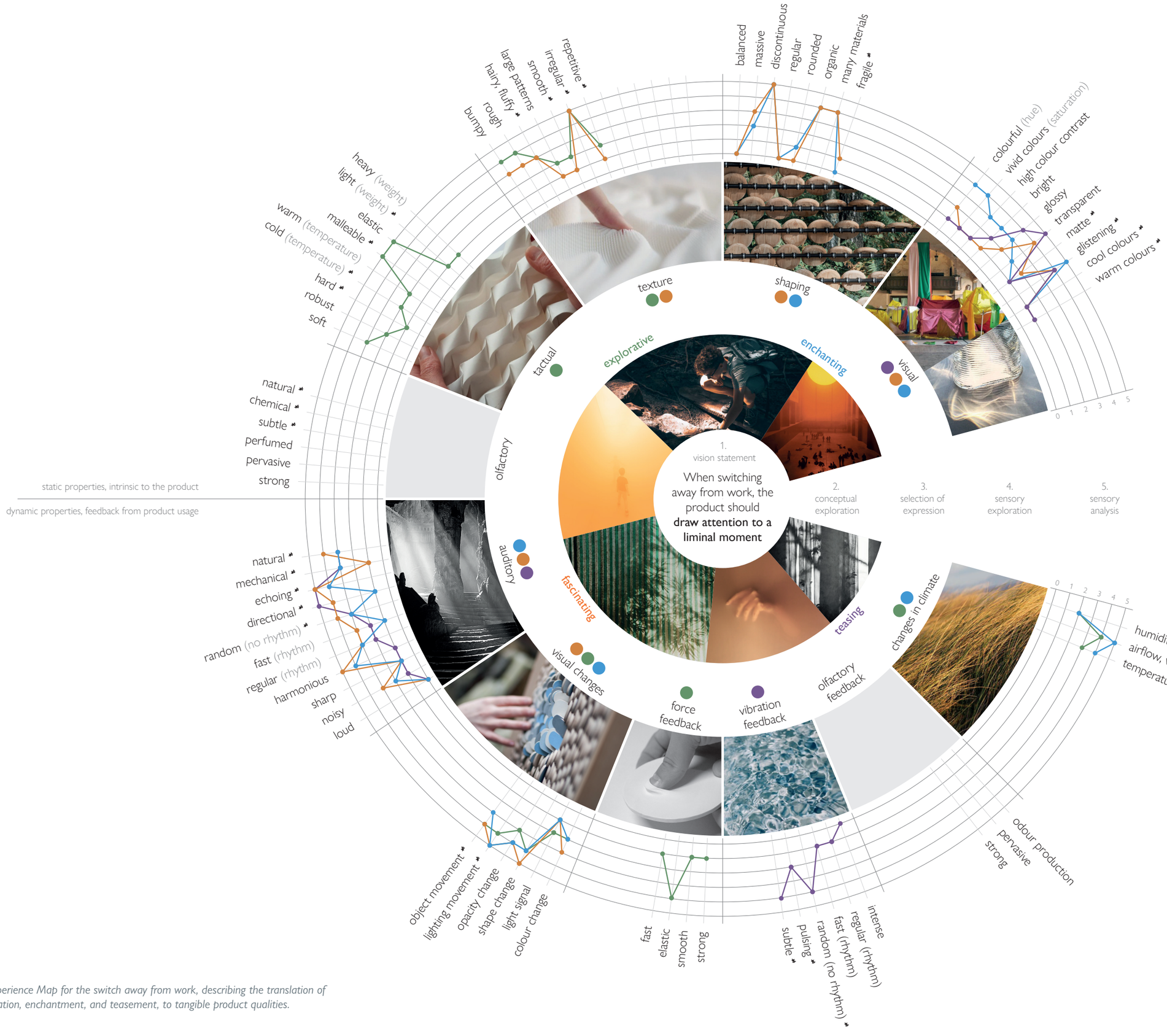


Figure 27: The Experience Map for the switch away from work, describing the translation of fascination, exploration, enchantment, and teasement, to tangible product qualities.

* = addition for thesis subject

Findings and take-aways

The switch towards work should activate work mood, should feel like a warming up (interaction vision, chapter 2.4.3). It should be energizing, refreshing, encouraging, prepared/ready. When switching away from work, the product should draw attention to a liminal moment. A moment of fascination, enchantment, exploration, and teasing. All these abstract descriptors are translated to tangible product qualities using the Experience Map method.
The product qualities (layer 5) that are most applicable to achieve the abstract descriptors (rated 4 or 5 in the sensory analysis) are summarised in figure 28. In this selection, some sensory properties (layer 3) and some abstract descriptors (layer 2) are deemed more important than others. Therefore, not all product qualities rated highly are included: only those that are expected to show potential for further ideation are included. Inclusion of olfactory elements is expected to be less suitable for an intervention in the WFH-environment. The use of visual and tactile elements is more suitable.

The Experience Maps emphasize the importance of haptics for an intervention with the desired character. As found from the collages (chapter 3.1.2.), the intervention should be energizing in one moment, and fascinating in another. For both of these characters, haptics (texture and tactility, but also airflow) show to be particularly interesting to focus on in further ideation. Besides, the Experience Maps show what qualities in the visual properties support achieving the desired character (table 28): glistening, transparency, glossiness, change of shape, organic and balanced shape, and movement of object and light.

		Switching towards work	*Switching away from work*
Vision statement (layer 1)		The product should activate the work mood.	The product should draw attention to a liminal moment.
Abstract character (layer 2)		Energizing, refreshing, encouraging, prepared/ ready	Fascinating, enchanting, explorative, teasing
Product qualities (layer 5) best applicable to achieve character	Visual	Bright, glossy, transparent, glistening, cool colours	Glistening, transparent, glossy
	Shaping	Balanced	Organic, discontinuous
	Texture	Bumpy, smooth, irregular	Bumpy, rough, irregular
	Tactual	Malleable, elastic, soft, cold (tempera-ture)	Malleable, elastic
	Olfactory		
	Auditory	Directional, harmonious	Directional, harmonious, echoing
	Visual changes	Colour change, light signal, shape change, object movement	Shape change, lighting movement, object movement
	Force feedback		Elastic
	Vibration feedback		
	Olfactory feedback		
	Changes in climate	Airflow, temperature change	Airflow

Figure 28: The selection of product qualities suitable for further ideation revolve around visual and haptic qualities.

Take-aways for ideation:

- Combine inflatability, functioning as energizer, with dynamic light textures, creating fascination.

3.1.5 Concept ideas: discuss with designers

Ideation during the second wave resulted in three ideas focussed on involving haptics, as this showed from the Experience Map. These three ideas (figure 29, 30, and 31) were discussed with design students. Their fresh look on things and knowledge in the design field helped iterating and decision-making.

Findings and take-aways

In the session a positive response was towards the idea of an inflatable lamp (figure 29). The interaction of inflating was positively received. It was also liked how the lamp leaves the decision to take a break or not up to the user: taking a break is extrinsically motivated, but not forced or too disruptive to work. There was also a positive response to the dynamic light textures of the stress ball lamp (figure 31) and the gesture lamp (figure 30). Therefore, the next iteration is to combine the inflatable element, creating the energizing moment (interaction vision, chapter 2.4.3) and the dynamic light textures, creating fascination.

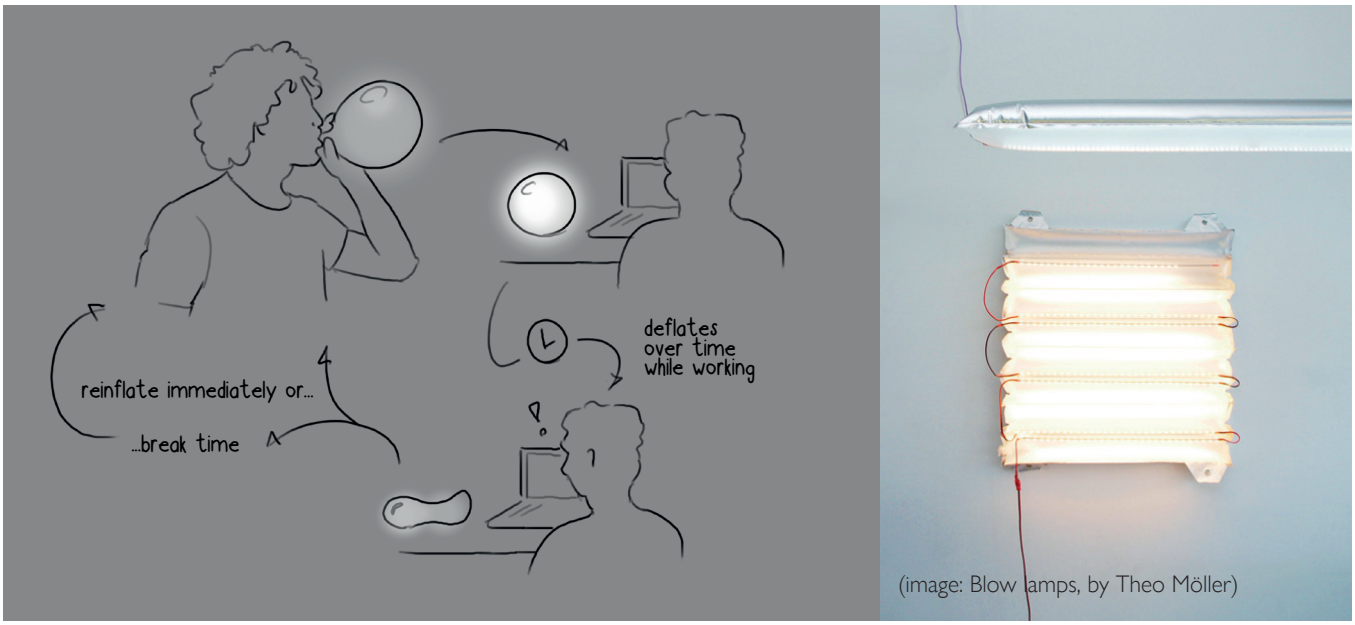


Figure 29: The inflatable lamp functions as a break reminder. It provides an energizer each time you inflate the lamp. The lamp creates a conscious decision: take a break, or immediately re-inflate?

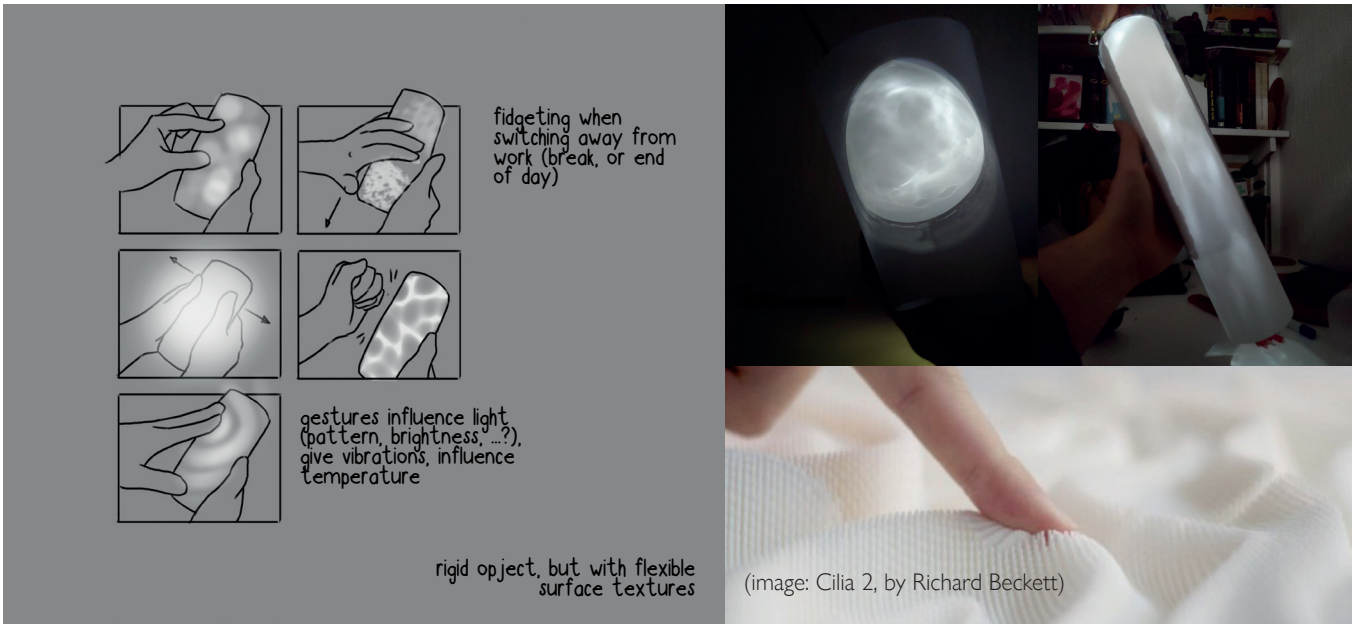


Figure 30: The gesture lamp is designed to create fascination in breaks. Using gestures on the lamp adapts light (pattern, brightness, colour), vibration, and temperature. It stimulates exploration: which gesture has which effect?

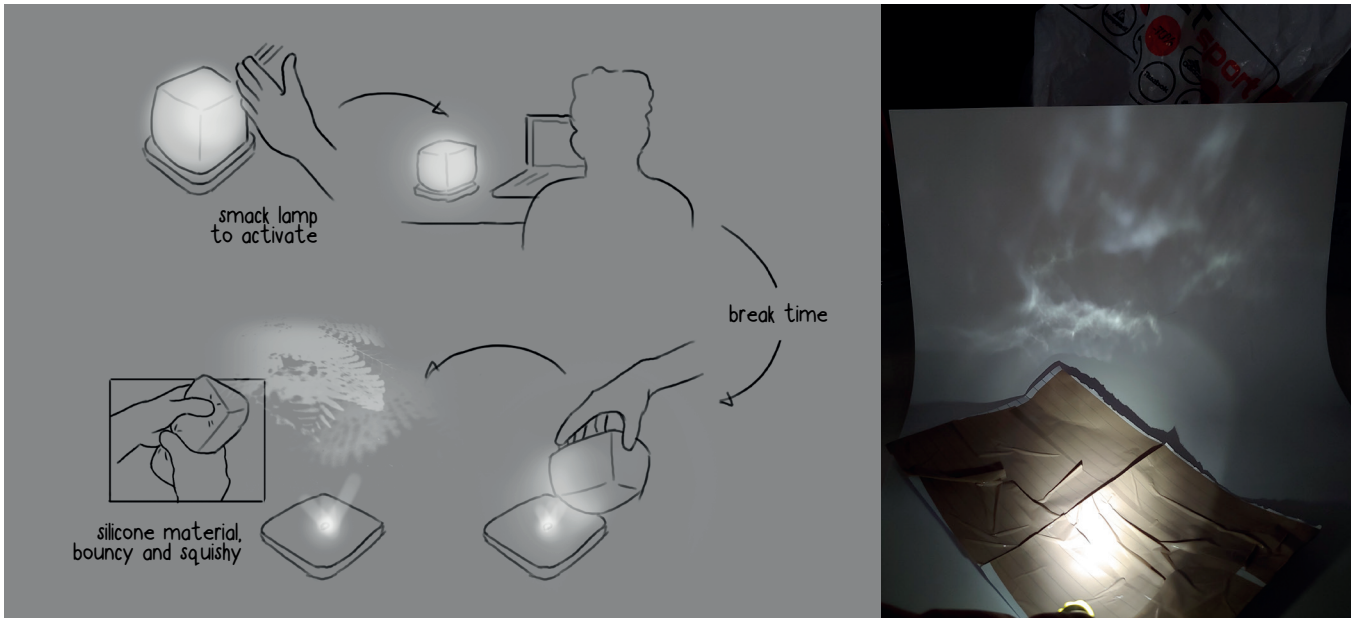


Figure 31: The stress ball lamp is a silicone bouncy cube lit from below. In breaks, the user removes the cube from its base and uses it as a stress ball. The base then projects dynamic light textures on ceiling or wall to enjoy.

Take-aways for ideation:

- Dynamic light textures through patterned cut outs, not through light projection;
- Patterned cut outs derived from biophilic design principles;
- Interaction of switching between the intervention's work-mode and non-work-mode (by flipping) makes the switch more conscious.

Criteria for intervention:

- Intervention should be comfortable to hold while inflating: easy to handle and with enough hold-on;
- Intervention should have a customizable timer, to suit fluctuating user needs;
- Intervention should be hung on the wall: within vision, but not taking up valuable desk space;
- Intervention should look different during work-hours and outside of work-hours, to add to the feeling of being away

3.1.6 Iteration to final concept

Through prototyping the inflatable lamp iteration described in 3.1.5 was tried out. However, the combination of inflatables and dynamic light textures was not successful: both projections on the surrounding environment (as is the idea with figure 31), as well as projecting patterns within the lamp itself (shown in figure 30), were little to not at all visible in a WFH-environment where functional lighting and daylight was present. Therefore, it was decided to step away from light textures created by reflections or filters, and instead focus on pattern created by the light visible through cut outs. To illustrate, figure 32: the focus is no longer on the brilliance of patterns projected around the lamp, but on the slits allowing the light to escape.

Findings and take-aways

The final concept idea is an inflatable lamp combined with dynamic light textures. The function of the lamp was designed, and is visualised in figure 33. From this schematic some criteria are derived, and some more design decisions are made.

The lamp should be comfortable to hold while inflating. When inflating, hands are probably positioned one at the nozzle, and one supporting the lamp. That is the way one would inflate a balloon too. The bottom of the lamp should therefore be easy to handle, with enough hold-on and comfortable ridges.

The lamp should deflate over time. How long this takes could be a pre-set, or customizable to the user's needs. Latter seems more suitable to the WFH-setting, as the time one wishes to work continuously could fluctuate day to day.

The lamp should be positioned somewhere within vision. From the questionnaire in chapter 3.1.3 it showed that desk space is valuable, and yet another object taking up space is undesired. It would therefore be a suitable solution to hang the lamp on the wall: within vision, yet not taking up desk space.

The light textures are not created by projecting light, but by patterned cut out (figure 32). To make this kind of light texture dynamic, the cut outs should be dynamic. Increasing the size of the cut out, a.k.a. increasing the space between the surface, lets through more light. Decreasing the gap limits the amount of light coming through. The type of pattern that is cut from the material, should derive to the principles of biophilic design (chapter 1.2.3).

In the evaluation of clusters in chapter 3.1.3 it was mentioned that a physical change in the design could add to the feeling of distancing yourself from work outside of work-hours. The lamp should therefore look different during work and outside of work-hours. Figure 33 describes an interaction of flipping the lamp at the switching moments at the beginning and end of the workday. An interaction as such would help making these switching moments more conscious.

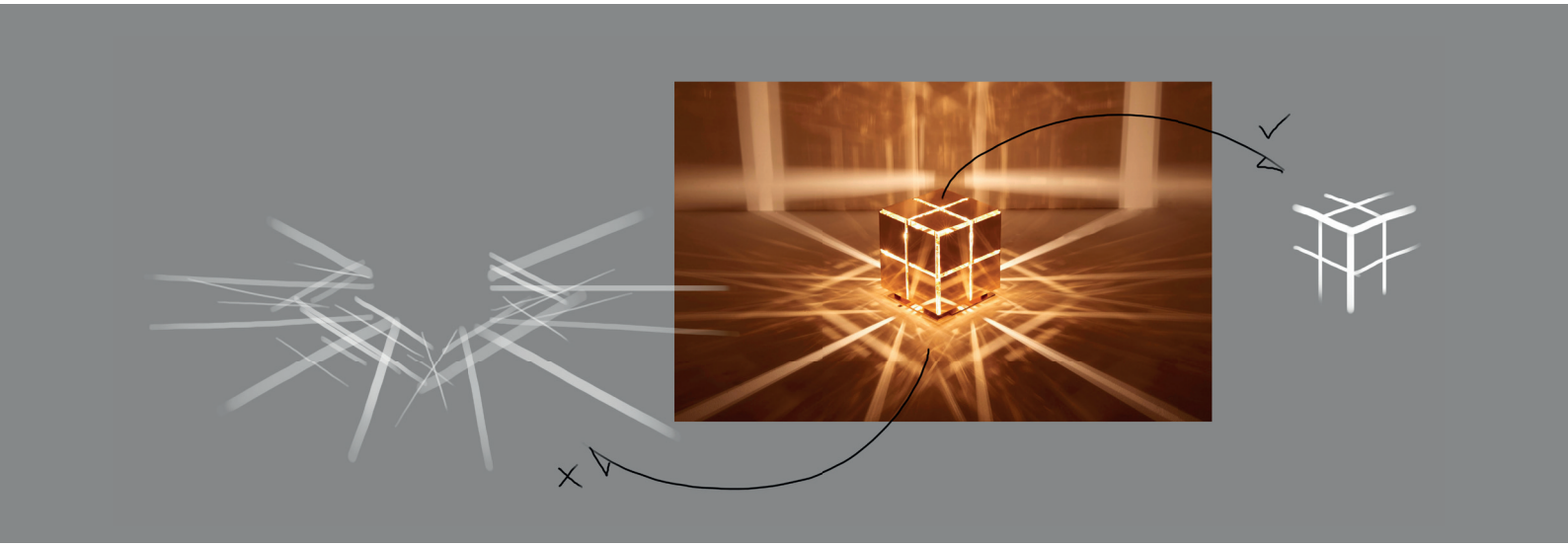


Figure 32: Textured light from projections or reflections turned out to be unsuitable for the intervention. Therefore, the attention shifts to light textures created by light visible through cut outs instead (image: Cube 6, by Mydriaz).

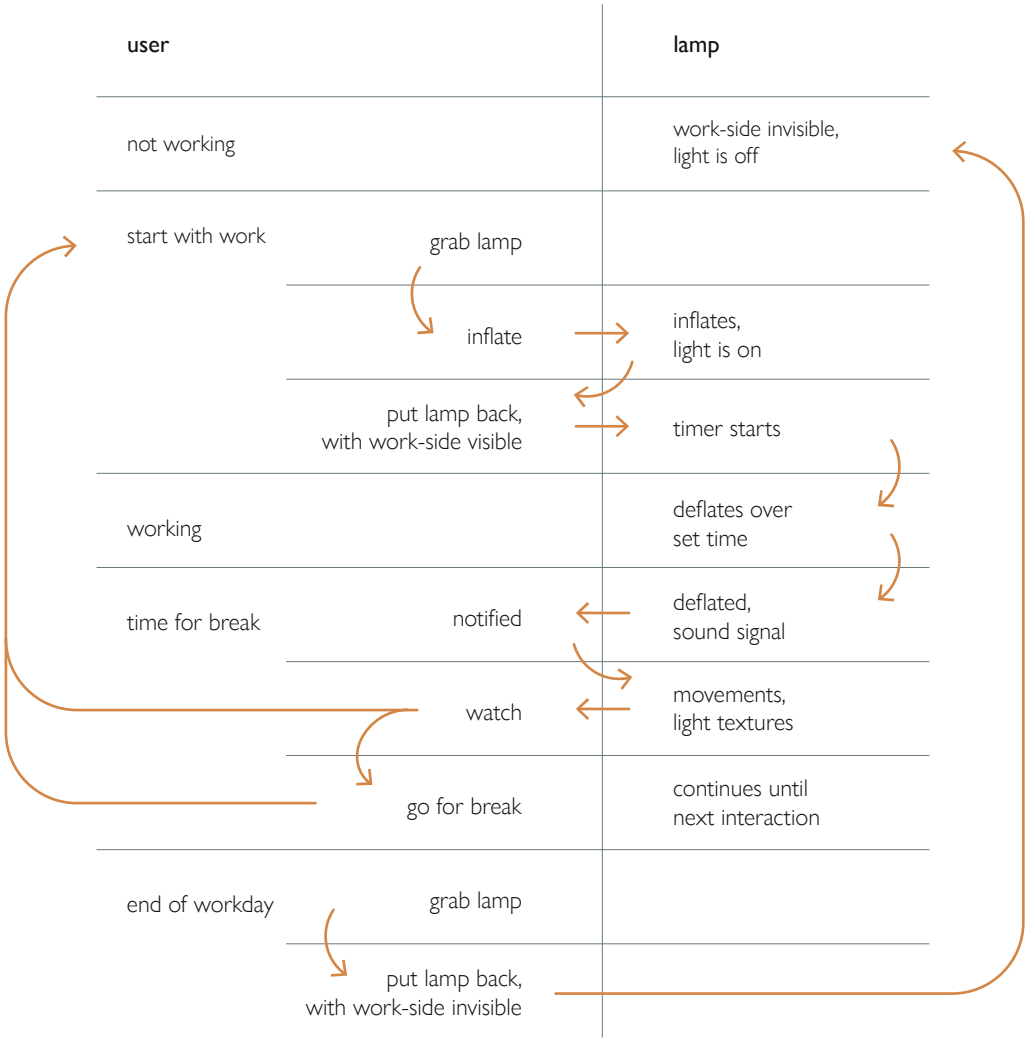


Figure 33: The function of the inflatable lamp concept choice schematically represented.

