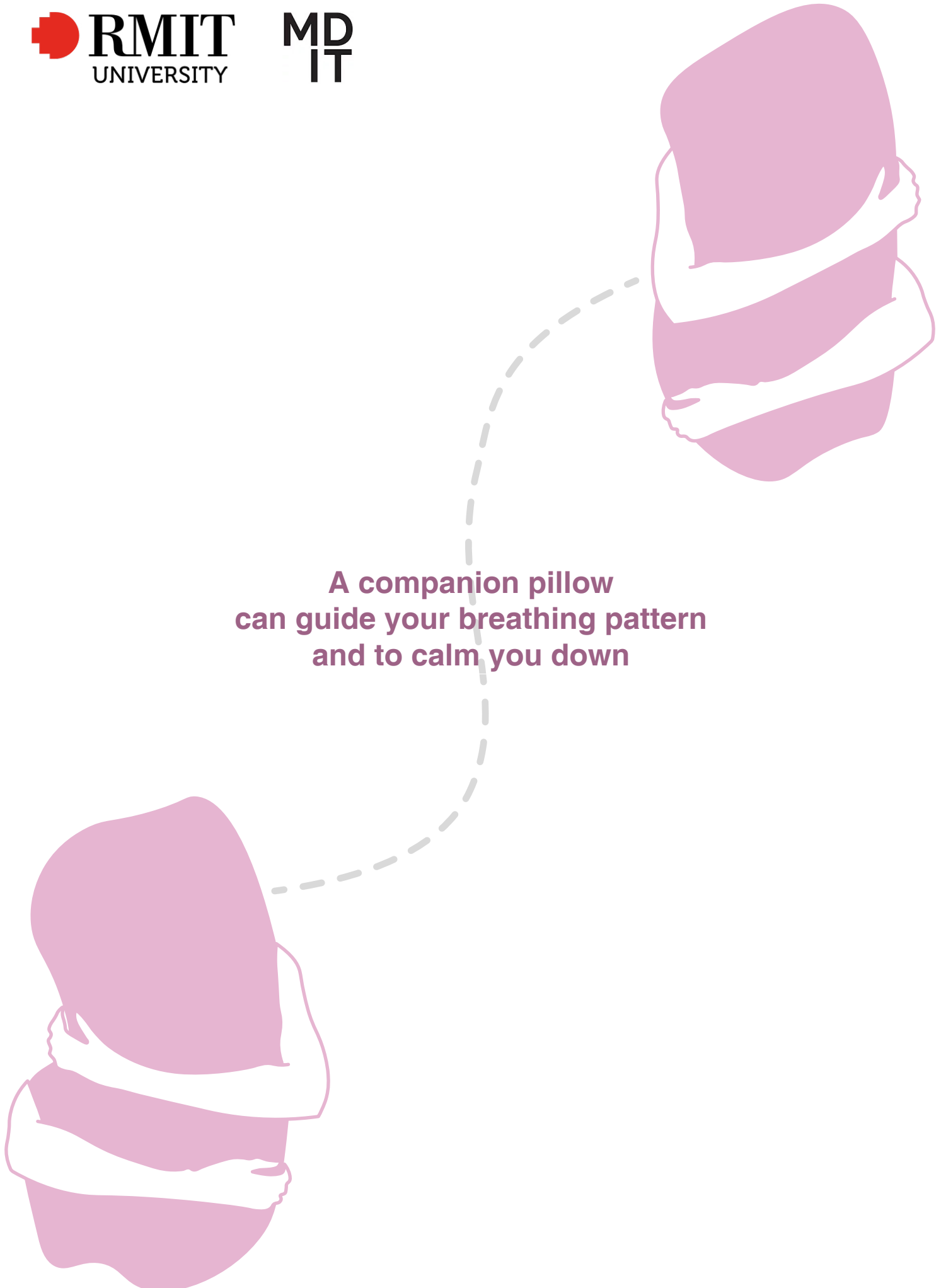




Soothe



**A companion pillow
can guide your breathing pattern
and to calm you down**

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Thank you.
Mengru Zheng

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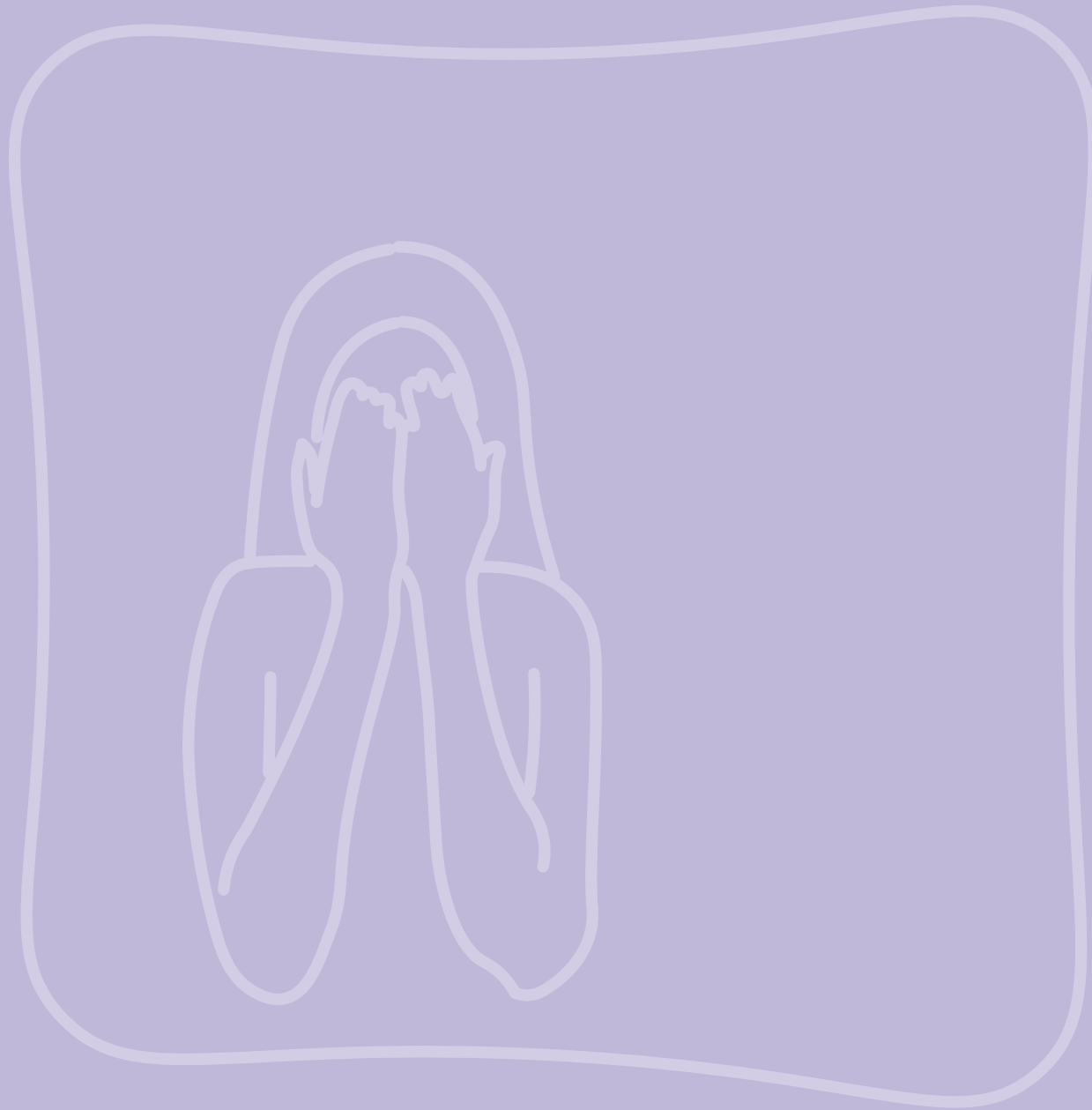
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Abstract

Currently, millions of people worldwide are suffering from social isolation due to COVID-19 restriction. Precedents such as astronauts and researchers working in remote locations also reveal that isolation could cause negative impact of mental wellbeing. Learning from these examples, this project aims to engage sensory augmentation opportunities and mindfulness practice to ease negative effect of isolation, which can include anxiety, social disconnection and insomnia.

The research approaches have included desktop study and, user-centric research such as questionnaires, interviews and observations. Methods during concept iteration include physical prototyping and user journey reframing with photographic storyboard in product-service perspective.

The output, Soothe, is a tactile companion pillow that helps achieve a calm breathing pattern and feeling of being hugged through providing appropriate patterns of light and warmth based on heart rate variability measurement. Personal and social possibilities are also considered in product-service, namely relaxation alone in comfortable lean-on posture, group meditation for various breathing techniques and social contact, as well as sleep guide in a lying posture. Finally the proposed significance is a new possibility to use interactive technology as a satisfaction of our emotional needs while blending interface into people's daily routine during periods of isolation.



Background

2.1 Effects of isolation to mental wellbeing

2.2 Physical problems caused by mental factors



© 2020 Justin Paget

Coronavirus: Social distancing and isolation can take a toll on mental health



© 2020 Nasa

Former Nasa astronaut Scott Kelly found it vital to cope with stress during long-period isolation



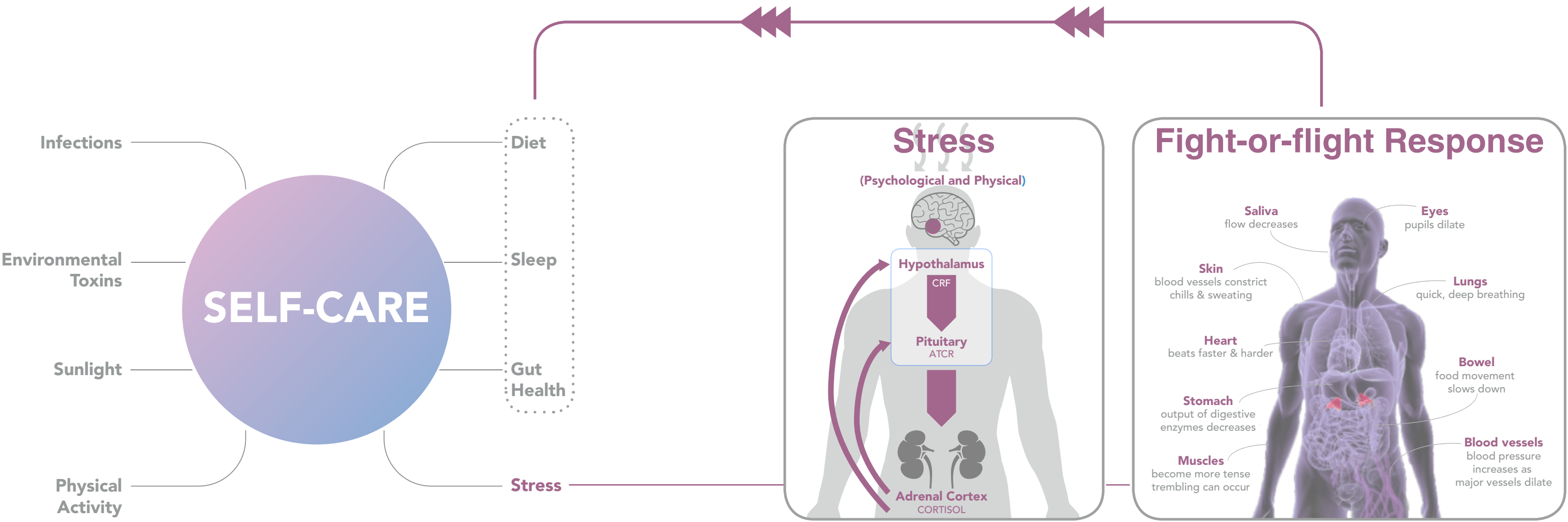
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Insomnia in a pandemic

2.1 Effects of isolation to mental wellbeing

This project was triggered by a pandemic-induced self-isolation due to covid-19. During this global disaster, people are compelled to stay at home without social connection, therefore dramatic panic appears among people.

There is no doubt that pandemic-induced self-isolation could play negative role on mental health (Willis, 2020), but some other circumstances in extreme isolation should also be considered, such as astronauts, scientists working in remote locations, and people with chronic health problems. Those people in long-term isolation could suffer from a series of negative emotions and distressing sensations, including anxiety, social disconnection and insomnia.



2.2 Physical problems caused by mental factors

According to Launspach’s speech (2018), negative mental impact, especially stress, could affect people’s health physically.

