Designing Interactions for Experiencing Mindfulness

Interaktsioonide kujundamine teadveloleku kogemiseks

Master's Thesis

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Summary

This thesis describes a process of exploring ways of designing for mindfulness – a state and a process originating from Buddhist meditation practices, and proven scientifically effective as treatment for mental health issues – to be experienced with the help of an interactive solution. Our literature review and research into current mindfulness related technological solutions in the consumer product market revealed a slight focus shift from the original idea of the concept – from simply being present in the moment and observing to self monitoring and analysing. By applying the methodologies of research through design, we used people's input as inspiration for designing interactions that would convey the idea of reflection for reflections sake, resulting in a concept of an interaction that would require for the "user" to stay passive.

Eestikeelne kokkuvõte

Käesolev teadustöö kirjeldab disainiprotsessi, mille eesmärgiks oli leida viise ärksameelsuse kogemiseks läbi interaktiivse tehnoloogilise lahenduse. Ärksameelsuse ehk teadveloleku mõiste tähistab seisundit, mis pärineb budistlikust meditasiooni praktikast ning mille teraapilised omadused näiteks vaimse tervise probleemide puhul on ka teaduslikult tõestatud. Uurides teaduslikku kirjandust ning hetkel turul olevaid ärksameelsust toetavaid tehnoloogilisi lahendusi, täheldasime me teatavat kõrvalekallet selle seisundi algupärasest mõttest – viibimine hetkes ning erapooletu jälgija rollis olemine on mõneti asendunud seiramise ja analüüsimisega. Rakendades disainipõhise uurimuse võtteid, tegime koostööd potentsiaalsete lõppkasutajatega, kujundamaks interaktsioone, mis võimaldaksid hetkesolemise kogemist. Antud disainiprotsessis välja töötatud interaktsiooni kontseptsioon eeldab kasutajapoolset passiivseks jäämist, mis sobitub ärksameelsuse algupärase ideega.

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1. Introduction

In the recent few years, meditation as a practice has been reaching a wider ground than ever before. Recommendations about taking short daily meditations and schools incorporating meditation into their classes appear in the news feed regularly[1, 2, 3, 4], and meditation in general is being viewed less and less as an esoteric practice and more as a part of a balanced lifestyle[5, 6, 7].

In addition to that, meditation has inspired an array of HCI solutions harnessing the benefits of the practice, which include stress reduction, pain relief, improvement of sleep and overall health etc. With our interest lying in mindfulness meditation, we took a look at the approaches taken and trends being followed in the development of different technological solutions connected to this concept.

Having noticed a slight focus shift from the original idea of mindfulness meditation in the current solutions, we applied design research for gaining inspiration from people, in order to explore ways of creating interactive solutions that would help people experience mindfulness in a different way. In short: to provide means for reflection for reflections sake, without any additional features.

2. Inspiration: Mindfulness

Mindfulness meditation being a strong influence in our research, we provide here an overview of the concept and the supportive theory strongly connected to it.

"Meditation is the practice of turning your attention to a single point of reference. It can involve focusing on the breath, on bodily sensations, or on a word or phrase known as a mantra[8]." One of the central components in meditation is mindfulness, which is the "*English translation of the Pali,* Sati *combined with* Sampajaña*, which as a whole can be rendered as awareness, circumspection, discernment, and retention*[9]." It can be described as a state of being present in the current moment and aware of oneself's thoughts, emotions and sensations without passing any judgements on them, thus not being made uncomfortable due to events of the past, anxieties regarding the future etc.

The utilisation of mindfulness is vast, e.g. in the therapy approaches of the "third wave" of behavioral therapies, such as Dialectical Behaviour Therapy, Mindfulness-Based Cognitive Therapy, Mindfulness-Based Stress Reduction, and Acceptance and Commitment Therapy[10]. Furthermore, studies have shown that already a short term practice period of mindfulness "*can bring a variety of physical, psychological, and social benefits*[11]," such as boosting the immune system[12], reducing chronic pain[13], and even increasing "*the density of gray matter in brain regions associated with memory, stress, and empathy*[14]".

2.1. Supportive Theory: Acceptance and Commitment Therapy

Acceptance and Commitment Therapy (ACT) is a mindfulness-based behavioural therapy utilising a mix of metaphor, paradox and mindfulness skills, along with experiential exercises and value guided behavioural interventions. ACT has been proven effective in the treatment of depression, obsessive-compulsive disorder, varieties of stress, chronic pain, anxiety, substance abuse etc.[10]

Here we list some of the aspects of ACT that we used as inspiration in our research, as described in [10]:

- "*ACT does not have symptom reduction as a goal. This is based on the view that the ongoing attempt to get rid of "symptoms" actually creates a clinical disorder in the first place. As soon as a private experience is labeled a "symptom," a struggle with the "symptom" is created.*"

- "*ACT assumes that the psychological processes of a normal human mind are often destructive, and create psychological suffering for us all, sooner or later.*"

- "*Clients* (of ACT therapists) *learn to stop fighting with their private experiences—to open up to them, make room for them, and allow them to come and go without a struggle.*"

- "*Our thoughts seem to be the literal truth, or rules that must be obeyed, or important events that require our full attention, or threatening events that we must get rid of. In other words, when we fuse with our thoughts, they have enormous in influence over our behavior.*
  Cognitive defusion means we are able to "step back" and observe language, without being caught up in it. We can recognize that our thoughts are nothing more or less than transient private events—an ever-changing stream of words, sounds and pictures. As we defuse our thoughts, they have much less impact and influence." The techniques of cognitive defusion include observing a thought with detachment, repeating it over and over, out aloud etc.

Additional aspects will be referred to later in the thesis.

2. HCI and Mindfulness

2.1. Introduction

"*A recent interest in interaction design is towards the development of novel technologies emphasizing the value of mindfulness, monitoring, awareness, and self-regulation for both health and wellbeing*[15]." One of the earlier proofs of computers as persuasive tools affecting attitude and behaviour changes dates back to 1985.[16] The vast, both scientific and experiential confirmation of the effectiveness of meditation and mindfulness together with the constant development of persuasive technology has paved way for different technological solutions ranging from elaborate systems incorporating virtual reality and sensors to mobile applications. All of them exploring this domain in the hopes of alleviating mental health issues or simply introducing the concept to people who are generally interested.

2.2. Current HCI Solutions Involving Mindfulness

We mapped a selection of different interactive solutions (Image 1) utilising the concept of mindfulness, based on literature review in the ACM Digital Library and research into the current consumer products and applications. We were looking to see whether these solutions could be grouped into trends or themes, based on the goals, characteristics etc. This mapping does not contain a comprehensive list of all the existing solutions, but rather aims to give an overview of different directions that have been taken in the development of such technological solutions. The output of these solutions varies, as we did not have a specific output for the interaction in mind, and therefore we chose to use "mindfulness" as the core connecting feature. The examples below are divided into three main categories: system prototypes, wearables, and mobile applications, that will be described in more detail in the following sub sections.

Image 1. The mapping of current technological mindfulness-related solutions, based on their primary purposes.

2.3. System Prototypes

In this section, working prototypes of interactive systems are reviewed, that we found in our literature review in ACM Digital Library, with the keyword "mindfulness". An overview of characteristics and features of each solution is presented in *Table 2*.

Solution	Purpose	Features	Components
Sonic Cradle	Stress reduction Meditation support through breath awareness	Biofeedback Sound	A hammock-chair Speakers Breathing sensor
The Virtual Meditative Walk	Pain management Meditation support	Biofeedback Visualisations Metaphor Sound	A virtual reality headset Galvanic Skin Response sensor
LIVeMotion	Meditation support	Biofeedback Visualisations Sound	Electrocardiogram sensor Electromyogram sensor Stretch sensor Galvanic Skin Response sensor Inertial Movement Unit Mechanomyogram Kinect Projector Speakers

Table 1.

Sonic Cradle

Sonic Cradle is an immersive audio environment programmed to help practice mindfulness meditation, aimed for novice meditators in particular. The "user" sits in darkness, in a suspended hammock-type chair, with sensors attached to their body, making the surrounding sound evolve according to their breathing. Thus, in *Sonic Cradle*, a person will potentially reach a state of higher awareness and a sense of presence, due to sensing a unity between their breathing and their surroundings and therefore the chance for the mind to go "wandering" grows smaller.

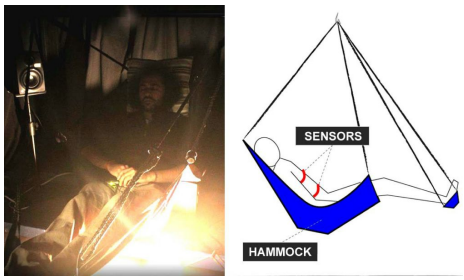

Image 2. *Sonic Cradle*

Mainly defined as "*stress intervention"*, implying a certain level of preexisting excess stress, *Sonic Cradle* is also seen by its creators as a motivator for independent pursuit and development of interest in the meditation practice in general. However, a study conducted with the prototype revealed that it might have a tendency to be perceived "too relaxing", which to some extent wanders off from the true idea of meditation – alertness and presentness, while "relaxing" relates more to the idea of being distracted or even sleepy.[17]

The Virtual Meditative Walk

The Virtual Meditative Walk (VMW) combines biofeedback with virtual reality (VR) to help accelerate the learning process of meditation through an immersive experience, primarily aimed at managing chronic pain, but is not limited only to such purpose – "*health practitioners, nurses, and patients suffering from acute symptoms can benefit from learning mindfulness meditation and to foster empathy*[18]." The goal of the system is to allow patients to concentrate on a specific task and divert their attention inward, to their physiological processes.

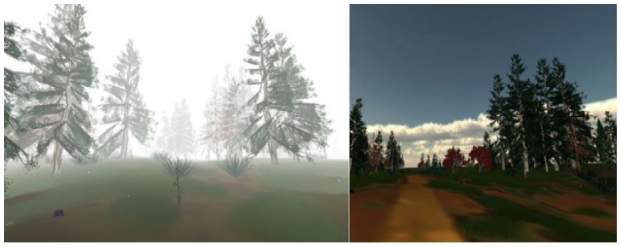

Image 3. *The Virtual Meditative Walk*

Using the VR system, the user is navigating in a virtual nature environment, with their arousal "translated" to presence of fog in the environment via Galvanic Skin Response. "*When patients learn how to reduce arousal, which is correlated with stress, the fog dissipates*[18]."

A study conducted with VMW showed that with immersion time as short as 12 minutes, the perceived pain levels of the participants were significantly lower than those of the control group.[18]

LIVeMotion

Image 4. *LIVeMotion*

The research project *LIVeMotion* is "*an interactive system designed to heighten the user's awareness of their bodily changes and motion to achieve a greater level of mindfulness*[19]," primarily aiming at reducing stress. The "*self-regulated musical experience in an audiovisual room installation, with visualisation and sonification mappings where the sound and visuals are feedback to the user based on their physical and physiological responses. This helps to bring awareness of a user's bodily actions, both consciously and subconsciously, including breathing, heart rate, muscle tension and others, in alignment with their current physiological state*[19]."

MeditAid

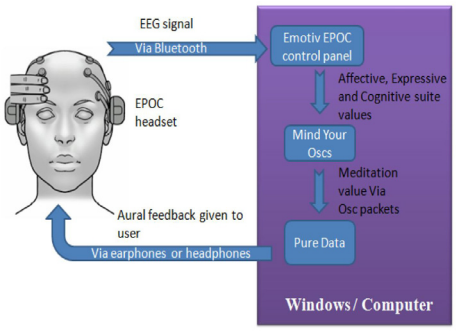

Image 5. *MeditAid*

MeditAid is "*a wearable system integrating electroencephalography (EEG) technology with an adaptive aural entrainment for real time training of mindfulness state*[15]." However, the primary goal of this prototype is to inform "*the design space of mindfulness meditation technologies*[15]," exploring the effectiveness of incorporating audio and the role of binaural beats and monaural beats in the mindfulness training.

2.4 Wearables

In this section we describe some of the more popular wearables developed in connection to mindfulness meditation. An overview of characteristics and features of each solution is presented in *Table 2*.

Solution	Purpose	Features	Components
Muse	Meditation support Stress reduction	Guided meditations Nature soundscapes Biofeedback Stats tracking	Headband Mobile application
Thync	Stress reduction Improvement of sleep	*Calm vibes* for relaxation *Energy vibes* for a boost	Module for forehead Strips for placing to the back of the neck Mobile application
Spire	Meditation support Activity tracking Stress reduction	Guided meditations Stats tracking Calm, Focus, Tension tracking Stress notifications Breathing exercises Deep breath reminders Steps & calorie count Breath rate Respiratory patterns Heart rate	A clip device Mobile application

Table 2.

Muse

Muse is a brain sensing headband that gives real time biofeedback of the mind's activities during meditation. With the entrainment of different nature soundscapes (e.g. rainforest and desert sounds), *Muse* works similarly to Virtual Meditative Walk, with calm sounds responding to calm brain activity, and intensified sounds to more active brain. Paired with a smart device via application, the headband is calibrated at the beginning of each meditation session, according to the user's brain activity at the moment, and a series of graphs and charts are presented after the sessions.[20]

Image 6. *Muse*

Thync

Thync is a modular headset paired with a mobile app that promises to alter the user's mood "*by signaling nerves on the head and neck to act on the brain's adrenaline system*[21]." The system has two modes, or *vibes* – *Energy* and *Calm* – activating the brain for an energy boost or relaxation respectively. The intensity of either *Vibe* can be adjusted individually before each session.

Image 7. *Thync*

Spire

Spire is a "*wearable activity and respiration tracking*[22]" device paired with mobile app. The small pebble like clip is worn in contact with the skin throughout the day, with the progress being displayed in the app. The mindfulness related features are: calm, focus and tension tracking, stress notifications, breathing exercises and guided meditations, and deep breath reminders.

Image 8. *Spire*

2.5. Mobile Applications for Meditation

Here, we give an overview of mobile applications aimed at improving the mindfulness meditation skill. An overview of characteristics and features of each solution is presented in *Table 3*.

Solution	Purpose	Features	Components
Headspace	Meditation support Stress reduction	Guided meditations for different purposes Animations Levels for unlocking Progress tracking	Mobile application

Solution	Purpose	Features	Components
Buddhify	Meditation support Stress reduction	Guided meditations Timer for unguided meditations Progress tracking	Mobile application
Calm	Meditation support Stress reduction Improvement of sleep, concentration, and health	Visuals Sound Guided meditations Practices for unlocking	Mobile application
Aeon	Stress reduction Thought distancing Meditation support	Visuals Metaphor Typing input	Mobile application
The Shredder	Stress reduction Thought distancing	Visuals Metaphor Typing input	Mobile application

Table 3.