3.2 Embodiment of the concept

The final concept idea is an inflatable lamp, combined with dynamic light textures. In essence, the lamp functions as a break-reminder. Now that the function of the lamp is clear (figure 33), and a broad set of criteria and take-aways are found throughout the ideation process (see margins), this chapter describes further development of the concept idea. This chapter describes the interaction with the lamp, its formgiving, and feasibility of the concept.

Take-aways for concept development:

- The lamp should consist of two parts: a unit (in essence the lamp itself) and a base (to hang the lamp on the wall);
- The unit should be two-sided: a 'work-mode' side that shows the light textures, and blank backside visible in non-work hours.

3.2.1 User interaction scenario

The visual in figure 33 describes schematically the step by step use of the lamp. Where the schematic describes inflation, deflation, movement and light textures, and a work-side being visible or invisible, it does not yet show how the lamp does these things. To decide upon these things, the schematic was translated into a user scenario (figure 34, and video 7).

Findings and take-aways

Through making the user scenario it is brought to light that the lamp should consists of two parts: a base that hangs on the wall, and a detachable unit. This combination makes it possible to easily inflate the lamp, because it is detachable, and easily hang it on the wall, as there is a holder. The unit is what emits the light, creates movement and dynamic light textures. The base includes an interface in which the timer can be set.

The take-aways from chapter 3.1.6 describe that the intervention should look different during work as opposed to outside of work-hours. The unit is therefore two-sided. One side shows the light textures, the other side is a blank slate.

3.2.2 Formgiving following biophilic design principles

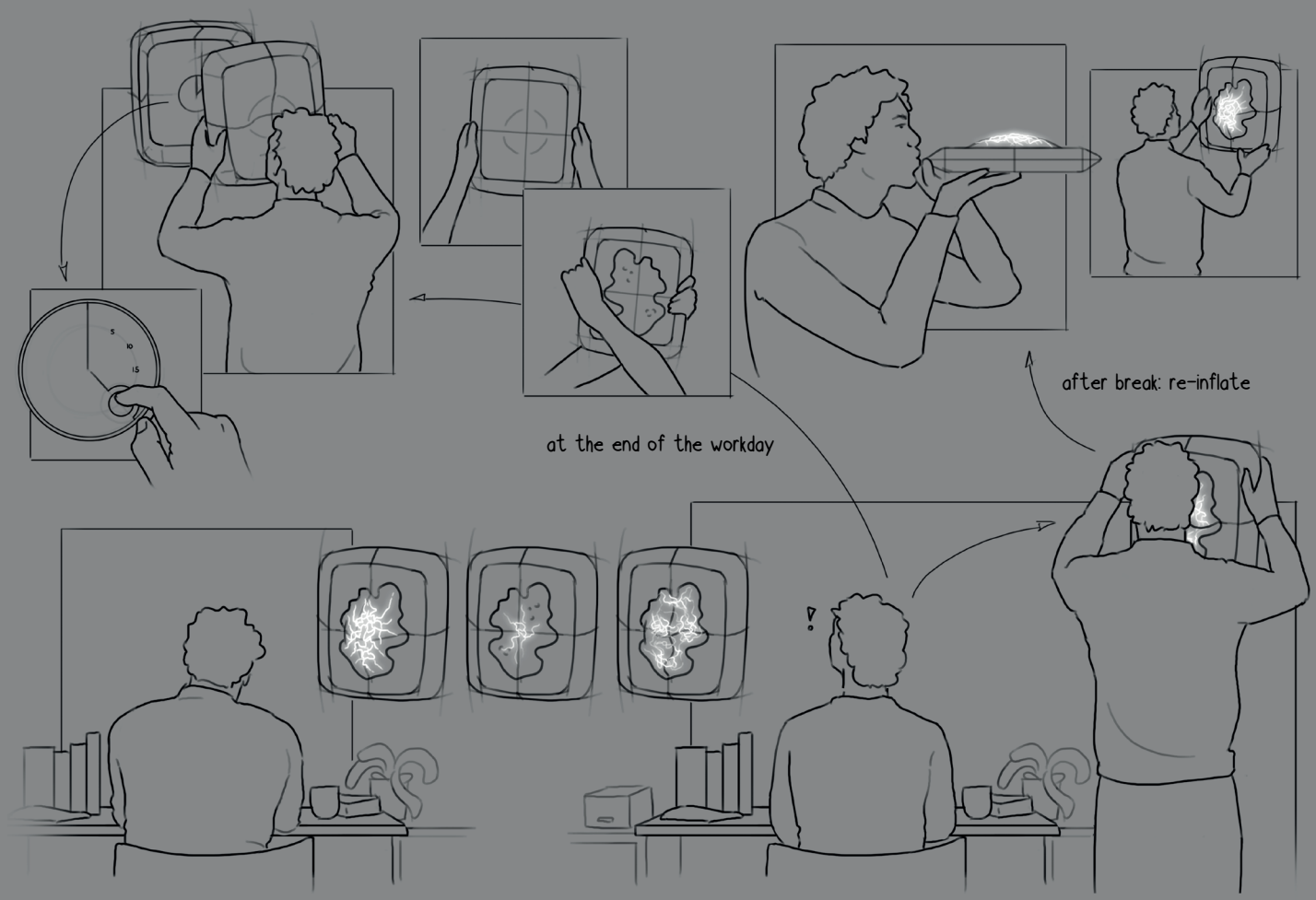
Now knowing what the intervention is and knowing the interaction with it, the next step is to visualise what a product doing these things should look like. Most important is the design of the patterned cut outs creating the light textures, as the light effects are what predominantly creates the fascination. Then, knowing the what and how of those patterns, the embodiment of the lamp is further explored.

Prototyping light texture patterns

The movement and light textures as described in figure 34 are to be given shape. As described in chapter 3.1.6, the dynamic light textures should be created through movable patterned cut outs, rather than light projections. Through prototyping it was explored how to create these movable patterns.

Creating a patterned cut out on an object that inflates creates the need for the surface to be stretchable. That way, with varying degrees of inflation, the cut out stretches out more or less, and thus the amount of light coming through the cut out can be manipulated. Inspiration on inflatable and stretchable surfaces and patterns is shown in figure 35, 36 and 37. Prototyping was done by cutting a pattern (first by hand, later by lasercutting) out of wood (using various thicknesses of veneer and multiplex) and attaching that to white stretchable fabric (Lycra).

The patterns tried out in prototyping are based on biophilic design principles. One of the six biophilic design elements (chapter 1.2.3) is *Natural patterns and processes*, which describes the incorporation of nature properties like growth, patterns, and fractals. Inspired by this category of biophilic design, a set of patterns was created (figure 38) and cut from wood. Some of these patterns are one piece (be it cut in a maze-like way), others are cut like puzzles. The puzzle-like patterns allow for more stretch, thereby allowing or more light to show, which makes the light effects more visible.



User scenario of the inflatable lamp

At the start of a workday, the user detaches the unit and flips it to 'work-mode', which is the side where the light comes out of. On the base, the user sets the timer to how long they want to work continuously until their next break. The user inflates the lamp, and puts the lamp back into the base, 'work-mode' facing outward. They get to work.

The timer starts running when the unit is put back in its base. Over time, the lamp deflates. At the end of the timer, it is fully deflated. The user is notified that it is time for a break by a sound signal of a bird's chirping. Then, the lamp starts creating movement and light textures (shown in video 7), drawing in the user's eyes away from work.

Then there is a choice. The user takes the break they scheduled beforehand, or decides to skip the break and immediately get back to work. When the user wants to get back to work, either after their break or directly, they re-inflate the lamp and the cycle with the timer repeats itself.

At the end of the workday, the user flips the lamp again, so that the 'work-mode' is turned inward: invisible during the non-work hours.

The user does not have to set a timer each time they start a cycle. They set the timer once, and the lamp keeps repeating that set time until the user decides to alter it.

Figure 34: User scenario of the inflatable lamp. The scenario is best experienced through video 7.

Knowing this, a second set of patterns was designed, based on another one of the six biophilic design elements, *Natural shapes and forms*, describing the use of representations of the natural world. Figure 39 shows three patterns and the natural shapes and forms they are inspired by. With these three prototypes the dynamic light effects were tried out. By positioning a light source behind the prototype, then stretching the pattern using transparent balloons and tubing, the desired dynamic light textures are visualised.

The type of movement of the light textures make are matched to the cut out patterns, and are too following biophilic design (figure 39). The pattern based on the cells has vertical moving effects, fitting with the vertical lines, inspired by raindrops going down a window. The mountain pattern has up-and-down movements on its 'mountaintops'. And the pattern inspired by cracked dirt has swirly movements, inspired by the random movement of for example fishes or critters. Bringing together these light effects and the scenario of chapter 3.2.1, video 8 shows the prototypes in their multiple stages: deflated, inflated, and creating light textures.

Shape and materialisation

The previous section demonstrates the design of the cut out patterns, but the lamp is more than that alone. For the further embodiment a few take-aways from throughout chapter 3 are to be considered.

From the idea clusters evaluated with homeworkers (chapter 3.1.3) it was found that the lamp should be positioned in peripheral vision, so that its light does not interfere with light from devices as laptops and such. In that evaluation, it was also concluded that the lamp should not be placed on the desk, that way saving desk space. And so, later in chapter 3.1.6, the conclusion was drawn that the lamp should be hung on the wall.

Chapter 3.2.1, the user scenario, then further specifies that the lamp should consist of two parts: a unit (the lamp, easier to inflate when handheld) and a base (in which to hang the unit on the wall). The unit should be comfortable to hold when inflating, meaning easy to handle with enough grip. Besides, the unit should be two-sided. That way the device has a 'work-mode' side which shows the light textures, and is reversable to a backside in non-work hours, hiding the light patterns and thus the work-relatedness of the lamp.

From discussing concept ideas with designers (chapter 3.1.6), and mentioned by homeworkers before as well (chapter 3.1.3), it was concluded to include a timer, which users can customize to their fluctuating needs. From creating the user scenario it was then found that it would be a suitable interaction to include this timer interface in the base of the lamp.

One last criteria is drawn from the prototyping with the cut out light textures. These cut outs are attached to a stretchable surface, and for the desired light effects to occur, this surface should be flat when the lamp is in deflated mode.

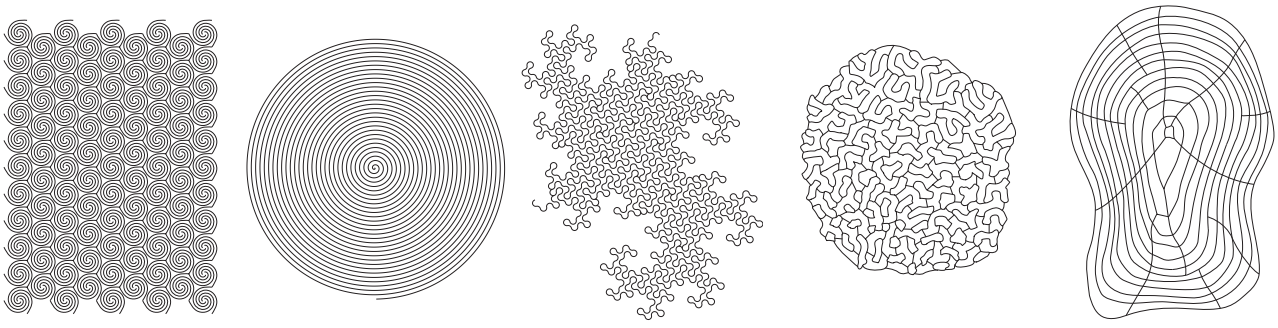


Figure 38: Patterns based on spirals, fractals, differential growth, and topography were initually tried out in prototyping.

Figure 35: Cutting paper following auxetic structures allows it to be stretchable (image: Ben Street).

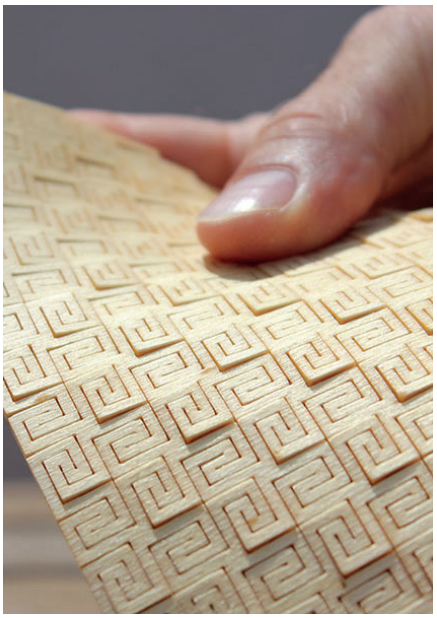


Figure 36: This laserut pattern allows wood to become double curved and flexible (image: kofaktorlab on Instructables).

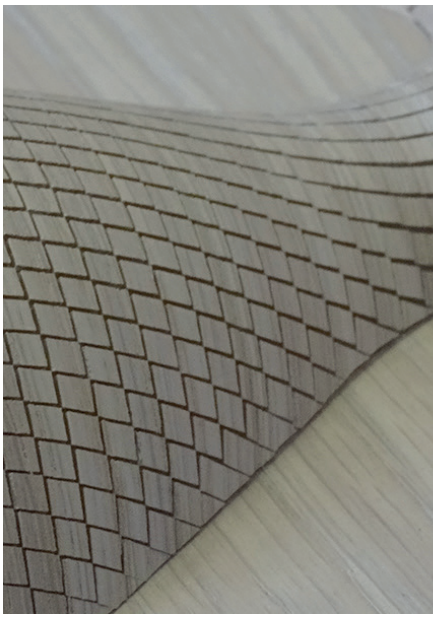


Figure 37: Wooden surface stretched by an airpocket below (image: AirWood by Arca).

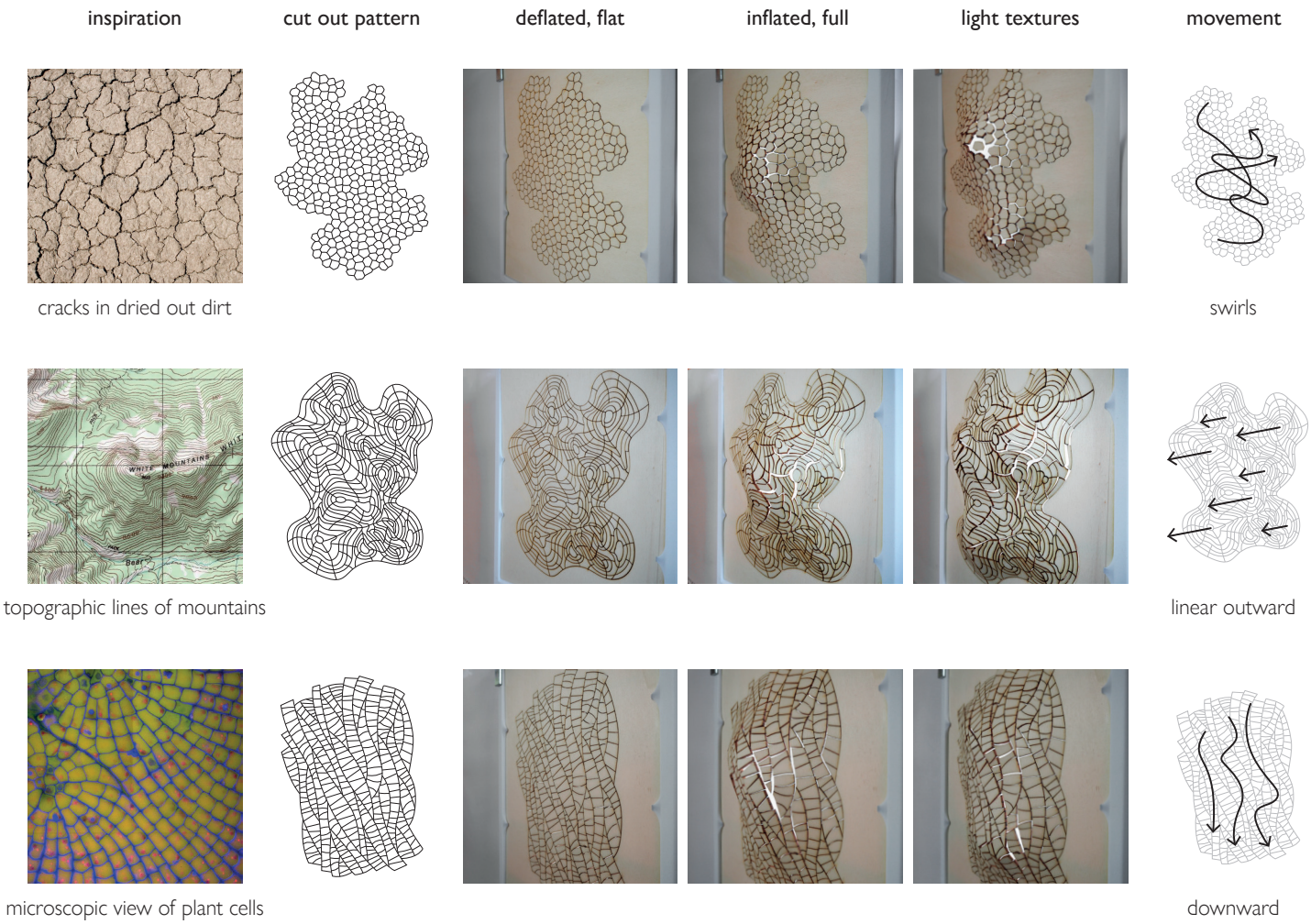


Figure 39: Three patterns, their inspiration, and prototype results. The light textures are best represented in video 8.

These criteria were then combined with biophilic design attributes to create a concept for the embodiment (figure 40). The biophilic design elements included in the design are the usage of natural materials (from element *Environmental features*) and using organic and curved lines and shapes (from element *Natural shapes and forms*). The design was inspired by solid wood sculptures, shown in figure 41 and 42. The combination of smooth curves and defined edges seem a suitable aesthetic to add to existing WFH-environments.

The type of timer chosen is one without a display. Rather, it is analogue like mechanical kitchen timers (figure 43). The surface on which the timer is located should not protrude, as then the unit would not fit the base. Sinking the timer into the base would make wrapping ones hand around the timer not possible. For this, instead inspiration was drawn from old-fashioned rotary phones (figure 44).

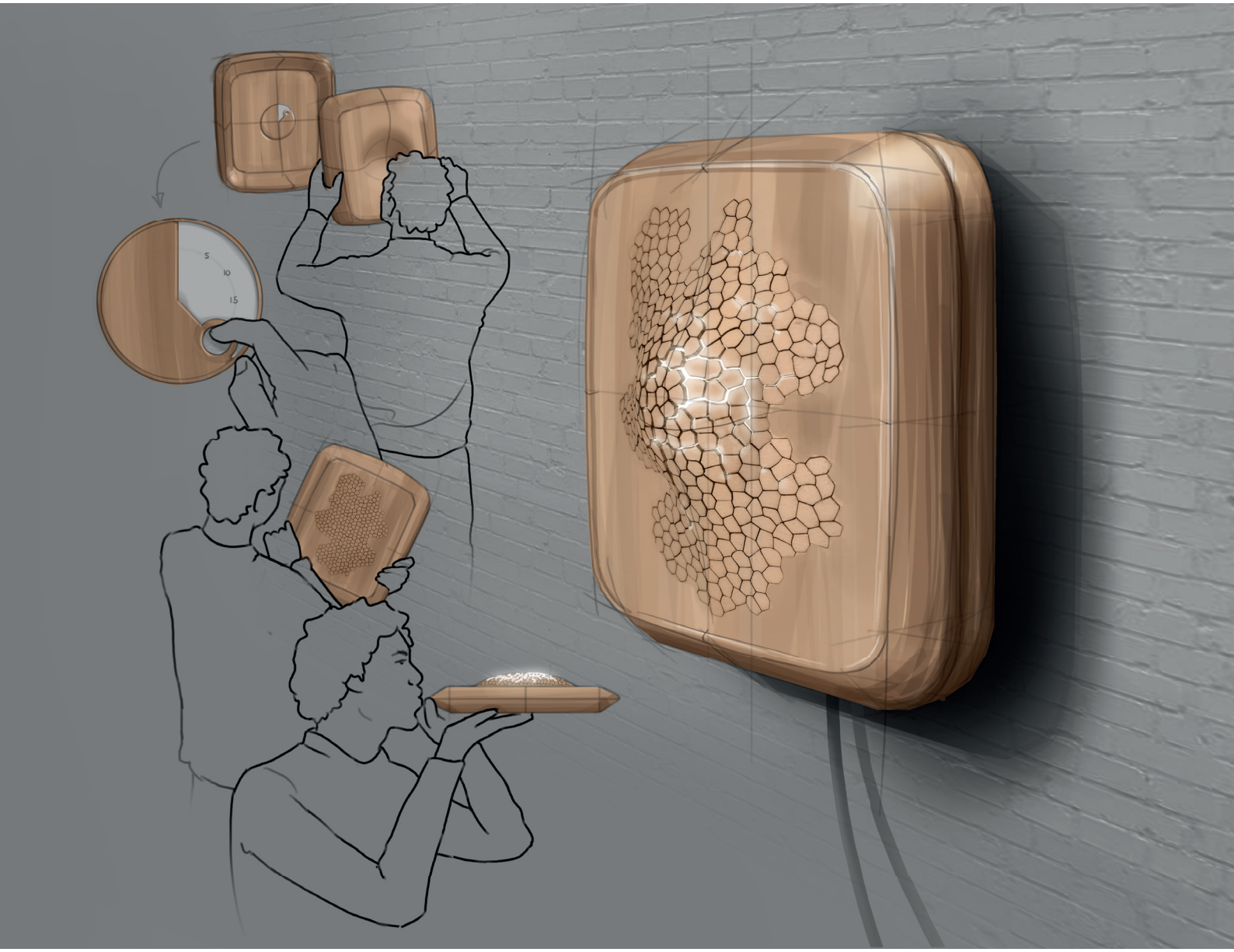


Figure 40: The final design proposal is made out of wood. When in 'work-mode' the lamp shows light patterns. When flipped, a smooth wooden surface shows and the design is a decorative piece rather than a WFH-lamp.

Figure 41: Smooth wooden dish with defined edges (image: sculpted dish by Dennis Bykov).

Figure 42: Rounded shapes, comfortable to hold (image: hand turned bowls by Gary Allson).

Figure 43: Analogue kitchen timer (image: Pie kitchen timer by DesignWright).

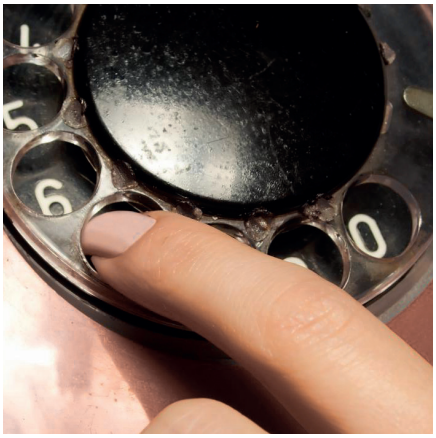


Figure 44: Dialing on a rotary phone (image: wiseGeek).

3.2.3 Feasibility: how to create an inflatable lamp

Following the user scenario of figure 34, this chapter describes the technological aspects that make creating of the different functions of the lamp possible. The illustration in figure 45 shows how these different elements combine in the design. On the subject of pneumatics, R. Scharff, PhD candidate on soft robotics, was consulted (personal communication, December 8, 2020).

The user detaches the unit from its base. Holding the unit in its place in the base could be done by using magnets. The base contains the timer, with which the user can set the desired time until break. The timer is a rotary switch, which (to clarify) does not rotate back to zero when the time is over. It stays at the set time, so that the user does not have to re-set the timer each time if they wish to remain working in the same length cycles.

Then, the user inflates the lamp. The inflatable part of the lamp desires some explanation. There should be multiple air pockets, as that allows for the light textures to be created, explained later on in this section. These air pockets could be separated, like balloons, but for assembly it would be more manageable for the air pockets to be one connected sheet. One way to achieve such an inflatable sheet is to look to the field soft robotics.

In soft robotics, soft materials are used for making robotics that are more suitable for delicate tasks (TU Delft, n.d.). One way of making these robotics move is by using pneumatics. By inflating strategically placed air pockets, a robot can move its 'limbs' (figure 47). The air pockets are often cast from silicone in a mould. However, MIT's Self-assembly Lab (n.d.) has designed a technique through which these inflatable pneumatic structures can be 3D-printed (figure 48, and youtu.be/vgz1O_Kc0A0). This allows for more intricate and multi-layered structures of air pockets in a plethora of shapes. Such an inflatable sheet of multiple individual silicone air pockets would be a suitable solution for the inflatable lamp.