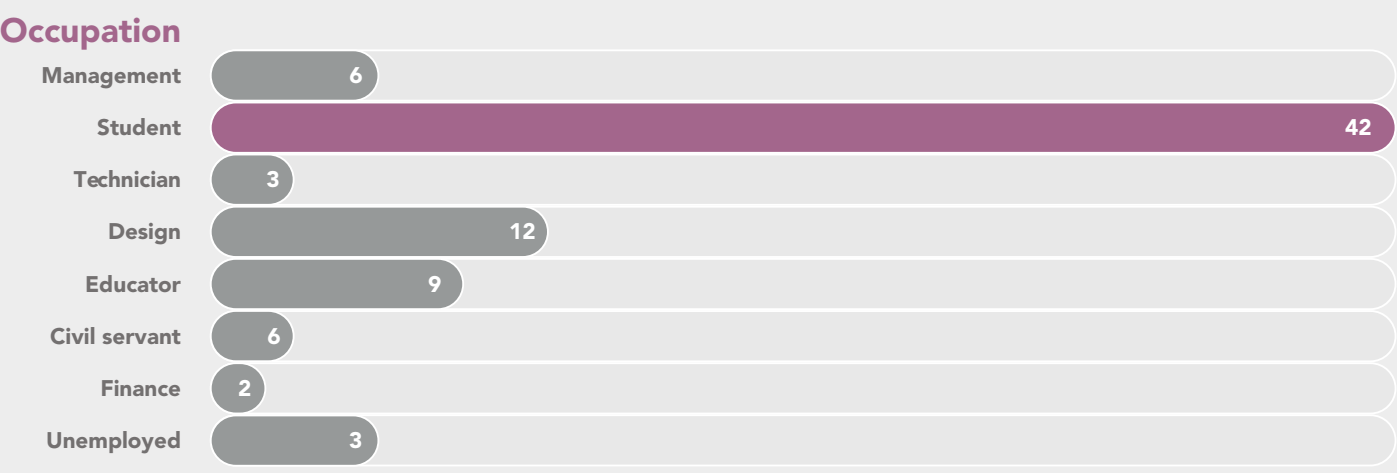
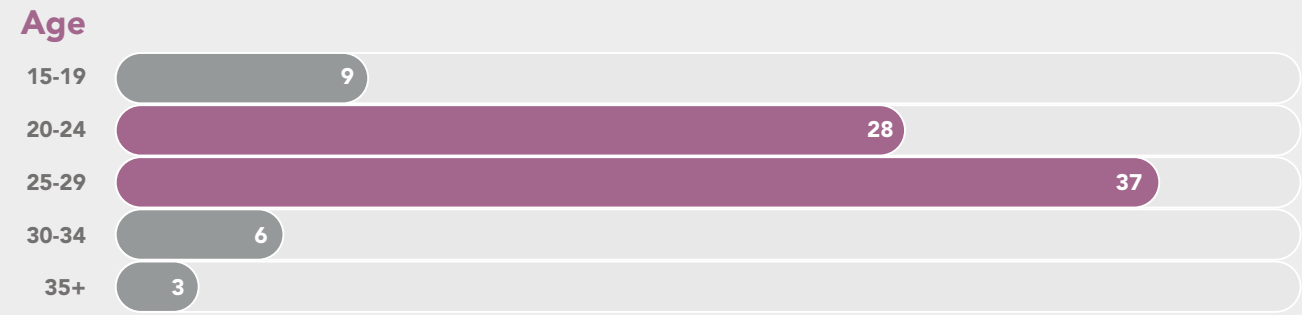
Even though mental problems mostly come from intangible factors, it could trigger electronic activity in our brain, which causes hormone-related chemical environment changes within our body. Those hormones bring about our fight-or-flight response. Diet, sleep and gut health will be disturbed seriously if human stay in fight-or-flight response during a long period.

Therefore, to solve mental problems due to isolation is urgent in self-care perspective.



Opportunity Finding

- 3.1 Questionnaire
- 3.2 Con-call interview
- 3.3 Findings & opportunities
- 3.4 Research question



3.1 Questionnaire

As the first step of opportunity finding, this method aims to explore the impact of self-isolation upon stress with quantitative analysis. 83 responses are collected from China and Australia, most of them are students, and age group mainly range from 20-29.

- The question includes:
- 1. How old are you?
 - 2. What's your occupation?
 - 3. Which country are you currently in?
 - 4. Do you feel stressed BEFORE self-isolation?
 - 5. Do you feel stressed DURING self-isolation?
 - 6. Which STRESSORS stress you mostly?
 - 7. Which IMPACTS did you meet while stressed?
 - 8. Which methods can EASE your stress during self-isolation?

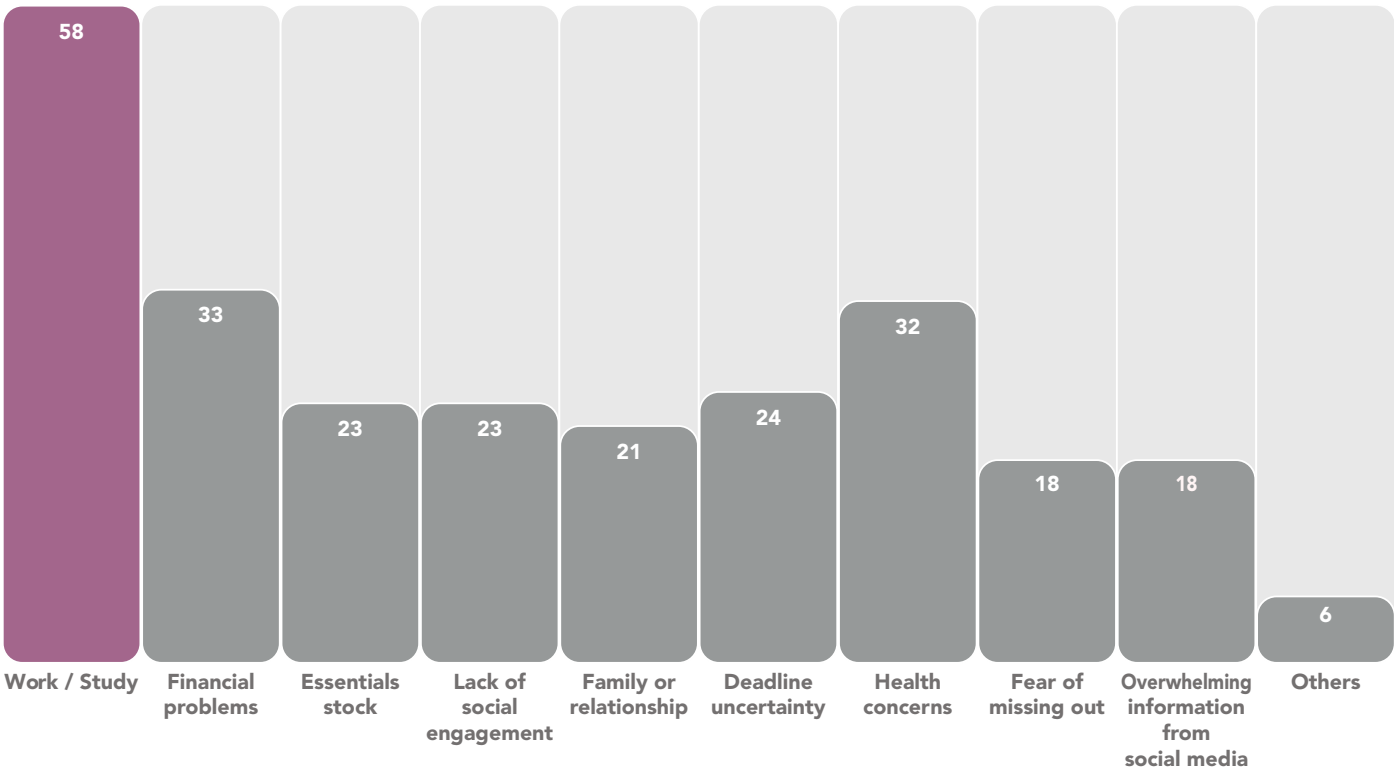


39.8%
of volunteers feel stressed
BEFORE self-isolation

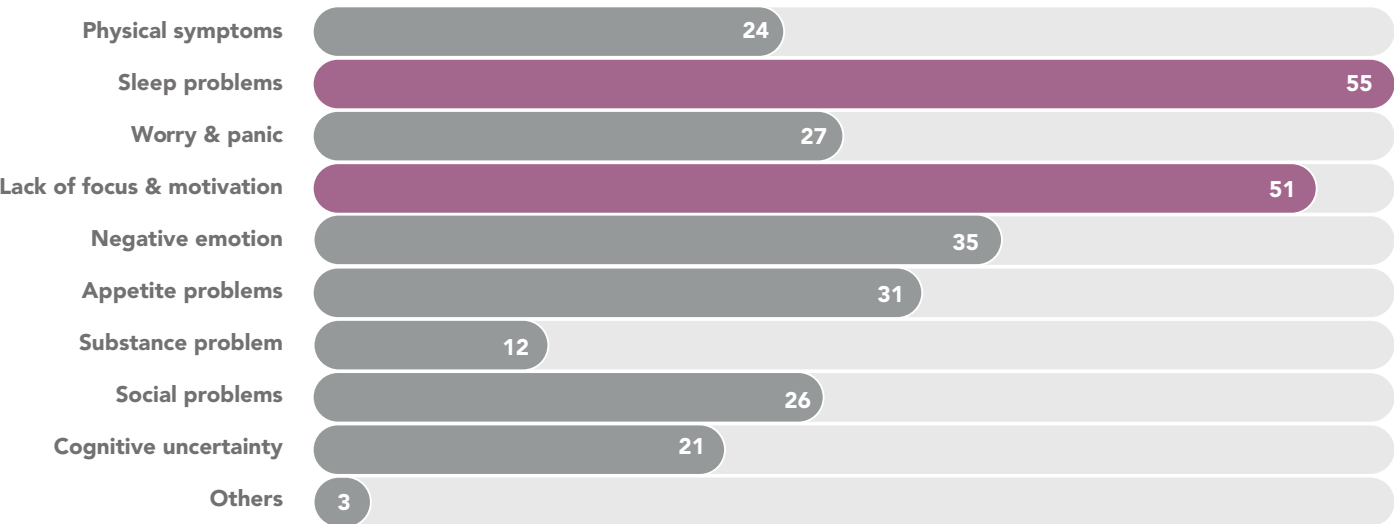


70.2%
of volunteers feel stressed
DURING self-isolation

Stressors



Negative Impacts



Stressors and impacts

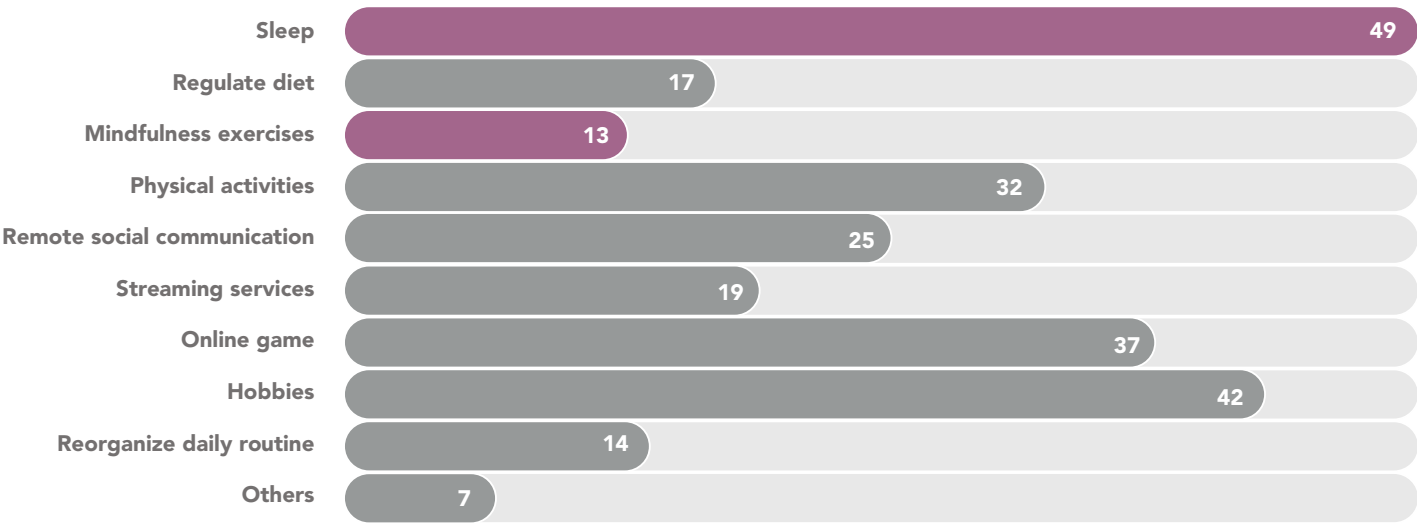
The proportion of volunteers who feel stressed expanded when they started self-isolation, which reveals obviously a negative impact on humans’ mental health.

The outcome shows that even though stress is normal, but self-isolation is an amplifier of stress. The most impactful stressor is work and study related issues followed by financial problems as well as health concerns. Moreover, sleep problems, lack of focus and motivation disturb their daily life dramatically.

Insight

The data shows that the main stressors are external factors, which is uncontrollable and hard to eliminate. However, design intervention could be considered to ease main negative impacts, because they are controllable for an isolated individual in personal perspective. This triggered me to focus more on potential solution to reduce impact especially some services about mental wellbeing but not cause.

How they ease stress



Gap between status and advice

In terms of how they try to ease their stress, sleep shows a most obvious preference. In addition, physical activities, online games and hobbies are also welcome stress reduction solutions.

Compared with experts advise from literatures and publications, only few people tried mindfulness exercise before, while a lot of experts promote that mindfulness is recommendable solution for stress reduction.

Literature Review Matrix

	Mindfulness	Talk to someone	Stop browsing social media	Change thinking	Regulate diet	Exercise	Distractive hobbies	Reorganize daily routine	Sleep
Singh, A. H. 2020		×			×	×	×	×	×
Young Minds 2020	×	×	×				×	×	
Guardian News 2020	×	×	×				×	×	
Patel , A. 2020			×	×					
Health Direct 2019	×	×		×	×	×	×	×	×
BBC 2010	×	×				×		×	

Insight

Firstly, sleep problem is the main negative impact, but sleep could also be regarded as a stress reduction method. Some people also have a symptom with too much sleep besides insomnia. Hence insomnia and sleep regulation should be considered in further research and design intervention. Also, such an obvious gap between existing routine and professionals' advices in mindfulness exercise reveals that mindfulness and meditation could be important opportunities for sleep reduction solution.