Headspace

Headspace is digital health platform describing itself as "*gym membership for the mind*[23]." The application offers audio meditation guides for both novices and advanced meditators, together with assisting animations and video introductions by the app's founder. Options provided by the app are unlocking different levels, practicing meditation for different purposes, and following one's progress.

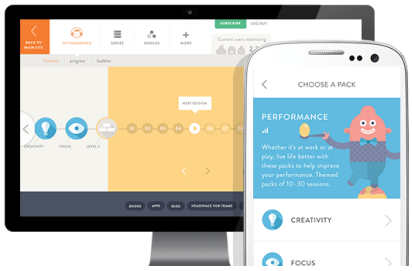

Image 9. ***Headspace***

Buddhify

Buddhify aims to alleviate stress through guided mindfulness meditations, thus increasing concentration and sense of balance. In addition to that, the application offers tips for "*deepening understanding*[24]" of the meditation practice, a timer for unguided sessions and the option to track one's stats.

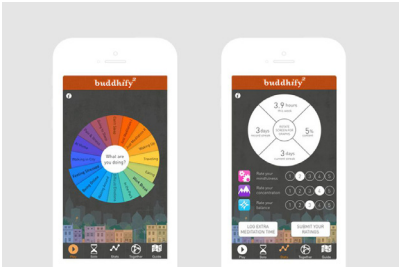

Image 10. *Buddhify*

Calm

Calm offers guidance in meditation in order to reduce stress levels, improve concentration, sleep and health in general. With videos of different nature sceneries as a background, a voice guides the meditation and explains the terms connected to it.[25]

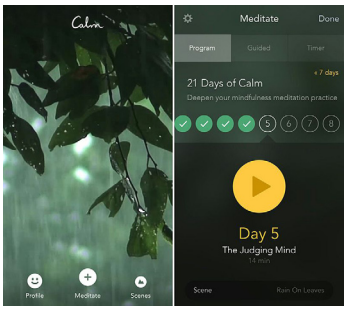

Image 11. *Calm*

Aeon

Aeon is more specifically built upon the concept of thought distancing, or *cognitive defusion*. It aims for the user to be aware of and observe their thoughts, while watching them disappear. The user types in a personally unpleasant thought, which is then "*visualized as written over a parchment placed under water and, as the waves pass over the thought, they progressively dissolve the ink*[26]."

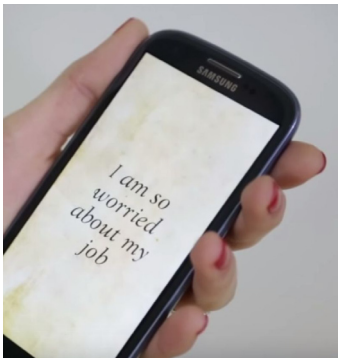

Image 12. *Aeon*

The Shredder

The Shredder operates with a similar logic to *Aeon*: the user is asked to type their negative thought, feeling or situation, which will then be "destroyed" by the virtual shredder.[27]

Image 13. *The Shredder*

2.6. Conclusion

The main goal for mapping these solutions was to define the backdrop of our interest area. The common denominator of all the solutions described in the previous section is to tackle an existing problem (prevalently stress). Although many of the solutions promise increased effectiveness in the mindfulness meditation practice, the claim is mostly decreased stress, increased focus, better health and other benefits, therefore potentially building specific expectations by the users' side. In addition to that, some of the prototypes and the wearable devices either use biofeedback, making the users dependent on external stimuli, or track their behaviour for later viewing. Furthermore, for example in the case of V*irtual Meditative Walk*, albeit a useful approach in managing pain, the logic of the fog in the environment reacting to the sensations of the user may call forth the urge to control one's sensations, therefore as a general introduction to mindfulness meditation it could be to some extent misleading, unless the users are explicitly instructed to simply observe the behaviour of the fog without trying to intervene.

We provided just a few examples of the vast selection of mindfulness meditation oriented mobile applications. The common properties across this landscape are the presumed continuous use of a mobile device and the possibility to track one's progress. Although, regarding mental health issues, "*for mild*" and "*moderate conditions digital tools may provide flexibility, choice, self-management strategies*[28]," reliance is seen as as one of the challenges of mental health apps, and also to possible increase of symptoms (e.g. anxiety) due to self diagnosis.[28]

3. Research Problem

The findings of [15] suggest that "*mindfulness technologies could potentially reduce the length of training to self-regulate one's attentional skills, particularly for novice meditators*[15]," thus providing a "*quicker access to the rich benefits of mindfulness for health and wellbeing*[15]." Although we by no means argue against developing such technology, and think that whatever means people find successful in their self help are acceptable (as long as they are not harmful to themselves or others), the landscape of the existing solutions made us think about the origins of meditation, or more precisely, as Krishnamurti put it: "*Meditation is not a means to an end. It is both the means and the end.*" This idea is illustrated well in a New Yorker cartoon by Gahan Wilson (Image 14), depicting two Buddhist monks sitting in a lotus position, the younger one having a dissatisfied expression on his face and the older monk saying: "*Nothing happens next. This is it.*"

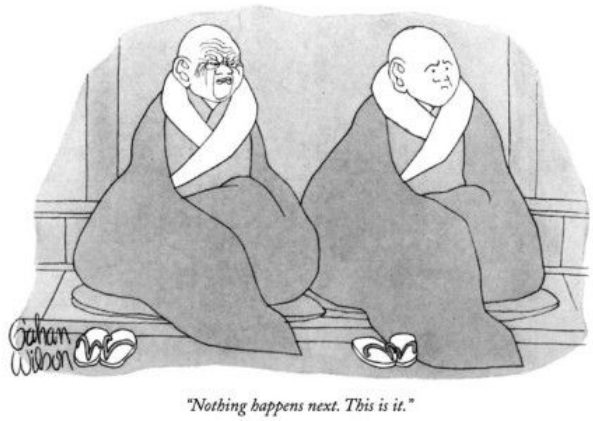

Image 14. A cartoon by Gahan Wilson, describing the essence of meditation.

The various tracking options featured in different wearables and applications partly steer them into the domain of task management and shift the focus away from the main principle of mindfulness – being here and now. We noticed a lack of solutions encouraging reflection for reflections sake.

Another thing we noticed was that the existing solutions supporting mindfulness rely on a rather unified definition of "user needs", i.e. they are addressing the needs that can be and are expressed by the users explicitly (e.g. stress reduction, focus enhancement, improvement of sleep etc.). But what if the actual "need" is something that is not immediately implied? What if we shifted our focus away from the need for changing something to the need for acknowledging and accepting?

The aim of this thesis is to explore ways of research and design in order to design solutions for moving away from targeting symptoms (stress, anxiety etc.) to be solved or alleviated, and instead taking a step back and acknowledging the context where such events are taking place, thus possibly changing the user's perspective on themselves and perhaps even paving way for more meaningful interactions.

The research includes:

- **Gaining knowledge**: to gain insight into theories related to mindfulness and into the ways people perceive their thoughts, which together would support and guide our decisions in the design process.

- **Design**: creating artefacts that would both support the search in the knowledge domain, and explore ways of provoking with regard to mindfulness.

The goal of this thesis is to design interactions for experiencing mindfulness. To address this goal, we posed the following questions:

- How people experience their thoughts and thought processes?
- How can the concept of mindfulness be communicated through an interactive solution?
- How to construct a design process for meaningful interactions?

3.1. Approach of the Thesis

The global methodology of this thesis is research through design, in which the researchers repeatedly reframe the problem in an attempt to make the *right* thing.[29] *(Right* meaning with "*an intention to transform the world from the current state to a preferred state*[30].") This is pursued "*through an active process of ideating, iterating, and critiquing potential solutions. The final output of this activity is a concrete problem framing and articulation of the preferred state, and a series of artifacts—models, prototypes, products, and documentation of the design process*[30]."

We were following the steps of design thinking, as described in [30]: "*the application of a design process that involves grounding—investigation to gain multiple perspectives on a problem; ideation— generation of many possible different solutions; iteration— cyclical process of refining concept with increasing fidelity; and reflection.*"

In [31, p22] the processes of the "fuzzy front end" of design are described as not having a "*clear path on how to proceed and"* possibly having "*many divergent paths to explore before any patterns can be discerned. In the fuzzy front end it is often not known whether the deliverable of the design process will be a product, a service, an interface, or something else. The goal of this exploration is to define the fundamental problems and opportunities and to determine what could be (or should not be) designed.*"

This motivated us to set our approach in designerly ways of doing research, one of the "*key ingredients*" of which "*is that they involve creative acts of making: designers creating probe packages, respondents creating interpretations of its ambiguous questions and answering them, design researchers making generative toolkits, participants using these toolkits to make expressive artefacts and discussing those, and codesigners creating and evaluating prototypes, often in iterative cycles. The act of making here is not just a performative act of reproduction, but a creative act which involves construction and transformation of meaning, by any or all the people just mentioned, and in all those activities*[32]."

The emerging landscapes of design research approaches and methods (Image 15) was used to define and help position this thesis.

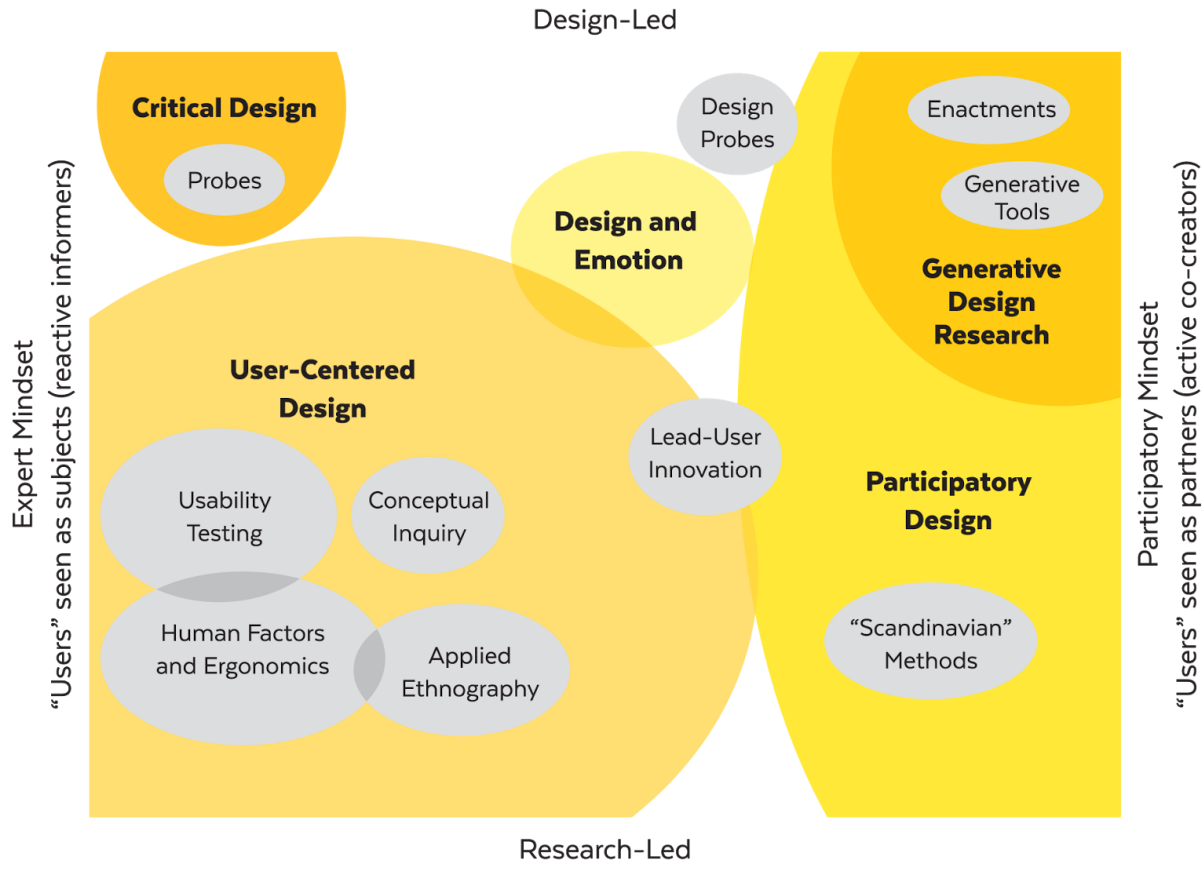

Image 15. *The emerging landscape of design research approaches and methods.* Illustration based on [31 p19, *Figure#1.2*].

All of the solutions described in the previous chapter rely on specific theories from psychology and those related to meditation and mindfulness, combined with appropriate metaphors, which have then been cast into the best practices of user-centered design (lower left corner of *Image 15*). User-centered design is aimed at helping "*make new product and services better meet the needs of "users"*[31, p18]." Research-led approaches are used "*with an expert mindset* (this refers to the perception of users as subjects, as opposed to them seen as partners in the process) "*to collect, analyze and interpret data in order to develop specifications or principles to guide or inform the design development of product and services*[31, p19]."

Due to the vast selection of existing technological self help solutions regarding meditation, and the accompanying promise for a healthier, less stressful, and overall better life, we wanted to take a critical look at the notion of seeking for inner peace in external devices. Therefore, we decided to start out the process of this thesis as critical design (upper left corner of Image 2), the central idea of which is making us think.[33] The approach "*came about as a reaction to the large user-centered zone, with its pervasive focus on usability and utility. Critical design evaluates the status quo and relies on design experts to make things that provoke our understanding of the current values people hold*[31, p19–20]," – the current values in this case resting on the idea of relying on external devices (and statistics provided by them) in order to obtain or maintain inner balance.

3.1.1. Probing as a Design Approach

Inspired by the idea of seeking for new opportunities instead of designing solutions for user needs we chose probing as the first step of the practical part of our research.[32]

Probing "*invites people to reflect on and express their experiences, feelings and attitudes in forms and formats that provide inspiration for designers*[32]." Below is a description (*Table 4)* of the nature of probes, taken from *A comparison of the three approaches to making* in [34].

What is made?	Probes are materials that have been designed to provoke or elicit response. For example, a postcard without a message.
Why?	Designers find inspiration in users' reactions to their suggestions.
What is it made out of?	Probes can take on a wide variety of forms such as diaries, workbooks, cameras with instructions, games, etc.
Who conceives?	Designers create the probes and send them to end-users and other stakeholders, often with little or no guidance of how the end-users should treat them.
Who uses?	End-users and other stakeholders individually complete the probes, returning them to the person who sent them out.

Table 4.

4. Studies

4.1. Introduction

The activities of the studies were planned and executed in small iterations, following a similar pattern: developing and synthesising ideas, designing, compiling, testing, interviewing, analysing. The process diagram of the practical part of our research is presented in *Image 16*.