The amount of air pockets used in prototyping was seven. This amount of air pockets allowed for plenty of possible combinations to be made (127 if you do the maths). However, the more air pockets, the bigger the set of possible light textures. And with more air pockets, smoother movements can be made. But it should be taken into account that, with increasing the amount of air pockets, while the product remains the same size, the size of the air pockets decreases. This limits how much each air pockt can increase, and therefore affects the degree to which the cut out patterns are stretched, and the light textures are visible. To find the balance between variety and size, and therefore the perfect amount of air pockets, more prototyping would be needed.

Then, back to inflation of the lamp. The lamp should be both manually inflated (by the user at the beginning of their work cycle), as well as automatically (in order to create the light textures at break time). Automatic inflation can be achieved by giving each air pocket micropump for inflation, and another micropump for deflation. This second micropump is needed so that the speed of deflation can be coded. That is needed for both the timed deflation during work, as well as for the light textures. For manual inflation, a separate tube with one-way valve can be added (figure 46).

Then, when it is time for a break, the lamp should create light textures. This is done by inflating and deflating sections of the inflatable sheet in random orders. To achieve such an effect, the micropumps can each be coded to follow a random pattern of inflation and deflation. The speed at which the air pockets inflate and deflate can then be controlled by a PWM signal to the micropumps. The PWM signal rapidly (read: a hundred times a second) toggles the power to the micropump on and off (Hirzel, 2018). The ratio between the time of the micropump being on and off can be manipulated. The bigger percentage of time the signal tells the micropump to stay on, the faster it inflates its corresponding air pocket. That way, the each sections of the inflatable sheet can inflate and deflate at its own rate, independent from the other sections.

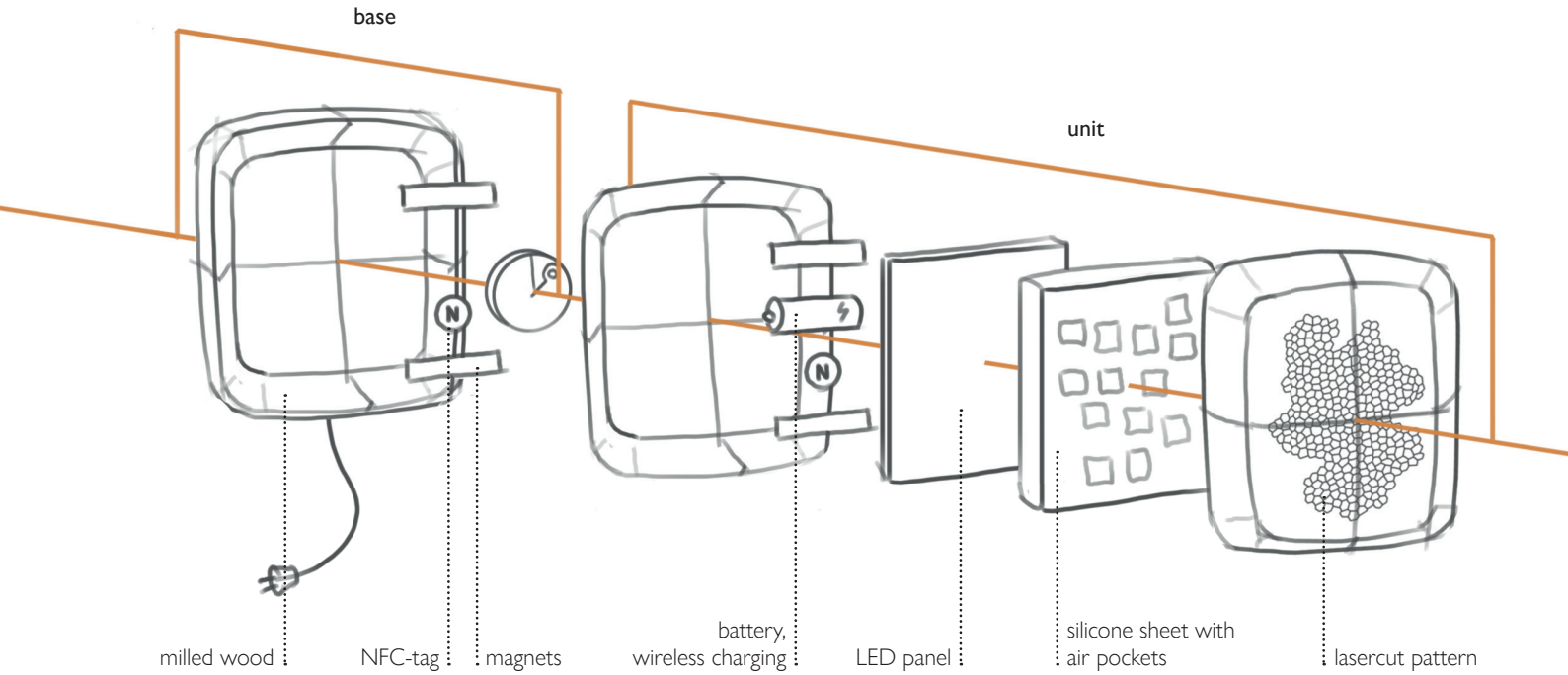


Figure 45: The inflatable lamp consists of a base, including the timer and electricity supply, and a unit, including the inflatable parts, LED panel, and patterned cut out.

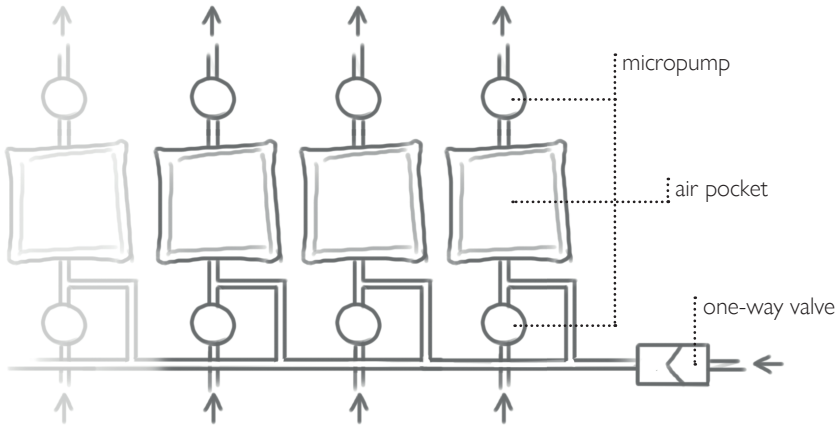


Figure 46: Each air pocket is controlled by two micropumps for both inflation and deflation. Manual inflation requires an additional one-way valve. The system can be repeated for the desired amount of air pockets.

At the end of the user's workday, they flip the unit, turning the patterned side inward. When turned inward like this, the light turns off. The light source suitable for this lamp is an LED panel. This creates uniform light for the whole patterned cut out.

The base has a power cord that can be plugged into a socket. The unit has a battery, so that when the user has detached the unit from its base, the electronics still function. Electricity supply to the battery in the unit can be done through inductive charging (wireless) for the smoothest finish on the embodiment. Otherwise, charging through a pogo pin connection could work as an alternative (figure 49). This type of contact charging has the advantages that connecting is easy, as there are no finnicky male-female connector pieces, and that disconnection in a sideways direction does not damage the electronics.

Data exchange between the base and unit, needed for the timer, can be achieved through an NFC-tag. Near-field-communication functions on small distances up to ten centimetres (Triggs, 2019), which is suitable for the lamp.

The whole body of the lamp can be created by CNC-milling wood. For a cheaper and possibly lighter solution, it could be made with (veneered) plywood. However, the finish is expected to be less smooth and of lower quality.

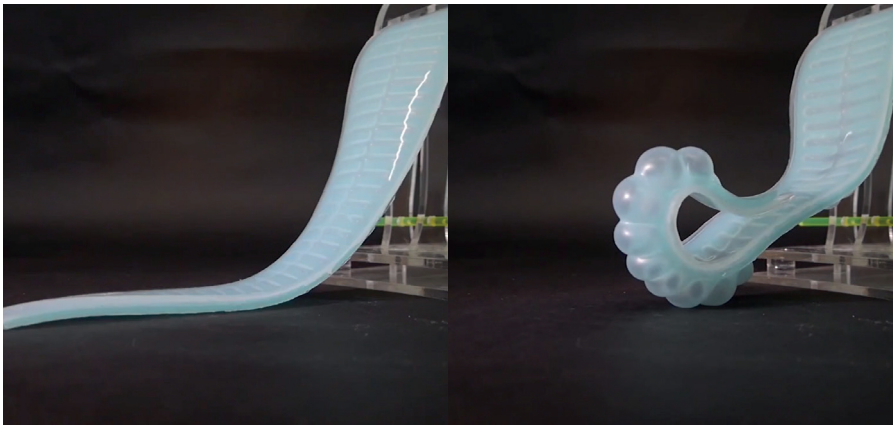


Figure 47: Silicone air pockets make the creation of soft robotic limbs possible (image: Furl, by Bijing Zhang & Francois Mangion).

Figure 48: Liquid Printed Pneumatics allow for the creation of intricately shaped inflatables (image: BMW, in collaboration with MIT, youtu.be/vgz1O_Kc0A0).

Figure 49: Wireless earbuds often use contact charging in a charging case (image: Soundguys).

3.3 Evaluation study

To test whether the design achieves the initial project aim and test its desirability, an evaluation study amongst homeworkers was done.

3.3.1 Purpose and research questions

The aim of this project was to develop a product that supports restoration during working from home. The goal of this study is to evaluate the concept in terms of this design goal, as well as its desirability.

The research questions are as follows:

1. Restorative potential: to which degree do homeworkers expect the concept to contribute to a restorative experience?
    1.1 To which degree does the design meet the four criteria for restorative experiences (being away, fascination, extent, compatibility)?
    1.2 To which degree does the design re-establish borders?
2. Desirability: how do homeworkers rate the concept's function and aesthetic?

3.3.2 Study design: survey

The lamp is not yet a functioning model, and can therefore not be tested in the field. And due to the COVID-19 pandemic it was not possible to organize a focus group to demonstrate the current prototype. Therefore, it was decided to present the design through video and image to potential users, and ask their opinion through a survey (appendix 5, in Dutch only).

The survey consist of multiple parts. First, the concept was presented using a user scenario (video 7, or figure 34 in chapter 3.2.1) and video footage of the lighting effects (video 8, or figure 39 chapter 3.2.2). Then, fourteen statements were presented. For each statement the respondents were asked to indicate on a seven-point Likert-scale to which extent they agree with it, 1 being 'completely disagree', and 7 being 'completely agree'. The statements relate to potential restoration, re-establishing boundaries, and longevity of product use. The questionnaire ends with three open-answer questions, relating to pricing and additional input for development of the concept.

The statements regarding the restorative potential of the concept were partially drawn from the Perceived Restorativeness for Activities Scale (PRAS), by Norling et al. (2008). This scale presents 12 statements, three for each of the four Attention Restoration Theory components, to be tested with users through a Likert-type questionnaire. Not all twelve statements are applicable in the case of the inflatable lamp concept, as the concept is not an activity. Seven statements from PRAS were used (also see figure 50): three for 'being away', three for 'fascination', and one for 'extent'. These statements were formulated to state 'interaction with this product' rather than 'participating in this activity', and were translated to Dutch. It should be taken into account that translating might alter the message. Statements for compatibility were not drawn from PRAS, as those could not be suitably formulated to apply to a product. Rather, additional statements were defined revolving around the compatibility of the concept and the WFH-environment.

Statements regarding re-establishing boundaries relate to the separation of work and non-work, and relate to conscious switching and structuring the workday.

Statements regarding the longevity and viability of the concept relate to using it for a longer period of time, and usefulness of it when doing so. The open-answer questions regarding pricing and additional input relate to desirability as well.

Sixteen homeworkers participated in this survey, both full-time and part-time homeworkers, and people who had been working from home until recently. The participants from prior research in this project (user research of chapter 2, user input of chapter 3.1.3), who had stated to be open for follow-up research, were contacted. Additional homeworkers were contacted as well, in order to compensate for possible drop-outs amongst the previous research participants.

3.3.3 Results

Results on the expected restorative potential, degree to which borders are re-established, and longevity of the concept are described, and additional ideas on concept development (from the open-answer questions in appendix 5, only in Dutch) are presented

Expected restorative value of the product

Three statements in the questionnaire referred to the sense of being away. The average score these statements received was around 4,4 which means the feeling of being away is not rated particularly strong. It could be that the term 'escape' (NL: 'ontsnappen aan') is a concept too big and abstract to achieve with a mere lamp design. The translations of both statement 1 and 2 used this term.

Another three statements regard the presence of fascination. The graph in figure 50 shows how most respondents agree with the concept and interaction being fascinating and drawing attention.

One statement refers to extent. With an average score of 5,5 respondents seem to moderately agree that the object sustains their interest, though there is quite a portion of neutral votes as well. These neutral voters also voted the viability of the product (statements 13 and 14, figure 50) at four or lower, meaning they would maybe not use the product for a longer period of time. There could be a relation between the lower experience of extent, and the lower rating on using the product for a longer period of time, and the product being useful when used repeatedly. Though, with the small amount of respondents, this conclusion cannot be drawn confidently.

The statements for compatibility were regarding the match between the concept and the WFH-environment. With an average of 5,7 and 5,4 respondents seem to moderately agree that the lamp is suitable for working from home, and the WFH-environment. Votes on the statement whether the concept suits working from home (statement 8) were all positive, above four. For the statement regarding the suitability of the concept and the WFH-environment, votes were positive or neutral.

Re-establishing borders between work and non-work

Three statements related to re-establishing borders and conscious switching between work and non-work (figure 50). The statement on whether the concept helps separate work and private life (statement 10) received an average score of 4,9. The scores are quite divided in the sense that there were both ratings below four, disagreeing with the statement, as well as ratings at six, almost fully agreeing with the statement. The ratings below four could be explained by the fact that the lamp is still present in the environment even outside of work hours, and might therefore function as a reminder of work.

Respondents agreed with the statement that the concepts helps them create structure in the WFH-day (statement 11), with an average of 5,6, and some neutral votes. The comment section of the questionnaire reveals some reasoning behind why the respondents thing the concept helps structure the day. One respondent describes how the concept would trigger them into taking breaks, and though they might not always follow that trigger, they expect it to be a step towards making the decision to skip a break more conscious. One respondent describes the concept as a trigger to move around more in their breaks.

Response to the statement on the product creating consciousness with the switching moments (statement 12) was quite positive, with an average on 5,6. There seems to be a trend that the concept helps in creating consciousness when switching between work and private time.

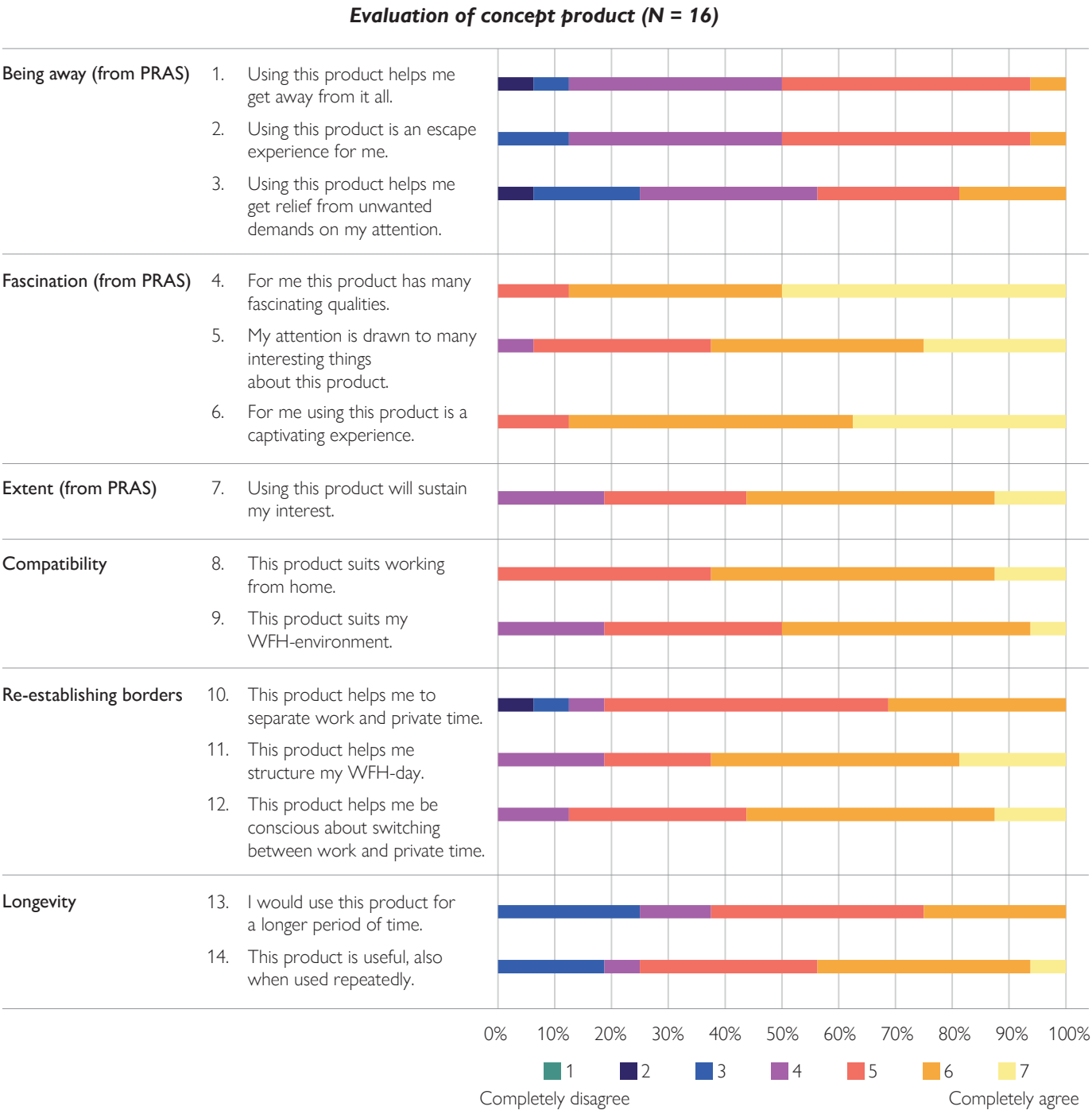


Figure 50: Evaluation of the concept was done through fourteen 7-point Likert-scale statements.

Price potential users are willing to pay for the product (N = 16)

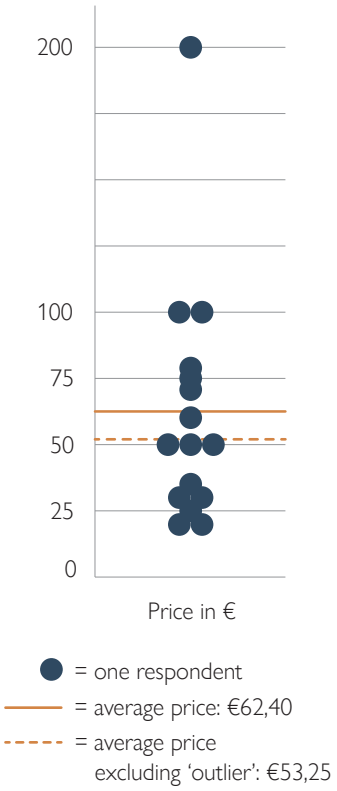


Figure 51: For each respondent, the price they are willing to pay is plotted in this visual.

Longevity and viability

Regarding the viability of the product, there are some points of attention. Aside from positive responses, respondents also showed some disagreement with the statement on whether they would use the product for a longer period of time (figure 50). A similar disagreement can be seen with the statement on whether the concept would be useful on the long run. Most respondents agree that it would, but there are again a portion of votes towards disagreement. This division seems to shine through in what the homeworkers would be willing to pay for the concept. The average of the price they are willing to pay is 62 Euros, but there is a great range from 20 to 200 Euros (figure 51). Only one participant stated a price of 200 Euros, and excluding them from the average, the price would be 53 Euros. However, as the number of participants is low it cannot be concluded that participant is an outlier.

One respondent describes how the price they are willing to pay depends on the finishing or quality of the product, and how many functions it has. They describe how more variation in lighting colours and patterns would determine whether they would use the lamp for a longer period of time. Another respondent describes that they would be willing to pay more of they are certain that the intervention would work for them.

The broad range of prices respondents are willing to pay could be explained by the fact that one respondent might have a bigger need for an intervention in their WFH-environment than another. Those with a bigger need for an intervention are expected to be willing to pay a bigger price.

Suggestions for concept development

With regard to additional ideas of patterned cut outs, respondents describe ideas involving grids of circles or triangles, and patterns more literally resembling nature, like light through trees or botanical shapes. One criterion arose from two respondents: once the lamp is deflated, the pattern should still be aesthetically pleasing, and radiate a certain calmness. It was also suggested to include the possibility to alternate between patterns, and have options for more light colours.

It was mentioned twice that the lamp reminded of something skin-like, as if from a horror movie, something lurid. The movements of the lamp are what created this feeling. Altering the type of movement the lamp makes could resolve this issue: the movement in the current concept is quite pointy and protruding. A more rounded and subtler effect could be more suitable.

One respondent suggests that this concept could also be a functional addition for the office, in the sense that it could help time meetings. Another respondent suggests an integration with time tracking application Timely. That way the lamp could help in logging work hours.

3.3.4 Conclusion

1. Restorative potential: to which degree do homeworkers expect the concept to contribute to a restorative experience?

The expected restorative potential was tested partially with the Perceived Restorativeness for Activities Scale (PRAS) (Norling et al., 2008). Through three statements, the degree of 'being away' was rated. The three statements tap into the psychological sense of being away, rather than the physical one. The response to these statements was towards the negative side, meaning that the respondents do not rate the concept as creating a sense of being away. These results tell us that the concept does not sufficiently draw the user away from work, and does not sufficiently create psychological distance from work. It could be that the sense of 'escape' (NL: ontsnapping) is too big of an abstract term to achieve with 'just' a lamp. Chapter 4.3 further focusses on possible improvements to improve the sense of being away.

Three statements evaluated whether the design creates fascination. The results show that the respondents agree that the design has fascinating qualities, and that their interest is drawn to many interesting things in the design. Use of the concept is rated as captivating. It can be concluded that the concept is seen as fascinating.

One PRAS statement regarding extent was suitable for evaluation of the concept, and there can therefore only be careful conclusions on whether the concept creates extent. The respondents mostly agree that the object sustains their interest. Also, the results show potential that implementing more variety in light effects could improve the degree of extent. More on these possible improvements in chapter 4.3.

With regard to compatibility, there were no PRAS statements tested, as they were unsuitable for the concept. So with regard to Attention Restoration, no conclusions can be drawn on compatibility. Instead, the results do teach us that respondents rate the concept as suitable for both homeworking, and their WFH-environment.

Re-establishing borders and creating consciousness at the switching moments between work and non-work was presented as a means towards a restorative experience. Respondents mostly agreed that the concept would help them separate work and private time. Two statements related to consciousness with switching moments. Both were only rated neutral, or in agreement, meaning that respondents do think the concept helps them create structure in their WFH-day, and think consciously about the switching moment between work and non-work.

2. Desirability: how do homeworkers rate the concept's function and aesthetic?

Though most respondents agree that they would use the concept for a longer time, and that its use on the long run would still be useful, also a portion of respondents disagree. Respondents state that including more options in lighting effects could improve the viability of the concept. Adding options for altering between types of patterned cut outs and having options for light or sound are further described in chapter 4.3. The viability, as well as the refinement of the product and whether it actually helps with WFH, determine what people would be willing to pay for the product.

As there are only sixteen respondents, these conclusions are tentative. This preliminary validation shows that homeworkers expect the product in its current design to serve as a modest support for restorativeness and conscious switching between work and private time, as was intended.

Figure 52: Ecflo is an inflatable lamp, functioning as a break reminder.

4 Final design: Ecflo

When working from home the balance between work and private life becomes unstable, because the boundaries between the two are unclear. This limits the degree to which restoration from work can be experienced. The aim of this project was thus to develop a product that supports restoration during working from home.

This chapter describes the approach that was followed towards achieving this design goal. It describes in what way the resulting product design meets the design goal, and discusses future steps for concept development and academic knowledge.

4.1 Approach: re-establishing work-hour boundaries and applying biophilic design

Through user research a design direction was defined, focused on re-establishing the borders between work and non-work. In concepting, biophilic design principles were applied. A particular emphasis in both is put on the how and what of taking breaks. This is done because breaks function as a replenishment of resources throughout the workday: breaks are when recovery takes place during the day.

4.1.1 Contextmapping: defining a design direction

User research was done in order to define design directions. Through contextmapping (Visser et al., 2005) homeworkers were first given an exercise booklet, and were interviewed after. From the user research a theme regarding 'toggling work-mode' was defined, describing how especially the sense of being away from work is limited when working from home. The phenomenon of the boundaries between work and private life becoming blurry when WFH as described by Gajendran et al. (2007) was found to be the primary issue from the user research. The design direction is therefore focused on re-establishing the borders between work and non-work, and making the switching moments more conscious.