3.2 Con-call interview

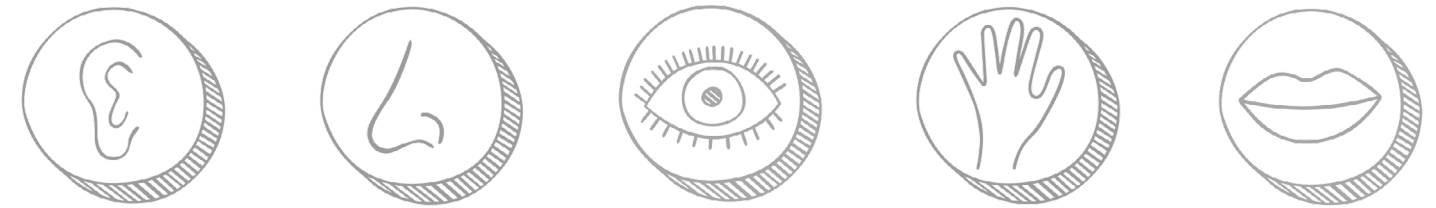
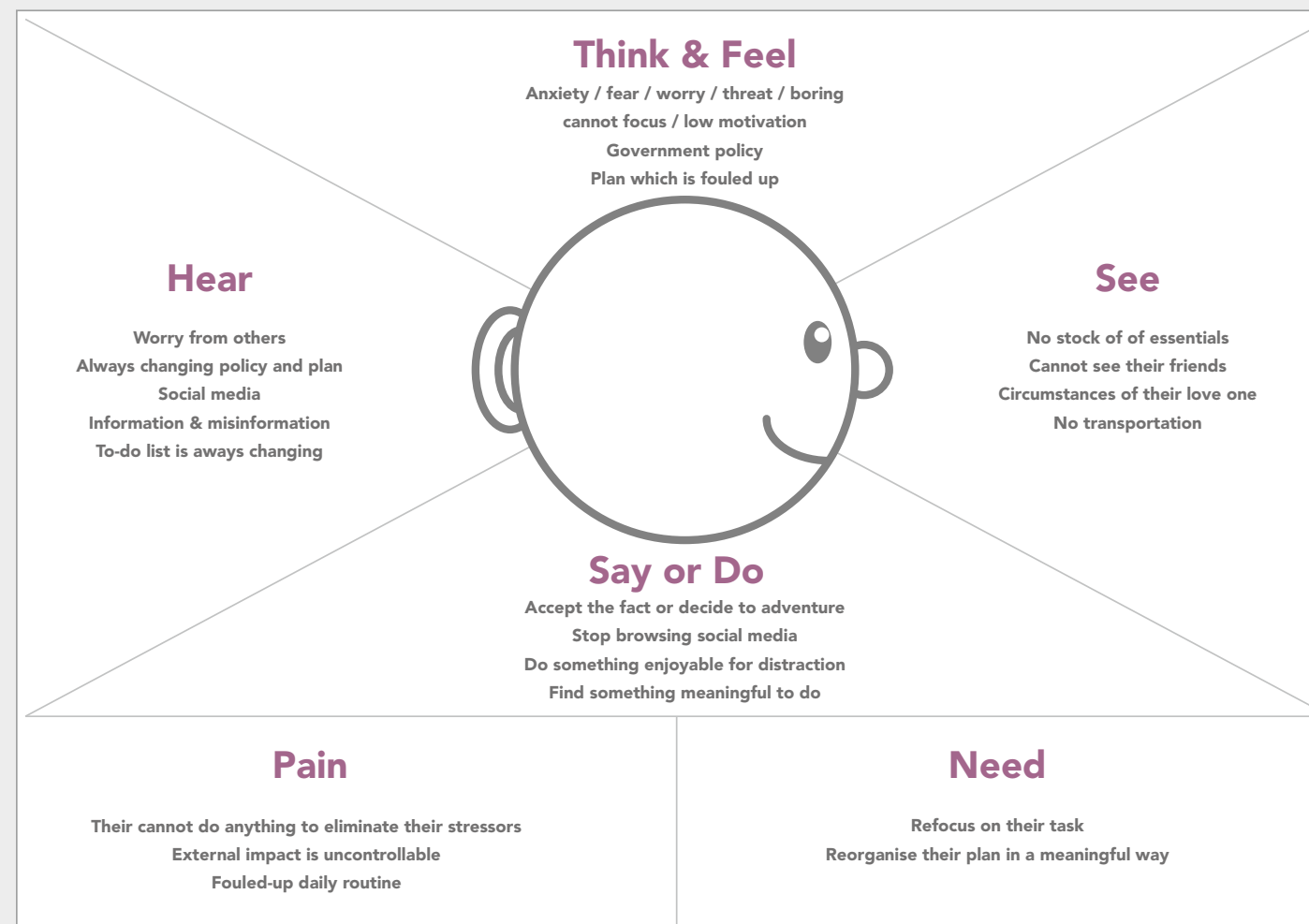
5 Con-call interviews are implemented as the second stage of opportunity finding. The aim is to understand interviewees' feeling about stress in depth and details.

Interviewees are asked to describe 5 aspects below:

1. Describe 5 keywords about stress
2. Their emotional changes based on daily routine
3. Their favorite method to ease stress and reason
4. What precedent have they experienced before
5. Possibility of 5 senses as stress reduction

Concluded information in empathy map

Their responses are concluded into a sympathy map. The outcome reveals that their main stressors are mostly uncontrollable, and the main need of the interviewees is to refocus on their task and reorganize their daily routine. They need to gain high capability of emotional regulation.



3.3 Findings & Opportunities

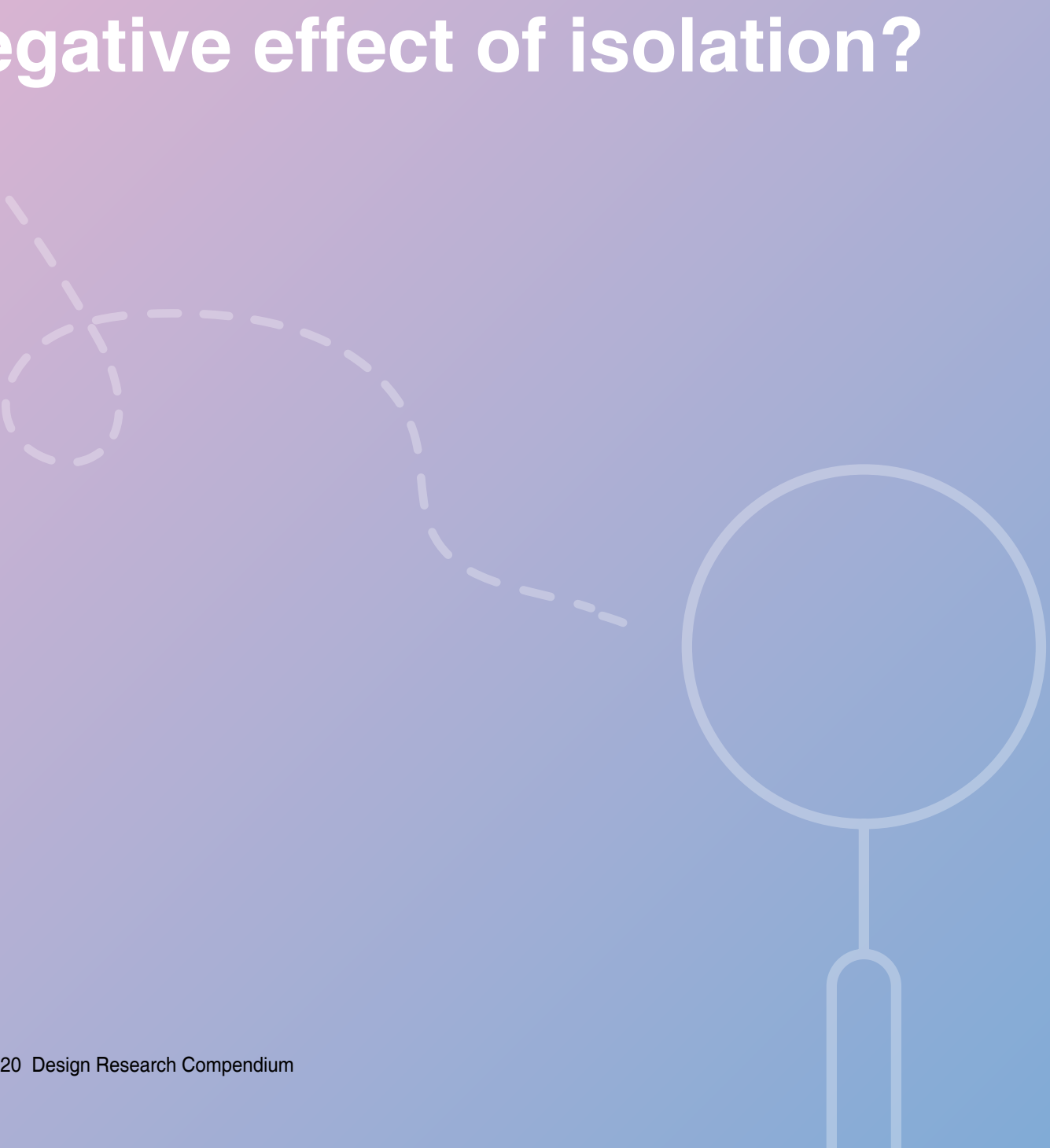
Above all, feedback in both questionnaire and con-call interviews shows that during self-isolation, too much screen time is the main reason of stress amplification. Therefore, new solution should be considered beyond a simple screen based application.

Also, sleep is disturbed with high stress, but it could be also cure. Interviewees claimed that insomnia and being sleepy during incorrect period all appears in their sleep problems. Their mind is overwhelmed with thinking especially during insomnia, which amplify their anxiety and stress. So sleep regulation could also be connected with mindfulness exercises.

Moreover, even though they didn't fill "mindfulness" in previous questionnaire, they still feel meditation and breathing adjustment are effective ways to ease stress in their previous experience. For example, one interviewee experienced breathing and relaxation training in an online campaign in his company. Another interviewee holds positive attitude with yoga video guiding from YouTube. The third precedent is suggested in an app of Apple Watch named Breathe, which is simply focus on breathing pattern with graphic animation.

Last but not least, their response shows that sight, sound, smell and touch could reduce stress level, which inspired me to take deep research into each senses possibility both in sensory experience patterns and technology.

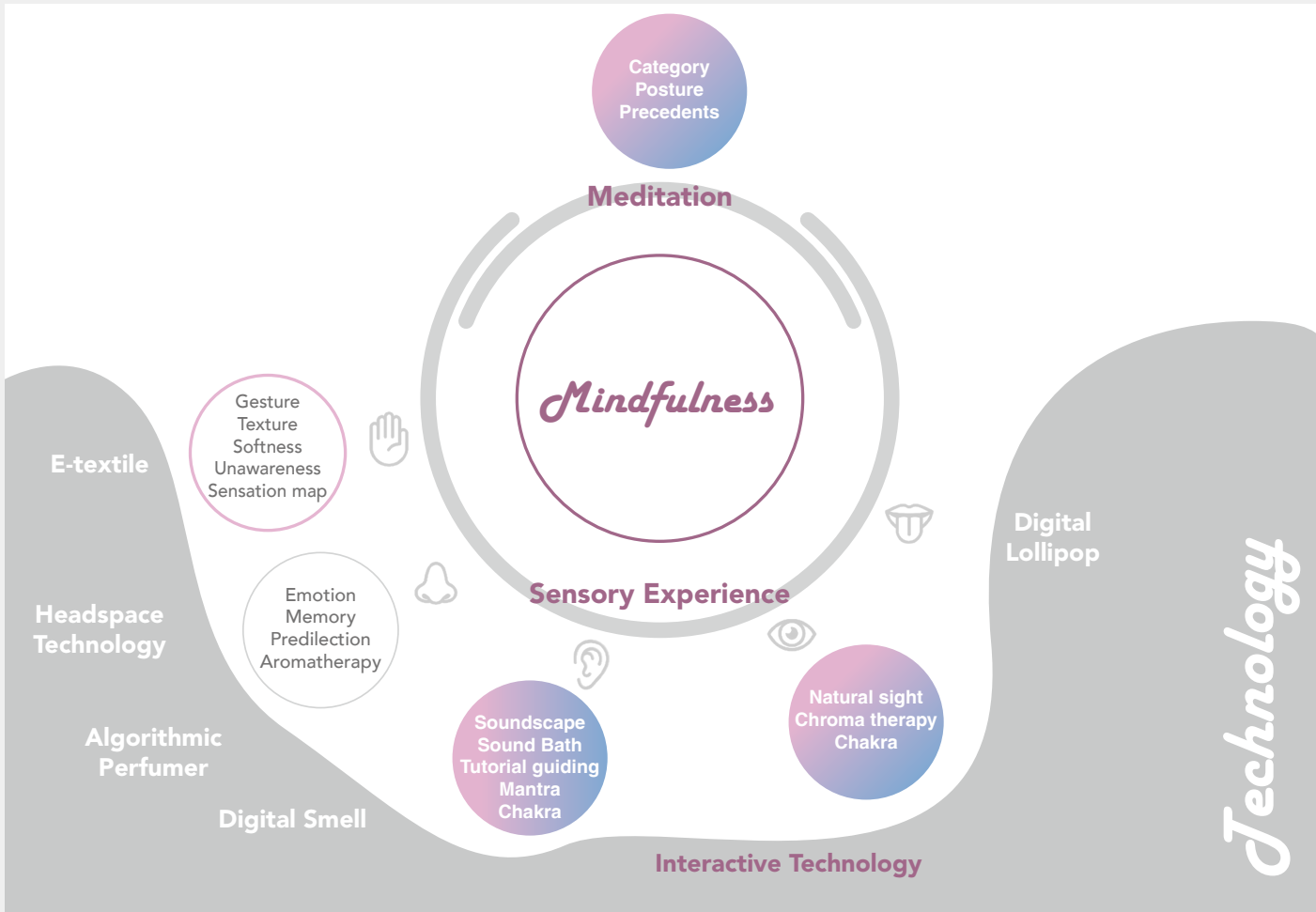
How to engage sensory augmentation and mindfulness exercise to ease negative effect of isolation?