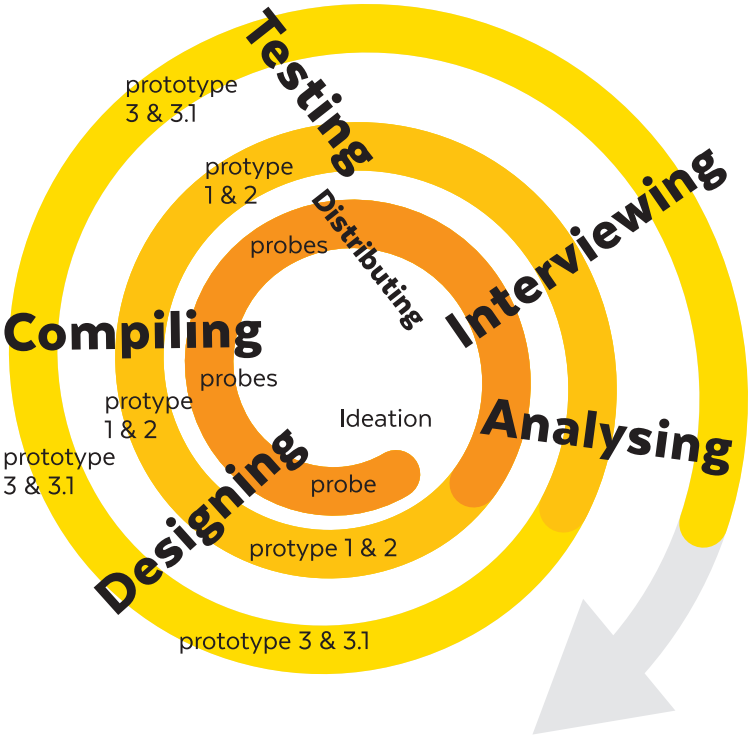

Image 16. The research process diagram of the thesis.

4.2. Phase 1: Probing

4.2.3. Introduction

As a first step in our studies, we designed a probe for exploring people's perception of their thoughts. After the probing period, the participants were interviewed, using the probe as a support in the discussion. The interviews were then analysed using affinity diagramming, which informed our next iteration. The process of Phase 1 is described in *Image 17*. The working research question and planned activities are listed in *Table 5*.

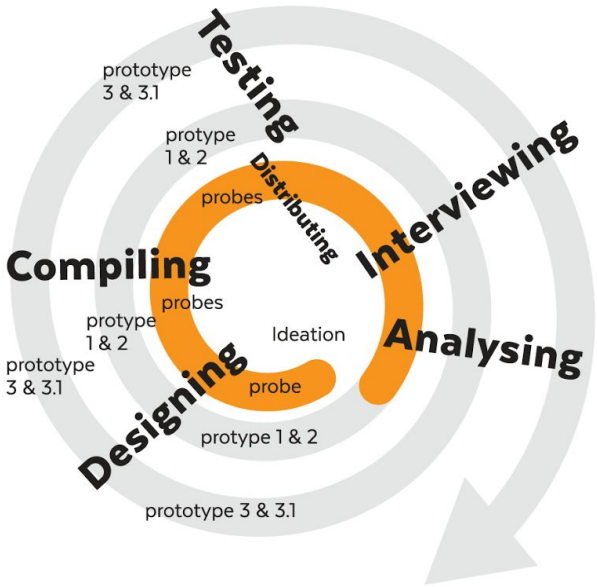

Image 17.

Phase 1	
Questions / Assumptions	How to provoke people to thinking about their thoughts/thinking processes?
Next steps	Designing the probe Compiling the probes Finding participants Assigning the probes Interviewing Analysing the interviews

Table 5.

4.2.3. Design Process of the Probe

Having set out for a critical design approach, a source of inspiration was needed. As a first step, the two topics of interest – critical design and mindfulness – were examined side by side, in order to find appropriate connecting points and position the research (*Image 18* and *19*).

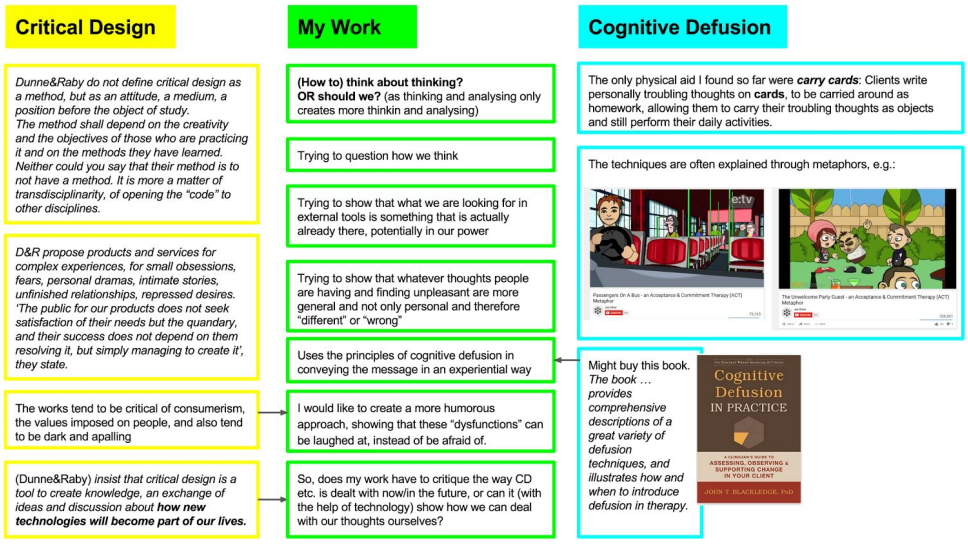

Image 18. The ideation process of the probe.

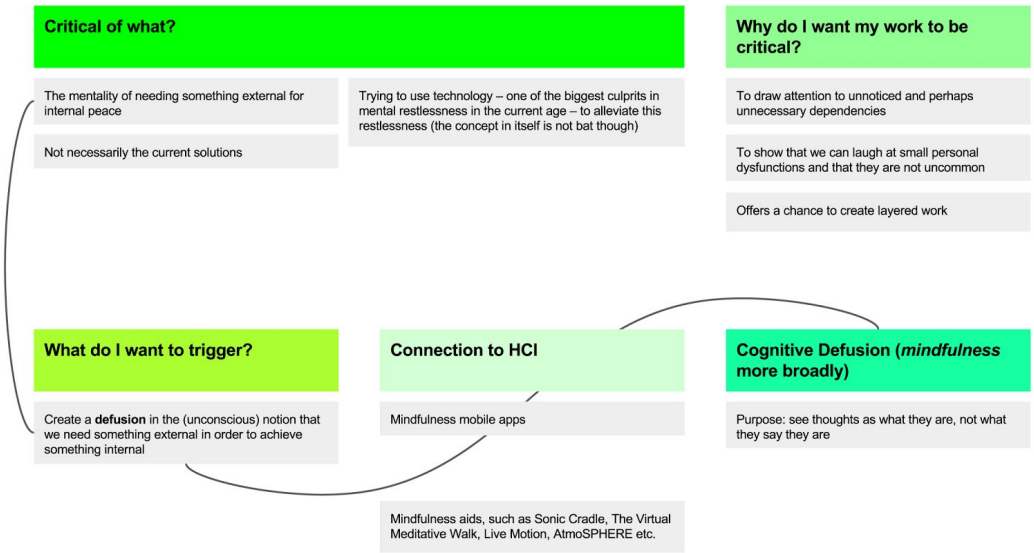

Image 19. The ideation process of the probe.

A literature review was conducted in order to find critical design examples drawing on a theory from psychology, it being the closest keyword to our topic. We found the project *Designs For Fragile Personalities In Anxious Times* by Dunne & Raby together with Michael Anastassiades, focusing *on "irrational but real anxieties such as the fear of alien abduction or nuclear annihilation. Rather than ignoring them, as most design does, or amplifying them to create paranoia,"* they "*treated the phobias as though they were perfectly reasonable and designed objects to humour their owners*[35]." The same way we were intending to do in our work, they offered a new perspective on familiar phenomena, e.g. soft toys shaped like nuclear explosions to face one's fears. However, due to the critical design approach relying more on interpretation and less on specifically defined rules, the review of the works was kept short.[36]

Having one of the central ideas in mind – trying to question how we think – ideas for concepts were sketched and discussed. The idea (*Image 20*) that was agreed on developing further into a probe, actually emerged outside the ideation session – or as Graham Wallas

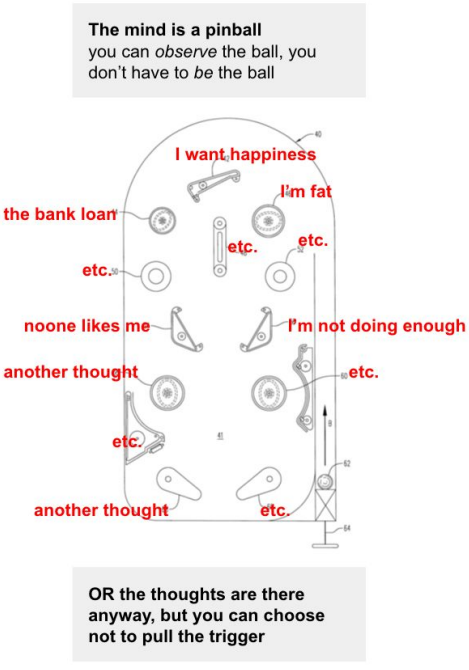

Image 20. Sketch for the probe design.

defined it – the "illumination" stage[37], as a result of having too many thoughts at the same time, and therefore intuitively imagining taking a step back from the revolving thoughts and letting it continue without participating (similar to the idea standing next to a pinball machine, without trying to actively follow the ball moving), and therefore experiencing a sense of "rest" in the mind. Researching the possible previous applications of the same metaphor, we found that a similar concept had been used in workshops for innovating business models.[38] We now had an opportunity to experiment with a known and used metaphor in a novel context, this time for exploring the ways people perceive their thoughts.

4.2.4. Compilation of the Probe

The probe (*Image 21*) consisted of the following elements:

- A3 size paper with the outline of a pinball machine board printed on it in light gray colour, for providing a necessary scaffolding for the exercise without setting too restrictive boundaries.
- A variety of stickers (colourful dots, characters, smiley faces, eyes, a roll of tape etc.) for boosting the imagination of the participants.
- A4 size paper with an introduction text, an example mockup of a "finished" pinball board (with texts left illegible) with tips for inspiration, in order to avoid the "blank page" paralysis. The layout of the instructions were specifically designed in a way that would make the task appear engaging, as opposed to having a page of written text only, and therefore possibly seeming too academic.
- A4 size plastic envelope for containing the probe.

The instructions (*Image 22*) started out with a general introduction to the topic written from a personal perspective, followed by a description of the aim of the given exercise – to map the habits of our minds and how we experience our thoughts, using the pinball elements presented. In the instructions, the participants were asked to mark down on the pinball board the thoughts they would get (daydreams, random recurring thoughts, worries, fears etc.) in the course of the next two days, using either the stickers enclosed with the probe or

whatever other means they felt suitable. The participants were asked to mark down their thoughts as touch points and interpret the logic of the pinball board individually (optional suggestions were drawing, writing comments, connecting thoughts, using newspaper cut-outs etc.), with the aim of making the board as personal as possible. The advisable procedure was to return to the board 3–4 times during the day, but in case the conditions would not allow it, taking notes during the day and compiling a "summary" on the board later was also acceptable. The participants were asked not to try to force their thoughts, instead simply observe how they appeared.

Image 21. The compiled probe.

Your mind as a pinball machine

If you, reading this text, are a human like myself, I'm sure you've experienced your thoughts go wandering excessively or even cause you discomfort at one point or another in your life. The Buddhists even have a metaphor for it – the Monkey Mind, describing the natural, chaotic state of the untrained mind, as if it was filled with drunken monkeys acting in a way... well, drunken monkeys would. You may also have noticed that the natural reflex of trying to "get rid" of thoughts has only a short term effect at best, but mostly just adds to the burden of thoughts, creating more struggle. Simply noticing and observing your thoughts in a non-judgemental way is actually a step towards a peaceful coexistence with your mind, proven by traditional meditation practices and also modern therapies.

This exercise is an attempt to map the habits of our minds, and more importantly: how we experience our thoughts – how and when do we notice them, our attitudes towards them etc., using the metaphor of a pinball machine, representing the chaotic state of the mind, jumping from one thought to another, sometimes getting stuck in a circle of specific thoughts etc.

In the course of the next two days, use this pinball board to describe the thoughts you have (daydreams, random recurring thoughts, worries, fears etc.). Name each thought and mark it down on the board as a touchpoint. You are free to interpret the logic of the pinball board whichever way you like: draw, write comments, create connections or loops between thoughts, use stickers or newspaper cutouts for illustration etc. – as long as it has to do with your personal recurring thoughts. In other words: make this board as "you" as possible. Ideally, return to the board 3–4 times a day and fill it out as you go a few minutes at a time, but if you don't have time or space for it, take notes during the day and visualise a "summary" on the board. Please do not try to force your thoughts in any direction, just mark them down as they emerge and indicate whenever you have the same thoughts again.

For inspiration:
You may...

...give a name for the whole board

...draw lines between thoughts that are connected or which tend to lead to other thoughts

...go outside the borders

...create a hierarchy of thoughts, if you perceive some of them "bigger" than others

...place a sticker next to a thought on the board, whenever it pops into your head again

...give a name for the pinball itself

...go crazy! (in a good way, that is. Of course, you *may* also really go crazy, noone can tell you not to, but I just hope you don't.)

...give a name for the trigger

If there's a thought you're uncomfortable writing down (although I encourage you to do it!), you may simply use a specific sticker or symbol for it.

Keep in mind (no pun intended...I think) that the results of this exercise will be anonymous and the nature or content of your thoughts will not be assessed in any way. There are no wrong answers, it is simply an attempt to take a glimpse at how people perceive their thoughts and sensations. This is not a psychological test, nor a test at all for that matter, so have fun observing and don't hold back, there are no rules!

Thank you!
Kadri-Maria

Image 22. The instructions of the probe.

4.2.5. The Participants

Six participants were chosen for the procedure (referred to as Participant 1, 2, 3, 4, 5 and 6) No special conditions were taken into account when choosing the participants, due to the research question aimed at how people think in general. As we were looking for qualitative data, we decided that six sets of probes would be enough for distributing. Three participants (Participant 3, 5 and 6) were introduced to the probe at once, one participant (Participant 2) separately and one participant (Participant 4), to whom the introduction was made over the phone, had the probe delivered to him by another participant. Due to a communication error, one of the probes had to be assigned online, as the participant (Participant 1) was in another city at the time, but showed high interest in doing the exercise. To her, the template with the pinball board outline and the instructions were sent via e-mail, together with a photo of the other components of the probe for inspiration.