Another theme found in the user research is 'nature at home', and encompasses amongst others data on preferences for a view on nature and presence of daylight and plants. This theme shows that following the methods of biophilic design is an interesting approach for a design for the WFH-environment.

4.1.2 Biophilic design: using nature elements in concepting

Nature is particularly good in meeting the four components of the Attention Restoration Theory. Besides, exposure to nature has a broad spectrum of benefits for health and well-being (amongst others Ulrich, 1983; Bringslimark et al., 2009; Beukeboom et al., 2012; Kjellgren & Buhrkall, 2010; Lederbogen et al., 2011). Knowing these advantages of nature, the field of biophilic design focusses on translating the principle of biophilia (our innate love for nature) to the world of design. Kellert (2008) describes six biophilic design elements, of which the following four are suitable for the WFH-environment: *Environmental features* (e.g. use of nature colours and materials), *Natural shapes and forms* (e.g. motifs of flora and fauna), *Natural patterns and processes* (e.g. change and growth), and *Light and space*. With regard to light, the use light textures, or brilliance light (Kelly, 1954), was given particular attention in this project, as it is a means to achieve fascination. In this project, restoration is supported by application of biophilic design principles.

4.2 Ecflo: towards a restorative WFH-environment

The final concept idea, Ecflo (Latin for 'to breath out', or 'to blow out'), is an inflatable lamp, that, in essence, functions as a break-reminder through dynamic light textures (figure 52). At the start of the workday the user sets their desired time until break and inflates the lamp. During work, the lamp deflates over time. Once it is time for a break, the lamp is fully deflated, and a sound signal of a bird's chirping notifies the user. Then, the lamp starts creating movement and light textures, drawing the user's eyes away from work. Ecflo seems to be alive, it is breathing and seeking attention. The product then stimulates a conscious decision: the user takes the break they scheduled, or decides to skip their break and immediately get back to work. When it is time to get back to work (so either after their break, or directly if the user decides to skip the break) the user re-inflates the lamp and the cycle with the timer repeats. At the end of the workday, the user flips the lamp to its neutral side (figure 52), so that the light patterns are not visible during non-work hours.

This section describes how Ecflo answers to the design goal (attention restorative) and design direction (re-establishing borders), and explains in which way biophilic design principles were implemented.

4.2.1 How is this design restorative?

The design goal for this project was to make (a product that creates) a restorative environment (space) or experience (activity or interaction) within the home environment. An environment or experience has to meet the four components of the Attention Restoration Theory in order to be restorative. This section describes the degree to which Ecflo meets these four components.

Fascination can be achieved through process a.k.a. activity, or content a.k.a. object (Kaplan, 1995). In design, this translates to interaction and shape. Ecflo is designed to create fascination through dynamic light textures that are ephemeral and random. Fascination should be without cognitive effort (Kaplan, 1995), something that can be achieved through the use of movement and patterns, latter of which are predictable, and therefore effortless. Through movement of light textures, the lamp draws effortless attention and holds onto it. The evaluation study in chapter 3.3 shows that homeworkers agree with this, in the sense that they think the design has many fascinating qualities, draws in their attention, and is intriguing in its use.

Being away encompasses both physically distancing oneself from the thing causing resource depletion (work, in the case of WFH), as well as psychologically (Kaplan, 1995). Both types of being away are limited when working from home. Physical distancing is difficult to achieve as the workplace is located where non-work hours are also spent. That can creates a limit on the degree of psychological feeling of being away too in the form of preoccupation with work and the inability to switch it off.

Ecflo creates a feeling of being away through its two-sidedness, and the switching between the two. One side of the lamp is designed for work-hours, the other for non-work hours. The change in appearance, as well as the interaction of flipping the lamp at the switching point between work and non-work, add to a feeling of distancing oneself from work.

The evaluation study in chapter 3.3 shows that the feeling of being away is however not optimal. Homeworkers only partially agree with statements on whether the concept creates an escape experience, whether it helps them get away from daily things, and whether it helps them get relief form unwanted demands on their attention. The feeling of being away should therefore be improved, so that the experienced restoration is enhanced. Chapter 4.3 discusses possible improvements.

Compatibility describes how the environment or experience and the person's intentions should match in order for it to be restorative (Kaplan, 1995). It also describes that a compatible environment or experience is responsive to the user. Ecflo is designed to be interactive, in the sense that interaction with it is extrinsically stimulated. The lamp reminds the user of its existence and desires interaction.

Compatibility was also translated to the fact that the design has to be suitable for the WFH-environment. The lamp is designed to be used for WFH specifically, and it aesthetic is made to be rather universal in the use of colour and material, so that it blends into most WFH-environments. From the evaluation study in chapter 3.3 it shows that homeworkers generally agree that the concept is suitable for homeworking and the WFH-environment.

Extent comes from the environment or experience being rich and coherent, with enough to see and think about (Kaplan, 1995). Yet, it should not be overstimulating or distracting. Ecflo is designed to occupy one's mind, and create a moment of daydreaming, through its dynamic light patterns and movement. The degree to which extent is achieved is briefly evaluated in chapter 3.3: homeworkers agree with the statement that the concept sustains their attention.

4.2.2 How does it re-establish borders?

The design direction drawn from the user research was to design something to re-establish the borders between work and non-work. By making the switching moments between work and non-work conscious, Ecflo aims to re-establish borders. Making the switching moments conscious is done through the interaction of flipping the lamp, and designing it to have a work-mode and non-work mode. Moreover, when switching the user's attention is drawn to a liminal moment. The lamp both draws attention towards work, as well as pulling the user's attention away from it.

When switching towards work, the intervention activate work mood. As there is no transitional moment now when working from home, the lamp creates a brief energizer between the non-work and work phases. This moment should feel energizing, refreshing, encouraging, and create a feeling of being prepared/ready (chapter 3.1.2). The lamp creates this by being inflatable. The act of inflating takes up a conscious moment, and takes some physical effort, as if it were a warming up (interaction vision, chapter 2.4.3).

When switching away from work the lamp draws attention to a liminal moment of fascination. This way, the focus does not instantly go from work to non-work. That way some psychological space is created to set the mind to non-work mode. This moment should feel fascinating, explorative, enchanting, and teasing (chapter 3.1.2), like finding a scenic spot on a hike (interaction vision, chapter 2.4.3). The lamp creates this feeling by its dynamic light textures, already described in chapter 4.2.1.

The evaluation study in chapter 3.3 shows that homeworkers generally agree that the concept helps them separate work and non-work. Besides, they agree that the concept helps them structure their WFH-day, and makes them conscious about switching between work and private time.

4.2.3 How is this design biophilic?

Throughout the project biophilic design principles were used, for both the embodiment of the lamp, as well as for the interaction with it. Four of the six biophilic design elements were used in the design of Ecflo: *Environmental features* (characteristics of the natural world), *Natural shapes and forms* (representations of the natural world), *Natural patterns and processes* (use of nature properties), and *Light and space* (Kellert, 2008). This section describes which design decisions were based on which biophilic design elements.

The embodiment of the lamp is biophilic in the sense that natural materials and colours are used (from element *Environmental features*) and shaping is inspired by organic and curved lines and shapes (from element *Natural shapes and forms*). The shape of the embodiment is kept relatively simple, so that the attention is brought to the organically shaped patterned cut outs. The design of the three final pattern cut outs (figure 39) are inspired by patterns in nature (from element *Natural shapes and forms*), like microscopic pictures of cells, topographic maps of mountains, and cracks in dried dirt. Other patterns explored through prototyping were inspired by nature properties like fractal patterns, spirals, and differential growth patterns (from element *Natural patterns and processes*). The lighting effects that the lamp creates using these cut out patterns are also inspired by nature. The movement the lamp makes resembles raindrops flowing down a window, or swirly movement of critters and fish, depending on the design of the cut out pattern.

In Ecflo, light is used to create shape and form (from element *Light and space*). The use of textured light was inspired by biophilic light textures. Light textures, or brilliance light, is biophilic if it has natural variation (nothing in nature is repeated), natural causality (with a logical source to make the texture's existence likely), and natural dynamics (nature is not static) (Aan de Stegge, 2018). The light textures in Ecflo are dynamic, ever changing and random and could therefore be considered biophilic.

The interaction with the lamp is designed from a biophilic design point of view as well. Central in the interaction design is the use of multisensory design. Sensory richness is described as an abundance of visual patterns, haptic sensations, smells, sounds, and tastes (Heerwagen & Gregory, 2008). Striving for sensory richness, or sensory variability (from element *Natural patterns and processes*), Eclo is designed with a focus on visual patterns, and haptics sensations. The lamp is supposed to be touched and held, and inflated using your own flow of air. Sound is involved in the design too, though in a way suitable for a work environment. Nature sounds were suggested in concept evaluation with potential users, and as bird sounds have restoration potential (Ratcliffe et al., 2013), bird's chirping is used as an audio cue to let the user know when it is time to take a break.

4.3 Recommendations for further development

Additional concept development is needed to optimize Ecflo. Besides, additional opportunities for the concept are discussed. With regard to validation, opportunities are discussed for development of a perceived restorative potential scale for product design.

4.3.1 Further concept development: opportunities for improvement

From the evaluation study in chapter 3.3 it showed that the experienced feeling of being away is little. Further development of the concept is needed in order to be sure whether the current design for the feeling of being away is sufficient, or whether additional ideation is needed.

It could be that the perceived feeling of being away is higher once the concept is tested through a further developed working prototype, as that creates a more immersive experience than video can achieve. However, it might also be that experiencing 'escape' (NL: ontsnapping) is rather ambitious to achieve through a WFH-lamp. Although designed towards creating a restorative experience, a desk lamp cannot replace the action of physically distancing oneself from the WFH-environment. Ecflo supports restoration and creates a consciousness about restoration, which can stimulate other restorative behaviours, like going for a walk outside during the WFH-day.

Also from the evaluation study in chapter 3.3 it showed that the viability of the design needs further attention. Currently, homeworkers are unsure whether they would use Ecflo for a longer time. Adding options for variation in patterned cut outs, light colours, and types of (bird) sounds could improve the viability of the concept. Besides, customization could also influence the degree to which extent is experienced. Extent describes richness and coherency, with enough to see and think about (Kaplan, 1995). One can imagine how customization could allow homeworkers to create a new experience with Ecflo once the extent of the 'old' experience has reached its potential.

With regard to patterned cut outs, multiple ideas were explored throughout the concept development (figure 53). Prototyping taught that, in order to make the stretchability of the pattern and thereby the light effects possible, the cut out pattern should consist of 'puzzle pieces'. These individual pieces should not be intertwined, as that limits the amount of stretch and thereby the light effects. Following this criterium, possibilities for inflatable lamp patterns are plentiful. Making variation in patterned cut outs possible could be achieved through making them interchangeable. The patterned cut out would then be a separate panel, replaceable by another pattern (figure 54).

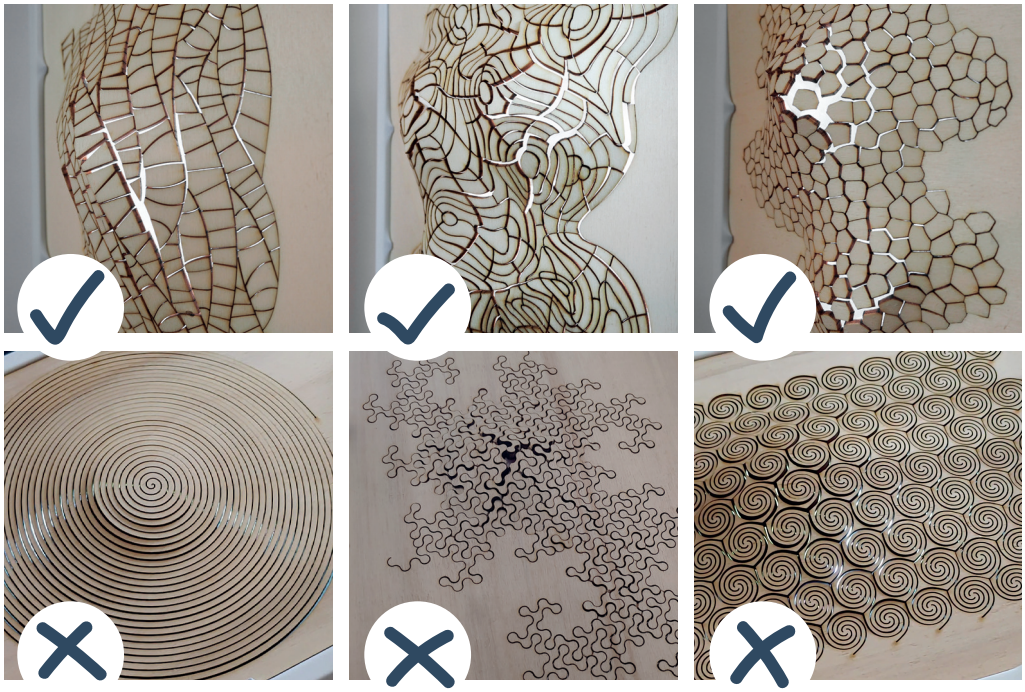


Figure 53: A selection of patterns prototyped with. Patterns that work well in terms of stretching and letting through light consist of 'puzzle pieces' that are not intertwined.

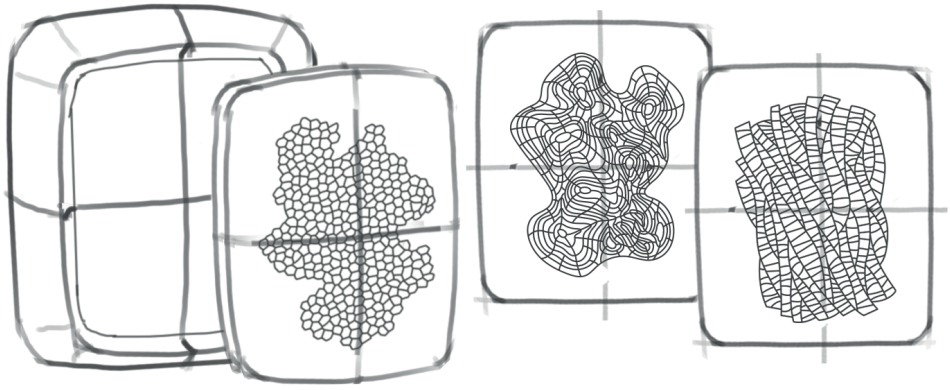


Figure 54: A possible redesign to the lamp would be to make the patterned cut out a separate panel, so that it can be exchanged for a different pattern.

The size and material of Ecflo could also be altered if desired (figure 55). The current size of the lamp was derived from prototyping. Prototypes with patterned cut outs of this size showed to be functional with regard to the desired lighting effect. However, scaling the concept up or down is expected to work fine. It should be taken into account that increasing size would increase the air pockets in the inflatable part of the lamp, which means that manually inflating the lamp would become increasingly laborious. A bigger inflatable lamp that fully automatically inflates and deflates, opens up possibilities for implementation outside of the WFH-environment. Smaller inflatable lamps could be created as a desktop version.

The material chosen for Ecflo is wood, as suits the biophilic design principle, and is neutral in its aesthetics and would therefore blend in easily in most WFH-environments. Variations in the type of wood can be made. Other materials like plastics are possible too, but diminish the biophilic aesthetic that Ecflo was designed with.

Many of the ideas presented above can be tested through additional prototyping. Through prototyping the system of (3D-printed) silicone airpockets, LED panel, NFC technology and other technologies described in chapter 3.2.3 should be explored. Besides, there is a concern regarding hygiene of the mouthpiece through which one inflates the lamp. A detachable mouthpiece would allow for easy cleaning, and a changeable HME-filter (heat and moisture exchanger filter) could draw the moisture out of the user's breath, which could help in keeping the inside of the lamp clean. Inflation could also be done using a small bellow, but that would make the interaction with the lamp more superficial. These things too would have to be further explored.

4.3.2 Opportunity for development of product restorativeness validation method

A further developed concept would need additional validation as well. In the evaluation study of chapter 3.3 the degree to which Ecflo is restorative was tested. The method of evaluation was derived from the Perceived Restorativeness of Activities Scale (PRAS) (Norling et al., 2008). However, the statements used in this scale (figure 56) are not all suitable for validation of a product and its interaction. The compatibility scale specifically relates to physical exercise. Besides, two of the extent scale statements could not be rewritten to suit product and interaction without altering the statement's message. It can therefore not be said with complete certainty what the restorative potential of the concept is. For this, a method for perceived restorativeness scale for products and their interactions should be created.

Such a scale could be designed following a method similar to how the Perceived Restorativeness Scale (PRS) was created by Hartig et al. (1997). This method encompasses sixteen statements, each relating to one of four components of the Attention Restoration Theory (Kaplan & Kaplan, 1989): being away, fascination, extent, and compatibility. Respondents are to indicate on a Likert-type scale the extent to which the statements fit their experience of the environment. A list of those agree-disagree statements could be composed for product and product interaction. The statements should relate to product and product interaction, in the same way that statements in PRS relate to environments, and statements in PRAS relate to activities. A list of such statements should then be tested on its validity and reliability. Figure 56 shows the statements used in the evaluation study of this project, and could be taken as a starting point for further development.

A method to verify perceived restoration could be a valuable addition to the fields of Positive Design (Desmet & Pohlmeyer, 2013). As described in chapter 1.2 there is a relationship between recovery from stress and restoring attention, and people's wellbeing. Resource depletion and lack of replenishment can have negative effects on fatigue and emotions (Zhu et al., 2019). Recovery, instead, has positive effects on wellbeing (Sonnentag, 2001). One can imagine how (product) design in the fields of design for subjective wellbeing and design for happiness has touchpoints with stress recovery and attention restoration. Those designs could benefit from a research method on perceived restorativeness.

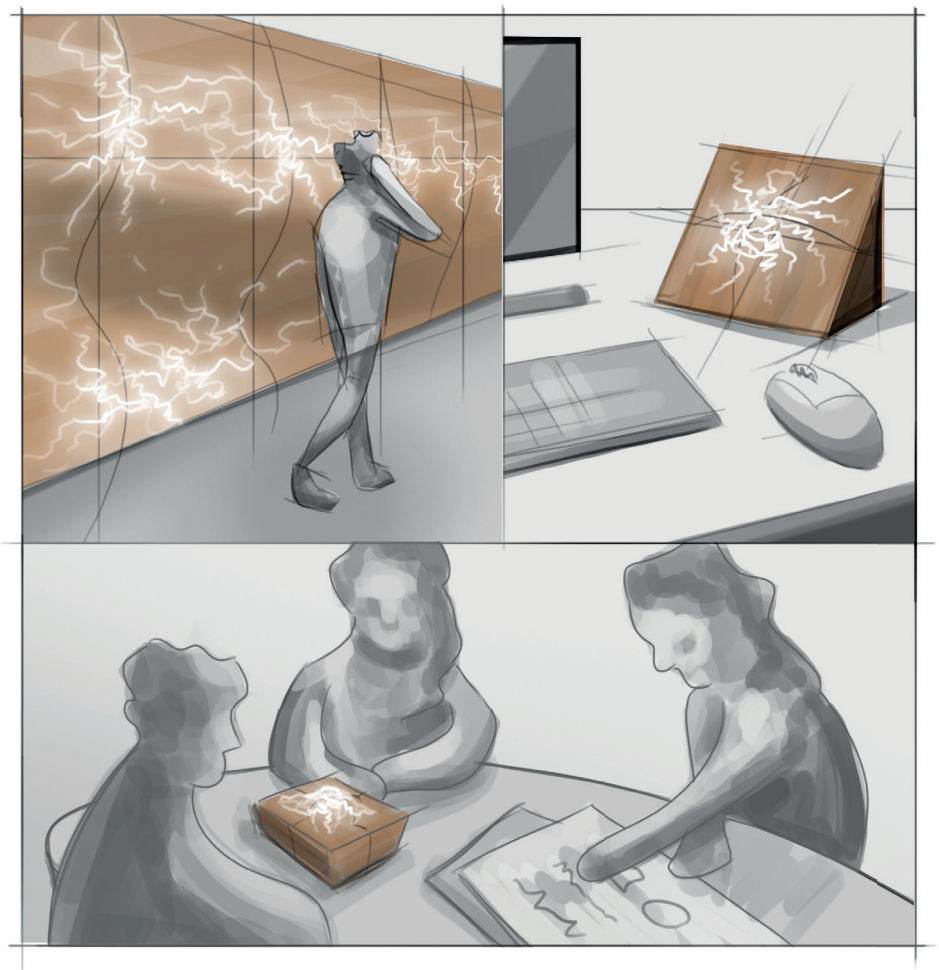
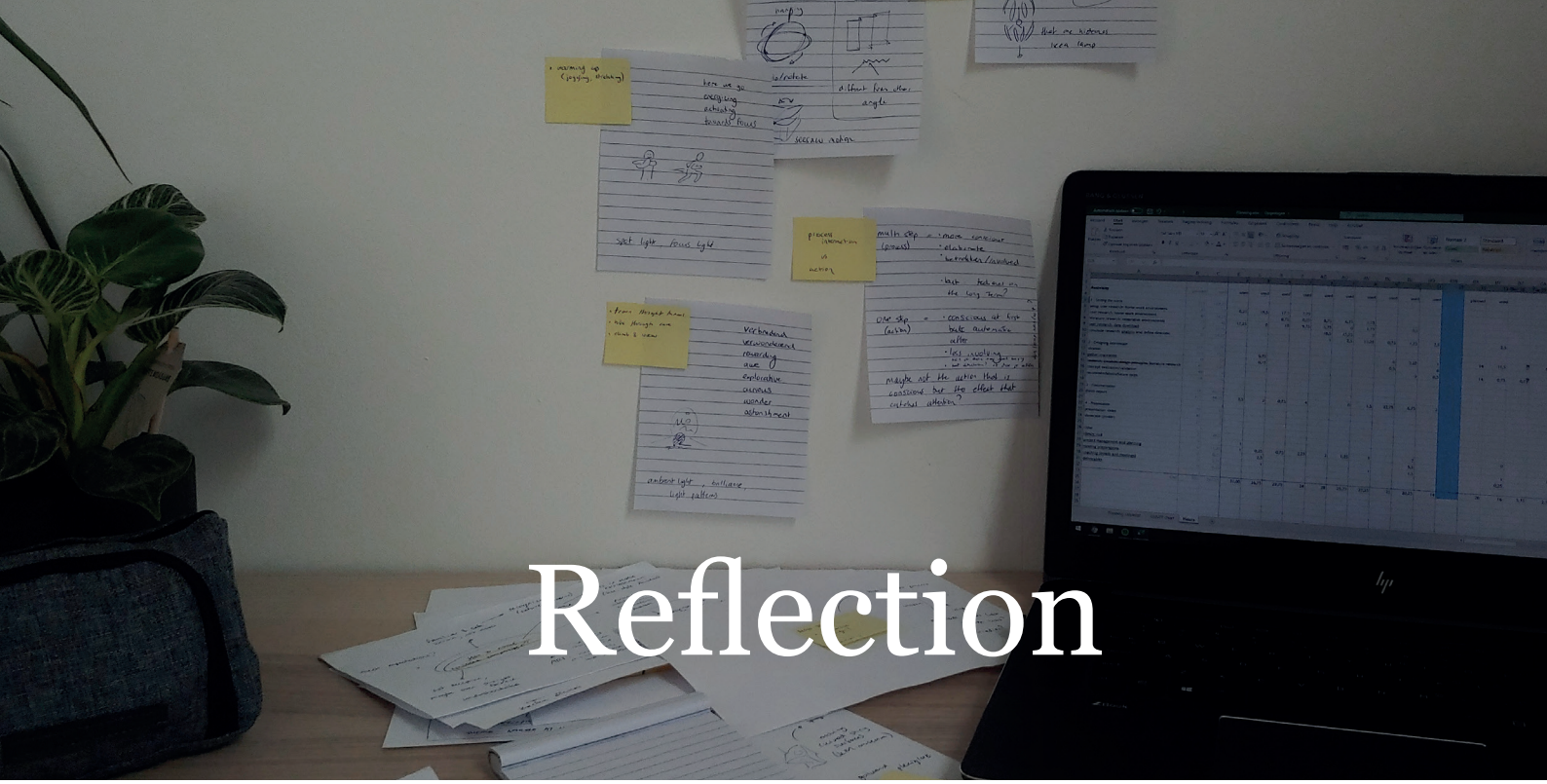


Figure 55: Scaling the inflatable lamp concept brings new possibilities for implementation. The concept could be implemented in public space or offices, or be scaled to a desktop item.