An abstract graphic on the left page. A dashed white line starts from the top left, curves downwards and to the right, ending near a magnifying glass icon. The magnifying glass is composed of a large circle and a handle, both outlined in white. The background of the left page is a gradient from pink at the top to blue at the bottom.

Exploratory Research

- 4.1 Research Mapping - meditation and senses
- 4.2 Sensory augmentation in human-computer interaction
- 4.3 Mindfulness exploration
- 4.4 Meditation posture
- 4.5 Posture documentary in insomnia

4.1 Research Mapping - meditation and senses



In this stage I explored and practiced different meditation, also, opportunities in each sense was separately explored. The purpose of this exploratory work is to understand how different senses has been combined with meditation or technology, and how meditation and mindfulness trigger positive impact emotionally and psychologically.

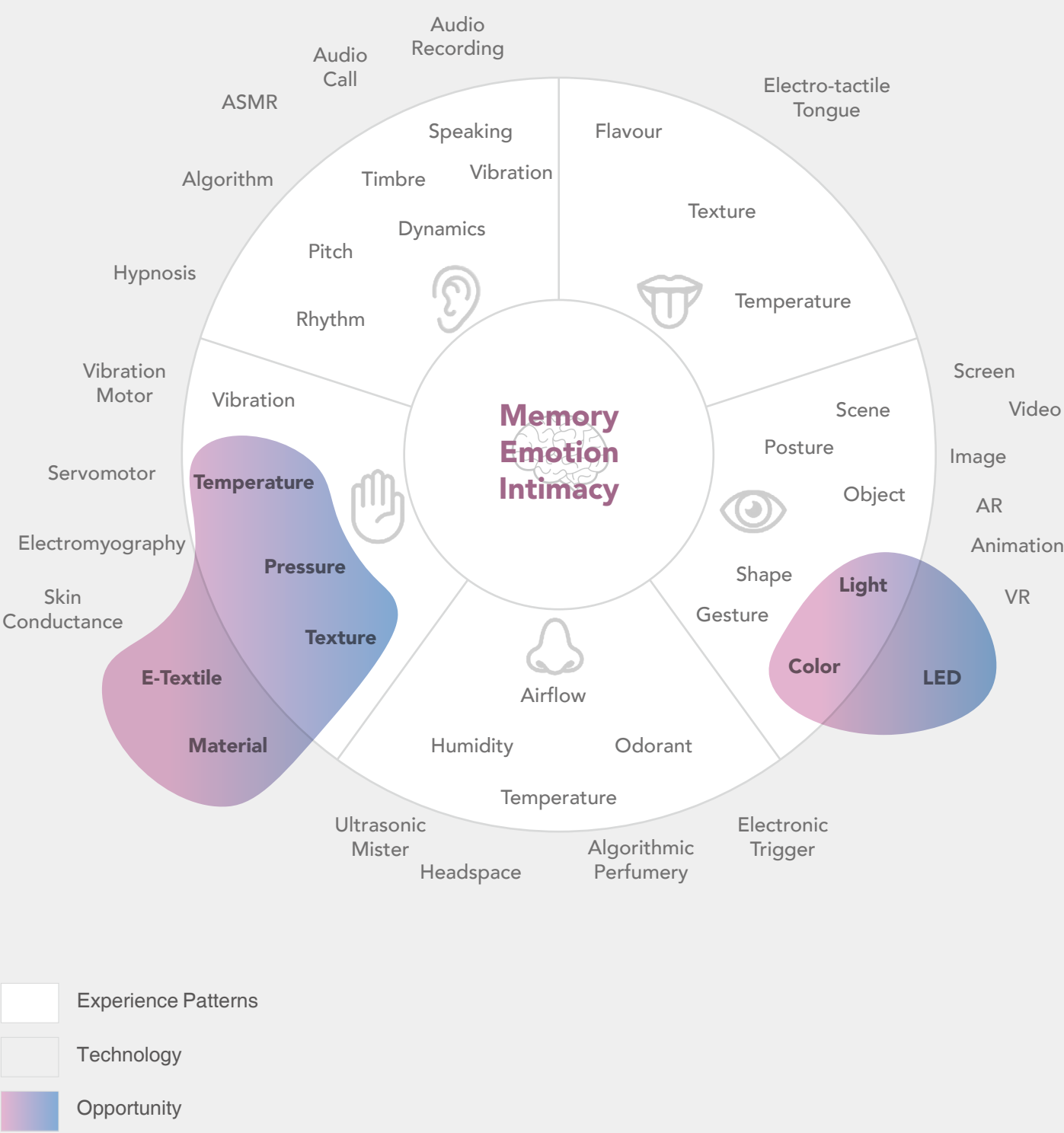
Insight

Because of the complexity of meditation category, most combination of meditation and sensory experience are still packaged in audio-visual guiding and screen based interactive application, but pop-up windows often distract and interrupt calming experience during meditation and mindfulness practice.

Olfactory experience can trigger emotion and memory efficiently, while gustatory experience is often engaged in preparation for a beginner as Raisin exercise (mindful eating) before the first meditation experience. Currently, the combination of meditation, olfactory and gustatory is mostly based on chemical technology. Electronic triggers for smell and taste are still immature and uncomfortable.

For haptic experience, meditation tutorials always ask participant to focus on physical sensation between their skin and contacted fabric, to gain an awareness of presence. Because the negative impact of isolation are also due to lack of haptic interaction between people, this could be an opportunity for further exploratory work.

4.2 Sensory augmentation in human-computer interaction



This map was built based on analysis of experience patterns and technological feasibility on sensory augmentation projects. Most case studies focus on augmented reality and virtual reality combining audio-visual senses, which is still similar information outcome as screen based interaction. Therefore some problems in current interaction design are discovered:

- 1. Too many screens embedded in different appliances increases complexity in audio and visual information, requiring a large amount of attention.
- 2. Too many pop-up windows are overburdening users with overwhelmed information, and could cause anxiety and “phantom ringing syndrome”.
- 3. Current haptic feedback in human-computer interaction are mostly focus on vibration, but other haptic information is lost such as temperature, pressure and texture, which could mediate sensory intimacy through technology.

Inspiration from Calm Technology

After comparing the opportunity and feasibility in sensory augmentation, I was profoundly inspired by Case (2016), Weiser and Brown (1997) about Calm Technology and ubiquitous computing. They promoted that the right amount of technology is the minimum needed to solve the problem, moving easily from the periphery of our attention, to the center, and back, without overburdening.

I started to consider how could my project create ambient awareness through blending interface into daily routine to reduce unnecessary complexity. Finally I decided to utilize E-textile achieve a soft interface which could also create haptic experience in temperature, pressure and texture, and apply lighting patterns to minimize output information into low resolution feedback. This could not achieve a perfect ubiquitous computing, but it is a good start to reduce overflowing information from screens and to come up with further vision in contextual awareness and proactive users’ need in interaction design.

Reduce unnecessary complexity
Increase sensory intimacy
Blend interface into daily routine

Mindfulness Exercises Test

	Exercise	Description	Sense	Effectiveness
1	Raisin Exercise	Task for beginner. Take a snack such as raisin, and pay attention to its looks, smell, taste, skin response and how it feels.	   	 
2	Breath Focus	Practitioners breathe slowly and deeply, counting their breaths or otherwise focusing on their breaths, and to ignore other thoughts.	  	   
3	Self-Compassion Pause	A worksheet instructs people to make physical contact with themselves, and take a few deep breaths, then vocalise mantra to themselves.	   	  
4	5 Senses Exercise	A worksheet. Notice five things to see, four things to feel, three things to hear, two things to smell and one thing to taste in a natural way.	    	  
5	Mindful Bell Exercise	Closing eyes and listening for the cue, ocus attention on the sound and continue concentration until it fades completely.		    
6	Stare at Center	Focus attention on the center of the shifting pattern of color. Let mind wander freely.		   
7	Mindful Seeing	Look at everything outside the window, notice every movement and avoid labeling and categorizing.		 
8	Mindful walking	Walk slowly and pay attention to physical sensation on feet, sound, smell and vision in the environment.	   	   

Meditation Test

	Exercise	Description	Audio	Status	Effectiveness
1	Focused Attention	It uses the object of our breath to focus attention and it is associated by a little body scan	 or 	Stillness	   
2	Body Scan	Imagine a photocopier light slowly moving over body, bringing attention to any discomfort, sensations, tensions, or aches that exist.		Stillness	    
3	Noting	Note the thought or feeling to restore awareness, create a bit of space, as a way of letting go, and to learn more about our thought patterns.		Stillness	   
4	Visualisation	This meditation invites people to picture something or someone in their mind instead of breath. It effortless without stress.		Stillness	    
5	Reflection	This technique invites people to ask themselves a question, and be aware of the feelings, that arise when they focus on the question.		Stillness	  
6	Loving-kindness	Its goal is to cultivate an attitude of love and kindness toward everything, by repeating the message (mantra) many times.	 or 	Stillness	   
7	Taiji & Qigong	Ancient Chinese practice that involves harnessing energy in the body by allowing energy pathways. It involve slow movement and imagination.		Movement	   
8	Kundalini Yoga	A physically active form of meditation that blends movements with deep breathing and mantras.		Movement	   

4.3 Mindfulness exploration

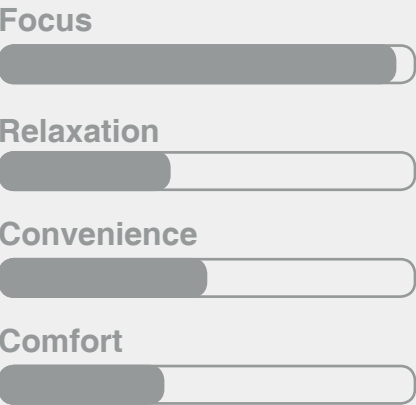
The aim of this exploratory work is to understand the effectiveness in different mindfulness skill in personal practice as a beginner.

According to suggested mindfulness exercises from Ackerman (2020), which is published on Positive Psychology, I start to do some mindfulness exercises for deeper research. Compared with short mindfulness exercises, I also did different meditation practice based on tutorials from Headspace application. All the effectiveness is assessed with my first view.

As a beginner, I found that breathing training is the easiest one to follow. Also, breathing is a key element for all other meditation tutorials. Body-scan and visualization is also friendly for beginners, because they are guided without effort. When the practice is worksheet based, the more complex it is, the more stress it could cause for a beginner. Other guided meditation could also cause stressful experience if a beginner cannot follow or if stressful thinking in mind still keeps wondering, especially in terms of Kundalini Yoga, Taiji and Qigong, which is based on a series of posture and body movement. Hence I realized that breathing pattern is the most valuable direction for my project development, because it is simple, primary and effective.

Breathing is the basis of all mindfulness exercises and meditation. It is effortless and beginner-friendly

Sitting cross-legged



Sitting on chair



Lying-down



Leaning on bed

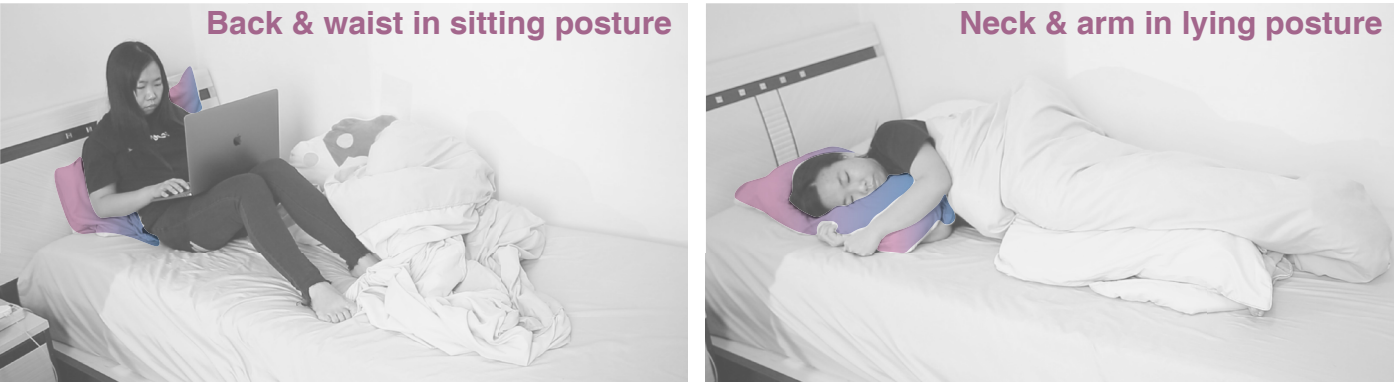


4.4 Meditation posture

After a series of meditation practice, I start to focus on meditation and mindfulness exercises in stillness.

Here are the four main postures I have tried. Sitting cross-legged posture is regarded as most effective one for focus in experts' opinion, but beginner could feel uncomfortable and cannot relax. Hence guiding tutorials always suggest audience to find a cushion or pillow as comfort support, or just follow normal sitting, or lying down posture, for ease to begin.

Considering my design intention is to popularize meditative methods to ease common mental problems for a wide user group, I narrowed my ideas to focus on comfort support with normal sitting and lying down posture, to make it friendly for beginners.



4.5 Posture documentary in insomnia

My questionnaire reveals that insomnia is an obvious negative impact on mental wellbeing during isolation. Furthermore, my exploratory work from meditation practice push me to explore how comfort support such as pillow and cushion can ease my stress and anxiety. Hence the aim of this stage is to understand how my pillows create soft haptic senses to reduce stress and anxiety during insomnia.