When handing over the probes, the participants were generally intrigued. Participant 2 immediately complimented the graphic design of the probe and expressed his general interest in such exercises, partly verifying our assumption that presenting the instructions in a visually intriguing way would provoke more genuine interest.

4.2.6. The Procedure

The time for the probes to be in the wild varied from two to five days, due to issues relating to the schedule or health of some of the participants, and other unforeseeable factors. The actual time spent with the probes varied from one evening to two days.

The original concept of design probes, introduced by Bill Gaver, Tony Dunne and Elena Pacenti, was to seek inspiration from the materials returned.[32] Subsequently, Tuuli Mattelmäki and Katja Battarbee proposed empathy probes – combining design probes with interviews and projective tasks, in order to "*gain a holistic and empathic understanding*[39]" of people. Inspired by that methodology, we scheduled an interview with each participant.

4.2.7. The Interviews

The interviews were conducted in different conditions, one at a university cafe, two interviews in an office setting (in a joint interview), two at the home of the participants, and one over Skype, also in her home setting. The duration of the interviews lasted from 20 to 30 minutes.

The interviews were conducted in a semi structured manner, with the following questions:

- How did you deal with this exercise?/How did you start?
- What thoughts did you leave out? Why?
- Please indicate the thoughts you find problematic. Please elaborate, why.
    - How do you feel about the fact that such struggles are not uncommon?
- What are your thoughts on working with this tool?
    - What did you find helpful?
    - What struggles did you have and how did you deal with them?
    - How did you relate to the pinball metaphor?
- What personal discoveries did you make during the process?

The order and the number of the questions varied depending on the flow of the conversation.

The aim of the interviews was to seek inspiration, therefore the questions were aimed both at people's perception of their own thoughts and experience with the provided tool.

The filled out templates (Image 4) served as assisting materials for the interviews. During the interviews, the participants were asked to "walk us through" their boards.

Image 23. The filled out probes served as helping materials for the interviews.

4.2.8. Highlights From The Interviews

Note was taken of feedback and ideas expressed by more than one participant regarding the interview questions, in order to detect any specific patterns:

- The task was perceived difficult at the beginning by two participants (Participant 3 and 5), but most of the participants started out with either writing down the first thing that occurred to them or by selecting an approach to the task.
- The thoughts that were left out from the board were the ones perceived as "*primitive*," "*instinctive,*" or "*negative*".

- The thoughts that were perceived as problematic were either connected to "vicious circles" and "negative" thoughts, or tasks and activities that were not being dealt with the "right" way.
- Due to the individual perception of "problematic" thoughts across the participants (i.e. mostly the thoughts themselves were not viewed as problematic but rather how the situations are handled that cause such thoughts), the question *How do you feel about the fact that such struggles are not uncommon?* was touched upon the least in the interviews.
- The experience using the tool was perceived either "relaxing", as "a good representation of the human mind". Some of the participants did not explicitly express their experience with the tool, as they were more concerned with the content of the exercise, i.e. expressing the thoughts. Also, interest was expressed in more than one case to see the results of such task executed over a longer period of time.

4.2.9. Analysis of the Interviews

Due to the rich nature of the interviews, affinity diagramming was chosen as the method for analysing the data gathered from the interviews for further inspiration.

All the expressed ideas that were assessed meaningful enough, were printed and cut out into cards to be combined with each other, in order to compose "stories" and detect different patterns (*Image 24* and *25*). The aim was to compile the ideas of different participants into several groups, forming as many topics as possible. Each interview was marked with a different colour, in order to avoid "stories" comprising of ideas of only one participant, thus not rendering universal in their nature.

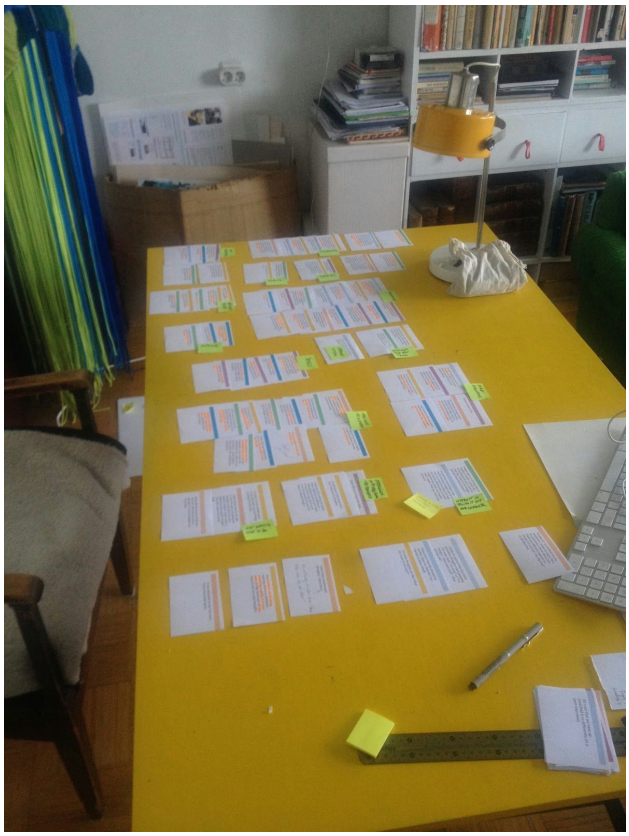

Image 24. The process of affinity diagramming.

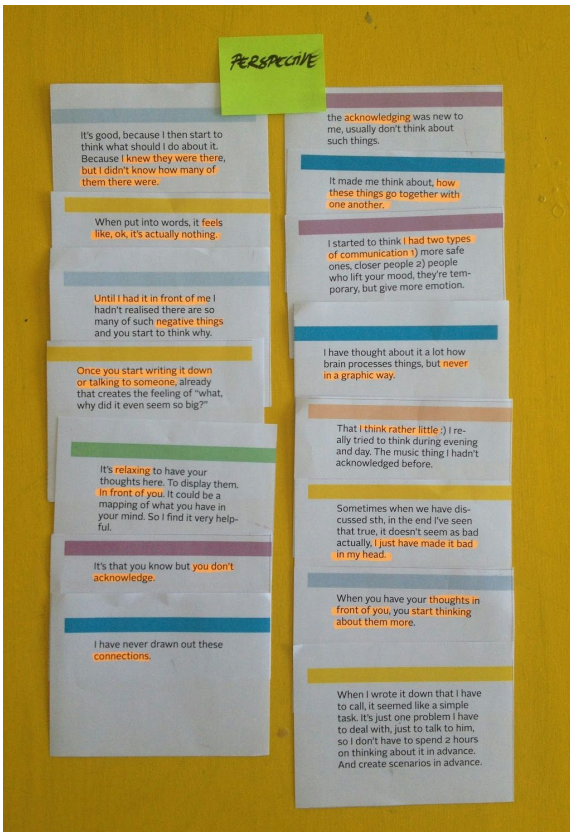

Image 25. A theme from affinity diagramming.

The topics detected in the affinity diagramming process were the following:

- **Perspective**

  Putting thoughts into perspective offers different takeaways for different people. We had assumed it is mostly good for creating a distance between oneself and one's uncomfortable thoughts, but the exercise also showed that it pointed things out to people in their thinking patterns they were unaware of. E.g. Participant 1: "*It's relaxing to have your thoughts here. To display them. In front of you. It could be a mapping of what you have in your mind.*"

- **The mind as a system**

  The thought processes seen on a more abstract level. E.g. Participant 4: "*These cycles are relatively similar. Every day the system is basically the same.*"

- **Judgements**

  A fact easy to slip one's attention is that any judgements made over their thoughts are *also* thoughts. It is the layer that people often misguidedly perceive as their true self.

- **"Would, should, could"**

  Few of the most "evil" thoughts. They seem "harmless" or task related, but actually create a set of stand-by activities that only cause suffering if they are not dealt with. Operates on the same level as "Judgements".

- **Self imposed rules**

  Rules the participants created for themselves when doing the exercise. E.g. Participant 3: "*I marked the time of the thoughts in parentheses,*" or Participant 1: "*I wanted to do it in portions."*

- **A rational approach**

  Both towards the task and the thinking process in general.

- **First associations**

  E.g. Participant 3: "*The first thing that came to mind I knew I had to put down was a thought I have each morning, so I instantly wrote it down.*"

- **Struggles with observing the thoughts**: e.g. Participant 3: "(The task was) *complicated in the sense that I don't observe my thoughts.*"

- **Not revealing**

  What the participants chose not to reveal and why.

- **Habits**

  Participants describing the habits in their thinking processes.

Most commonly the task made the participants acknowledge their thoughts either the first time or in a different way than before. This, for us, was an indication of an existing need for personal reflection.

However, while affinity diagramming helped to define the general aspects to be addressed in the concept design, some cards individually emerged as a potentially stronger source of further inspiration (*Image 26*), as they either created intrigue or offered a new perspective on a familiar aspect.

For example, Participant 1 commented on the fact that her board did not have almost any thoughts with a negative connotation, by concluding that it "*depends on the fact that times have been good.*" This made us consider an aspect in the solution that would draw attention to uncomfortable thoughts being caused by external stimuli, and not by something that people *are*, thus offering a chance to choose what is affecting them and what is not.

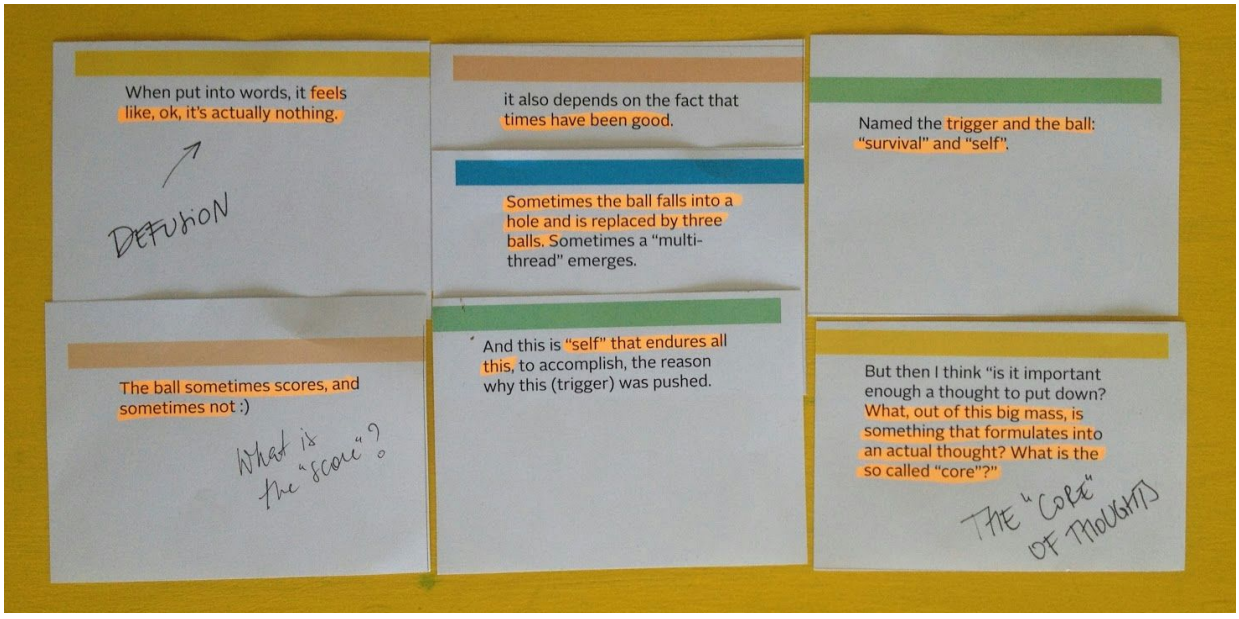

Image 26. Cards that did not comprise a "story" with each other, but stood out individually.

The concept of a "trigger" stood out the most, as it was described by Participant 2, having named the trigger of the board "survival" and the ball "self". When developing the probe, we had been more focused on what would be happening in the bigger part of the pinball board, and despite suggesting in the instructions that to name the trigger is also an option, we did not predict the level of possible importance of it. As the participant described: "*What pushed me every day to go through is the survival, to be successful, to live a better life, stuff like this that's related to the survival and …. human beings to have a better life, a better place, stuff like this. And this is "self" that endures all this, to accomplish, the reason why this* (trigger) *was pushed. And every time I pushed more, like, you know the pinball machine you push it hard and you push it slow. So if it's slow, that means you are in a good place and you want a little bit better place, so the survival instinct is not that hard, so it would go slow.*"

4.2.10. Reflection

Although the participants had the probes in their possession for two to four days, the actual time spent on the exercise proved to be rather short due to their individual schedules. This could be considered as a potential limitation of the study, however, having a somewhat busy schedule was normal to the participants and therefore focusing more on describing and less on analysing (which will inevitably happen over a longer period of time) potentially kept the expressed thoughts more true to nature.

Thinking about thoughts being a somewhat paradoxical and potentially complicated task, the pinball board format seemed to help approach it playfully, by allowing to find specific positions for thoughts, create connections between them etc.

Based on observations and reviewed literature, the topic of this thesis was set up on a premise that having difficulties with or discomfort caused by one's thoughts every once in awhile (or more often) is a rather widespread phenomenon. For us, this exercise revealed how much the perception of difficulties can vary from person to person. For example, when Participant 4

described "*I would like to avoid "will start soon", to actually deal more with the stuff.*", he described something he had to change in his behaviour, without acknowledging the actual thought of wanting to avoid something. Therefore, even though a person might say they do not have any thoughts causing discomfort, what they often experience as uncomfortable *are* actually the result of different thoughts (conclusions, expectations, projections etc.).

We also saw that even when specifically asked to describe their thoughts, an automatic filtering process happened, in many cases resulting in descriptions of phenomena or domains of life, instead of recognising this "filtering" part as thoughts as well. We realised we were designing for an experience that is highly prone to multiple interpretations.

4.2.11. Outcome

The outcome of the first phase of our studies is listed as categories in *Table 6*.

Phase 1	
What was produced	Probes consisting of an A3 pinball board template, stickers and an instruction note
Criticisms	The set of usable elements provided in the probe were not taken advantage of to a very large extent
Confirmations	There is a need for personal reflection
Ideas	"Trigger" as the central element in the concept

Table 6.

4.2.12. Next Steps

We set forth to elaborate on the idea of a "trigger" by finding connecting points with the supportive theories of our work, connected to mindfulness.

Russell Harris explained in his article about ACT: "*It is not the presence of anxiety that comprises the essence of an anxiety disorder. After all, anxiety is a normal human emotion that we all experience. At the core of any anxiety disorder lies a major preoccupation with trying to avoid or get rid of anxiety.*" Also, in ACT, the term "clean discomfort" is used, describing the natural

level of discomfort every person experiences both physically and emotionally in different situations. But the discomfort levels increase significantly, once the person starts to struggle with it, causing additional suffering ("dirty discomfort"). "Struggle switch" is another metaphor from ACT, describing the choice of attitude a person has when experiencing an unwanted thought, emotion, event etc., which is "*like an emotional amplifier—switch it on, and we can have anger about our anxiety, anxiety about our anger, depression about our depression, or guilt about our guilt*[10]."