Statements fom Perceived Restorativeness for Activities Scale (PRAS) (Norling, 2008)	*Statements adapted to suit perceived restorative potential of products, used in evaluation study of this project.*
Being-away scale BA1. Participating in this activity helps me get away from it all. BA2. Participating in this activity is an escape experience for me. BA3. Participating in this activity helps me get relief from unwanted demands on my attention. *Fascination scale* F1. For me this activity has many fascinating qualities. F2. My attention is drawn to many interesting things about this activity. F3. For me participating in this activity is a captivating experience. *Extent scale* E1. For me this activity has qualities that draw me further in. E2. The more I participate in this activity the more I want to explore it. E3. Participation in this activity will sustain my interest. *Compatibility scale* C1. Participating in this activity helps me achieve my physical activity goals. C2. This activity matches my fitness and training objectives. C3. When participating in this activity I expect I will feel a certain way when I am done.	*Being-away scale* BA1. Using this product helps me get away from it all. BA2. Using this product is an escape experience for me. BA3. Using this product helps me get relief from unwanted demands on my attention. *Fascination scale* F1. For me this product has many fascinating qualities. F2. My attention is drawn to many interesting things about this product. F3. For me using this product is a captivating experience. *Extent scale* E3. Using this product will sustain my interest.

Figure 56: The statements used to evaluate the concept's expected restorative potential (right) are derived from the Perceived Restorativeness for Activities Scale (left). Not all PRAS statements are suitable for product and interaction, making the list of statements applicable for product and interaction incomplete.



Reflection

The reflection is not included in the repository.

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Supporting restoration in the home-work setting

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TU Delft

Appendices

Appendix 1: Sensitizing package

The sensitizing package used in the contextmapping user research consists of a homework booklet, stickers, consent form, and return envelope.

Sensitizing homework booklet

Hallo thuiswerker!

Wat fijn dat je me wilt helpen. Aan de hand van dit boekje leer ik graag wat thuiswerken voor jou betekent, hoe het er voor jou uitziet, en hoe jij het aanpakt. Het boekje gaat over jou en jouw thuiswerk-situatie. Er zijn dus geen foute antwoorden.

Het boekje bevat opdrachten en vragen, verdeeld over vijf dagen. Iedere dag heeft een thema waarover de opdrachten of vragen die dag gaan. Werk het liefst vijf aansluitende thuis-werk-dagen aan de opdrachten. Als er een weekend tussen zit, ga dan na het weekend weer verder.

Bij sommige opdrachten heb je stickers nodig. Die zijn achterin het boekje bijgevoegd. Verder heb je een pen nodig, en dagelijks ongeveer een kwartier tijd. Je mag zelf een moment op de dag kiezen om de opdrachten te maken. Met één uitzondering: op dag 4 is het belangrijk dat je aan het begin van je werkdag de opdracht leest!

In de envelop zit ook een toestemmingsformulier. Om met jouw antwoorden aan de slag te gaan, heb ik het formulier ingevuld en ondertekend nodig. Het zijn er twee, ook één voor jou.

Na afloop ontvang ik dit boekje en het formulier graag terug. Later in het boekje lees je daar meer over. Dan plan ik ook graag een moment met je om verder op je antwoorden in te gaan.

Als je vragen hebt, twijfel dan niet en laat het me weten.

Bedankt!
Leonie

Contact:
06 2720 6700
leonieremmerswaal@gmail.com

Dag 1. Over jou

Vandaag leer ik jou en je huishouden graag beter kennen. Vul het profiel hieronder in.

Naam: _____

_____ *Leeftijd:* ____

Werkt als _____

bij _____

Werkt nu ____ *weken/maanden** ***grotendeels vanuit huis***

** doorstrepen wat niet van toepassing is*

Hoe 'gewoon' is thuiswerken voor jou? Hoe vertrouwd ben je ermee?

Helemaal niet vertrouwd	○ *1*	○ *2*	○ *3*	○ *4*	○ *5*	○ *6*	○ *7*	*Volledig vertrouwd*

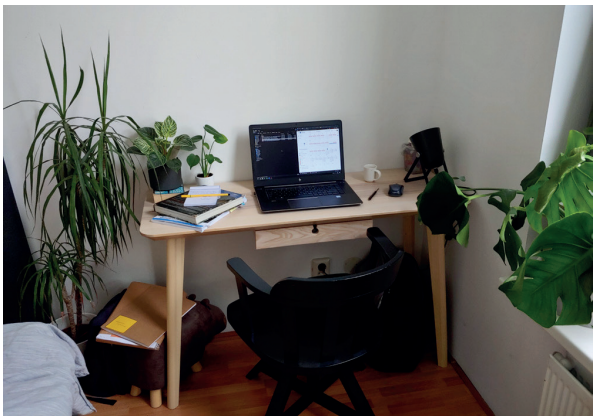
Hoe ziet jouw huishouden eruit? Woon je alleen, samen, of met kinderen? Gebruik stickervel 'Dag 1' en plak jouw huishouden in het kader hieronder. Vergeet ook jezelf niet! Schrijf er ook bij wie deze mensen zijn (bijv. partner of huisgenoot).

In wat voor type huis woon je? (bijv. appartement, studentenhuis, rijtjeshuis met tuin, ...)

_____

Dag 2. Over jouw werkplek

Maak een foto van jouw werkplek. Probeer je hele werkplek op de foto te krijgen. Ruim vooral niet op. Ik zie graag hoe jouw werkplek eruit ziet zoals jij hem ook écht gebruikt. Hier is hoe de mijne eruit ziet:



Stuur de foto naar mij op. Dat kan via Whatsapp (06 2720 6700) of e-mail (leonieremmerswaal@gmail.com).

Welke dingen heb jij op je werkplek? Denk aan producten zoals een telefoon of een notitieblok, maar ook aan dingen als muziek of een computerprogramma. Vul voor elke onderstaande categorie een ding in in de cirkel.

Favoriete ding

Meest gebruikte ding

Mooiste ding

Meest inspirerende ding

Meest frustrerende ding

Meest teleurstellende ding

Je mag er ook tekeningetjes bij maken, als je dat wilt.

Dag 3. Over jouw werkomgeving

Vandaag zoomen we een stukje uit. Het draait niet meer alleen om je werkplek (i.e. je bureau), maar om de gehele ruimte waarin je thuis werkt.

Een ruimte heeft altijd een bepaalde sfeer (i.e. atmosfeer, ambiance, stemming). Beoordeel de atmosfeer in jouw werkomgeving. Bedenk steeds: *hoe passend is deze beschrijving voor mijn werkomgeving?*

De atmosfeer in mijn werkomgeving is ***knus.***

Helemaal niet mee eens	○	○	○	○	○	○	○	*Helemaal mee eens*
	1	*2*	*3*	*4*	*5*	*6*	*7*	

De atmosfeer in mijn werkomgeving is ***levendig.***

Helemaal niet mee eens	○	○	○	○	○	○	○	*Helemaal mee eens*
	1	*2*	*3*	*4*	*5*	*6*	*7*	

De atmosfeer in mijn werkomgeving is ***gespannen.***

Helemaal niet mee eens	○	○	○	○	○	○	○	*Helemaal mee eens*
	1	*2*	*3*	*4*	*5*	*6*	*7*	

De atmosfeer in mijn werkomgeving is ***zakelijk.***

Helemaal niet mee eens	○	○	○	○	○	○	○	*Helemaal mee eens*
	1	*2*	*3*	*4*	*5*	*6*	*7*	

Teken hieronder een plattegrond van de ruimte waarin jij werkt. Je tekening hoeft niet mooi te zijn. Schrijf er eventueel dingen bij ter verduidelijking. Geef ook afmetingen aan.

Niet vergeten: lees morgen de opdracht 's ochtends, voor je aan het werk gaat!

Dag 4. Over pauzes nemen

Vandaag draait het om pauzes nemen. Probeer gedurende de dag bij te houden wanneer je een pauze neemt.

Gebruik de Post-it om je pauzes te turven. Plak hem in het zicht op je werkplek, zodat je er gedurende de dag aan denkt. Plak de Post-it hier aan het einde van de dag weer terug en beantwoord dan de vragen aan de rechterkant.

Turf je korte pauzes (bijv. je telefoon checken), lange pauzes (bijv. lunchen) en alles ertussenin (bijv. koffie drinken).

Wat heb jij in je pauzes gedaan vandaag?

Wat had je willen doen in je pauze maar heb je niet gedaan?

Was dit een 'normale' dag, of neem je normaliter meer/ minder pauzes?

Van de pauzes die je hebt geturfd, ...

... hoeveel waren geplande pauzes?	... hoeveel waren er korte pauzes (tot 5 min*)?	... hoeveel waren lange pauzes (halfuur of meer)?

** Een korte pauze heet ook wel een micro-break. Een micro-break van één tot vijf minuten heeft al positieve effecten op je energieniveau en aandachtsvermogen[1]. Niks om je schuldig over te voelen dus!*

Dag 5. Over jouw ideale werkplek

Stel in het kader hiernaast jouw ideale werkplek samen. Denk vandaag vooral fantasierijk: jouw werkplek hoeft niet echt te bestaan. Geen antwoord is fout, alles kan en mag.

Je kunt tekenen en er dingen bij schrijven om je ideale werkplek toe te lichten. Je kunt de stickers van 'Dag 5' gebruiken, maar je mag ook zelf (beeld)materiaal verzamelen en toevoegen. Denk ook aan het volgende:

- Wat voor dingen gebruik je? En welke decoraties en andere objecten zijn er?
- Met welk uitzicht wil jij werken?
- Ben je alleen of zijn er anderen bij? En wie dan?
- Wat voor geuren wil je in je ideale werkomgeving? En welke geluiden?

Als je iets specifieks in gedachte hebt, hoor ik het graag! Stuur me een audiofragment je op.

Ruimte voor je vragen, overige antwoorden, opmerkingen, aanmerkingen, notities, anekdotes, gedichtjes, adviezen en eitjes die je kwijt moet:

Tot ziens, thuiswerker!

Bedankt voor je hulp! Links heb ik ruimte opengelaten voor eventuele vragen, opmerkingen en andere dingen over thuiswerken die je nog graag kwijt wilt.

In de envelop die je hebt ontvangen, zit een gefrankeerde envelop met daarop mijn adres. Stuur daarmee alsjeblieft het boekje en toestemmingsformulier naar mij terug.

Zodra ik het pakketje heb ontvangen, neem ik contact met je op om een afspraak te maken. Ik wil dan graag je antwoorden bespreken, en verdere vragen stellen. Daarvoor wil ik graag je e-mail adres:

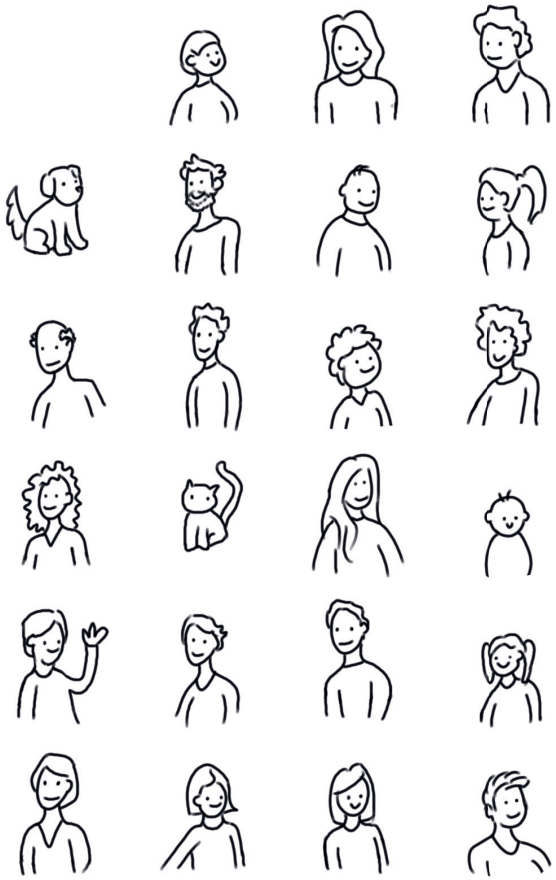
_____

Tot dan!

Groet,
Leonie

1| Bennett, A. A., Gabriel, A. S., & Calderwood, C. (2020). Examining the interplay of micro-break durations and activities for employee recovery: A mixed-methods investigation. Journal of Occupational Health Psychology. https://doi.org/10.1037/ocp0000168

Dag 1. Zit iemand er niet tussen? Teken diegene dan op deze sticker erbij.



Dag 5. Texturen

Dag 5. Texturen

Toestemmingsformulier dataverzameling voor het onderzoek: ‘Thuiswerken: hoe werkt dat?’

Dit onderzoek is deel van een afstudeerproject dat doelt op het onderzoeken en verbeteren van de thuiswerkomgeving. Het afstudeerproject is deel van de Master Design for Interaction, gevolgd aan de Technische Universiteit Delft.

Het doel van het onderzoek ‘Thuiswerken: hoe werkt dat?’ is om meer te weten te komen over hoe thuiswerken er voor mensen uit ziet, en wat voor problemen men met thuiswerken tegenkomt, ook in vergelijking met de ‘normale’ werkomgeving zoals bijvoorbeeld kantoor. Dit onderzoek gaat in op zowel de fysieke werkomgeving als de emoties die ervaren worden tijdens het thuiswerken.

De deelnemer ontvangt een huiswerkboek, waarmee de eerste onderzoeksresultaten worden verzameld. De resultaten van het boekje worden geanalyseerd en gebruikt als aanknopingspunt voor een vervolginterview. In dat interview wordt naast de resultaten van het boekje, ook verder ingegaan op het verloop van een typische thuiswerkdag.

Persoonlijke gegevens die wordt verzameld in dit onderzoek omvatten naam, leeftijd, werkomschrijving, adresgegevens, e-mail en telefoonnummer. De drie laatstgenoemde data zijn enkel voor het bereiken van de deelnemer en zijn geen deel van de onderzoeksresultaten.

Daarnaast zijn foto- en filmmateriaal deel van de verzamelde resultaten. Deze dienen enkel een rol binnen het analyseren van de data en zullen alleen onherkenbaar (i.e. geanonimiseerd) worden gebruikt binnen het afstudeerproject als communicatiemateriaal met betrokken partijen (e.g. coaches, presentaties, verslaglegging). Geen van de persoonlijke gegevens worden zonder toestemming gepubliceerd.

De verzamelde data wordt gedurende het afstudeerproject bewaard (tot eind januari 2021). Geanonimiseerde resultaten worden vastgelegd in verslag (i.e. thesis) en presentatiemateriaal, welke gearchiveerd worden in de TU Delft Education Repository.

De deelnemer heeft het recht gedurende het onderzoek op ieder moment met het onderzoek te stoppen, zonder daarvoor een reden te hoeven aangeven.

Bij vragen, opmerkingen, of klachten over dit toestemmingsformulier of gedurende het onderzoek, kan de deelnemer terecht bij Leonie Remmerswaal.

06 2720 6700
leonieremmerswaal@gmail.com

Beantwoord alstublieft de volgende vragen door het relevante vakje aan te kruisen:

Ik heb de informatie op voorgaande pagina gelezen en begrepen. Eventuele vragen die ik had zijn beantwoord.	○ *ja*	○ *nee*
Ik geef vrijwillig toestemming mee te doen aan dit onderzoek en ben ervan op de hoogte dat ik het recht heb om vragen niet te beantwoorden als ik dat niet wil.	○ *ja*	○ *nee*
Ik ben ervan op de hoogte dat ik het recht heb om me uit het onderzoek terug te trekken zonder daarvoor een reden te hoeven aangeven.	○ *ja*	○ *nee*
Ik begrijp dat binnen dit onderzoek de volgende informatie wordt verzameld, en stem daarmee in: - De door mij gegeven antwoorden en persoonlijke data in het huiswerkboekje; - Foto- en filmmateriaal van het huiswerk en het interview, welke fungeren als analyse- en communicatiemateriaal binnen het project en de daarbij betrokken partijen (e.g. coaches, presentaties, verslaglegging); - De door de onderzoeker gemaakte aantekeningen gedurende het interview.	○ *ja*	○ *nee*
Ik begrijp dat persoonlijk informatie met betrekking tot mijn identiteit (e.g. naam, leeftijd, werkomschrijving, adresgegevens, e-mail en telefoonnummer) niet worden gedeeld buiten de betrokken partijen.	○ *ja*	○ *nee*
Ik stem ermee in dat mijn antwoorden anoniem mogen worden geciteerd in verslaglegging en presentaties.	○ *ja*	○ *nee*

Naam deelnemer	*Handtekening*	*Datum*

Naam onderzoeker	*Handtekening*	*Datum*

06 2720 6700
leonieremmerswaal@gmail.com

Appendix 2: Interview guide

Interview guide

Benodigdheden:

- Interview guide
- Huiswerkboekje van deelnemer
- Tijdlijn template
- Gekleurde stickertjes
- Voor aantekenen: notitieblok. pen/stiften, Post-its
- Audio recorder (app)
- Bedankje

Introductie (10 min)

Het interview bestaat uit twee delen en duurt ongeveer anderhalf uur. Eerst heb ik nog wat vervolgvragen over je huiswerkboekje, en daarna maken we een tijdlijn van jouw thuiswerkdag.

Bij het invullen van het huiswerkboekje heb je al een toestemmingsformulier ingevuld. Ook voor dit deel van het onderzoek geldt: jouw antwoorden worden alleen anoniem gebruikt in mijn afstudeerverslag en voor het communiceren met mijn begeleiders. Ik zal geen data publiceren.

Ik werk alleen aan dit project en kan niet alles wat je zegt opschrijven. Om ervoor te zorgen dat niks van jouw input verloren gaat, wil ik het interview graag opnemen. Zo kan ik later terugluisteren naar wat je gezegd hebt. Is dat goed?

Tijdens het interview ben jij de expert over jouw thuiswerksituatie. Er zijn dus geen foute antwoorden.

Heb je voor we beginnen nog vragen?

I

Deel 1: Door het huiswerk (35 min)

Dag 1: Over jou (+)

Werk je nu alleen maar thuis of ook elders? Werk je (alweer) op locatie?
Heb je meerdere werkplekken in huis? Welke heeft je voorkeur? Waarom?

Dag 1: Huishouden (+)

Als iemand met mensen samenwoont:

Zijn deze mensen ook thuis als je aan het werk bent? Zijn zij ook aan het thuiswerken? Zijn ze in dezelfde ruimte?

Wat zijn de voordelen van huisgenoten hebben, als het gaat om thuiswerken? En de nadelen? Wordt je wel eens gestoord door je huisgenoten? Familie? Buren?

Als iemand alleen woont:

Wat zijn de voordelen van alleen thuis zijn, als het gaat om thuiswerken? En de nadelen? (Mis je bepaalde mensen?)

Dag 1: Huis (-) kort houden

Wat is er fijn aan jouw huis, als het aankomt op thuiswerken?
Wat betreft thuiswerken, wat mis je aan jouw huis? (e.g.: aparte kantoorruimte, tuin, …)

Dag 2: Dingen op de werkplek (-) kort houden

Waarom is dit jouw meest favoriete/gebruikte/mooiste/inspirerende/frustrerende/teleurstellende ding?

Dag 3: Atmosfeer (++)

Waarom heb je de atmosfeer knus/levendig/gespannen/zakelijk beoordeeld?
Wat maakt het dat jouw werkomgeving knus/levendig/gespannen/zakelijk is?

Dag 5: Ideale werkplek (+++)

Is jouw ideale werkomgeving meer/minder knus/levendig/gespannen/zakelijk dan je huidige werkomgeving?

Wat voor uitzicht heeft jouw ideale werkplek? Hoe is dat anders dan je huidige werkplek?

Deel 2: Tijdlijn maken (45 min)

Nu wil ik samen een tijdlijn maken van jouw thuiswerkdag. Ik heb daarvoor dit template. De horizontale as is de tijd, van het begin tot het einde van je werkdag. De verticale as geeft aan of de dingen die je doet een positieve (+), neutrale, of negatieve (-) ervaring zijn.

Problemen op de werkdag (+++)

Laten we een tijdlijn maken van je werkdag gisteren.

+ *Wat deed je aan het begin van de dag? Wat doe jij om je werkdag op te starten?*

  Wanneer op de dag liep jij tegen problemen/obstakels aan? Plak daar rode stickers.
  Wat was je grootste ergernis gedurende de dag?

+ *Wat deed je aan het einde van de dag? Hoe sluit je je werkdag af, en schakel je over naar je vrije tijd?*
  Wat doe jij het liefst in je vrije tijd?
  Hoe rust jij het beste uit?

Pauzes nemen (++++)

Wanneer had jij deze dag pauze? Plak daar een blauwe sticker.

Plan je je pauzes van te voren?

Neem jij altijd een pauze wanneer je die nodig hebt? Of sla je wel eens een pauze over?
Stel je pauzes wel eens uit?

Wat deed je in je pauzes? Waar neem jij pauzes? Ga je weg van je werkplek?
Wat had je willen doen? Waarom doe je dat niet, wat houdt je tegen?

Neem je pauzes alleen? Of samen?
Initiëren anderen wel eens jouw pauzes? Of is dat alleen iets uit jezelf?

+ *Wat voor pauze werkt voor jou het beste? Een lange of korte pauze? Zijn er bepaalde activiteiten die het beste werken?*
+ *Wat geeft jou energie?*

Andere werkdagen (+)

Werkdagen zien er niet altijd hetzelfde uit.

Was dit een goede/gemiddelde/slechte dag?
Wat is er anders aan de tijdlijn op een slechte dag?
En op een goede dag?

Zien jouw pauzes er dan ook anders uit? Meer/minder pauzes? Andere activiteiten?
(Hoe beïnvloedt de werkdruk het pauzes nemen?)

Verschil thuiswerken en op locatie (-) kort houden

Wat is er anders aan je werkdag nu, in vergelijking met op kantoor?

Afsluiting (5 min)

Wat zijn je verwachtingen over thuiswerken voor de toekomst? Blijf je thuiswerken, ook als dat niet meer 'verplicht' is?

Plantenstekje als bedankje geven.

Waar ga je hem neerzetten?

Zijn er nog dingen die je kwijt wilt? Heb je nog vragen?

Appendix 3: Interim evaluation with homeworkers

Google Forms

Following pages show the set-up of the questionnaire sent to homeworkers. This questionnaire was sent through Google Forms.

Ideeën voor thuiswerkers

Thuiswerken is momenteel grotendeels verplicht, of in ieder geval erg wenselijk. Ik ben binnen mijn afstudeeropdracht aan het onderzoeken wat ik kan doen om het thuiswerken daarom aangenamer te maken. De afgelopen maanden heb ik daarvoor literatuur doorgespit en onderzoek onder thuiswerkers uitgevoerd (waar jij misschien wel aan hebt meegewerkt). Met die kennis ben ik gaan brainstormen voor (product)ideeën, en dat is waar deze enquête nu over gaat.

De vraag is eigenlijk: wat vind jij ervan?
In deze enquête worden twee concepten aan de hand van beeld en tekst uitgelegd. Daarna volgen voor beide concepten een paar open vragen. Wees daar alsjeblieft zo uitgebreid mogelijk want daar heb ik het meeste aan (en schroom ook niet met kritiek). Let er bij het beantwoorden op dat het niet gaat om hoe het product eruit ziet, maar om wat het doet.

Je antwoorden worden anoniem verwerkt. Jouw feedback op de conceptideeën wordt gebruikt om ze te verbeteren en daarna in detail verder uit te werken. Mogelijk komt jouw feedback in een later stadium nogmaals goed van pas. Daarom zal ik je aan het einde van deze enquête vragen of je beschikbaar bent voor eventueel vervolgonderzoek. De gegevens die je daar achterlaat worden alleen gebruikt om met jou contact op te nemen, en worden uiteraard niet gedeeld met anderen.

Alvast bedankt!

Groetjes,
Leonie Remmerswaal

Masterstudent Design for Interaction, TU Delft
Bij vragen of opmerkingen: 06 2720 6700
*Vereist

Concept idee 'Gesturelamp'

Bekijk de volgende video, de video heeft geen geluid. (of kijk 'm hier: http://www.youtube.com/watch?v=G4--33LkjE4)

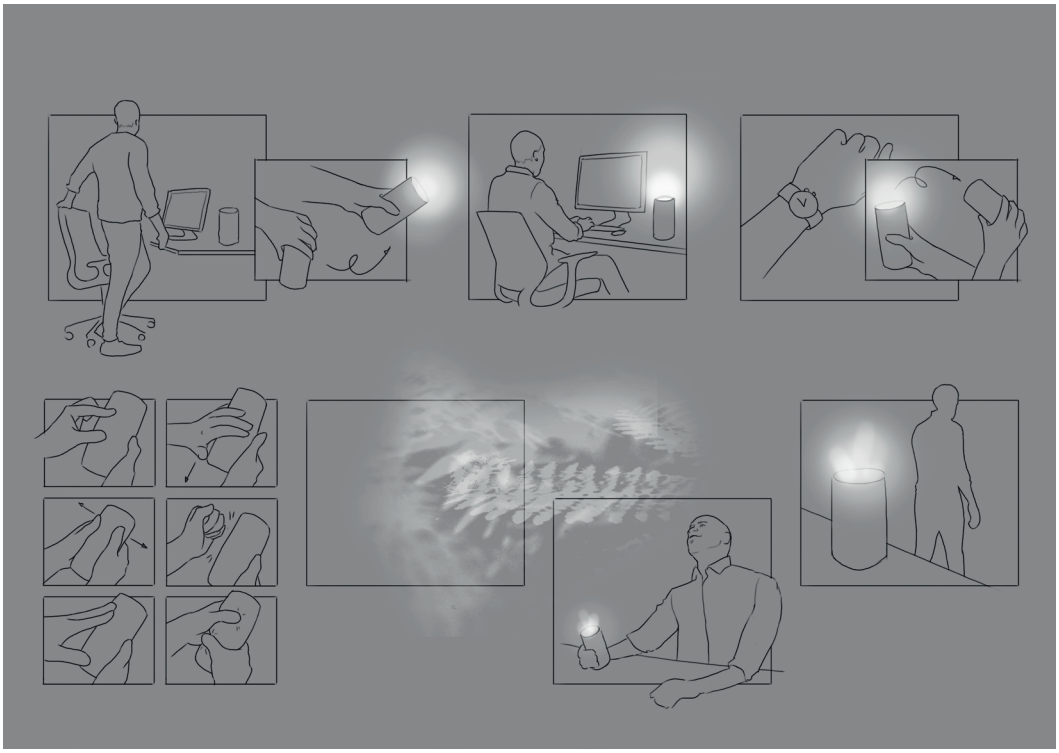
Uitleg van het concept.