As per Chillot (2013), the physical sensations of objects we touch influence our more abstract feelings, but only in unawareness. If people pay attention to whether their feeling changes when they are touching something, their mind will overrule it. Hence this exploratory work was implemented into a long documentary film to inspire my design research according to the methodology from Raijmakers, Gaver and Bishay (2006).

After reviewing the documentary footage, the finding shows that while in sitting posture, the most relaxing soft support is for back and waist unconsciously. Compared with sitting posture, the most relaxing soft support is for neck and arm unconsciously in lying posture.



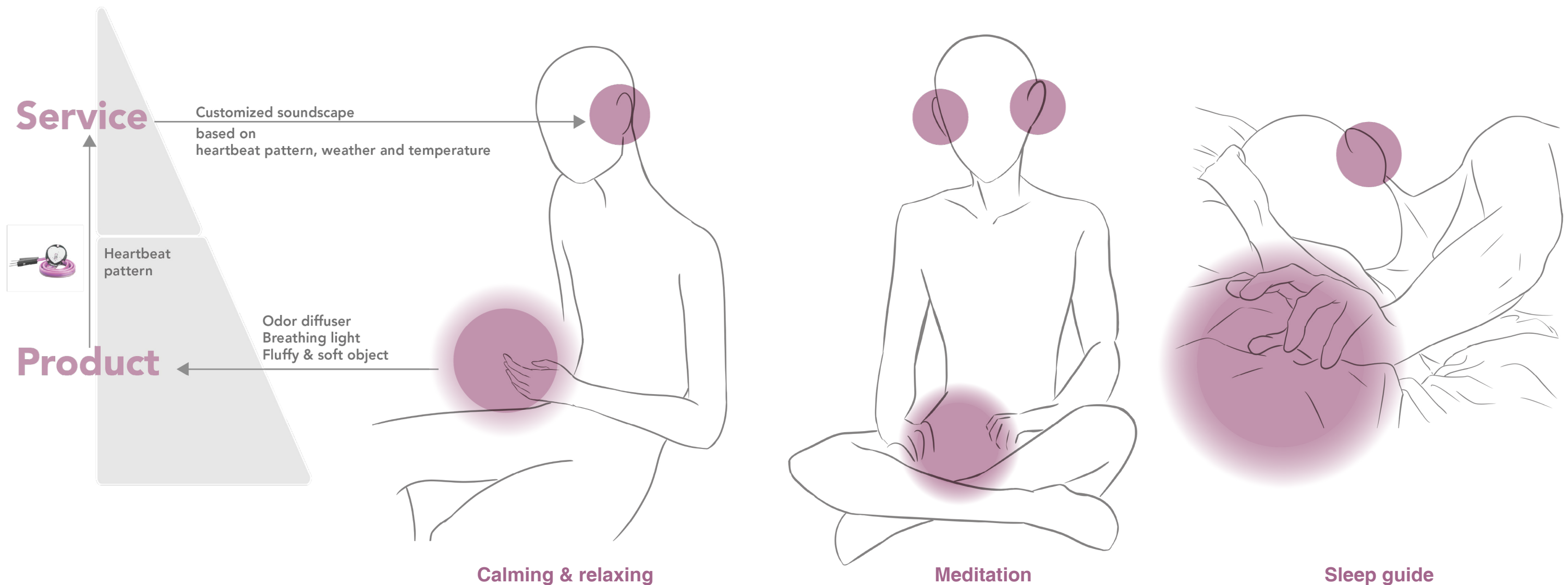
Concept Iteration

- 5.1 Proposal I - interactive diffuser
- 5.2 Proposal II – interactive pillow
- 5.3 Feedback & insight from meditation experts
- 5.4 Precedents
- 5.5 Opportunity reframing in customer journey map

5.1 Proposal I - interactive diffuser

Responses from previous con-call interview showed that fluffy texture and soft object could reduce stress through squeezing and stroking gesture. In addition, natural soundscape and odors in aromatherapy is also practical solution for stress reduction.

Hence the first concept was a haptic interactive object with fluffy texture and soft fill, with the function as an odor diffuser and breathing light. It can detect user's heartbeat patterns as a data input, then customize appropriate lighting colors and soundscapes as output, based on algorithmic analyzing heartbeat pattern, weather information and temperature from online data base.



Reflection

This was a start to combine multiple sensory experiences into mindfulness exercises, but it wasn't innovative enough because only some functions are added to existing product. Subsequently it inspired me to implement deeper research into senses, experiences and meditation, but not restricted by my previous experience in product design.

5.2 Proposal II – interactive pillow

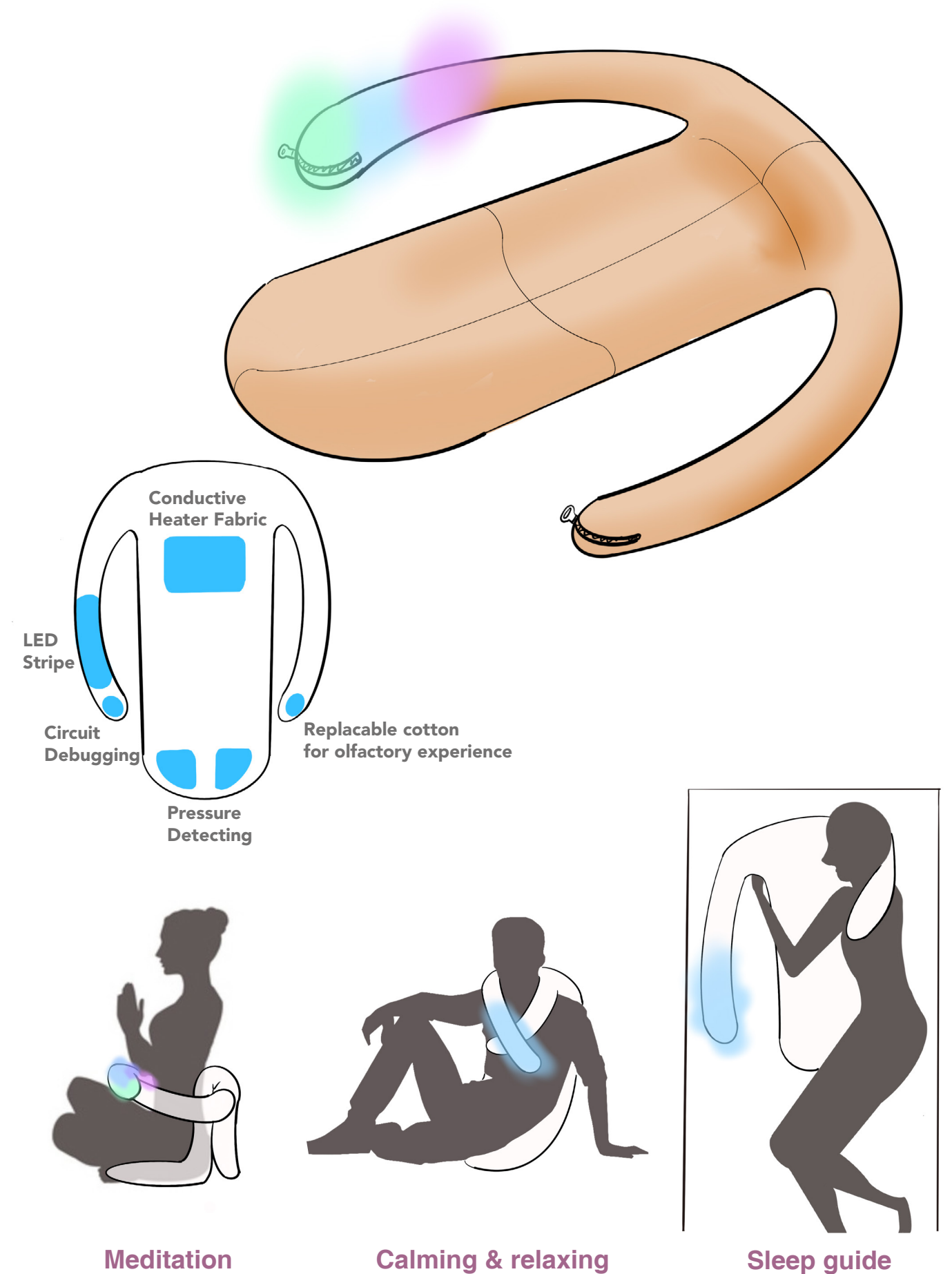
According to my exploratory experience in mindfulness exercises, pillow and cushion are useful for beginners as comfort support. I was also inspired by sensory augmentation research and calm technology about blending interface and users' daily routine to reduce task based user experience.

Therefore the second concept is a human-shaped pillow with embedded e-textile. Pressure-sensitive sheet can detect whether users sit on it, then it utilize light to guide breathing patterns with brightness and create mindful seeing practice with shifting hue. Olfactory experience is created by pre-customized cotton, while conductive heater fabric can provide warmth just like being hugged.

Reflection

Although hugging a pillow was an idea from casual conversation about personal sleep custom, this proposal triggered me to consider how can technology satisfy our emotional need. According to the experience during COVID-19 restrictions, lack of physical and social contact are the critical problems. So I decided to explore digital intimacy to enrich mindfulness exercise in this direction.

**How to achieve
DIGITAL INTIMACY
to enhance mental wellbeing while
missing physical and social contact?**





Keala Salmond Moonlight Meditation

As you practice deeper, asana posture is really effective because it makes you focus on the present moment.

But most of beginners would feel uncomfortable so I also provide pillows in my class. So that they will not hate meditation when they start it.



Yu Yin Heartfulness China

If you didn't open your mind firstly to practice the basic meditation in asana, it is not effective that you just follow others.

In heartfulness we want to popularize meditation practice to most people. I recommend you to go deeper into relaxation, because it will not restrict target groups. People such as pregnant women and elderly can also practice.

We also have campaign on WeChat, we can meditation at the same time no matter where you are.



Wen Xinquan Heartfulness Finland

In Raja Yoga we have a breath practice named pranayama.

Mostly focus and relaxation are not separate from each other. For example, your breathing practice as relaxation could be preparation for meditation. Then your focus mode could be the second stage of meditation.

5.3 Feedback & insight from meditation experts

After discussed my concept with 3 meditation teachers I realized that the most important task for me was to balance user need of target group and in-depth meditation.

Firstly, questionnaires reveal that insomnia is also a problem to solve, but sitting cross-legged is a posture to avoid falling asleep. According to Ms. Yu, relaxation in normal sitting and lying down posture is easy to follow not only for beginners and also for specific groups such as pregnant women and elderly. Considering anxiety and insomnia is the negative impact for a broad target group, I should focus on relaxation skills friendly for beginners.

Secondly, interviews and inspiration from calm technology made me want to achieve invisible interface to reduce focus on screen, but complexity in yoga genres, postures and movements makes it hard to mediate without screen. When we talked about breathing techniques, opportunities are admitted to ease anxiety and insomnia for relaxation.

Finally, I was invited into the WeChat group of Heartfulness. It impressed me that their remote group meditation is popular, even though there were just text messages as reminder as start and end. This inspired me a potential solution to reduce the feeling of social disconnection.

5.4 Precedents

Here are the four most insightful precedents encouraged me reframe my project in different fields. The four precedents include interior design, user interface design, critical design and product-service design. My project developed based on a combination of advantages from these different precedents.

Chromotherapy Sauna



Service providers, such as Sunlighten and Sauna Valley, offer chromotherapy sauna for stress reduction and muscle relaxation. The key theory here is to use color to impact people’s emotion during a sauna, people can also reduce their stress with warmth. Case study in scientific, medical fields as well as chakra meditation shows a long history of color implementation. This precedent gave me an overview about impact of different colors on emotional and physical condition.



Compression Carpet



Designed by Lucy McRae, it aims to offer a hug to a person craving intimacy. The context of this precedent is where the growing influx of technology starts to have a big impact on people's mental wellbeing. It aims to use softness and pressure to create an artificial hug to ease anxiety due to lack of face-to-face social connection. The issue is similar like my project, so it inspired me to explore how the softness and pressure can create a feel of intimacy like being hugged.

Breathe



Breathe is an application in apple watch with metaphoric animation and vibration to guide calm breathing pattern. It inspired me how a expanding and shrinking graphic animation can impact heart rate with a simple interface. It provide sensory experience in sight and touch, but the constrain still remains that some pop-up windows are disturbing.