We noticed that the "trigger" could be directly connected to the "struggle switch" concept – the strength of the "pull" of the "trigger" relates to the idea of being either active (struggling) or passive when stimulus occurs.

The aim now was to find ways to introduce the concept of *not* committing to awareness as a trigger. I.e. the kind of interaction that would "prefer" for the user to not commit to dynamic elements on the screen. The metaphors described above are easy to understand when explained, but in order to go beyond a simply descriptive animation, we needed to find ways to translate these concepts into a meaningful interaction.

4.3. Phase 2: Concept 1 and 2

4.3.1. Introduction

With inspiration gathered from the probing and supportive theory, we started an ideation on how it could be combined with the concept of mindfulness and designed into a prototype that could be tested with people for feedback. The activity was planned in small steps, avoiding leading the participants in a specific direction with too finalised or closed concepts. The process of Phase 2 is described in *Image 27*. The working research questions, assumptions, and planned activities are listed in *Table* 7.

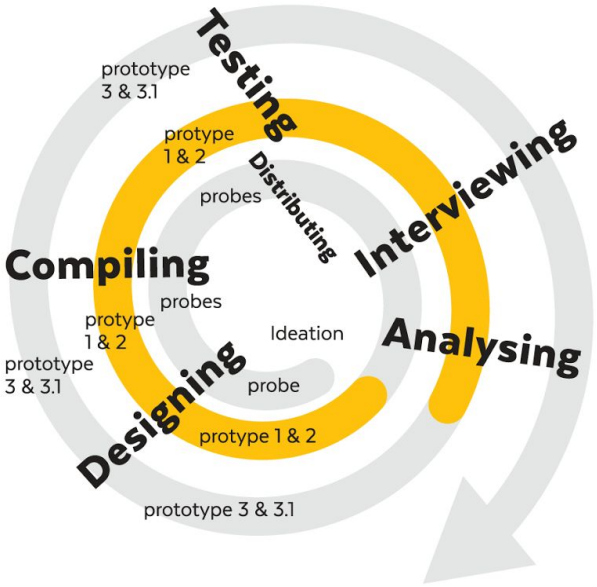

Image 27.

We gathered visualisation ideas around concepts of "intervening with thoughts" and "awareness" – the two "opposites" of mindfulness, in which the first one would describe the result of trying to control one's thoughts and the second one showing how the thoughts react when awareness of thought processes happening is lost. Although these concepts are two sides of the same phenomenon, we decided to test them separately, in order to see whether they would cause different reactions or whether one would be more provoking than the other.

Phase 2	
Questions	How to depict thinking processes in a simplified manner? How can the participants contribute to the further development of the concept?
Assumptions	A more abstract form is more provoking
Next steps	Define a tool for prototyping Composing prototypes Finding participants Arranging test sessions Interviewing

Table 7.

4.3.2. Concept 1: Intervening With Thoughts

Depicting the idea of intervening with thoughts, a simple visualisation was created as a sketch (*Image 28*). It depicted a graphic interactive interface in a steady but slow enough flux (*Image 28: 1.*), so that the user would get the urge to try to "fix" it or set it back in the original order (*Image 28: 2.*), but the result of this interaction would actually create more chaos. Once the user would stop trying to intervene, the interface would return to its original state.

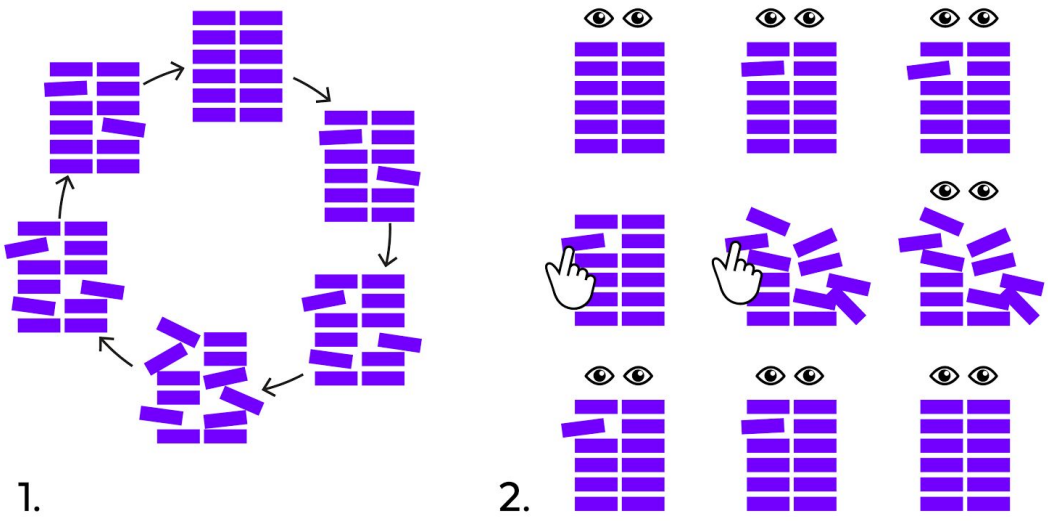

Image 28.

The concept consisted of 37 slides (*Image 29*), plus an extra slide in the end, explaining the idea of the exercise, thus allowing the participant reflect on their individual experience (instead of providing the explanation at the beginning of the slide show). Each slide depicted 16 rectangular blocks in two columns. Starting out, the columns were perfectly organised, and on slide 1, accompanied by the following text: "*Think of this set of blocks as your mind, each block representing a thought. First, simply observe it.*". Moving through the slides, some of the blocks started to move outwards, slide by slide, in an unorganised manner, and then returned to their original positions, forming two straight columns again, this time with the instructive text: "*Now, continue observing, but imagine as if you were trying to push the blocks back in order when they start to wander.*" on slide 18. This time, the blocks would drift from their original position even more, until the appearance of the text: "*Now, simply observe again.*", with the following slides showing the return of the blocks to their original organised positions again.

The last slide contained the following explanation: "*This exercise demonstrates the fact that just by observing your thoughts, your mind will eventually calm down. By trying to force or suppress thoughts, only more tension is created. But there is a "way back" from even the messiest thoughts by simply observing the activities of your mind, without trying to intervene.*

Simply, each time you notice you've got carried away with whatever kind of thoughts again, bring your attention back to being aware of the fact that they are just thoughts."

This was directly inspired by the approach towards symptoms in ACT – namely, not having symptom reduction as a goal – an approach that strongly reflects the idea of mindfulness: observing without judgements.

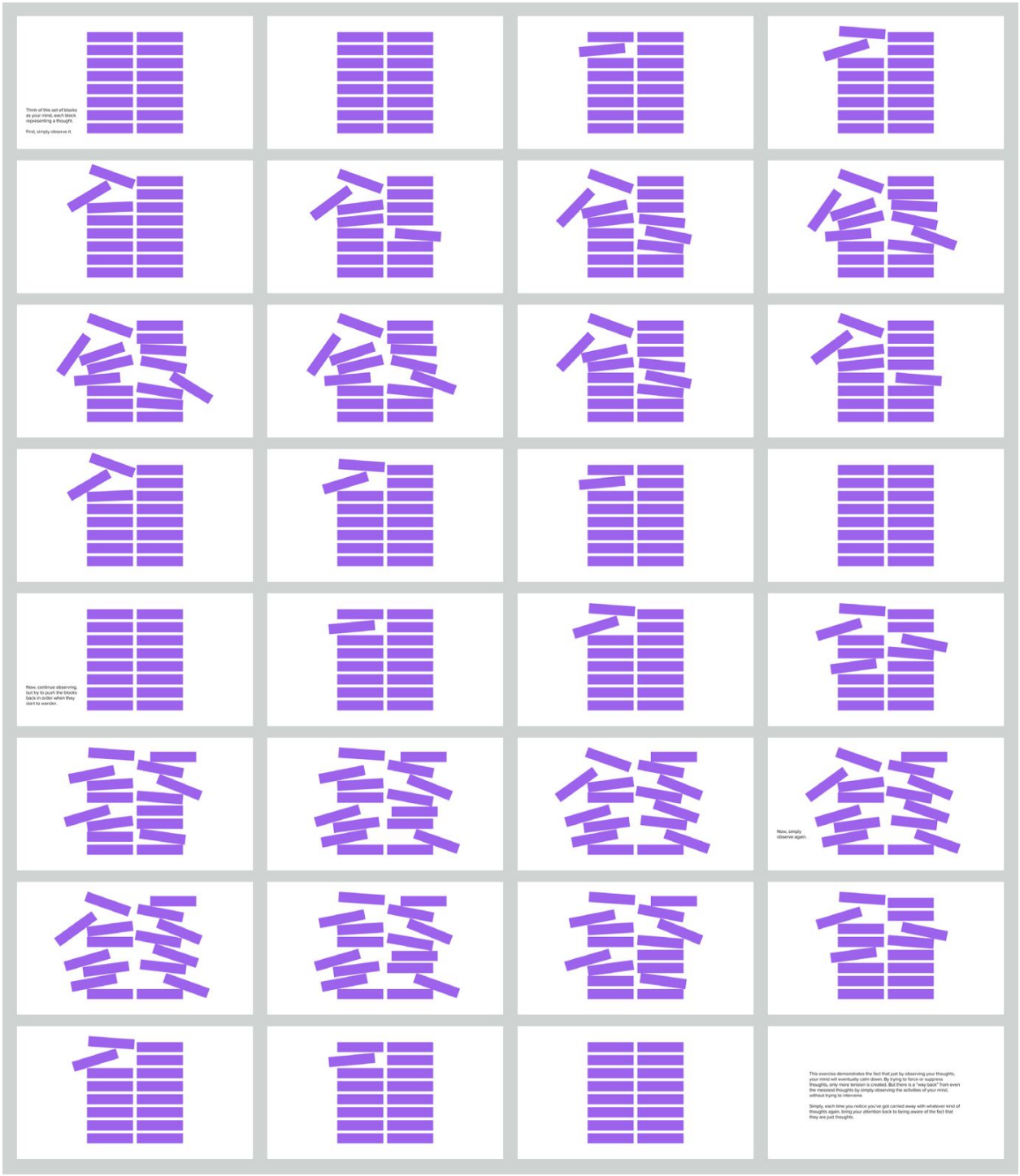

Image 29. The slides of the "Intervening" concept. To be read rows first, from top to bottom.

4.3.3. Concept 2: *Awareness*

Simultaneously, we worked on the second concept focusing on "awareness". The concept was initially sketched based on the logic of thoughts intensifying and multiplying when focused on them and losing general awareness of oneself (*Image 30*).

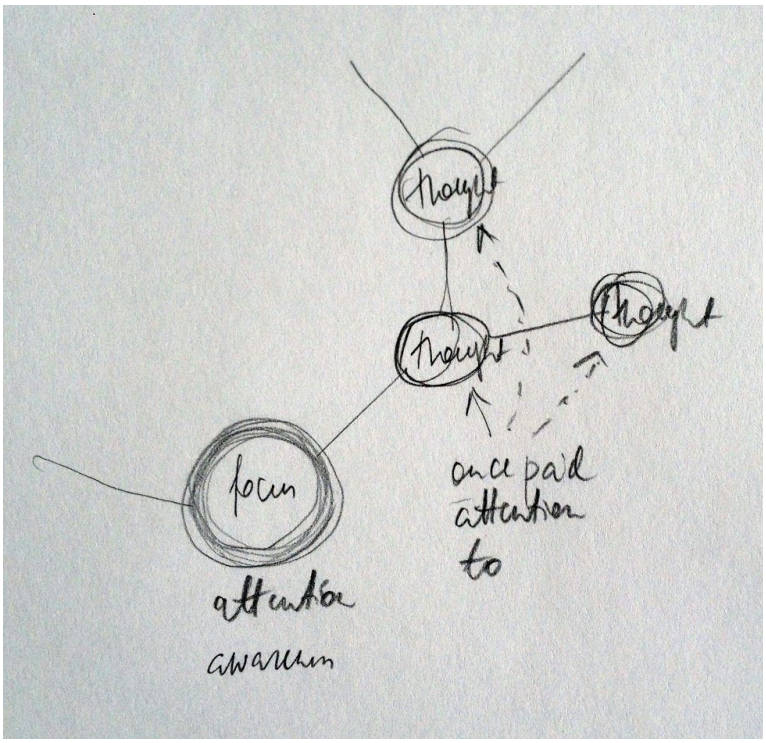

Image 30. Initial sketch of the "Awareness" concept.

The concept consisted of 85 slides (*Image 31* and *31.1*), and same as in the first concept, with the last slide explaining the idea of the exercise. Each slide had one common element: a bubble in the centre with the label "awareness". The first slide was accompanied by the text: "Focus on the Awareness.", followed by a smaller bubble "growing out" of the central bubble and detaching from it, and then doing the same motion in reverse. Next, the participant was instructed to "follow the growing bubbles", witnessing the growth of the smaller bubble again, with two more bubbles coming out of that one, until the instructions to focus on the awareness again appeared.

The same logic was repeated throughout the slideshow, telling the participant to follow the "growth" to larger and larger extent, until they were told to focus on the "Awareness" again for the final time, resulting in the screen returning to its original state with the one central bubble.

The last slide contained the following explanation: "*This exercise demonstrates the fact that thoughts (the "bubbles") come and go, but the intensity of these thoughts rely on how much attention you pay to them.*

Even the most uncomfortable or distracting thoughts become less intrusive over time if awareness of this process is maintained. Simply, each time you notice you've got carried away with the emerging "bubbles" again, bring your attention back to being aware of the fact that they are just thoughts."

This explanation was formulated based on the instructions provided in various meditation guides (e.g. *Headspace*).