Als je start met werken keer je de lamp om, daarmee zet je hem aan. Tijdens het thuiswerken functioneert de lamp gewoon als bureaulamp: de lamp is in werk-modus.

Wanneer het tijd is voor een pauze, die jij dus zelf initieert, keer je de lamp weer om. Dat activeert de vrije-tijd-modus van de lamp. Door verschillende 'gestures', gebaren zoals je bijvoorbeeld ook op je telefoon gebruikt, activeer en verander je lichtpatronen. Dit doe je zo lang als je er behoefte aan hebt. Zie het als een mengeling van een stressbal en een kaleidoscope.

Ben je er klaar mee? Dan zet je de lamp weer neer en ga je pauze houden zoals je normaliter ook zou doen. De lamp dimt uit zichzelf. Als je dan terug komt van je pauze, herhaal je de cyclus.

Je neemt zo even een bewust moment om te schakelen tussen werk en vrije tijd.



Beantwoord nu de volgende vragen. Wees zo uitgebreid mogelijk.

Let op: het gaat er niet om hoe het product eruit ziet, maar om wat het ding doet.

1. Wat vind jij goed aan dit idee? *

2. Wat vind jij niet goed aan dit idee? *

3. Wat zou jij aan dit idee veranderen, toevoegen, of weghalen? *

4. In hoeverre zou dit idee jou met thuiswerken helpen? *

Concept idee 'Sfeermachine'

Bekijk de volgende video, de video heeft geen geluid. (of kijk 'm hier: http://www.youtube.com/watch?v=wY8wWg4w1no)

Uitleg van het concept.

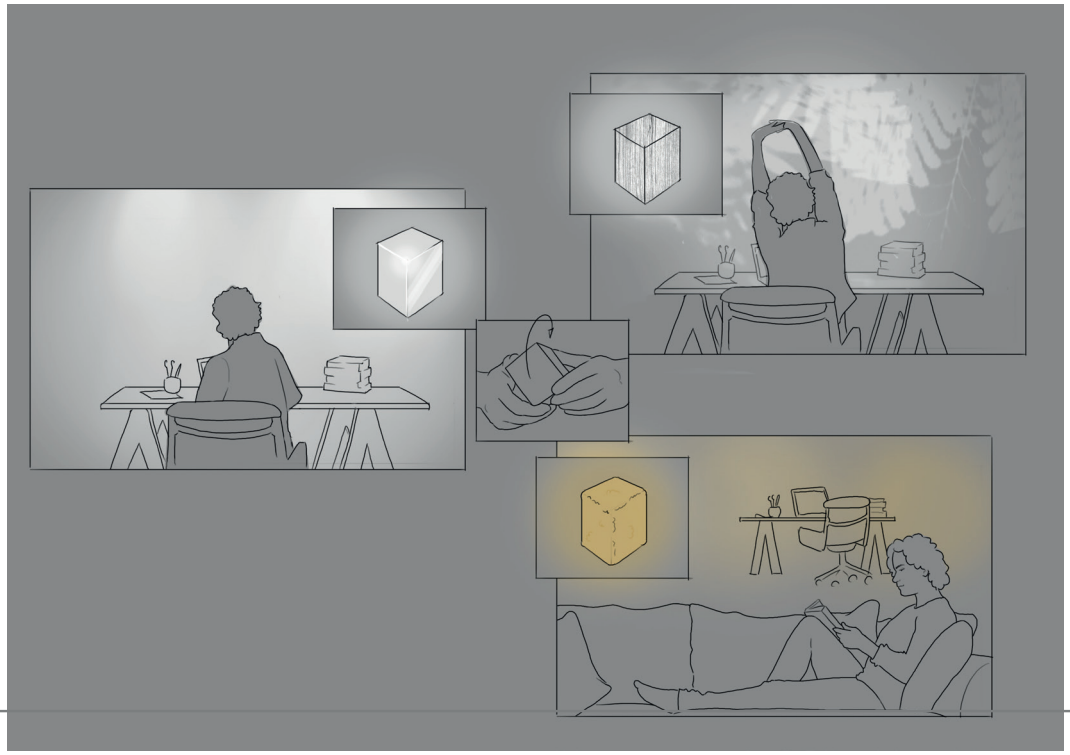
Dit product heeft drie verschillende standen, twee voor tijdens het werken en één voor daarbuiten. Je kiest een stand door het product naar de desbetreffende kant te draaien. Door gebruik van licht en verschillende materialen maakt het product een passende sfeer voor tijdens en buiten werk.

In hard-werken-stand is de verlichting feller en kouder van kleur, om de associatie met kantoor en een werksfeer te creëren. Het product zelf heeft ook een koudere, meer steriele uitstraling. Je wordt niet gestoord door het product, totdat jij besluit dat je daar aan toe bent.

In zacht-werken-stand maakt het product een meer levendige sfeer. Door dynamisch licht, geluiden (denk aan vogeltjes, geroezemoes) en tast (een briesje wind bijvoorbeeld) trekt het product voorzichtig jouw aandacht. Een vriendelijke reminder dat de buitenwereld ook nog bestaat. Het product heeft in deze stand een meer natuurlijk uiterlijk, denk bijvoorbeeld aan houttextuur.

Wanneer het dan tijd is voor een pauze, of als de dag erop zit, schakel je naar niet-werken-stand. Daarmee wordt het licht warmer en gezelliger. Het product heeft in deze stand dan ook een zachter materiaal. Het product mengt zich zo in de rest van je thuisomgeving.

Zo krijg je een sterkere associatie met werk tijdens de werkuren, maar niet daarbuiten. Het maakt je werkplek alleen een plek voor werk binnen de uren dat dat nodig is.



Beantwoord nu de volgende vragen. Wees zo uitgebreid mogelijk.

Let op: het gaat er niet om hoe het product eruit ziet, maar om wat het ding doet.

1. Wat vind jij goed aan dit idee? *

2. Wat vind jij niet goed aan dit idee? *

3. Wat zou jij aan dit idee veranderen, toevoegen, of weghalen? *

4. In hoeverre zou dit idee jou met thuiswerken helpen? *

Bedankt!

Zoals in de introductie al aangegeven, wil ik je graag vragen of je open staat voor vervolgonderzoek. Als ik je mag benaderen voor vervolgonderzoek, laat dan hieronder graag je email-adres achter.

Results

Deelnemer	Concept idee 'Gesturelamp'			
	Wat vind jij goed aan dit idee?	*Wat vind jij niet goed aan dit idee?*	*Wat zou jij aan dit idee veranderen, toevoegen, of weghalen?*	*In hoeverre zou dit idee jou met thuiswerken helpen?*
1	Ik vind de omkeer actie van de lamp nice. Ik denk dat dat een bewuste actie kan zijn waarbij je jezelf weer even "aan" zet, net als de lamp. Ik denk dat ik dan wel weer makkelijker in werkmodus ga of er juist makkelijker uit kom.	Ik snap nog niet zo goed hoe de gestures op de lamp met verschillende lichteffecten werken. Ik denk ook niet dat ik echt zin zou hebben in voor én na mijn pauze spelen met de lichteffecten. Maar opzich is het niet erg als de mogelijkheid er wel is, dan zou ik wel zien of ik er zin in heb per moment. Ik vind het rustig spelen wel een mooi contrast met het korte moment van puur de lamp omdraaien.	Misschien kan de lamp ook op een langzame niet echt storende manier aangeven wanneer het tijd is voor pauze? Bijvoorbeeld als het licht dimt of als het een andere kleur wordt? Dat je niet meteen een storende wekker hebt, maar je wel doorhebt dat het misschien tijd is voor pauze terwijl je nog rustig kan afmaken waar je mee bezig was tov. een wekker waarbij je meteen uit je concentratie raakt.	Ik weet niet zo goed of ik een extra voorwerp op mijn tafel zou waarderen, want ik houd heel erg van een leeg bureau. Maar misschien kan de lamp ook opgehangen oid. Ik weet verder dat het uiterlijk/de vorm van de lamp nu nog niet is uitgewerkt, maar het is wel belangrijk dat de lamp geen storend lichtpunt zou vormen tijdens het werken, dus bijvoorbeeld geen felle stip. Bureaulampen hebben immers een andere functie en dus vorm dan sfeerlampen bijvoorbeeld. Ik denk dat het interessant is hier nog verder over na te denken. Ik zou het wel waarderen als deze lamp dan ook echt functioneert als bureaulamp (die tolereer ik wel op mijn tafel namelijk haha)
2	Je bent even met je handen bezig, in plaats van met het scherm	Ikzelf zou het prettig vinden als je er ook een soort timer op kon zetten, zodat je weet wanneer je pauze voorbij is. Ik werk altijd met pomodoros, 25 min werken, 5 rust, dus dat zou ik handig vinden om erin te kunnen verwerken	Iets van een timer dus	Ik wil in mijn pauzes nog wel eens switchen van het ene scherm naar het andere, ik denk dat je dat hiermee minder snel doet
3	Goed; het creeert een overgang tussen werk en vrije tijd/pauze. Een beetje zoals de treinreis/fietsrit tussen werk en thuis.	Tja heb het nog niet in de praktijk kunnen toetsen. Maar je moet wel de discipline opbrengen om niet de lamp gewoon om te draaien en weg te lopen maar even het overgangmoment te creeren. Aandachtspunt is misschien dat de kaleidoscoopfunctie ook wel weer een lichtimpuls geeft en dat doet de pc/laptop ook al de hele dag. Muziek?? of natuurgeluiden ?	Misschien nog een licht- of geluidsignaal of iets dergelijk als het tijd is voor een pauze? Zie ook de opmerking over muziek of natuurgeluiden toevoegen.	Dit idee zou wat meer structuur in de balans tussen werk en pauze en de overgang daartussen kunnen aanbrengen. Ontspanmomentjes
4	creatief, actief, iets anders	je hebt niet altijd behoefte aan een lamp, energie gebruik	oplaadbare lamp, hoe stel je de tijd in? een klokje / timer oid	leuke gimmic, kan helpen om op tijd je pauzes te nemen
5	Het concept vind ik heel leuk omdat je nu een product hebt wat je constant bewust maakt van werk of vrijetijd. Hierdoor is het denk ik wel makkelijk om voor jezelf duidelijker pauzes af te bakenen. Ook is er een duidelijk moment wanneer het werken voorbij is. Daarnaast is het een simpel product en lijkt het mij heel makkelijk te gebruiken. Bovendien neemt het weinig ruimte in op je werkplek.	Doordat het op basis van licht werkt lijkt het mij overdag lastig om er veel profijt van te hebben omdat je de projecties dan niet goed ziet.	Je zou aanvullend nog geluiden kunnen toevoegen. Zodat als je de lamp in vrijetijds-modus zet je geluiden te horen krijgt die je van te voren hebt ingesteld en associeert met ontspanning en vrije tijd. Dat werkt in een lichte omgeving misschien beter dan een lamp. Je zou eventueel nog verschillende kleuren licht kunnen toevoegen, zodat je een nog beter onderscheid kunt creeëren tussen werk- en vrijetijds-modus In dit ontwerp lijkt de lamp met name gericht te zijn op het plafond. Het lijkt mij echter fijner als je hem makkelijk schuin zou kunnen neerzetten zodat je het licht op de muur tegenover je kunt projecteren en je niet omhoog hoeft te kijken, want dat hou je niet zolang vol.	Het grootste probleem waar ik met thuiswerken tegenaan loop is het afbakenen van pauzes en het afsluiten van de werkdag. Ik denk dat dit product er aan kan bijdragen om het onderscheid tussen werk en vrijetijd bewuster te onderscheiden.

Deelnemer	Concept idee 'Gesturelamp'			
6	ik ben heel erg benieuwd naar het materiaal en de feel. want als het echt een stressbal achtig gevoel heeft (maar fancy) dan zie ik er wel wat in. ik ben echt al jaren zuur over dat mijn broer ooit een ocean light had die die weg heeft gegooid zonder aan mij te geven. dus het idee van spelen met licht spreekt me heel erg aan.	ik zou zelf niet de rust kunnen vinden voor zoiets tijdens het werken ben ik bang. ik zou of dat ding aan laten staan tijdens het werken (lekker iets om naar te kijken naar meetings, leuk, maar niet jouw bedoeling) of vergeten 'm aan te zetten. zolang ik achte rmn werk plek zit en mn laptop staat open op iets werk gerelateerds voelt het niet als pauze voor mij	wat er in mij op kwam, is om dit concept te hebben maar dan misschien wel op een timer (die je vast om heel bewuste redenen er niet in hebt gedaan maar ok). ik zie voor me dat dit ding ergens semi in mn zicht op JUIST niet mn werkplek zou zijn, bijvoorbeeld in mn keuken of bij mn bank. en dat er dan opeens langzamerhand lichtbewegingen komen waar ik dan onbewust mesmerized van wordt en dan naar die kamer/plek geleid wordt om mn pauze te nemen. (hoe ik dan ooit weer begin is de volgende vraag)	dit precieze idee zou mij niet heel erg helpen. het is eerder iets waar ik na mn werk van zou genieten eigenlijk.
7	Het klinkt als iets wat goed de aandacht trekt. Je bent even helemaal gefocust op die lamp. Juist dat vind ik persoonlijk erg fijn als het aankomt op het schakelen naar vrije tijd/even totaal niet aan werk denken. Daarbij biedt de lamp de optie om te variëren qua patronen, wat ervoor zorgt dat je niet telkens naar hetzelfde patroon kijkt.	Kan me voorstellen dat, afhankelijk van het aantal patronen, de lamp op een gegeven moment niet meer die focus aantrekt (je raakt eraan gewend). Daarnaast vraag ik me af of het goed is om de lamp ook voor werk te gebruiken. Ik kan me voorstellen dat dat ook wel weer een associatie met werk kan veroorzaken. En daardoor dus het beoogde effect tijdens de vrije tijd modus vermindert.	Misschien meer beleving toevoegen doordat je er meer mee kan dan alleen gestures. Misschien dat je er ook gewoon letterlijk in kan knijpen/draaien of bijvoorbeeld dat het geluid maakt dat meeveranderd met het licht.	Dat ligt er echt aan hoe goed het mij uit mijn werkdenk modus haalt. Ik vind micropauzes initiëren vaak lastig, dus het zou me zeker helpen als het mijn aandacht trekt en ruimte biedt om mijn gedachten te laten 'stromen'.
8	Origineel idee. Kan me goed voorstellen dat je met licht kunt 'spelen' en verschillende stemmingen / sferen kunt opwekken. Zoals: nu werken, nu ontspannen en zo. Je maakt het onderscheid tussen werken en ontspannen meer zichtbaar, letterlijk gezien.	Kan geen argument bedenken.	Ik zou zeker een timerfunctie toevoegen. Daar heb je vast en zeker al aan gedacht. Dat is nodig om je werk beter te plannen. Leg een koppeling met een visie op (thuis)werken. Er zijn allerlei visies in omloop. Er is er een (weet de naam even niet) die zegt: 25 min werken en telkens 5-10 minuten pauze. Dat kan deze lamp natuurlijk prima ondersteunen.	Ik zou zo'n lamp zeker uitproberen. Maar het is denk ik voor mij geen noodzakelijk attribuut.
9	Multi-functioneel (als lamp en 'stressbal').	Het stimuleert misschien wat minder om even van de werkplek weg te lopen, wanneer je in je pauze de lamp als stress-relief (door het spelen met de lichtjes) te gebruiken.	Een soort 'pomodoro-techniek' toevoegen aan de lamp: de lamp heeft na het eind van de pauze een bepaalde kleur/patroon die aangeeft dat je pauze voorbij is. Nog beter is als je de duur van deze pauze zelf kan instellen.	Ik weet niet hoeveel dit product voor mij persoonlijk zou toevoegen; vaak zoek ik tijdens mijn pauze-momenten andere manieren om even te 'ontstressen'.
10	het maakt je aan het begin van een werkperiode bewust hoe lang je wilt werken en wanneer je dus pauze wilt houden. Met de lichten 'spelen' heeft wellicht een beloningsaspect. Tot slot kan het feit dat er een lampje aan staat, een vertrouwd gevoel geven	ik denk dat de lichteffecten gauw gaan vervelen. Daarnaast is er geen indicatie van hoe lang je pauze houdt, maar dat is niet zo'n probleem vind ik	Ik denk dat je het zo kan laten, simpel concept, niet te ingewikkeld maken	Ik vraag me af of ik elke dag bewust pauzemomenten wil bedenken. Meestal fluctueert dat een beetje, maak ik bijvoorbeedl eerst iets af voordat ik ga lunchen, omdat ik anders uit de flow ben. Maar voor mensen doe het lastig vinden om op tijd te pauzeren, kan het wellicht helpen
11	Het is functioneel en kan gebruikt worden tijdens en na werk. Zelfs als thuiswerken eindigt, is de lamp handig om te hebben.	ik weet niet of ik het zelf zou gebruiken. Mijn pauzes zijn vaak druk en weet niet of als ik tijd overheb ik naar een lamp / lichtshow wil kijken... Ik neem liever afstand van scherm tijd en ga naar buiten.	Ik zou het meer een soort timer maken, en met lichteffect iemand herinneren om pauze te nemen.	Het zou mij niet veel helpen met thuiswerken. Het engine voordeel is de lamp zelf maar in dat geval kan ik elke soort tafellamp kunnen kopen.
12	Het lijkt me fijn om een vriendelijk ding op mijn bureau te hebben dat is afgestemd op mijn werk/pauze-modus. Het idee van licht vind ik ook prettig.	Ik vind het moeilijk om me er een goede voorstelling van te maken. Wat kan hij nog meer dan aan/uit. Wat kan ik er nog meer mee dan het als lamp te gebruiken. En als ik pauzeer zit ik niet achter mijn bureau en ben ik niet op mijn werkkamer. Ik snap niet goed wat de meerwaarde is van de lamp tijdens mijn pauze.	Misschien een timer er aan toevoegen, zodat de lamp aangeeft wanneer het tijd is voor pauze. Met een vriendelijk geluidje erbij? Op het plaatje lijkt het alsof het kneedbaar is. Daarvan zie ik niet de meerwaarde, dat zou ik weglaten. Misschien kun je nog spelen met verschillende kleuren licht, afhankelijk van wat je 'nodig' hebt op verschillende delen van de dag. Of misschien afhankelijk van je stemming/energieniveau. En in de winter misschien een toevoeging aan daglicht?	Als er een timer in zou zitten zou het me wel kunnen helpen denk ik om op gezette tijden pauze te nemen. Verder vind ik het lastig om me er een goede voorstelling van te maken.

Deelnemer	Concept idee 'Sfeermachine'			
	Wat vind jij goed aan dit idee?	*Wat vind jij niet goed aan dit idee?*	*Wat zou jij aan dit idee veranderen, toevoegen, of weghalen?*	*In hoeverre zou dit idee jou met thuiswerken helpen?*
1	Ik vind de verschillende standen van het licht nice, ik denk dat ik dat zou waarderen tijdens mijn werk en tijdens mijn na-het-werk-chill-momentje. Ook vind ik het wel leuk dat de stand terugkomt in het uiterlijk van het product.	Ik zou opnieuw bang zijn dat het licht in de weg zit.	Ik bedenk me dat het misschien tof zou zijn als het ding bestaat uit twee objecten, namelijk de lichtbron zelf (die dan de functie kan hebben zoals hierboven of hiervoor beschreven) en een ander object waar je de lichtbron in kunt verstoppen als het ware zodat het je niet afleidt of zodat het niet fel in je gezicht schijnt (door bijvoorbeeld de lichtbron in stralen te focussen ipv overal heen). Op die manier heb je ook een "thuis" voor het product. (Bij mij hebben spullen een plek waar ze altijd staan en ik weet niet of ik zou kunnen wennen aan een blokje licht dat op verschillende plekken in mijn kamer zwerft.)	Ik denk vergelijkbaar met het vorige ontwerp. Ze lijken ook op elkaar en ze zouden ook prima te combineren zijn in één ontwerp denk ik.
2	Veel mensen hebben op dit moment geen echte werkplek en zitten gewoon aan de keukentafel - ik denk dat dit een mooi product zou zijn om toch het gevoel van een aparte werkplek te hebben.	Ik zou er niet per se ook geluid uit willen hebben, ik denk dat het dat iets minder multifunctioneel maakt	Misschien zou je het geluid alleen kunnen laten afspelen bij het wisselen van de welstand naar de pauzestand?	Ik denk dat het psychologisch zou helpen je werk en privé te scheiden, zelfs al zijn die twee op dezelfde plek
3	Ja leuk. Komt tegemoet aan de suggestie die ik bij het vorige (lamp die je draait) idee heb gedaan. Vooral de geluiden spreken mij aan.	Nou ik vind dit eigenlijk wel een heel goed idee. Is de tijd dat de werkdag of pauzemoment ook in te stellen? Je wil natuurlijk niet gestoord worden door vogelgeluiden oid als je nog in een videocall zit dus in hoeverre is dat moment ook te bepalen? Ik weet niet in hoeverre de lamp ook al ziet ie er in de relaxmodus anders uit je toch herinnert aan je werk en alles wat nog niet af is?	Je gaat er bij dit concept wel vanuit lijkt dat de werkplek zich ook in de huiskamer bevindt. Dat hoeft natuurlijk niet. Kun je dan de lamp meenemen van de werkplek naar je huiskamer of zelfs slaapkamer ?	Ja ik denk het wel. Ook hier een afsluiting van de werkdag. Zoals gezegd spreken de geluiden/briesje mij erg aan.
4	origineel, multi functioneel	energie gebruik, hoe laad je de lamp op? is de lamp fel genoeg om bij te werken/lezen, je hebt niet altijd behoefte aan licht, kan je de muziek ook uitzetten?	eventueel de optie van meer verschillende kleuren	het is weer wat anders, je moet het wel inbedden in een soort wens tot gedragsverandering,
5	Doordat het product 3 'standen' heeft is het afwisselend waardoor er denk ik minder snel gewenning optreedt aan de lamp. Leuk dat het design van de lamp ook wisselend is tussen de 3 zijden. Ook goed dat er een geluidscomponent aan dit product zit.	Opnieuw vraag ik mij af hoe groot het profijt van een lamp is, wanneer de ruimte waarin gewerkt wordt al erg licht is.	Misschien wat ver doorgedacht, maar misschien zou je nog een verwarmingscomponent kunnen toevoegen. Met name in de wintermaanden hebben veel mensen last van hele koude handen achter de computer etc. Als de lamp wat lokale warmte uitstraalt, geeft dat een gevoel van geborgenheid en ook wat comfort voor je handen.	Ik denk dat het zeker kan bijdragen om een beter contrast te creeëren tussen werken en vrijetijd. Door de 3 verschilldende standen, kan er ook onderscheid gemaakt in het soort waar je mee bezig bent.