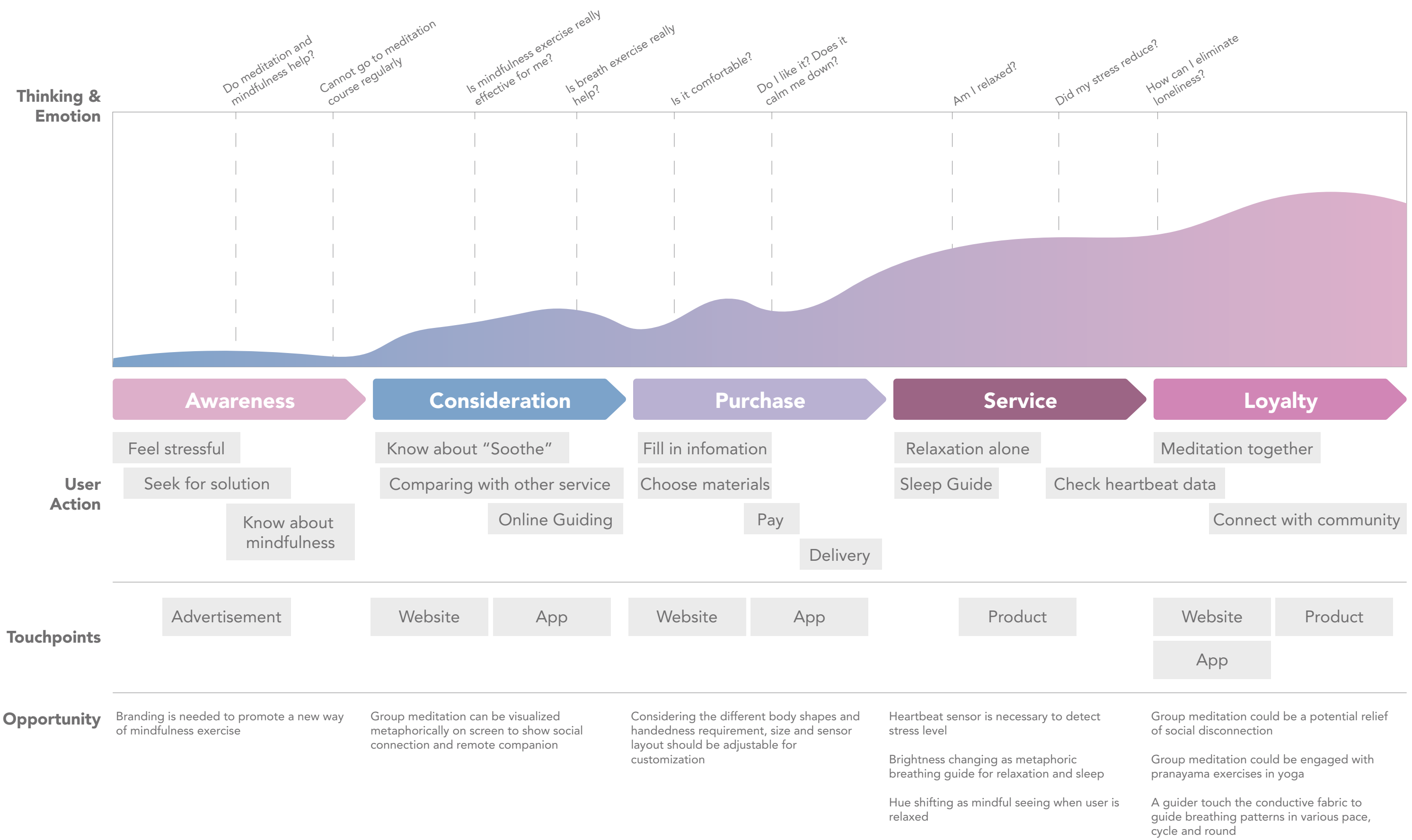


Aduri



Aduri is a meditation cushion. It implements gentle pulses to guide breathing and focus associated with sound guiding from its app. It is a start to reduce focus on screen, and the main sensory augmentation is vibration of the cushion and sound from the headphone. But sensitivity on vibration is personally different among users, which triggered me to think about other haptic possibilities.

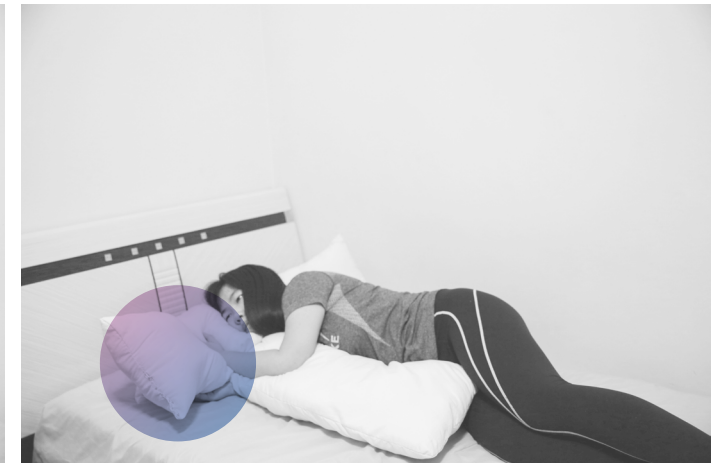
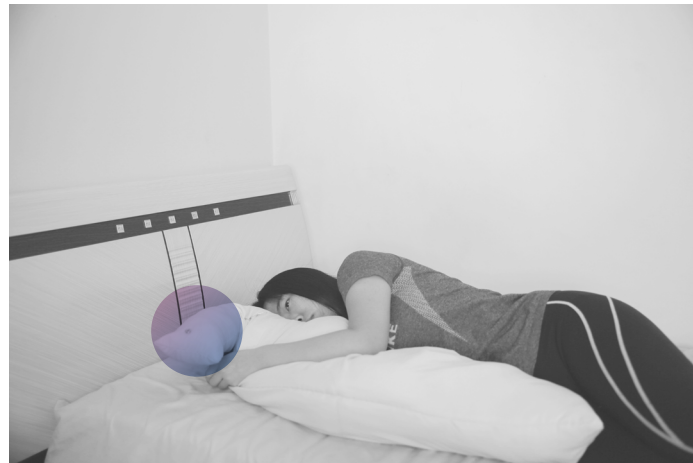
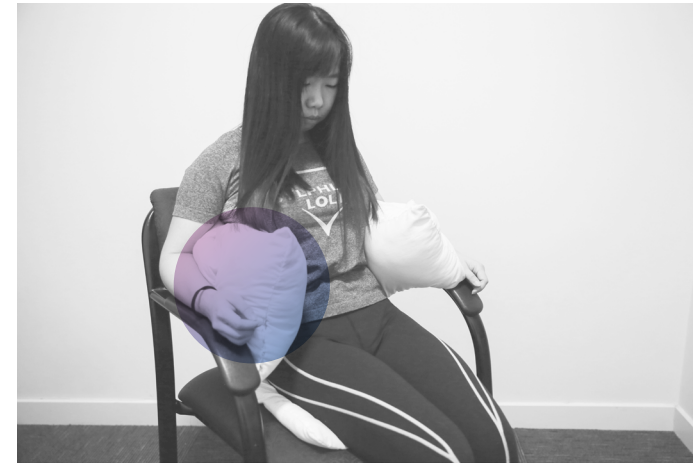
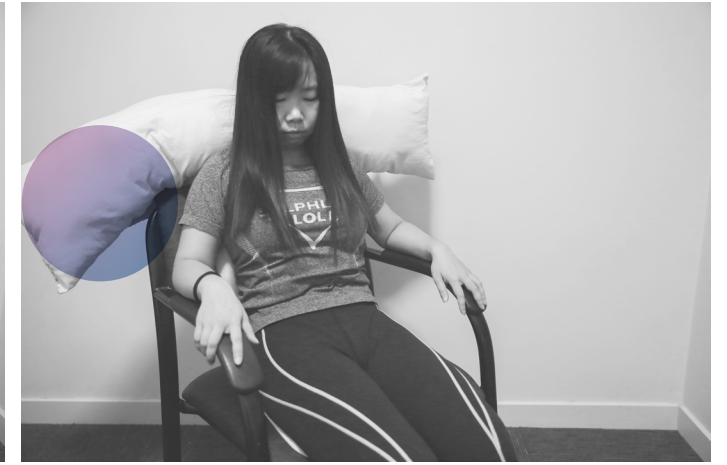
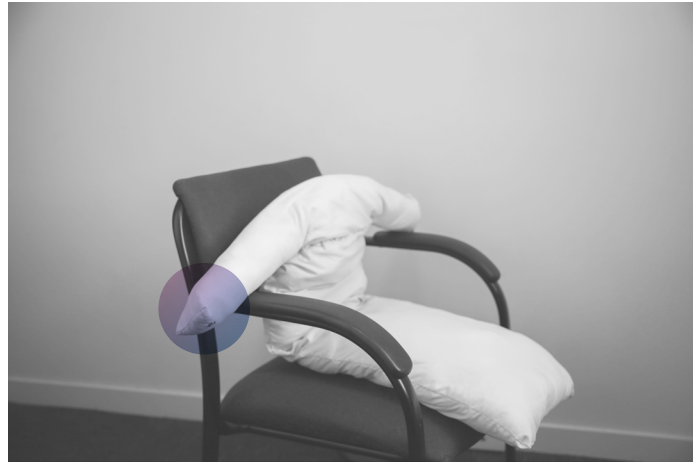
5.5 Opportunity reframing in customer journey map





Prototyping

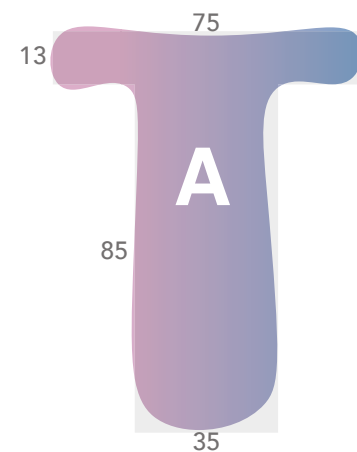
- 6.1 Comfort Test
- 6.2 Stress assessment with heart rate variability detection
- 6.3 E-textile test
- 6.4 Light pattern test
- 6.5 Sewable circuit



6.1 Comfort Test

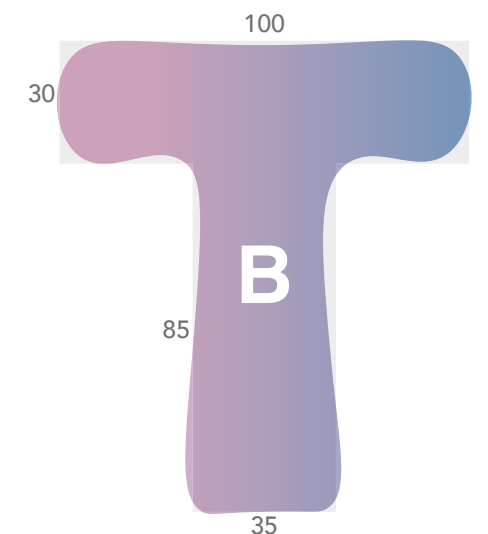
This step is to test whether the original idea from my sketch can achieve an ergonomic comfort in different posture while watching the lighting patterns.

Version A is the original idea in my sketch, with arms of the pillow hugging user's neck. But during testing I found it is inconvenient to touch the interface and to watch the lighting pattern if the arm is surrounding user's neck.



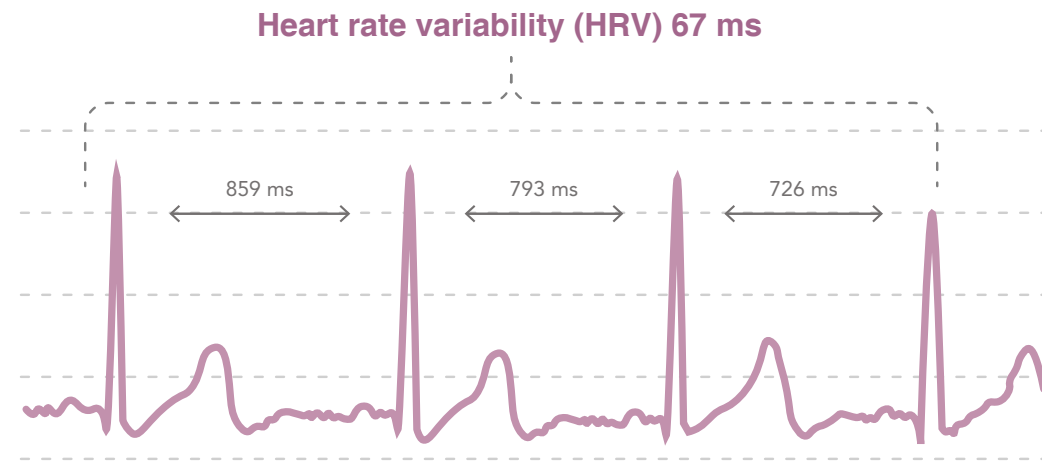
Version B is the second test, with larger arms of the pillow hugging user's waist. In this test I found it is better to keep the interface near user's hand for touch. The lighting patterns are also easy to watch and my waist feels more comfortable.

Therefore version B guided my final concept in shape and posture.

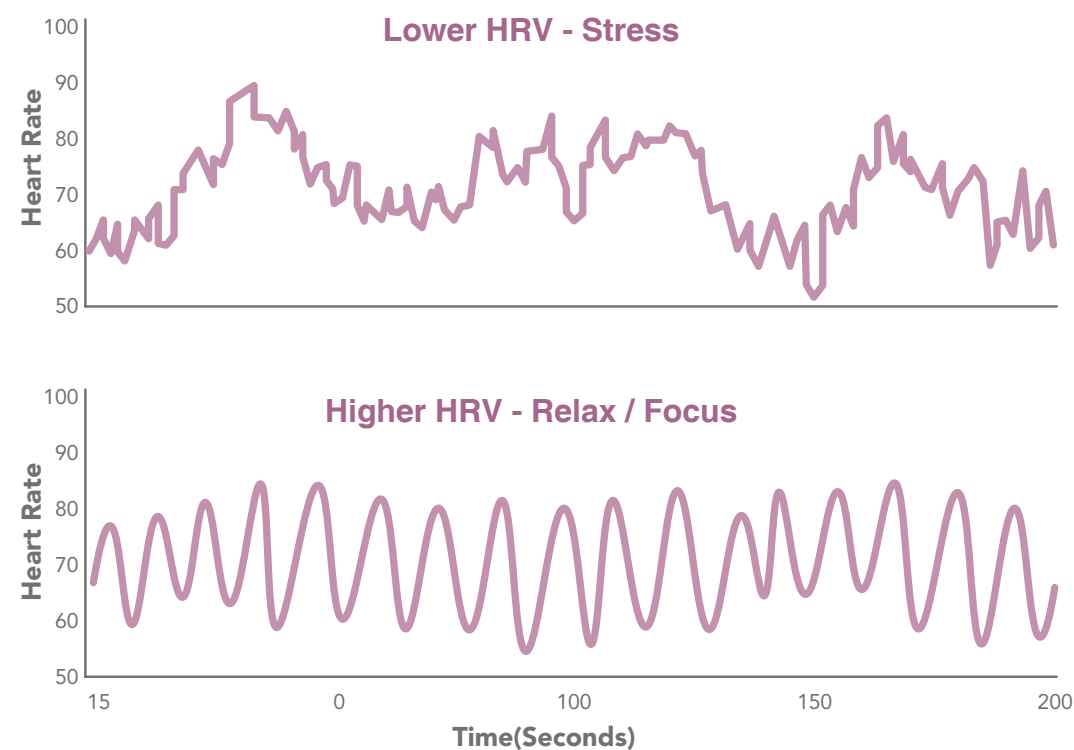


6.2 Stress assessment with heart rate variability detection

According to Castaldo et al. (2015), it is feasible to use HRV detecting to assess people's mental stress level. In this stage I tried to learn the principle about how our heart rate variability can reveals our stress level, and how can I utilize this algorithm to guide our breathing pace.