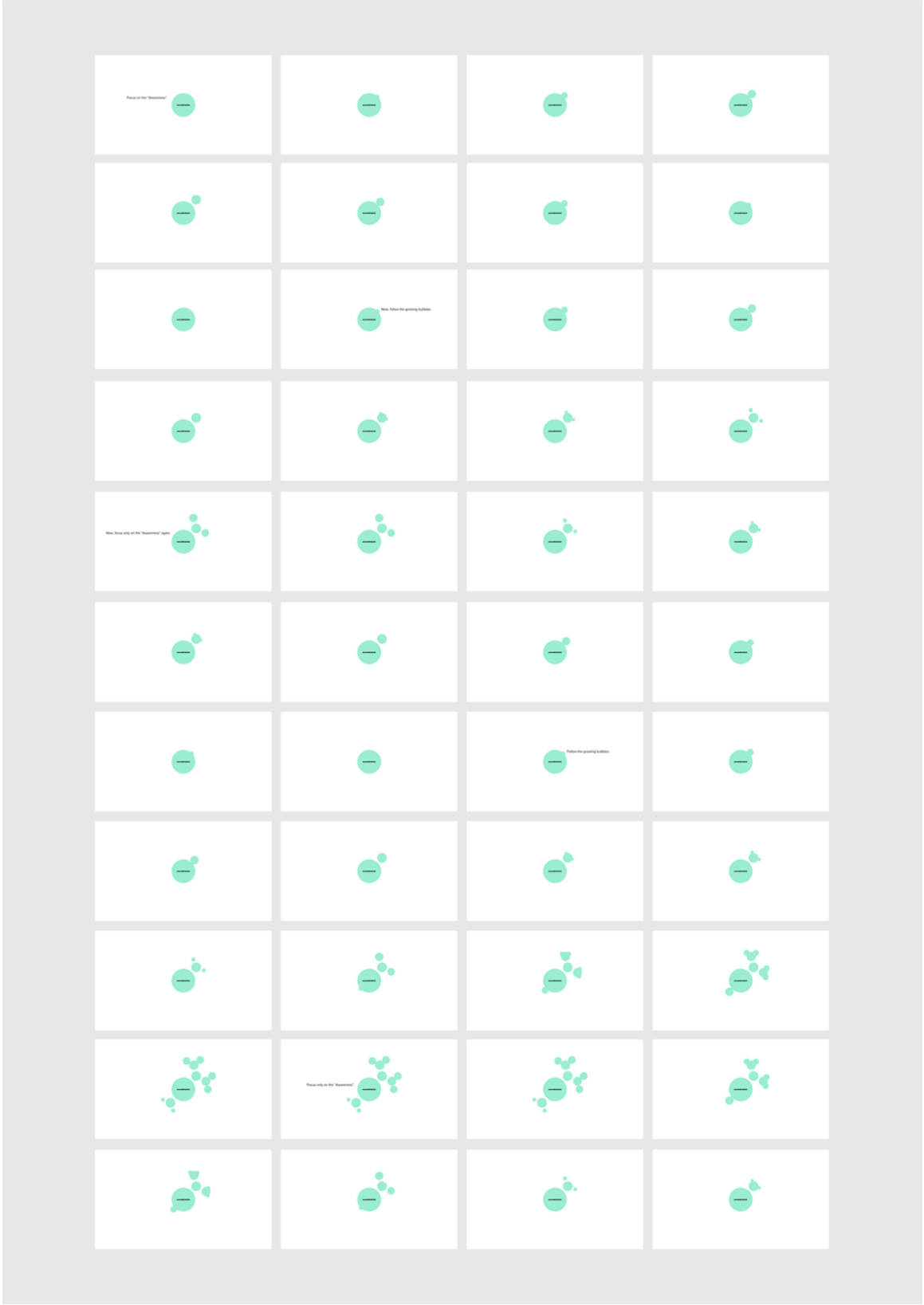

Image 31. The slides of the “Awareness” concept. To be read rows first, from top to bottom.

Image 31.1. (Continued) The slides of the "Awareness" concept. To be read rows first, from top to bottom.

4.3.4. Compiling the Test Prototype

The graphic design of the concept was not relying on any principles of psychology or any other guidelines. The aim was to depict "order" in as simple means as possible.

Partly due to the time constraints of the thesis, and partly to keep the concepts as simple as possible as a principle, a prototype was created in a slide show form to test the idea. The slides would be either viewed as a played presentation or clicked (or tapped) through by the participants themselves.

As these concepts were developed simultaneously, they were combined into one presentation, one succeeding the other. In order to learn whether seeing one concept first would affect the perception of the other in any specific way, the order in the presentation was switched in half of the test cases.

4.3.5. The Participants

Six participants (referred to as Participant 7, 8, 9, 10, 11 and 12) were chosen for testing the concept. The only condition was for them to not have taken part in the probing session, to avoid any biases.

4.3.6. The Procedure

Participant 7 and 8 took the test at their homes, with the slideshow being shared with them as a link, and the test session taking place during a Skype call. Four participants tested the concept in an office setting, the concept set up on an iPad and a tablet, with the researcher present. The four participants were divided into pairs, in order to evoke discussion after testing.

Two participants (doing the session at home) had "Intervening With Thoughts" as the first concept and four participants had "Awareness" as the first concept.

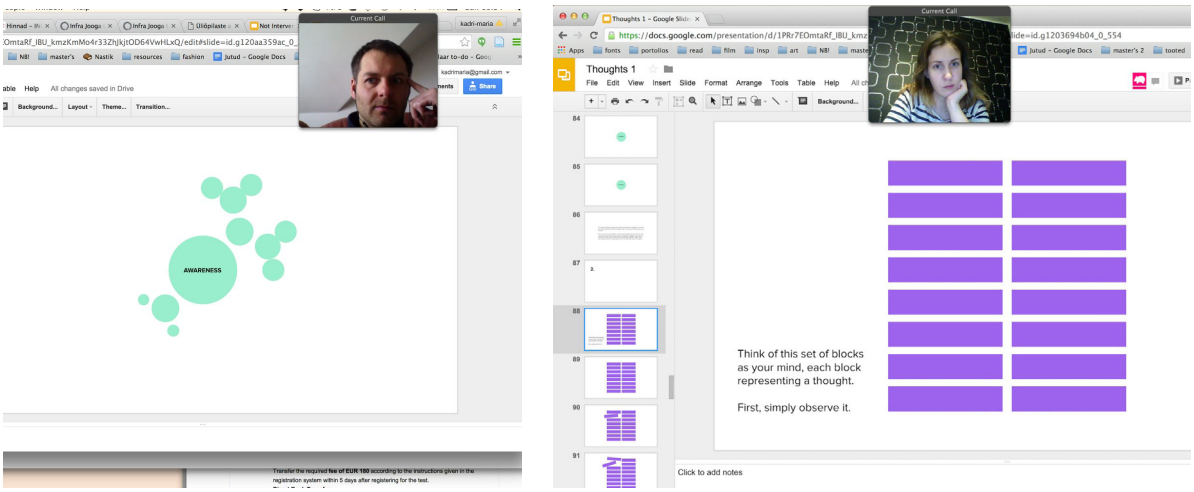

Image 32. Testing session of the first prototype via Skype.

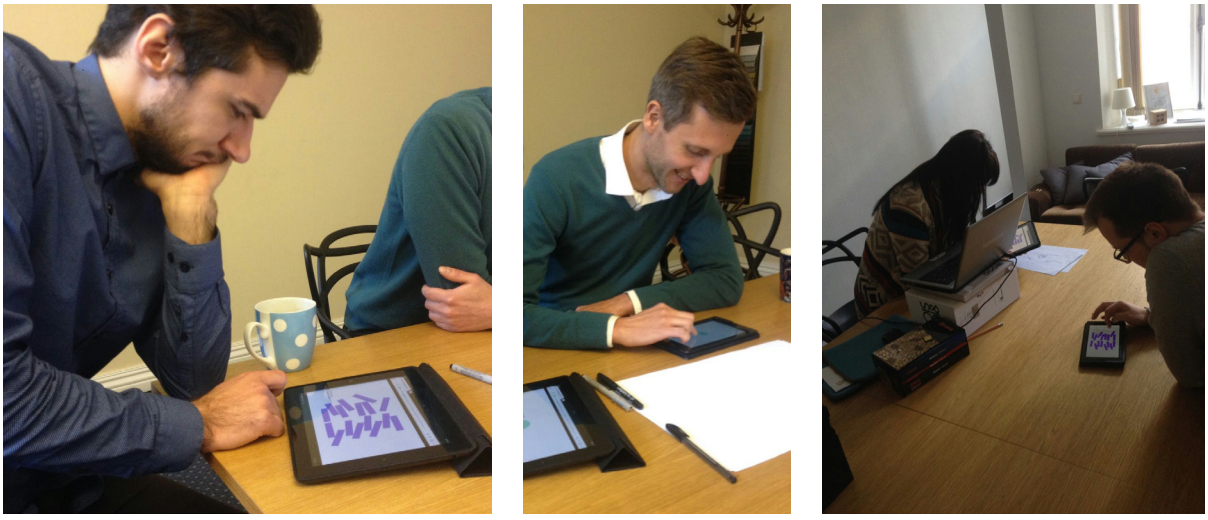

Image 33. Face to face testing session of the first prototype.

4.3.7. The Interviews

The semi-structured interviews were conducted directly after testing either concept, with the following scaffolding questions:

- What is going on in your head right now?/How do you feel after this exercise?
    - (in the need/opportunity to extend the question:)
        - What have you learned?
        - Would you come back to this method in your private experiences?

- How did you find the instructions to be?
- How would you depict the elements yourself?
- When having distracting or uncomfortable thoughts, how do you usually deal with them? (only asked after the first concept)

After finishing with both concepts, additional questions were asked:

- How would you compare the two concepts?
- Which one did you find more relatable?
- Which one raised more questions?

4.3.8. Highlights From The Interviews

Again we took note of comments that stood out in one way or another, and inspired us:

"Awareness":

- Participant 8 asked halfway through the exercise if she should start again, as she had thought that "awareness" meant following everything that was going on the screen, not the specific bubble in the middle. Although the approach was "incorrect" within the exercise, the general understanding of the concept of awareness was actually correct.
- Participant 11: "*I noticed when the bubbles grew, I projected myself on the bubbles: when the bubbles grew to the left side, I felt my consciousness also expand to that direction. (...) It feels like mainly, when I'm that bubble, the consciousness is here in the centre (*diaphragm*), then I felt something start growing from that side (*upper right*), and I felt I was more aware of this part of the room around me. When it shrunk, the awareness came pack to the centre of me. It's like my body or consciousness started to reflect the same movement. It was like a conductor. An interesting experience.*" We realised there was a possibility that this kind of interaction could have an actual effect on the user.

- Participant 12 mentioned that drawing out a system like that for oneself could be helpful daily.
- Participants 7 and 9 mentioned the visualisation related to the branch like structure of thoughts they perceived in their own thinking processes.

"Intervening":

- Due to having experienced the "Awareness" concept before, Participant 7 said he was not motivated to follow the instructions of trying to "push back" the blocks, as he felt he knew the result in advance ("*what will happen will happen*")
- Participant 7: "*A trigger was missing, why things started to organise again.*"
- Participant 11: "*I have to do something repeatedly in order to understand or feel it.*"
- Participant 12 struggled with the exercise, as he perceived it as a task and was not sure what was expected from him. He perceived the exercise to be "too abstract" even for someone like himself, by whom high level of abstraction is generally welcomed.
- Participant 12 perceived the "second" column of thoughts as a separate thing, not being affected by the "first" one ("*If it was one column, then one thought would affect the other and all would be connected.")*.

We took note of two of the participants', personal approaches when dealing with uncomfortable and distracting thoughts:

- "*I've realised blocking doesn't help, I must think it through, rationalise, "digest" it, make peace with it.*"
- "*I start thinking about something and get very far, then I think how did I get here? Then I will go back to the original thought step by step.*"

Although not directly, both of them related to the "mechanism" of mindfulness: not trying to block one's thoughts, accepting them, and shifting the attention away from the distracting thought. We noticed that in many cases, the similar logic was already within the minds of

the participants, it would only need to be projected onto an appropriate visualisation, to make the connection.

Regarding the elements of the concept:

- Participant 1 wondered whether the effect would in the end come down to people preferring either round or square shapes. ("*The use of different shapes made me feel in different ways.*")
- Participant 10: "*the bubbles were nice, but I'd change the boxes,*" "*The graphic design of* ("Awareness") *was better.*"

In addition to that, suggestions were made by some of the participants regarding the logic of the concepts:

Combining Concepts

- It was suggested by Participant 1 that the two concepts could be united, adding the idea of "intervening" to the "awareness" concept.

Connected Thoughts

- It was suggested that lines could connect the bubbles, or the bubbles be connected to each other (as opposed to detaching), which, looking back, was actually visualised in our original sketch of the concept.

Personalised Visualisation

- Participant 11: "*It would be interesting to show this to people, that this is your consciousness, like a training machine, your awareness starts to copy what's shown, to mirror it.*"

Image 34. Video stills from an interview after testing.

4.3.9. Analysis of the Interviews

As in the previous, probing phase, the priority was to collect ideas that would inspire or intrigue, and broaden our understanding people's perception. Note was taken of patterns that emerged, which are hereby described as themes:

The line between the exercise and the actual self

- In the "Awareness" exercise, Participant 1 was not sure whether she should focus on the "Awareness" on the screen or actual awareness within herself. Also in the "intervening" exercise, Participant 11 commented: "*I observed what's on the screen, but didn't observe myself*". This drew our attention to the difference of setting the concept up as a task and designing for an actual experience.

"Awareness" as one point on the screen *versus* the "whole picture"

- As the exercises were simplified visualisations of profound concepts, for some participants it was difficult to grasp "awareness" as one point. Due to the same fact, and to the choice of words in the instructions, in many cases it was perceived as a focusing exercise. E.g Participant 12: "*I didn't think what I should do myself, but was just looking at what's going on on the screen.*", Participant 8: "*I didn't know if I had to focus visually or on awareness in myself.*"

"My thoughts are not organised"

- The most common remark regarding "Intervene" was that the visualisation did not relate to the actual perception of thoughts (Participant 10: "*For me it was very rigid, thoughts are actually more in a flow*"). Although our aim was to convey the idea of balance, not necessarily concreteness and order, we took note of these remarks and recognised it as a weak point of the design.

Beyond abstraction

- In a couple of cases, participants tried to assign labels or roles to different blocks representing thoughts (Participant 8: "*I chose about five blocks and gave them name, but when they started to move, I didn't know which thoughts they were.*").

Inherent Mindfulness

- In three cases, there were similar indications of the participant's unconscious understanding of the concept of mindfulness (Participant 8: "*I didn't feel like I necessarily have to move them back,*" Participant 10: "*Forcing order on your thoughts is violent and doesn't work,*" Participant 11: "*The feeling of forcing the thoughts did not feel natural.*")

In a couple of cases, it was mentioned that they "understood" the second exercise better due to the first one.

To test our assumption that the more abstract exercise would be more provoking, we sorted appropriate fragments of the feedback into two themes, additionally indicating the "positive" (meaning approval, the concept being relatable, marked with green background) and "negative" (meaning confusion, or the concept not relating to actual perception, marked with red background) (*Image 35*).

We noticed that although looking at the data visually, "Intervening" ("Blocks") may seem more provoking, but mostly the questions by the participants were related to how this task should be solved, not provoking ideas about thinking in general. So, we concluded that solution utilising a high level of abstraction will make people wonder more about the visual part than the idea.