Deelnemer	Concept idee 'Sfeermachine'			
6	ik vind het idee van de 'friendly reminder dat de buitenwereld bestaat' mooi	ik hou er zelf niet van om """"onnodige""""" elektrische producten te hebben in huis. dus iets wat altijd aanstaat ben ik geen fan van. ook snap ik de relatie van de kleuren licht, maar van kil licht wordt ik nooit gelukkig, ook niet in een werksituatie. ik vind het juist heel fijn aan thuiswerken dat het warmer en gemoedelijker voelt. ik weet ook niet zo goed wat ik vind van het idee dat dit ook voor na werk is, omdat het wel als een werk gerelateerd product voelt. ik ben bang dat ik mezelf dan te bewust daarvan zou zijn? maar dat kan ik niet zo goed inschatten	ik dacht in eerste instantie dat dit iets was wat je een plat vormpje was die je op de muur kon plakken en op een of andere manier vond ik dat idee wel vet	niet zo veel ben ik bang
7	Het feit dat er ook op geluid en zaken als textuur wordt ingegaan. Dat verbeterd de ervaring voor mijn gevoel. Lijkt me vooral een goed product voor aan het einde/begin van de werkdag. Ook goed dat er nog een soort 'overgangsstand' is tussen hard werken en vrije tijd. Goed om te zien dat je zelf bepaald wanneer je toe bent aan verandering van de lampstand. Lijkt me ook goed dat je door ander soort licht ook een soort afstand kan nemen van je werk (draagt bij aan het gevoel dat je in een andere omgeving zit).	Dat je het ook gebruikt voor korte pauzes. Ik vraag me af of je dan genoeg tijd hebt om echt goed te schakelen/ of je het dan niet alsnog gaat associëren met werk. Ik vraag me daarbij af of het starten met werken niet lastiger is als je in zo'n ontspanmodus de dag begint.	Misschien iets als de mogelijkheid om automatisch aan het einde van een werkdag over te schakelen naar ontspanstand. En misschien een manier waarop je ook langzaam van de ene naar de andere stand over kan gaan met name bij de start van werk (daar wil je toch even inkomen).	Ik denk voor de kleine pauzes minder, maar vooral het schakelen uit werk erg goed.
8	Net als hiervoor: ik vind het een origineel idee. Er is nu al wel zo'n hue lamp, die van kleur kan veranderen (philips), maar het is niet echt een geweldig ding. Ik kan me voorstellen dat een lamp of een verlichtingssysteem (meerdere componenten) een hulpmiddel kan zijn om verschillende sferen op te roepen of bepaalde activiteiten (werk, ontspannen) te ondersteunen.	Geen enkel bezwaar of voorbehoud. Eentje dan: als je dit goed wilt doen, gaat het niet goedkoop worden. Mijn ervaring is dat goede verlichting erg duur is. Ook is het een vak apart om voor bepaalde ruimtes een verlichtingsplan te maken. Onderschat dat niet (maar dat wist je natuurlijk al) .Kijk	kijk goed om je heen welke initiatieven er reeds zijn. Praat met deskundigen op gebied van verlichting.	Sta er zeker voor open, maar is voor mij geen noodzakelijk attribuut. Goede tafel, stoel, computer, akoestiek, koffie zijn voor mij belangrijker.
9	Leuk idee! Vooral fan van de geluidjes (persoonlijk werk ik altijd heerlijk met het geluid van regen/wind o.i.d.). Ook goed om de associaties met de verschillende werksferen gescheiden te houden door de drie standen.	Nada.	De niet-werken stand (warm licht) inclusief effecten (geluid, patronen). Ook graag de optie om OF geluid OF patronen aan te zetten, maar niet per definitie beide tegelijk.	Met name de geluiden zouden me zeker helpen. Normaal gesproken zou ik hiervoor mijn computer aanzetten (wat weer afleidend is). Met dit product zou ik, als ik simpelweg iets moet lezen en mijn computer niet nodig heb, toch naar fijne geluiden kunnen luisteren zonder afgeleid te raken.
10	associatie tussen sfeer en bezigheden creeren	ik vraag me af of 'kil' licht activiteit bevordert? Sterke verlicihting is wel belangrijk. Geluid kan concentratie verhogend zijn (muziek) of afleidend, dat is voor iedereen ook heel persoonlijk	Veel individuele instellingen met uitleg over wat concetratieverhogend en -verlagend kan werken	ik gebruik al verlichting en muziek ter ondersteuning van mijn concentratie, dus ik heb geen behoefte aan een spcifiek apparaat hiervoor
11	De verschillende kleuren en het multi functionele gebruik.	als ik het goed begrijp verander je de stand handmatig, ik zou er ook een timer functie aan geven.	timer functie	deels, ik Ben erg geintreseerd in de focus en het effect van licht.
12	Het product is ondersteunend aan de aard van het werk dat je doet. Kan ook helpen om in een meer relaxte werktoestand te komen of juist in een sterkere concentratie-modus. En ook fijn dat het product na/buiten het werk weer een ander uiterlijk heeft waardoor er geen associatie met werk is.	Ik denk dat ik ook in de hard-werken stand liever een natuurlijk uiterlijk heb, dus niet steriel, maar de aard van het licht kan misschien wel verschillen. Dat lijkt me wel nuttig. Verder wil ik wil ik na het werk eigenlijk niks meer zien dat met het werk te maken heeft. Ik heb een aparte werkkamer, dus 's avonds zie ik het product niet. Maar dat is een luxepositie.	Dat vind ik lastig. In ieder geval moet de levendige stand voor mij niet té dynamisch worden. Dus rust uitstralen. En associatie met natuur is erg fijn. Ruisende bomen?	Het zou me misschien wel kunnen helpen mits het niet te kunstmatig wordt. Ik vind het een heel interessant en leuk idee.

Appendix 4: Other explorations in ideation phase

Not all explorations in the ideation phase have a direct relation to the final design. They are therefore not part of the main story in this thesis, but are worth to mention either way. This appendix discusses three of those explorations.

Hands-on: light textures

Why:

Inspired by the principles of brilliance light, and biophilic light textures (both discussed in chapter 1), hands-on explorations with light and materials were done. The goal was to create dynamic light textures, moving light patterns that create a feeling of fascination.

Findings:

Some highlights of these hands-on explorations are as follows.

A combination of a small torch light and brown packing tape creates cloud-like patterns. These patterns could be projected on a surface (figure A2, video A2), within a shape (figure A1), or somewhere in the room (video A1). Applying the packing tape in a shape creates a two sided effect: lit on one side, it creates brilliance light and the shape shows, while lit on the other side, no effects occur (figure A3, video A3).

Another highlight was the combination of the small torch light and deformed transparent plastic. Light reflected from this deformed plastic creates a water-like effect, caustics (figure A4, video A4). One other experiment with semi-transparent paper and hollow-core plastic created an effect resembling how sand ripples at the beach (figure A5, video A5)

Take-aways, why this experiment was not continued with:

The experiments created plenty of light textures, both biophilic as well as ones with potential for further ideation. However, the light effects were often based on light projection, which were only visible in a darkened environment. Then, trying to translate these light effects to projection within a lamp, the effects became obsolete. Though these light textures did create fascinating effects, they are not suitable for application within this project.

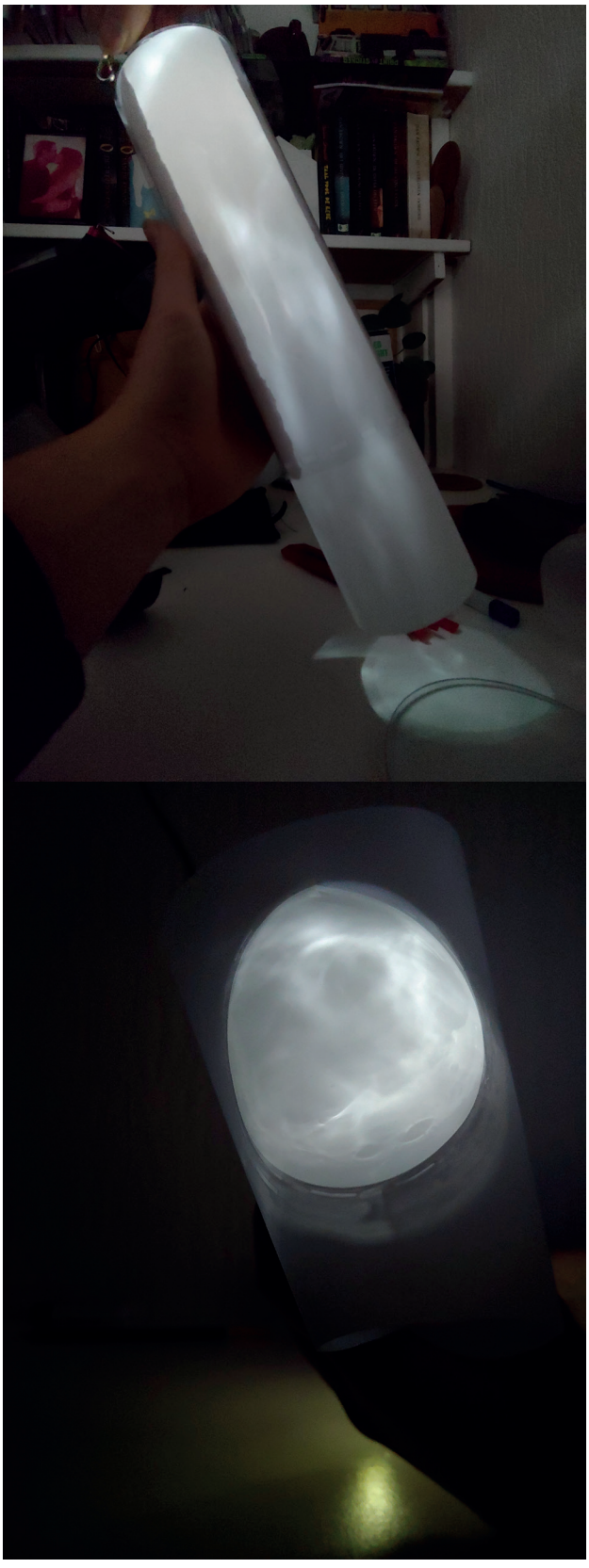


Figure A1: Projected within a cylinder, the light creates a moon-like visual.

Figure A2: Cloud-like patterns through packing tape, projected on a plane.

Figure A4: Caustics effect through reflection on deformed clear plastic.

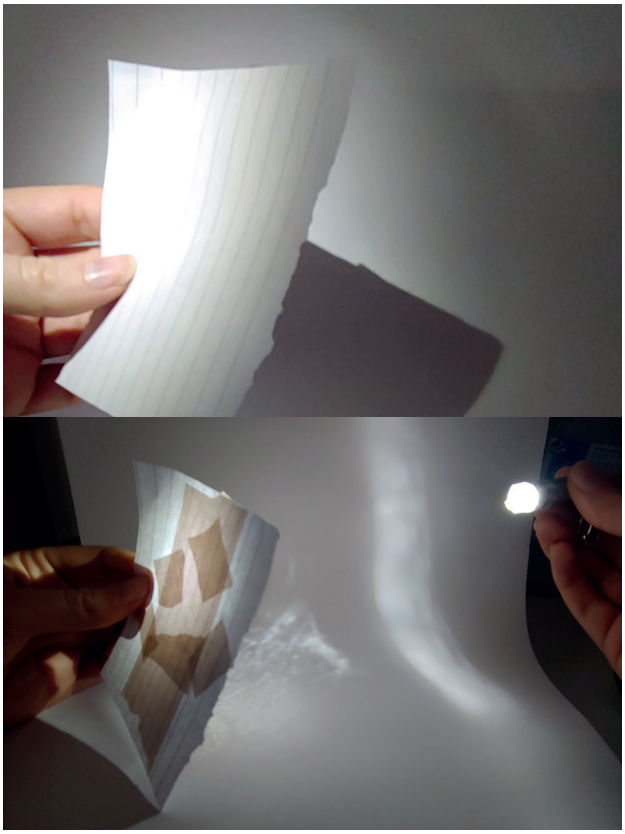


Figure A3: Two-sided effect of a packing tape smiley face.

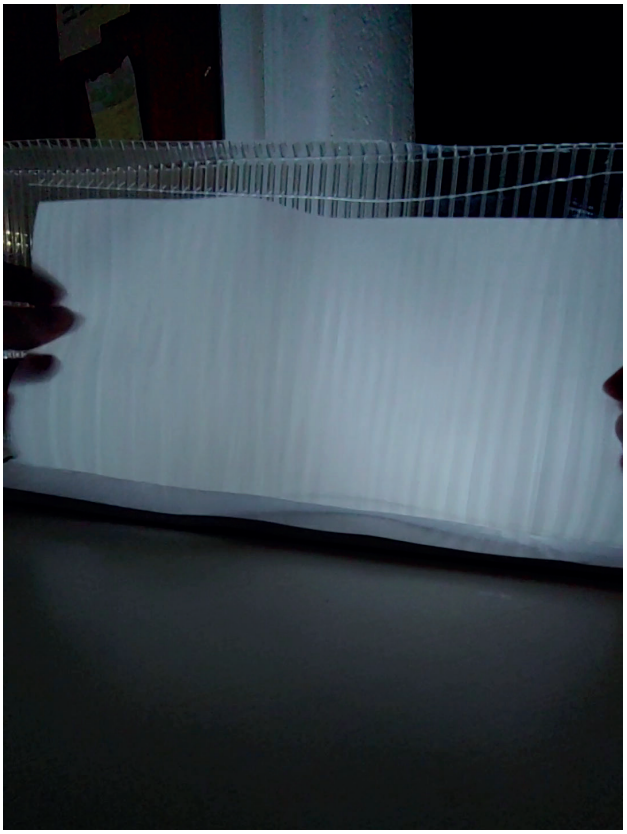


Figure A5: Sand-like ripples through semi-translucent paper and hollow-core plastic.

Inflatables and aeroMorphs

Why:

The idea of an inflatable lamp desires some experimentation to figure out the feasibility of it. Cutting shapes from a variety of plastics (e.g. garbage bags, PEVA shower curtain, plastic folders) and applying heat using an iron, inflatables were made.

Findings:

Creating hand-made inflatables using plastic and heat showed to be quite easy (figure A6, video A6). In this process, shapes based on aeroMorphs were tried out too (figure A7, video A7). These aeroMorphs are shape changing inflatables that can transform from flat to elaborate 3D shapes (Ou et al., 2016).

Take-aways, why this experiment was not continued with:

Combining these inflatables with light showed less successful. As a basic, static stand-alone lamp, the idea would be feasible: especially the translucent material created a soft ambient light. However, combining the fascinating light textures with these inflatables did not result in any visible effect. The idea of aeroMorphs was therefore discarded.

Haptic seeking moodboard

Why:

Both from the principles of biophilic design (see chapter 1.2.3) as well as findings from the multisensory mapping method (chapter 3.1.4) it showed important to elaborate on haptics in the ideation phase. Touching and haptic seeking (the near possibility of touching) are fundamental when it comes to biophilic design, as viewing alone lacks action-reaction (Bloomer, 2008). Therefore, a moodboard was created, showing 'things' that cause the feeling of haptic seeking (figure A8).

Findings:

The 'things' included in the moodboard are surface textures or interactions. Upon reasoning with oneself as to why things cause haptic seeking, it all boils down to collecting information that our eyes cannot detect: temperature, pressure, vibration, texture, mass. Touching helps to form perception. There is a sense of curiosity, a desire to learn about the material. Sometimes we seek touch to find comfort (a soft blanket or a cup of tea to warm your hands on) or satisfaction (rolling your fingers across the flaps of a mailbox).

Take-aways, why this experiment was not continued with:

While the final design discussed in chapter 4 also involves haptics, the interaction is not inherently focused on haptic seeking. And while this experiment did create a better understanding of the reasons behind haptic seeking, the final design did not need further implementation of haptics as haptic seeking is not the main purpose of the product.

Ou, J., Skouras, M., Vlavianos, N., Heibeck, F., Cheng, C. Y., Peters, J., & Ishii, H. (2016). *aeroMorph - Heat-sealing inflatable shape-change materials for interaction design*. In Proceedings of the 29th Annual Symposium on User Interface Software and Technology (pp. 121-132).

Bloomer, K. (2008). *The Picture Window: The Problem of Viewing Nature Through Glass*. In S. R. Kellert, J. H. Heerwagen & M. L. Mador (Ed). *Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life*. (pp. 253-261). Hoboken: John Wiley & Sons.

Figure A6: Home-made aeroMorph inflatable.

Figure A7: Inflatables were made by melting shower curtain in shapes using an iron.

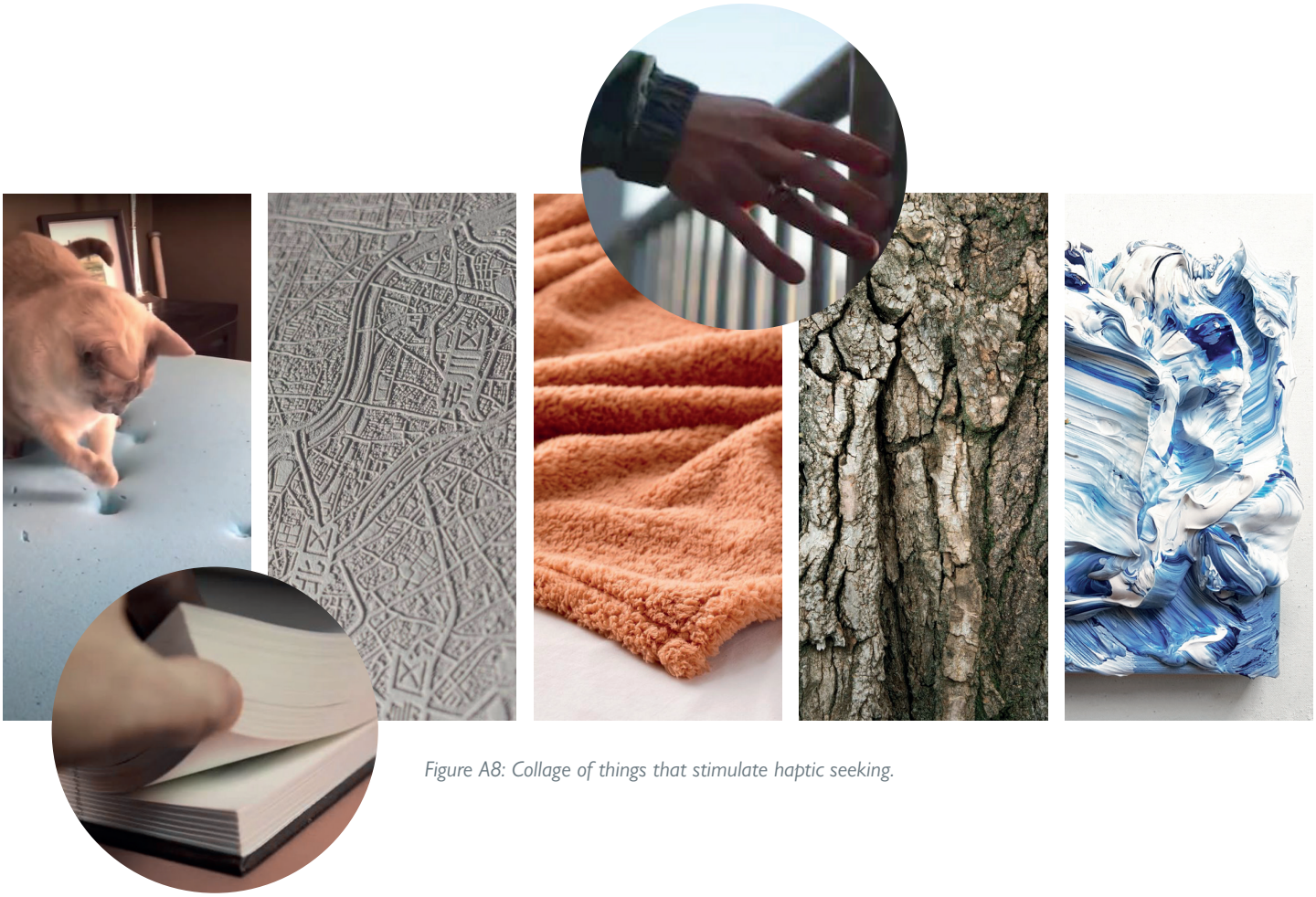


Figure A8: Collage of things that stimulate haptic seeking.

Appendix 5: Product concept evaluation study

Google Forms

Following pages show the set-up of the survey sent to homeworkers. This questionnaire was sent through Google Forms.

The following statements were used. They were translated to Dutch and presented in a scrambled order, so that not all statements regarding the same scale were presented consecutively.

Being-away scale (from PRAS)

1. Using this product helps me get away from it all.
2. Using this product is an escape experience for me.
3. Using this product helps me get relief from unwanted demands on my attention.

Fascination scale (from PRAS)

4. For me this product has many fascinating qualities.
5. My attention is drawn to many interesting things about this product.
6. For me using this product is a captivating experience.

Extent scale (from PRAS)

7. Using this product will sustain my interest.

Compatibility (NOT from PRAS)

8. This product suits working from home.
9. This product suits my WFH-environment.

Does it re-establish borders?

10. This product helps me to separate work and private time.

Does it make switching moments more conscious?

11. This product helps me structure my WFH-day.
12. This product helps me be conscious about switching between work and private time.

Longevity:

13. I would use this product for a longer period of time.
14. This product is useful, also when used repeatedly.

Productconcept voor thuiswerkers

Thuiswerken is momenteel grotendeels verplicht, of in ieder geval erg wenselijk. Ik ben binnen mijn afstudeeropdracht aan het onderzoeken wat ik kan doen om het thuiswerken daarom aangenamer te maken. De afgelopen maanden heb ik daarvoor literatuur doorgespit, onderzoek onder thuiswerkers uitgevoerd, en met die kennis (product)ideeën verzonnen. Het resultaat van die afgelopen maanden is waar deze vragenlijst over gaat.

In deze enquête wordt allereerst een productconcept uitgelegd aan de hand van beeld en tekst. Er zit ook videomateriaal met geluid in deze enquête. Daarna volgen er een aantal gesloten en open vragen. Het invullen van de vragenlijst duurt ongeveer 15 minuten. Je kunt de enquête het beste op een computer invullen, dan is het beeldmateriaal het beste te bekijken.

Je antwoorden worden anoniem verwerkt. Jouw antwoorden worden gebruikt om te valideren in hoeverre het concept voldoet aan de ontwerpdoelen die ik aan het begin van mijn afstudeeropdracht heb opgesteld. Ook wordt jouw feedback in acht genomen voor verdere ontwikkeling van het concept. Wees daarom graag eerlijk, en schroom niet met kritiek.

Alvast bedankt voor je deelname!

Groetjes,
Leonie Remmerswaal

Masterstudent Design for Interaction, TU Delft
Bij vragen of opmerkingen: 06 2720 6700
*Vereist

Uitleg van het concept: 'Pattern Lamp'

Pattern Lamp is een lamp voor thuiswerkers. Je hangt de lamp ergens in de buurt van je werkplek, zodanig dat je er altijd zicht op hebt. Het werkt goed om hem zo op te hangen, dat je hem ziet vanuit je ooghoeken. Je stelt een timer in op hoe lang jij aaneengesloten wilt werken. De lamp helpt je om je dan ook aan die geplande tijd te houden. Als het tijd is voor pauze, stimuleert de lamp je om ook echt even weg te stappen van je werkplek. De lamp laat dan de keuze aan jou: neem je inderdaad een pauze, of ga je toch direct weer verder met werken?

Deze video laat het gebruik van de lamp zien. Let op: bekijk deze video met geluid!

http://youtube.com/watch?v=FJncEa9shF4

Het gebruik is dus als volgt.

De lamp bestaat uit twee delen: de lamp zelf en de houder waarmee hij aan de muur hangt. Aan het begin van je werkdag pak je de lamp uit de houder en draai je hem van niet-werk-modus naar werk-modus. Je stelt de timer in. Dan blaas je de lamp op, en gaat het licht aan. Dan hang je de lamp terug in de houder, nu dus met de werk-modus naar buiten.

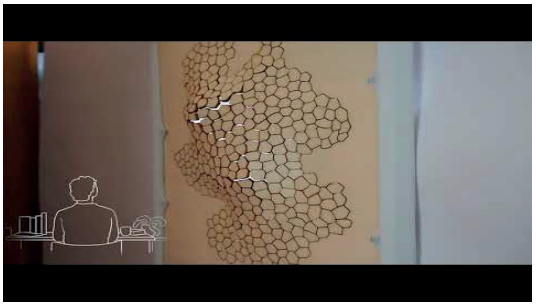
Dan begint de timer te lopen. Terwijl je aan het werk bent, loopt de lamp langzaam leeg. Zodra de lamp helemaal leeg is gelopen, klinkt er een geluidssignaal: vogelgeluiden laten je weten dat de timer is afgelopen.

Dan beginnen er zich lichteffecten te vormen. De lamp beweegt in willekeurige patronen en trekt daarmee je aandacht, even met je ogen weg van werk.

De keuze is dan aan jou. Je neemt pauze, of je gaat toch meteen verder met werken. Na je pauze (of dus direct, als je de pauze besluit over te slaan), blaas je de lamp opnieuw op. Dan herhaalt zich de cyclus met de timer.

Aan het einde van je werkdag draai je de lamp weer terug naar niet-werk-modus. De lamp staat dan uit en er is niets van het patroon te zien.

Bekijk de volgende video. Deze video laat de beschreven lichteffecten zien. Deze video heeft geen geluid.