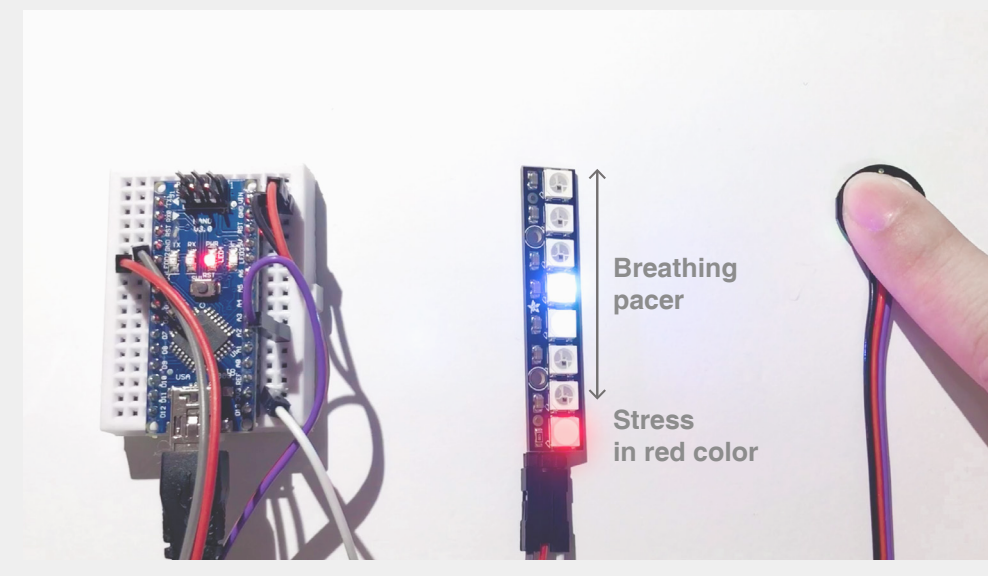
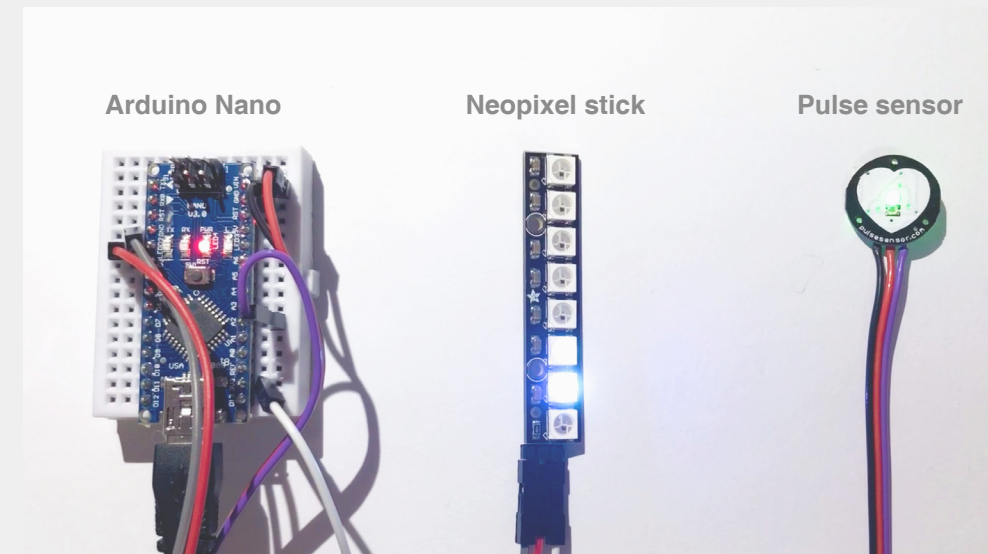
We normally think about our pulse as being a relatively constant value measured in beats per minute. I also hold that opinion before I start to research about heart rate variability. But surprisingly I found that our heart rate is always changing (Castaldo et al. 2015). Therefore scientists use heart rate variability to assess the variance of heart rate.



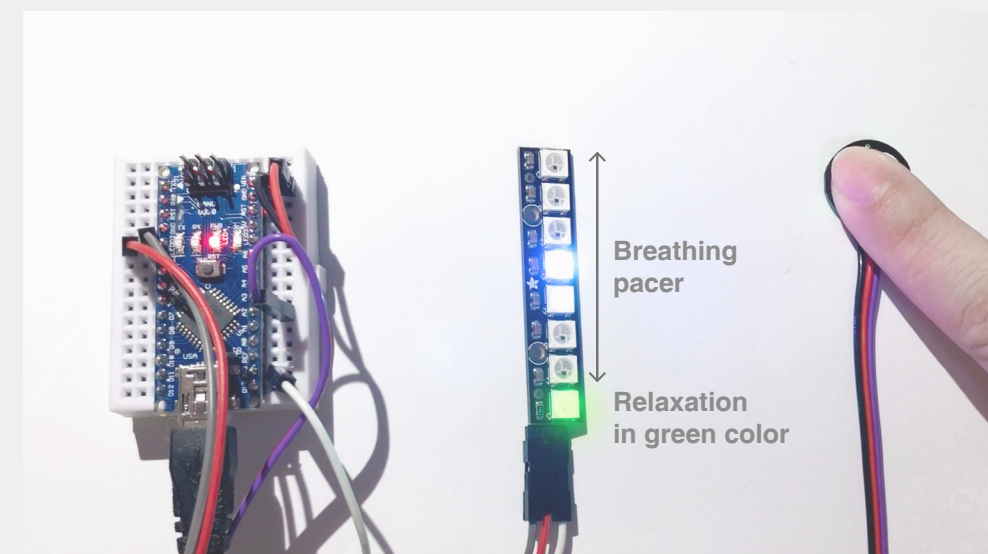
, if a people are in stress, his heart rate will change in an irregular curve, which could be assessed with a lower HRV. On the other hand, if a people are in relaxation or in focus, his heart rate will change in a regular sine curve, which could be assessed with a higher HRV. Another research from McCraty and Shaffer (2015) found that meditation trainers' heart rate change similar like the sine curve, and also promote that heart rate variability could detect stress level.

HRV detection test

After understanding the basic principle to use heart rate variability detection for stress assessment, fortunately I found a library from Cunningham (2016) to detect HRV using Adafruit Circuit Playground and pulse sensor. Here I adjusted the code slightly to match Arduino Nano and another Neopixel stick. This experiment aims to test whether a slow down breathing pattern can decrease my stress level.



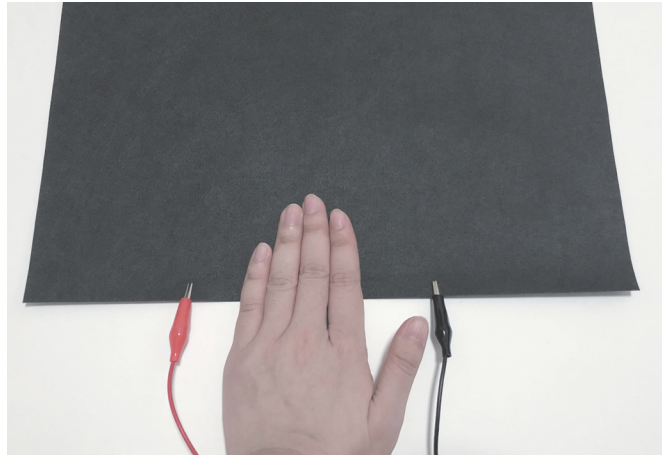
The blue light moving from one side to another side guides inhalation and exhalation. At first, the red color revealed that my heart rate variability is low and I was in stress.



After two minutes, nearly 24 cycles (1 inhalation + 1 exhalation), my heart rate variability increased and the green color showed I was in relaxation. The outcome reveals the feasibility to use slow down breathing to calm people down.

6.3 E-textile test

In sensory augmentation research I learned that I could use e-textile to create a soft interface, so in this stage I tried to test how available e-textile could provide electrical signal and feeling of touch, especially for a calming experience.



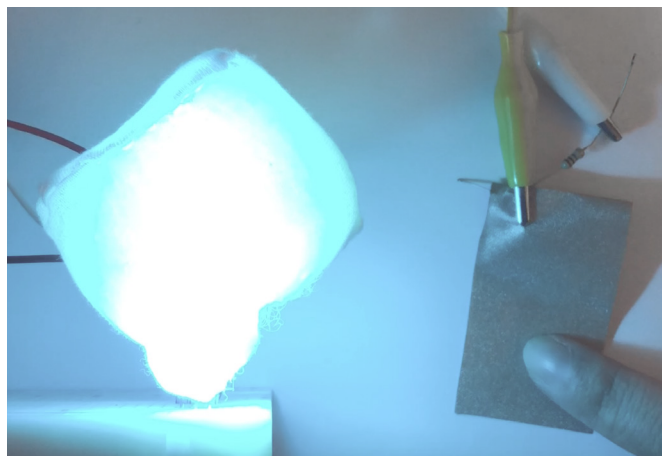
Heater fabric

The heater fabric requires a higher voltage with 12V to trigger a slightly warmth. In my experiment, I felt it was comfortable to touch. But other components of the whole circuit can only operate in a low voltage with less than 6V. Here I tried a voltage regulator to match heater fabric to other low voltage components, and it worked, but regulator was too hot. During my research I could not solve it, but for further development I should consider how to radiate the heat from regulator.



Pressure-sensitive sheet

In this experiment, I use pressure-sensitive sheet to detect my force and trigger the light while I pushed it. Before I tested the pressure sensitive sheet, I thought too ideally. After this experiment, I found it is not sensitive enough. It requires a hard material as a base, and a large force to trigger the signal change. Therefore I decide not to use it, because it wasn't a calming experience when I push it with effort. Also, if the sheet is embedded into a soft pillow, it is hard to ensure whether the force is enough to trigger.

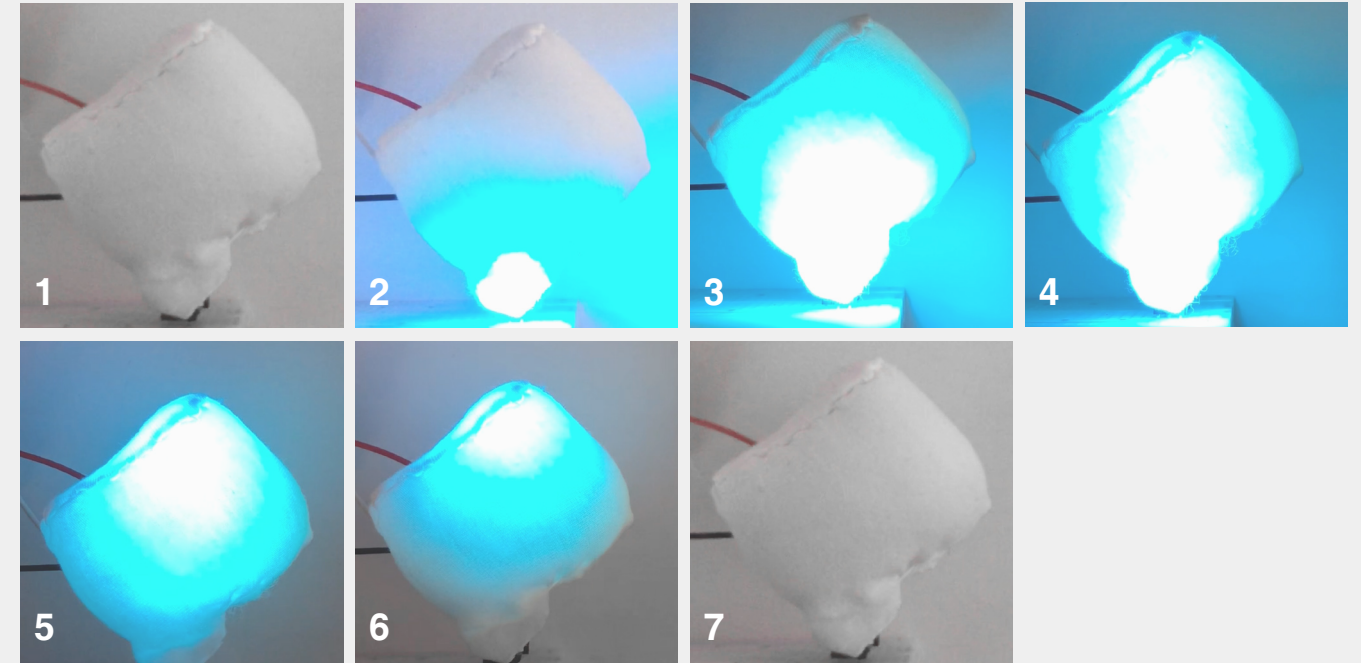


Conductive fabric

The resistance of conductive fabric is nearly 0 Ohm, hence it could be used as a capacitive sensor when it is connected with a large resistance according to Stern (2013). During the experiment I can trigger the lighting change with a soft touch, so that I felt it was the best e-textile to blend the soft touchable interface into a pillow in a calming experience effortlessly.