We also noticed that the "awareness" exercise was perceived more as a task than a self observation by the participants.

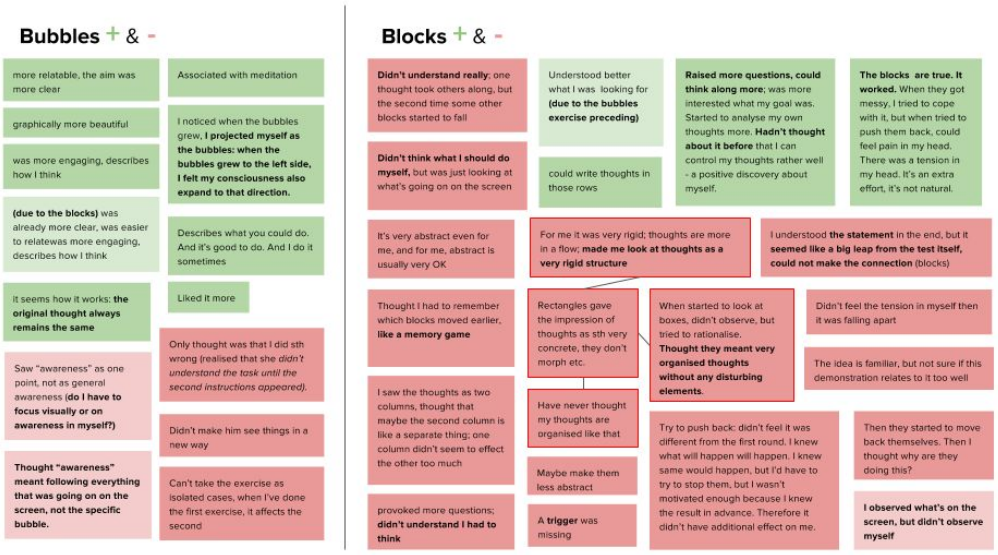

Image 35. Dividing comments into "positive" (green) and "negative" (red) ones. Similar ideas are marked with a lighter shade.

4.3.10. Reflection

The critical design approach had served as a helpful starting point, but as we were dealing with a subject as personal as one's thoughts are, we realised it would be too challenging to try to provide a solution that would provoke a sense of perspective in a larger audience. Therefore, in the course of this phase we organically moved towards participatory design.

Although we had some doubts regarding the low fidelity of the prototype, the participants proved (based on the feedback) to be more focused on the idea and not distracted by the fact that the "interactiveness" was actually simulated by their own activity. By this we are by no means claiming that testing the same ideas in high fidelity (meaning the events occurring as a reaction to eye or body movement, for example) would not produce different results, but the follow-up discussion and questions from the participants being focused on the content indicated that form of the concept was much less an obstacle in the immersion than anticipated.

As some of the participants found the more abstract version ("Intervening") more relatable and would start to rationalise it more, we saw that "more abstract" is not necessarily more provoking. In addition to that, our presumption had been that the concept that would raise more questions would be the one that is more difficult to understand or relate to, but in one case, the questions were directed "inwards", not towards the task at hand (Participant 8: "*I could think along more…was more interested what my goal was. Started to analyse my own thoughts more.*").

The most important takeaway for us from these sessions was the realisation that each person interprets even instructed journeys in their own way, causing an inevitable inclination in perception into various directions.

4.3.11. Outcome

The outcome of the second phase of our studies is listed in categories in *Table 8*.

Phase 2	
What was produced	"Intervening" prototype in Google Slides format "Awareness" prototype in Google Slides format
Criticisms	"Intervening" looks too organised to depict thoughts A more abstract form is not necessarily more provoking There is a fine line between provocation of thought and confusion due to multiple interpretations
Confirmations	Google Slides format is rich enough for prototyping
Ideas	Combine the two versions into one Leave the elements (e.g. bubbles) connected to each other People's interpretation varies, some guiding keywords might be needed

Table 8.

4.4. Phase 3: Concept 3.1 and 3.2

4.4.1. Introduction

In the next iteration, our goal was to create a design that would demonstrate the same principles without needing a an additional explanation. We wanted it to be open enough so that it would have some room for personal reflection, and guided enough in order to maintain a certain structure, and for the participants not to get too carried away with their own interpretations. An additional question we had for the next iteration was: what level of abstraction in a visualisation would still succeed in conveying the general idea of mindfulness? The process of Phase 3 is described in *Image 36*. The working research questions and planned activities are listed in *Table 9*.

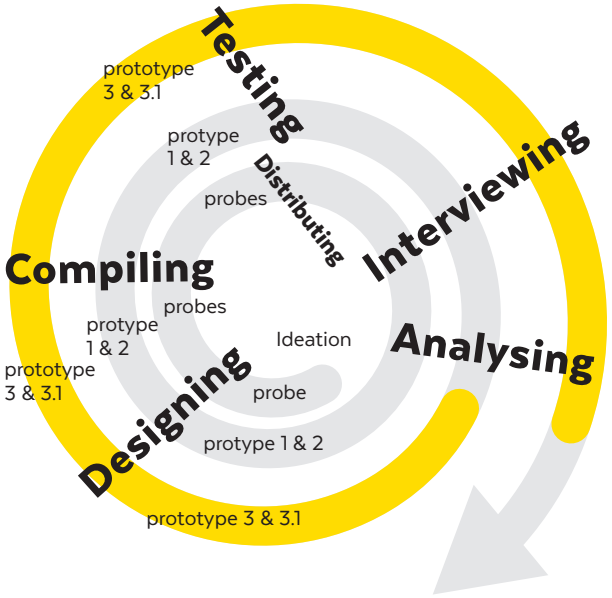

Image 36.

Phase 3	
Questions	What kind of instructions or keywords should be displayed on the screen? What level of abstraction in a visualisation would still succeed in conveying the general idea of mindfulness?
Next steps	Create a design that would demonstrate the same principles without needing a separate explanation to conclude the demonstration Combine the two versions into one Leave the elements (e.g. bubbles) connected to each other Compiling prototypes Finding participants Conducting test sessions Interviewing Analysing

Table 9.

4.4.2. Compiling the Prototype

As suggested by Participant 1 in the previous phase, we now decided to combine the two concepts into one prototype. We chose the "Awareness" version as basis, due to the fact that this visual representation was perceived more relatable by the participants in the previous phase.

4.4.3. Concept 3 – the "closed" version

A Google Slides presentation containing 196 slides was composed (*Image 37* and *37.1*). The general logic of this concept was kept similar to the "Awareness" concept, simulating an animation of elements appearing and growing, and shrinking and disappearing. For a better overview, the design of the concept will be described in bullet points, in relation to previous concepts, to comments by the participants, and based on our previous conclusions and goals:

- The first slide displayed a central bubble, with the text "my true self" in the middle, and circles in the background, growing outwards and gradually lighter in colour. The aim of this illustration was to emphasise the activity on the screen happening within the person, and that although the central point is in main focus, awareness of its surroundings must be kept (with the remarks in mind regarding the "focus" from the previous iterations by the participants).

- "My true self" was chosen as the label for the central point, in order to create a higher level of fusion in the experience (relating to the comment "*I didn't know if I had to focus visually or on awareness in myself.*"). The first slide was accompanied with the instructions: "*Think of the centre of this screen as the essence of what you are. First, whatever happens on the screen, simply focus on "my true self".*"

- On slide 10, instructions were given: "*Now, start following the emerging blobs. They represent your thoughts.*" followed by a similar logic of elements appearing and growing when paid attention to, and shrinking and disappearing when attention brought back to oneself, as in the "awareness" concept.

- Instead of perfect circles, irregularly shaped blobs were used this time as the representation of thoughts, relating to the participants' comments on thoughts being more in a "flow" and irregular in nature.

- To give the thoughts even less homogenous feel, we used different colours for different "thoughts", but with no specific intention with different colours in mind.

- Each "fully manifested" thought (meaning the endpoint of a thread) was this time given a label: "Everyday tasks", "Future plans", "A daydream" (twice), "Past events", "Anxiety", "A memory", "A random thought", "A plan" and "Possible failure". The aim was to give the concept enough structure so that the participant would not be left spending too much time on assigning roles to the elements, and at the same time maintaining enough space for personal reflection.

- For the element of "Anxiety", the logic of the "intervening" concept was applied: towards the end of the presentation, the participants were instructed to imagine they were trying to control the "Anxiety". In the two following slides, the element shrunk, but was then returned to its original size, and expanded even further, partly covering other "thoughts" on the screen. This was to demonstrate the fact that trying to force one's thoughts and sensations will mostly result in the opposite of the desired outcome.

- "Anxiety" having reached its maximum expansion, the participants were now instructed to focus on "my true self" again, resulting in all the elements shrinking and disappearing, in the end leaving them with the same view they had started out with at the beginning.

4.4.4. Concept 3.1 – the "open" version

To find an answer to our question – how high level of abstraction in a visualisation would still succeed in conveying the general idea of mindfulness? – we decided to create an alternate version of the same concept, without the textual part. To make this highly abstract version more relatable, the central bubble was replaced by a round photo of the specific participant. We were interested in both, how much of the intended idea would be grasped, and any original ideas the participants might have when testing this version.

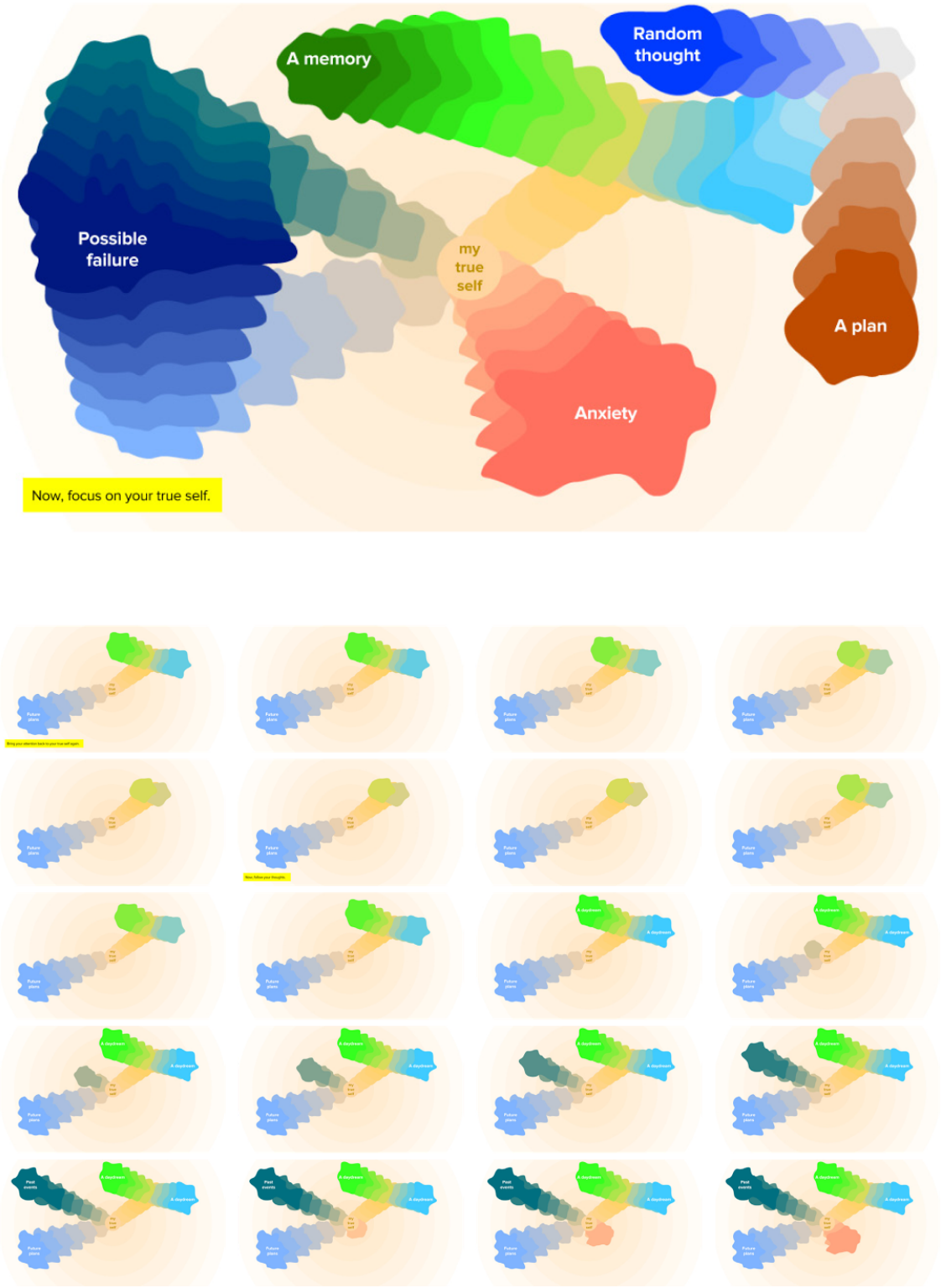

Image 37. Slides from Concept 3.1.