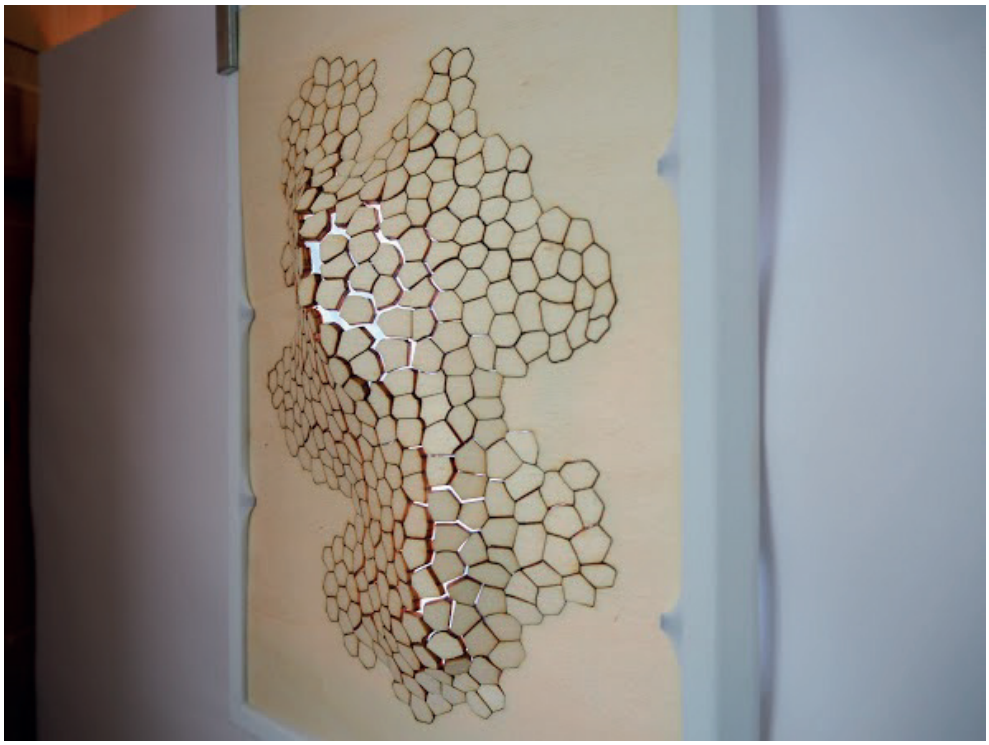
http://youtube.com/watch?v=mAvC8DHRLH4

Als je nu een goed beeld hebt van wat de Pattern Lamp is, ga dan door naar de vragen.

Geef voor elke uitspraak hieronder aan in hoeverre je het ermee eens bent.

Daarbij is 1 'Helemaal niet mee eens', en 7 'Helemaal mee eens'.

Bekijk eventueel nog eens de video: https://youtu.be/mAvC8DHRLH4



1. Gebruik van dit object helpt me aan dagelijkse dingen te ontsnappen. *
(Let op: er staat 'ontsnappen', er staat NIET 'ontspannen')

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

2. Dit object heeft veel fascinerende eigenschappen. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

3. Gebruik van dit object is intrigerend. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

4. Gebruik van dit object zorgt voor een gevoel van ontsnapping. *
(Let op: er staat 'ontsnapping, er staat NIET 'ontspanning')

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

5. Er is veel interessants gaande en dat trekt mijn aandacht. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

6. Dit object houdt mijn aandacht vast. *

Markeer slechts één ovaal.

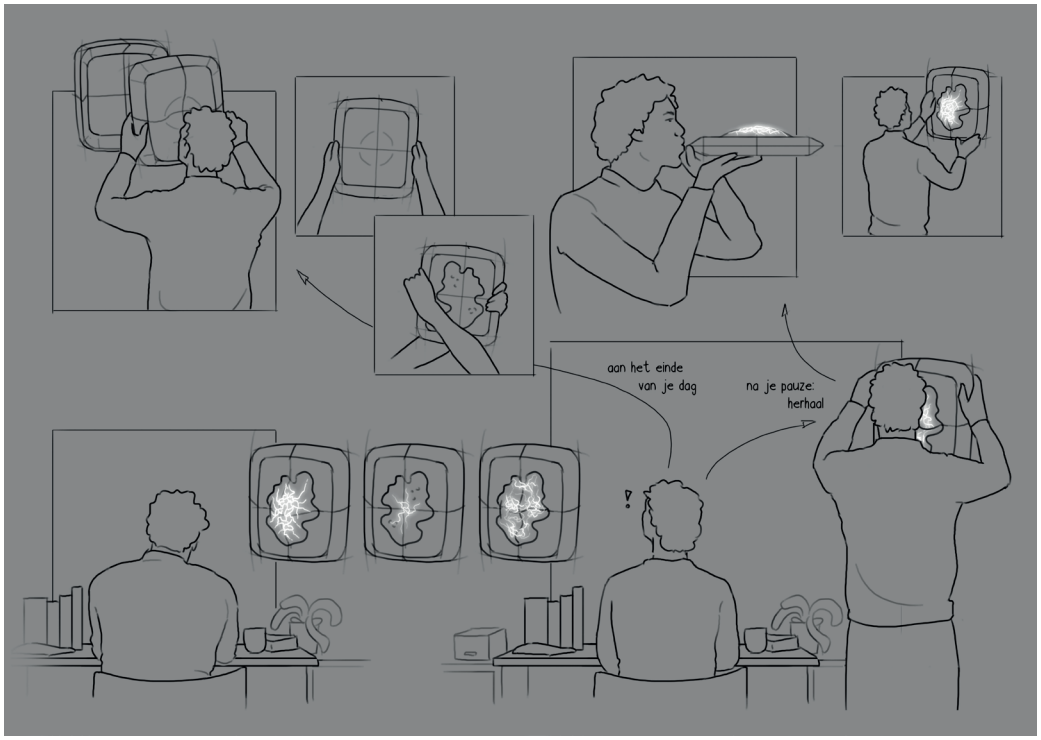
	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

7. Gebruik van dit object helpt me weg te komen van dingen die ongewenst aandacht van me vragen. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

Even het geheugen opfrissen. Kijk eventueel nog eens de video:
https://youtu.be/FJncEa9shF4



8. Dit object past bij thuiswerken. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

9. Dit object past bij mijn thuiswerkomgeving. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

10. Dit object helpt mij om werk en vrije tijd van elkaar te scheiden. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

11. Dit object helpt mij om structuur aan te brengen in mijn thuiswerkdag. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

12. Dit object helpt mij stil te staan bij het schakelen tussen werk en vrije tijd. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

13. Ik zou dit object voor een langere tijd gebruiken. *

Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

14. Ook bij herhaaldelijk gebruik is dit object nuttig. *

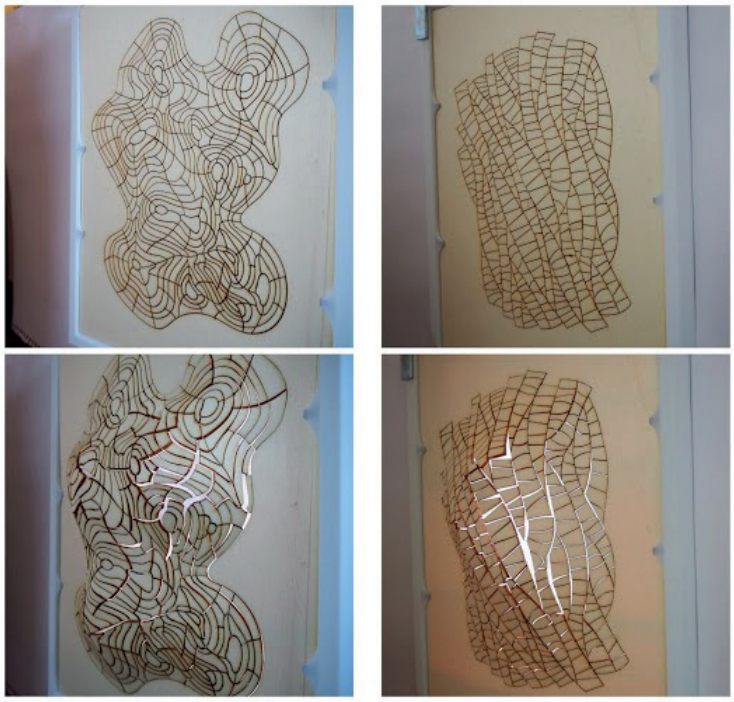
Markeer slechts één ovaal.

	1	2	3	4	5	6	7	
Helemaal niet mee eens	◯	◯	◯	◯	◯	◯	◯	Helemaal mee eens

Dan nog een paar open vragen.

15. Hoeveel geld zou jij voor dit product over hebben? *

16. Het uit hout gesneden patroon behandeld in deze vragenlijst is één van de vele mogelijke patronen. De patronen hieronder zijn nog twee voorbeelden. Wat voor patroon zou jij nog meer willen zien? *



Bedankt voor het invullen van deze enquête!

17. Heb je nog opmerkingen, aanvullingen, ideeën, of andere zaken die je kwijt wilt? Laat die dan hier achter.

Results open-answer questions

Deelnemer	*Hoeveel geld zou jij voor dit product over hebben?*	*Wat voor patroon zou jij nog meer willen zien?*
1	50,-	bloemen, golven.
2	70	het rechter patroon met de rechthoekjes. ik zou ook minder organische patronen willen zien, zoals driehoeken of cirkels met sterren. het organische associeer ik met de huid en dat maakt het minder mooi om naar te kijken, al is dat misschien een weinig voorkomende associatie.
3	25 euro	iets met meer verspringende kleuren, wel zachte tinten
4	50 - 100 euro	iets met bladeren / de zon die door de bladeren schijnt...
5	60 euro	bolletjes ipv vierkantjes (of vierkantjes die veranderen in bolletjes als dat kan)
6	50 euro	Lastige vraag, ik was al zeer gefascineerd door het eerste patroon en vind die interessant genoeg. Zou wel leuk zijn als je om de zoveel tijd het patroon kan wisselen nu ik erover nadenk.
7	misschien €40 max?	dit vind ik moeilijk te zeggen, maar ik zou een patroon willen die er ook nog leuk uit ziet als ie niet opgeblazen is
8	80 euro	Rechts! (de meer 'hoekige')
9	€50,- (ligt vooral aan de afwerking	De rechter
10	€30	Zo'n mesh patroontjes met allemaal kleine driehoekjes :)
11	€200	Ik snap deze vraag niet. Ik vind het organische heel leuk. Van deze voorbeelden de linker. Ander patroon : Spinnenweb? Blad van een boom, bijv esdoorn of kastagne
12	20	Organische ronde vormen
13		
14	99 euro	Cirkelvormig
15	100	Zelf zou ik de voorkeur hebben voor een patroon dat vooral rust creëert, ook wanneer deze niet aan staat. De rechter lijkt daarin meer te slagen.
16	30 euro	Een patroon met meer cirkels zou nog een optie zijn
17	20,-, ik denk meer als ik zeker zou zijn dat het voor mij zal helpen	Een landschap of iets met bloemen/dieren/bos, zodat je er misschien wat langer naar kijkt
gemiddeld	62,4375	
gemiddeld excl 200	53,26666667	

Deelnemer	*Opmerkingen*
1	
2	Ja zeker, Leo. Echt heel knap dat je zoiets kan maken en het idee is ook heel aantrekkelijk. Iets wat kan helpen om te structureren, maar zowel visuele als auditieve prikkels. En de uitwerking is zo uniek, met dat hout en de bewegingen. Ik ben helemaal onder de indruk. (oh ja en ik moest nog zeggen dat ik maar één of twee dagen in de week thuiswerk.) hopelijk heb je hier wat aan!
3	Ik vind het idee mooi, het bewegende plaatje houdt je aandacht vast maar heeft door de beweging van de blokjes ook wel iets lugubers over zich, een bewegende muur uit een horror film als ik het extreem mag formuleren
4	
5	heel origineel maar ik vraag me wel af of het na een paar weken nog echt de aandacht trekt? Het heeft best iets horrorfilmachtigs vind ik. Overigens het gaat nu over de thuiswerksituatie maar een dergelijk concept zou ook in de kantooromgeving wellicht een aanvulling kunnen zijn (zelfs tijdens vergaderingen om bv pauze of eind van het overleg aan te geven)
6	
7	JA, ik heb zelf niet zo veel last van niet goed genoeg door werken met thuis werken, maar ik neem wel chronisch te weinig pauze en zou gedurende de dag erg goed gaan op meer beweging en ik denk dat dit product een heel goed excuus is voor beweging. ik ben trouwens wel benieuwd, is het licht sterk genoeg om ook patronen op je muur/vloer/plafond te laten zien? dat lijkt me wel een nice bonus namelijk
8	
9	Ik denk dat ik het product zelf meer zou gebruiken als het meerdere standen heeft qua patronen. Daarbij dus ook de mogelijkheid om bijvoorbeeld de kleur van het licht, geluid en het tempo van de patronen te bepalen. Ik zou zelf liever een wat rustiger verloop van het patroon zien/ een meer gelig/oranje licht (patroon ging in het filmpje vrij snel en fel wit voelt zo kil). Daarbij bepaald afwerking in mijn ogen ook hoeveel ik er aan kwijt zou willen zijn. Verder denk ik dat het product een goede manier is om je erop te wijzen om pauze te nemen, maar uiteindelijk bepaald variatie bij mij of ik het langer zou gebruiken. Ten slotte is bij mij zo dat werkdruk uiteindelijk deels bepaald of ik een pauze neem. Al is een trigger om erover na te denken al een eerste stap naar bewustwording. Aangezien het belangrijk is om ook pauzes te nemen tijdens het werken! Overigens vind ik het opblazen wel intrigerend, geeft toch een interessante draai aan het product.
10	Het lijkt me heel handig als je hem niet per se aan de muur hoeft te hangen. Dus dat je eventueel ook de houder schuin op je bureau neer kan zetten.
11	Ik vind het een heel spannend ontwerp. Leuk om naar te kijken. Het zou kunnen dat het afleidt door de beweging. dat zou een nadeel zijn als je geconcentreerd wil werken.
12	
13	
14	Integratie met een platform als Timely zou van toegevoegde waarde kunnen zijn (veel meer impact dan een lopend klokje). Als koper zou ik me zorgen maken over het schoonhouden van de lamp, met name het blaasstuk.
15	In mijn thuiswerkomgeving heb ik beperkt licht van buiten (zolderraam) waardoor een dergelijke oplossing als deze lamp een mooie aanvulling is. Kan me voorstellen dat het dus afhankelijk van de omstandigheden thuis een nog grotere of minder grotere meerwaarde levert. Ben ook vooral benieuwd hoe de mensen op langere termijn reageren. Nu ik het concept voor het eerst zie lijkt het een inspirerend voorwerp dat helpt bij "gezonder" thuiswerken en zoals bij elk nieuw voorwerp probeer je in het begin je fanatiek te laten leiden door het product. Hoe houd je de gebruiker ook geprikkeld om de lamp op de vooraf bedachte manier te gebruiken? Verder een zeer inspirerend product dat helemaal past in de huidige tijd! (:
16	Ik werk inmiddels niet meer thuis. Ik denk dat het product zeker kan bijdragen om meer structuur in je werkdag aan te brengen en onderscheid te maken tussen werk en ontspanning. Het opblazende effect is een hele mooie toevoeging om het wat levendiger te maken en meer de aandacht te trekken. Ik ben wel benieuwd hoe lang het effect aanhoudt als je er op den duur aan gewend raakt.
17	

Appendix 6: Project brief

DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name	Remmerswaal 4277
initials	L given name Leonie
student number	4365070
street & no.	
zipcode & city	
country	
phone	
email	

Your master programme (only select the options that apply to you):

IDE master(s):	( ) IPD (★) DfI ( ) SPD
2nd non-IDE master:	
individual programme:	- - (give date of approval)
honours programme:	( ) Honours Programme Master
specialisation / annotation:	( ) Medisign
	( ) Tech. in Sustainable Design
	( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair	Sylvia Pont	dept. / section:	HICD
** mentor	Susanne Colenberg	dept. / section:	DCC
2nd mentor			
organisation:			
city:		country:	

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Procedural Checks - IDE Master Graduation

TU Delft

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Sylvia Pont date 02 - 07 - 2020 signature Sylvia Pont - IO Digitally signed by Sylvia Pont - IO Date: 2020.07.02 19:12:34 +02'00'

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 44 EC

Of which, taking the conditional requirements into account, can be part of the exam programme 30 EC

List of electives obtained before the third semester without approval of the BoE

★ YES all 1st year master courses passed

○ NO missing 1st year master courses are:

name Colinda van der Bunt date 17 - 07 - 2020 signature

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: ★ APPROVED ○ NOT APPROVED

Procedure: ★ APPROVED ○ NOT APPROVED

comments

name Monique von Morgen date 23 - 07 - 2020 signature

Initials & Name L Remmerswaal 4277 Student number 4365070

Title of Project Applying nature's powers in work-at-home situation

Personal Project Brief - IDE Master Graduation

TU Delft

Applying nature's powers in work-at-home situation — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 10 - 07 - 2020 — 11 - 01 - 2021 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

The past few months have been different. Due to the pandemic, changes had to be made to the way we work and study. Inspired by these events, the focus of this graduation project is the home-work environment.

When working from home, the barrier between work and non-work starts to blend. Your home environment has become your workplace: there are no more natural shifting points between workday and spare time. This could have effects on your concentration and motivation. We are not feeling as productive as we would like to be. We can feel the pressure of performing, but procrastination comes in our way of doing so. And not only pushing yourself to work has become more difficult. You might also have trouble letting go when work is done, or when the day is over. It might be difficult to say that it's enough. After all, your work is right there all the time.

The proposition underlying this brief is that people in the home-work environment can benefit from exposure to nature, as nature has attention restoring and stress reducing powers.

The theory of attention restoration (Kaplan & Kaplan, 1989) poses that nature can work as a means of restoring attention. Exposure to nature can help improve our focus and ability to concentrate (Ohly, White, Wheeler, Bethel, Ukoumunne, Nikolaou, & Garside, 2016). The theory originates from environmental psychologists Stephen and Rachel Kaplan (1989). They describe four key components that make environments restorative: 1) the environment should provide a feeling of being away from regular thoughts and concerns; 2) it should allow for soft fascination, holding your attention without expending effort; 3) it should be compatible, an environment of your own choosing; 4) extent, the environment should allow for a feeling of immersion and engagement. Natural environments often fulfil these components, and are therefore restorative.

Perception of nature also causes reduction of negative feelings and has a role in recovery of stress (Ulrich, 1981, 1983). Individuals experiencing stress or anxiety benefit from exposure to natural views, whereas urban scenes lacking vegetation or water have no or even negative effects on psychological wellbeing. These natural elements can be real, like actual vegetation or views of nature through a window, but even representational exposure of nature (e.g. photographs or paintings) shows to have similar effects (Beukeboom et al, 2012).

Beukeboom CJ, Langeveld D, Tanja-Dijkstra K. (2012). Stress-reducing effects of real and artificial nature in a hospital waiting room. J Altern Complem Med. 18(4): 329–333.

Kaplan, R., & Kaplan, S. (1989). The experience of nature: A psychological perspective. Cambridge, UK: Cambridge University Press.

Ohly, H., White, M. P., Wheeler, B. W., Bethel, A., Ukoumunne, O. C., Nikolaou, V., & Garside, R. (2016). Attention Restoration Theory: A systematic review of the attention restoration potential of exposure to natural environments. Journal of Toxicology and Environmental Health, Part B, 19, 305-343.

Ulrich, R.S. (1983). Aesthetic and affective response to natural environment. In I. Altman & J. Wohlwill (Eds.), Human Behavior and Environment, Vo1.6: Behavior and Natural Environment, New York: Plenum, 85-1 25

Ulrich, R. S. (1981). Natural versus urban scenes: Some psychophysiological effects. Environment and Behavior, 13, 523-556.

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Personal Project Brief - IDE Master Graduation

TU Delft

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

This graduation project is based on the opportunity to apply the knowledge of nature's restorative (Kaplan & Kaplan, 1989) and stress-relieving (Ulrich, 1981, 1983) powers in the situation of working from home. Nature could mediate in the struggles that we find when having to work from home. Aim for this project is to find out how to make (a product that creates) a restorative environment within the home setting.

Kaplan, R., & Kaplan, S. (1989). The experience of nature: A psychological perspective. Cambridge, UK: Cambridge University Press.

Ulrich, R.S. (1983). Aesthetic and affective response to natural environment. In I. Altman & J. Wohlwill (Eds.), Human Behavior and Environment, Vo1.6: Behavior and Natural Environment, New York: Plenum, 85-1 25

Ulrich, R. S. (1981). Natural versus urban scenes: Some psychophysiological effects. Environment and Behavior, 13, 523-556.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Research how to make a restorative environment in the home-work setting. Applying biophilic design principles to create a product that makes the home-work setting perceptually more natural.

Research on the mechanisms behind the Attention Restoration Theory (Kaplan & Kaplan, 1989) will teach how to design for a restorative environment. Then, user research gives a clearer view of the home-work environment, and shows opportunities for the right moment and place for an intervention. It is expected that the intervention should not intervene with the work, and should be used on the user's own terms, whenever it is convenient to them.

The intervention should fit with the key principles of the Attention Restoration Theory (Kaplan & Kaplan, 1989). It is therefore expected that the interaction with the intervention will be 'offline' (e.g. no screens involved). The intervention is expected to be a product, possibly a set of multiple, to be used as a toolkit to create a custom restorative environment.

This project will follow the principles of biophilic design (Kellert, Heerwagen & Mador, 2011), as these seem fitting to the subject and are of personal interest of the graduate student. These theories explain how 'good' biophilic design takes into account all senses, and is not just as simple as putting a potted plant. The biophilic design principles are followed from the outset and throughout the design phase, and are central in decision making.

Kaplan, R., & Kaplan, S. (1989). The experience of nature: A psychological perspective. Cambridge, UK: Cambridge University Press.

Kellert, S.R., Heerwagen, J., & Mador, M.J. (2011). Biophilic Design: The Theory, Science and Practice of Bringing Buildings

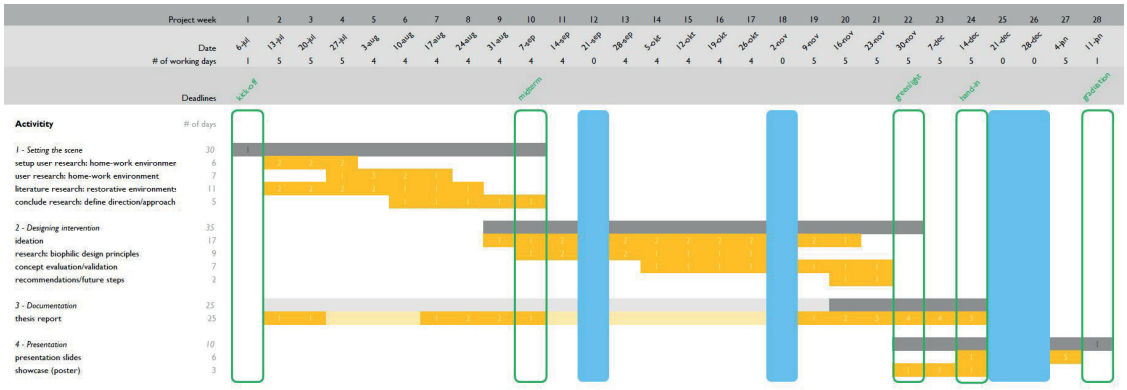
Initials & Name L Remmerswaal 4277 Student number 4365070

Title of Project Applying nature's powers in work-at-home situation

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 10 - 7 - 2020 11 - 1 - 2021 end date



In week 1, the kick-off meeting takes place on Friday. Hence, this week only has 1 working day.
In week 28, there is also only one working day, as the graduation is planned that week.

From beginning of August to end of October (week 5 to 17) the graduation project will be four days a week, because of student assistant work. Else, the graduation is full-time.

The weeks marked in blue (week 12, 18, 25 and 26) are non-working days.

The working days per week are shown in the chart ('# of working days') and add up to 100 days.

Personal Project Brief - IDE Master Graduation

TU Delft

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

During the elective course Environmental Psychology at Leiden University, I learned about restorative environments and what role nature can have in it. In general, human behaviour has always fascinated me. In my graduation I want to further delve into the field of restorative environments and find out how to apply the knowledge in design.

With regards to design, I want to further develop my quick-decision-making skills and follow more of a 'trial and error' approach. I often want to overthink things thoroughly before making decisions and trying out concept ideas. During courses Exploring Interactions and Interactive Technology Design I noticed how valuable it is to work in faster iteration cycles. While this contradicts with what I am comfortable with, I think it will help me develop my ideas to more convincing and stronger concepts.

Regarding research, I am looking forward to fully immerse into the knowledge that is already there and find relations between them and opportunities for my project. Researching has been the most interesting part of the design process for me. I feel like in my graduation project I have the opportunity to learn more about how to execute and practice with doing user research, as well as desktop research.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Initials & Name L Remmerswaal 4277 Student number 4365070

Title of Project Applying nature's powers in work-at-home situation