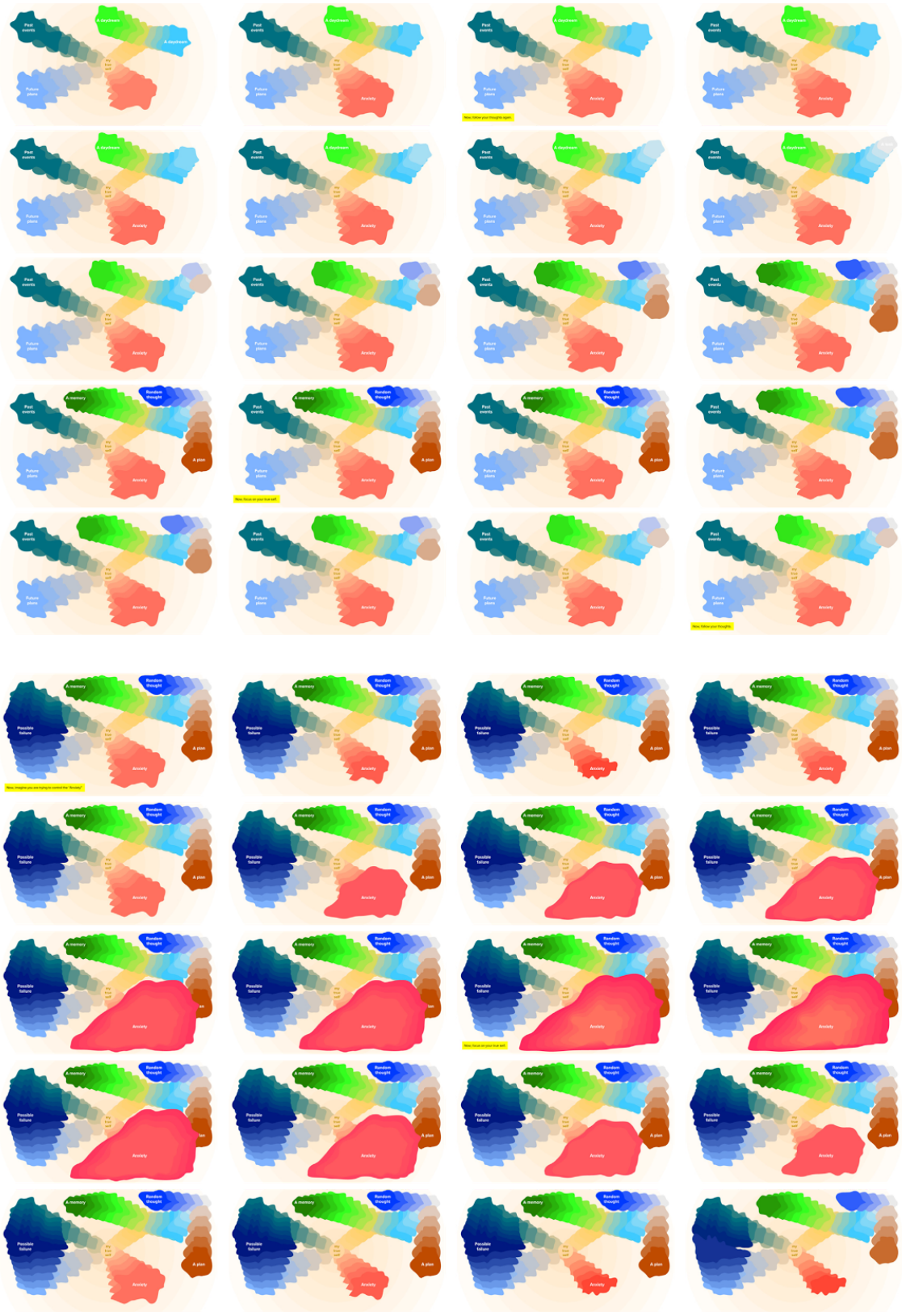

Image 37.1. Slides from Concept 3.1.

4.4.5. The Participants

Altogether twelve participants (referred to as Participant 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24) were chosen for testing the concept – six for either version of the concept – and as in the previous procedures, the only condition was for them to not have taken part in the probing session for avoidance of biases.

4.4.6. The Procedure

The initial plan was to distribute the "open" version online, so that the participants would be guided at a minimum level, in order to leave as much for interpretation as possible. The participants were asked to go through the slideshow more than once, at different times over the course of two to four days. After the testing period, a short semi structured interview would be conducted via Skype.

The "closed" version would be tested in face-to-face sessions, with interviews following immediately after one view of the slide show. The interviews were planned in either pairs or groups, in order to evoke discussion.

However, after the first session with three participants (in an office setting, using an iPad, a tablet and a laptop), we noticed that the presence of the researcher during the testing session was not necessary. Therefore, all the rest of the participants were given some time with the presentation on their own at their chosen time, and the interviews were scheduled for a different time. Again, in order to evoke discussion, we decided to form pairs out of four participants, this time in which one had tested the "open" version and the other the "closed" version.

Image 38. Testing session of the "closed" version.

4.4.7. The Interviews

We used the same questions as in the previous phase, this time leaving out the ones regarding the design and the instructions and focusing more on how the participants had experienced this concept.

Image 39. Interviews.

4.4.8 Highlights from the Interviews

As in the preceding phases, note of comments that stood out either by inspiring us or offering a different or even opposite perspective from ours.

The "closed" version

- Participant 13 commented that she could think about herself as the dot in the middle, and her actual being at the same time ("*I could focus my attention on my actual self.*").
- Participant 15 commented that it could be helpful as an explaining material ("*You don't have to read through a pile of theory in order to understand a concept.*").
- Participant 17 elaborated on the "my true self" element: "*Maybe it shouldn't be "self", but "unself" instead. Selfless attention. So that the parameters of ego disappear.*"
- Participant 17: "*Had it been in estonian, the experience had been more intuitive. For example, "past events" - I had to think what they are.*"

The "open" version

- Participant 24: "*I felt like I was a plane in the sky, and interesting things started to happen, and I didn't even understand whether I'm creating them or am I on an adventure somewhere.*" Although described metaphorically here, it relates to the idea of the choice between acknowledging thoughts ("*creating*") trying to control thoughts, or getting carried away with them ("*adventure*").
- Participant 23: "*When I looked at the empty slide, I felt ok, but with more elements I had mixed feelings.*"
- Participant 24: "*Joy in me grew when colour appeared and shrunk when they disappeared.*"
- Participant 22: "*When there are many elements, it makes you tap the slides faster – want to see what will start to happen.* "

4.4.9 Analysis of the Interviews

In the analysis phase, we were again looking for more common patterns among the participants to either confirm, argue, or generally bring out aspects in the prototype.

The "closed" version

The most common comment across all of the participants of the "closed" version was that they felt the visualisation was accurate:

- Participant 15: "*It visualises well the way things are in the mind.*"
- Participant 17: "*I tested to test this model against my own psychology, and it matched to a large extent.*"
- Participant 10: "*It didn't exactly offer anything new, but visualised the idea well. I think this is how things actually are.*"
- Participant 19: "*I know this logic* (being present in the moment)*, so I recognised that in this. But I noticed doing this* (exercise) *also worked. I felt good when it was just the dot again. One could do it before going to bed.*"

In a few cases, the use of colour was specifically noticed. It was either perceived as accurate or raised questions, how much had it been thought through:

- Participant 15: "*The colours actually seemed to match how I felt.*"
- Participant 17: "*I didn't exactly understand the colours. Some of the colours matched, but others didn't. I didn't know what to read from it exactly.*"

The "open" version

The sensation provoked the most with this version was curiosity of what would happen next.

Surprisingly, three out of the six participants perceived the concept rather similarly to our intentions:

- Participant 18: "*At the beginning I didn't understand it, I had no associations, but when I looked at it again...I had a thought – maybe because of my picture in the middle – that maybe they are threads of thought that start to evolve, and then they mix, and jump from one to the other.*", "*It seemed very similar to how thoughts in people's head evolve and mix.*

When you develop an idea, when they become stronger, disappear, start again with new nuances. One thought supports the other, blends together."

- Participant 20: "*The blobs seemed like human emotions, how they expand, move, go lighter, more appear, then disappear. So there's a movement like this.*"
- Participant 23: "*The last couple of times I felt a pressure in my head, like my head's exploding and all of this stuff is coming out of my head, so, in the end it felt like my thoughts and emotions, and that there's so many of them.*"

As this version did not come with any instructions, the perception of interactions was different from the "closed" version: the participants could affect the elements directly, by clicking forward or backward, whereas in the "closed" version the reactions of the screen were simulated with the help of instructions.

The absence of instructions, however, resulted in participants starting to play with the prototype more, e.g. moving in different directions in the slides, altering the pace of the slides changing, moving to next slides according to the rhythm of the music they were listening to etc.

In this version, the participants were more inclined to assign meanings to different colours and see specific shapes in the blobs:

- Participant 18: "*The more red the warmer the thought seemed.*"
- Participant 16: "*I'm not sure what the shapes mean. The green and bright blue are like stars, they make me happy, but the dark blue looks like an evil fish…I'm neutral about the others.*"
- Participant 22: "*The big red blob added suspense, I hoped it would even cover my photo.*"
- Participant 23: "*When the red expanded, I felt anxious, wanted it to go away.*"

4.4.10. Reflection

As the design had been made to look more "organic", the participants were more focused on how this exercise made them feel and were less distracted or puzzled by potentially inaccurate representations.

In a couple of cases the participants commented that they saw it rather as a scheme (Participant 15), a psychological test (Participant 17) and that they perceived it as a focusing exercise (Participant 13) – none of the comments were exactly negative, but expressed a perception that was a little shifted from our original intention (Participant 15: "*I saw it from third person view, I put myself into separate time or moment, not exactly in the moment of testing,*"). However, these comments could have been the result of the fact that the participants were specifically asked to test the prototype.

This was also the moment we realised our work was not only about finding ways to demonstrate a concept, but through this concept, we became aware of a type of interaction not yet widely explored – an interaction that would imply passiveness from the user's side.

4.4.11. Outcome

The outcome of the third phase of our studies is listed as categories in *Table 10*.

Phase 3	
What was produced	"Closed" version prototype in Google Slides format "Open" version prototype in Google Slides format
Criticisms	Was perceived as a test Maybe too schematic due to the labels The use of colours raised questions
Confirmations	The visualisation is accurate The connections are made even with a high level of abstraction, if the forms are "organic" enough
Ideas	"Passive interaction" as a possible concept for a wider application

Table 10.

5. Discussion

5.1. Thoughts on the Approach

Wanting to dig deeper into people's perceptions, we had to go beyond the tested and approved options (e.g. using the design decisions made in the design of current solutions as inspiration) and look for what people themselves potentially had to offer as inspiration. For that, designerly ways of doing research is inarguably resourceful.

However, just as the opportunities this approach provides are seemingly endless, so is the level of potential confusion in the process. With the emphasis being on inspiration rather than specific data, the methodology of designerly ways of doing research requires high interpretation skills and rigorous decision making, as each step in the process can lead to a number of elaborations and new directions. For us, it was helpful to build our work around specific keywords and working research questions.

We admit that despite consciously being focused on finding inspiration, we were nevertheless affected by the instinct to group similar fragments together in the analysis of the probing phase, instead of compiling completely new and original stories out of them. The latter technique can potentially reveal more tacit and latent knowledge[31, p67 *Figure#3.2*], thus informing the design to cater future needs.

As stated in section 3.1., we started our research from the upper left corner of the research map (Image 1), in the critical design "bubble". However, during the process, we found ourselves somewhere in between that and the upper right corner (everything involved in the participatory design "bubble"). We concluded that the main idea is not to fit the methods and methodologies of a work process into a specific frame, but it can actually work the other way around: defining our approximate position on the map provides us with inspiration and tools from the domains nearby.

5.2. Limitations of the Study

Due to the time constraint and technological possibilities, each iteration was conducted in similar settings. In a few cases, the participants either expressed slight anxiety or had specific assumptions towards the prototype, because they were asked to try out something. The participants had to be assured that it was the prototype that needed testing, not their abilities.

The interactions in the prototypes were simulated with the help of instructing texts. As the comments made by the participants did not indicate that it was a disturbing factor, we did not consider it problematic. However, at this point we do not know, how much would the feedback differ, if the same concepts were tested in the actual form that they imitated.

Time could be considered as another limitation of our study. As was commented by a participant in Phase 1, that it would have been interesting to see the results of the pinball exercise over a longer period of time, and additionally, the concepts we were working on were dealing with a topic not very easily accessible, the research could have benefited from a longer time for reflection.

5.3. Future Work

5.3.1. Passive Interaction

Coming from one of the limitations of the study – the given setting – future work will involve testing the prototype in more anonymous setting, i.e. a public space, where people would not sense a specific expectation in testing.

As the general interaction design paradigm is constantly moving in the direction of higher level of engagement and intuitiveness, less attention is being paid to the need for intended non-use of digital media, that could be a valid argument in the exponentially growing number of applications and devices designed for every thinkable need (and simultaneously creating new needs). The applications designed for limiting the use of a device are currently

mostly related to tracking one's activity. For example, the application called *Checky*[40] tells the user how many times a day they look at their phone, and *Moment*[41] tracks the time spent on one's phone daily, with an option to set limits for use and other related features. In this case, the desired non-use of a device is actually attained through further use and monitoring of the same device.

The central interaction in our prototypes was actually constructed around the logic that if there is a dynamic activity on the screen, it should rather not be interacted with. This made us think about this concept in a wider context. For example, interfaces "benefiting" from "non-use", by visually showing a structure break or information becoming less legible when physically interacted with, could find application in public displays or in demonstrations of humans' impact on the nature etc. Of course, the biggest challenge in designing for passive interaction would be tackling the human instinct to intervene and deconstruct.

Elaborating further on the "intervening" concept, we thought of an interface that could potentially train patience: in addition to the interface becoming more chaotic when intervened with, it could also somehow "intensify" (visuals growing larger or sounds turning louder) when the user tried to ignore it (relating to the idea of trying to avoid thoughts).

5.3.1.1. Precedents for Passive Interaction

Although not yet widespread, the term and overall concept of *passive interaction* is not unprecedented. However, the context of theories and experiments regarding the concept varies.

For example [42] explores "*the potential for passive interaction in interactive narratives*[42]" in video games, where "(r)*esponses that indicate increases and decreases in physiological arousal are used to inform appropriate narrative progression and pacing*[42]." The aim is to utilise mood and emotion based filmic characterisations, for possibly increasing accessibility and avoiding

speech and natural language inputs. In this case, passive interaction is means for progress in a story, not personal reflection.

[43] deals with passive interaction in the context of ambient intelligence engineering, where e.g. information is retrieved from a person phone by surrounding objects in the environment, in order to "adjust" to the "user".

Based on our keyword search so far, the tendency of application of the concept in the current scope appears to be towards simplifying tasks and processes. However, passive interaction being the current end point of our research, further investigation into papers and possible existing solutions regarding similar concepts is needed.

5.3.2. Further development of Concept 3

Another direction for possible future work comes from one of the limitations of Concept 3. As it was viewed by a couple of the test participants as a scheme, and additionally was shown to a therapist in an informal setting, causing interest, there is a potential to develop this concept into an aiding material for mindfulness based therapies.

6. Conclusion

This master's thesis was a journey from finding meaningful ways to introduce a specific concept (mindfulness), to pinpointing a concept of interaction that would possibly have a wider range of application.

Our initial aim was to develop an interactive concept that would demonstrate the principles of mindfulness in an experiential way, which at the same time would require a possibly low level of physical immersion (e.g. compared to the prototypes described in section 2.1.). Research through design approach lead us not only in our search to find answers to questions, but also brought forth ideas for broadening the research – exploring the possibilities with people and developing the initial concept further made us see that we were not simply defining an interaction to convey a message, but the same message was actually enclosed in the interaction itself. Meaning that the non-burdening way of interacting with our thoughts – by simply acknowledging them and not going along with them – became an inspiration look further into the kind of interaction that would imply the "user" to stay passive.

Through this we also learned that the use of supportive theories are not limited to helping solve the problem at hand, but can also provide a scaffolding for the research approach itself, e.g. in our case, allowing things to set and ideas come forth themselves, as opposed to actively trying to solve tasks throughout the process, or, focusing on the process of the research, and letting it inspire us, instead of a specific outcome.

Above all, we learned that a much more valid question at the beginning of a research process is not necessarily "what are we designing *for*", but instead, "what are we designing *about*".

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