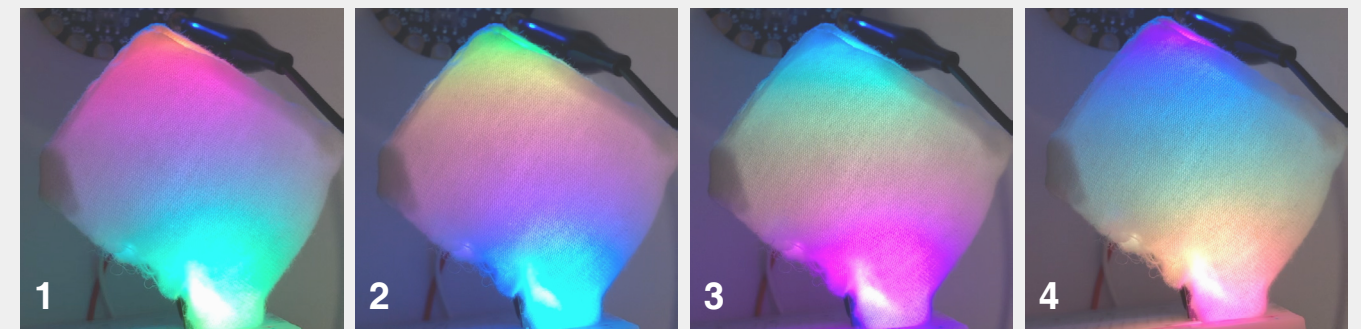
6.4 Light pattern test

According to previous inspiration from Breathe in Apple Watch and mindfulness exercise in mindful seeing, I started to test which lighting pattern could be embedded in a pillow. Here I use poly-cotton and polyester fill as light diffuser outside to cover Neopixel stick to test which lighting pattern is best.



Expanding & shrinking

Unlike the breathing pacer I tested in heart rate variability experiment before, a moving single LED pixel is not obvious when polyester and fabric covered it outside. Subsequently, I made the lighting area expanding and shrinking by changing the amount of lighting pixels. Finally it achieved a metaphoric lighting pattern, because the meditation tutorials also asked me to expand or shrink my belly while practicing breathing.



Expanding & shrinking

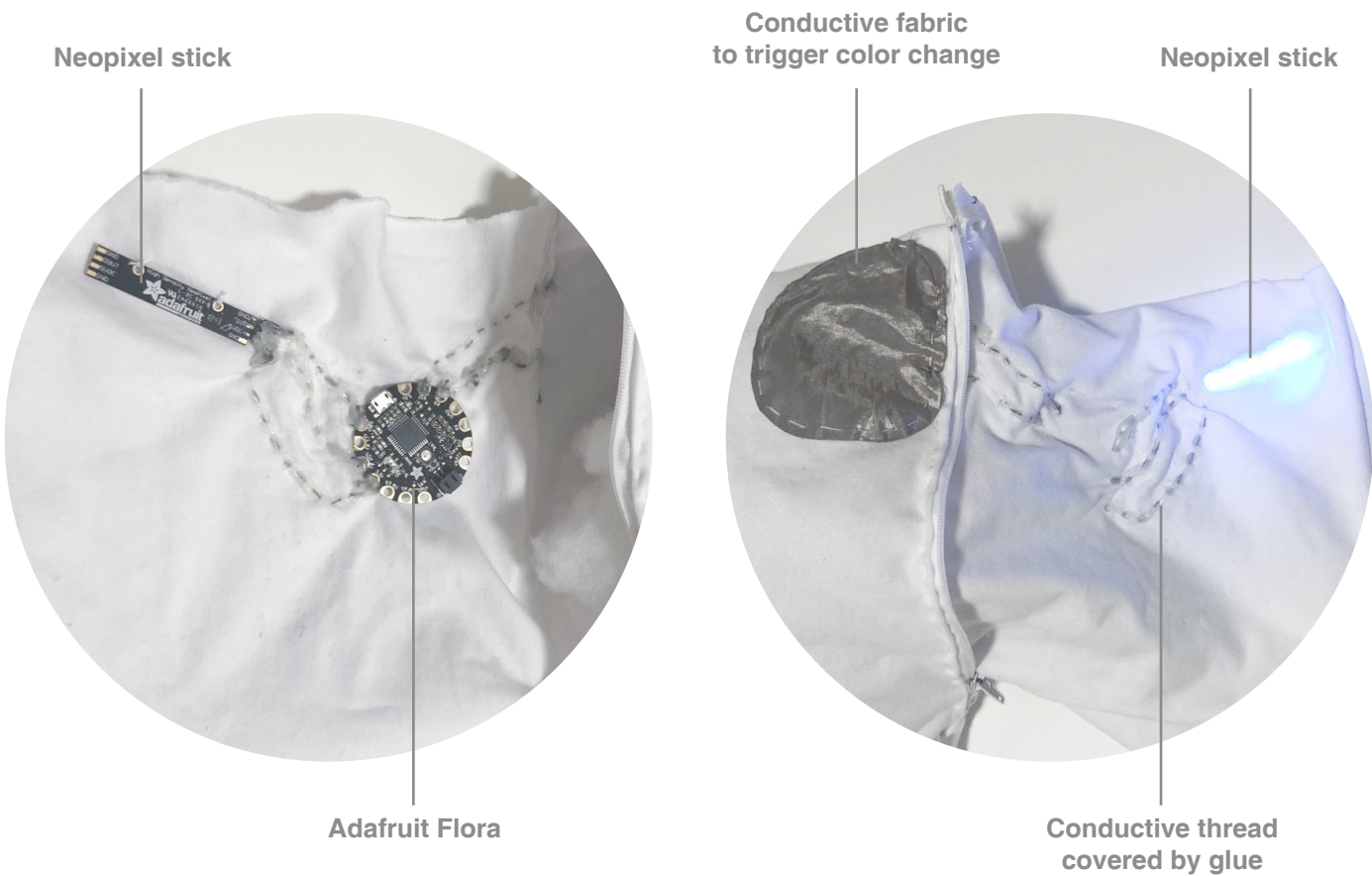
In my mindfulness practice, I practiced "mindful seeing" and "stare at center" by staring at something with slowly shifting patterns such like color, shadow and movement. Here I tried to combine mindful seeing practice and chromatherapy in the rainbow-like pattern embedded in a pillow.

6.5 Sewable Circuit

After experiments with different components in e-textiles and light patterns, I tried to combine these components into a pillow with conductive thread. This step aims to verify whether a soft interface in a pillow is feasible.

Positively, the basic functions, such as breathing light and conductive fabric triggering color change, are feasible. But the connection problems also appeared. At first the circuit was unstable because of short circuit and untightened connection between conductive thread and sensors. Then I tried to use hot melt glue to cover all circuit connection and thread, then the circuit became more stable.

This is an early vision reveals that this proposal is feasible in industrial perspective. Also, this prototype could help me to mediate my idea and user journey for further concept iteration.





7.1 Introduction

7.2 Branding

7.3 Digital intimacy

7.4 App

7.5 Wristband

7.6 Pillow

7.7 User manual

7.71 User manual - relaxation alone

7.72 User manual - group meditation

7.73 User manual - sleep guide

7.1 Introduction

Lack of physical contact harms mental wellbeing. Obviously, more and more people suffer from anxiety, social disconnection and insomnia due to isolation during COVID-19 restrictions. Other groups, such as astronauts, remote research group and people with chronic health problems also need to cope with loneliness. Even in our normal lives, growing influx technology starts to impact mental wellbeing. This calls attention to exploring the future relationship between human and machines.

Soothe is a haptic companion pillow to relieve anxiety, social disconnection and insomnia through a soft hug. The product-service also includes an app for mode selection and a wristband for heart rate variability detecting. The human-like shape and heater fabric from back can achieve a feeling of being hugged as a comfort support. Also, people can lie on it and hug it on a bed. To cope with anxiety and insomnia, it uses biometrics and appropriate lighting guidance to personalize slow-down breathing patterns based on meditative breathing techniques. To relief loneliness, people can join a group meditation with other people in remote location. They can practice various breathing techniques through audio broadcasting guidance when warmth makes them feel being hugged.

This project aims to use interactive technology to satisfy people’s emotional needs while blending interface into people’s daily routine.



App



Wristband



Pillow

7.2 Branding

Considering Soothe is a product-service, I need to build an identity of this brand. It aims to calm people down emotionally in daily life, so I choose a calming color palette with purple, blue and light grey to mediate its brand intention.

Through this product service, the goal is to promote people to notice how their heart reflects their feeling, and how a soft pillow can soothe them through hug and being hugged. So the main element of logo design is a illustrated hug and a soft shape of heart.

LOGO



Vertical

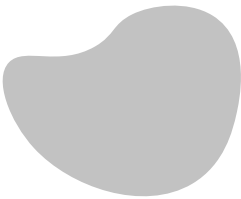


Horizontal

Submark



Hug



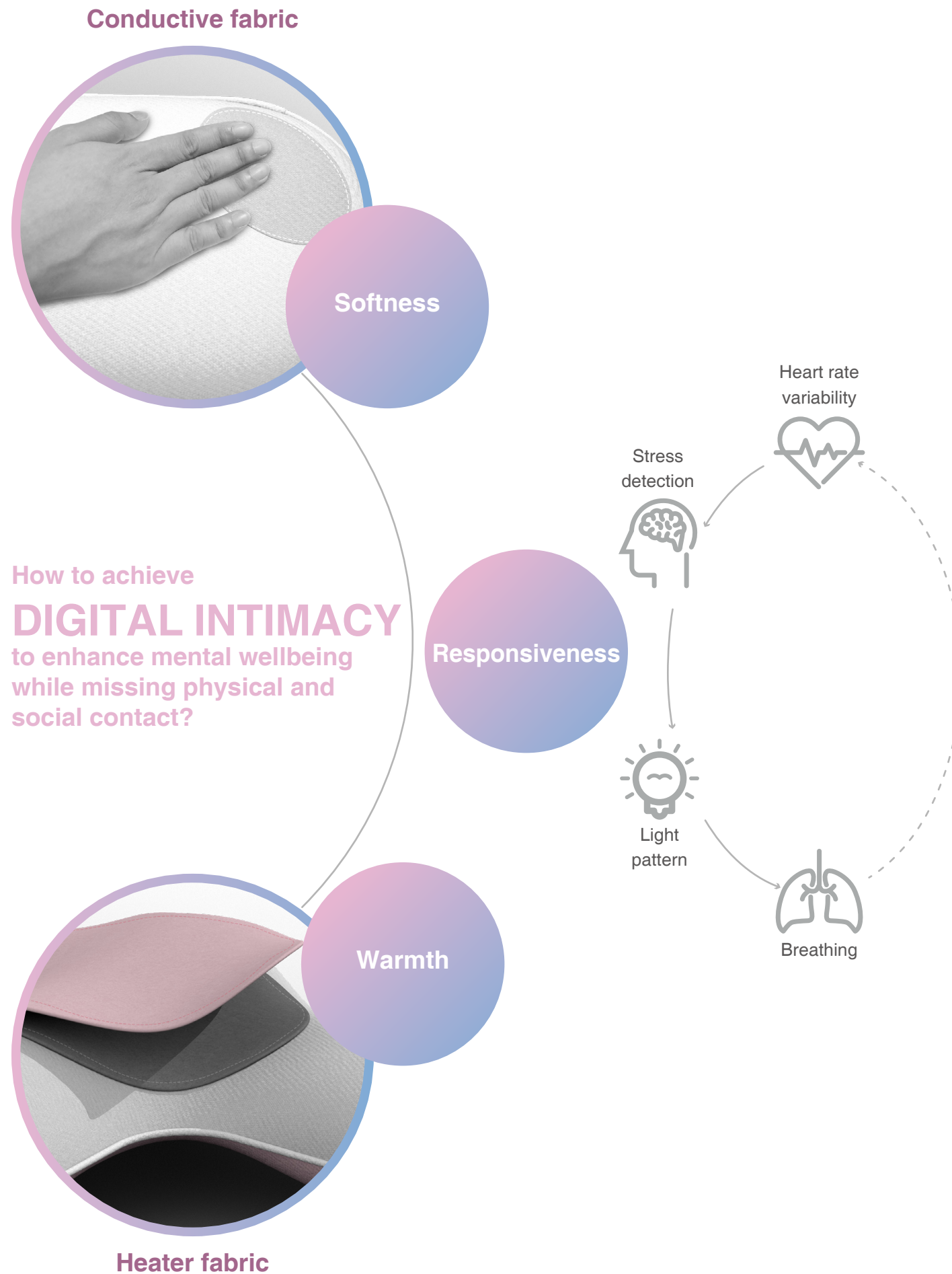
Soft shape & heart

Color



Package





7.3 Digital intimacy

Coping with the problems that lack of physical contact cause negative impact of mental wellbeing, Soothe originally started with an artificial hug. There are already some precedents use warmth and pressure in a jacket or in a sandwiching machine to create a feeling of being hugged. Block and Kuchenbecker (2019) studied what patterns could increase feeling of intimacy using digital solution. Softness, warmth, and responsiveness is the ingredients they found to improve intimacy in an artificial hug. Inspired by the study, I considered how Soothe could create its own digital intimacy.

Softness

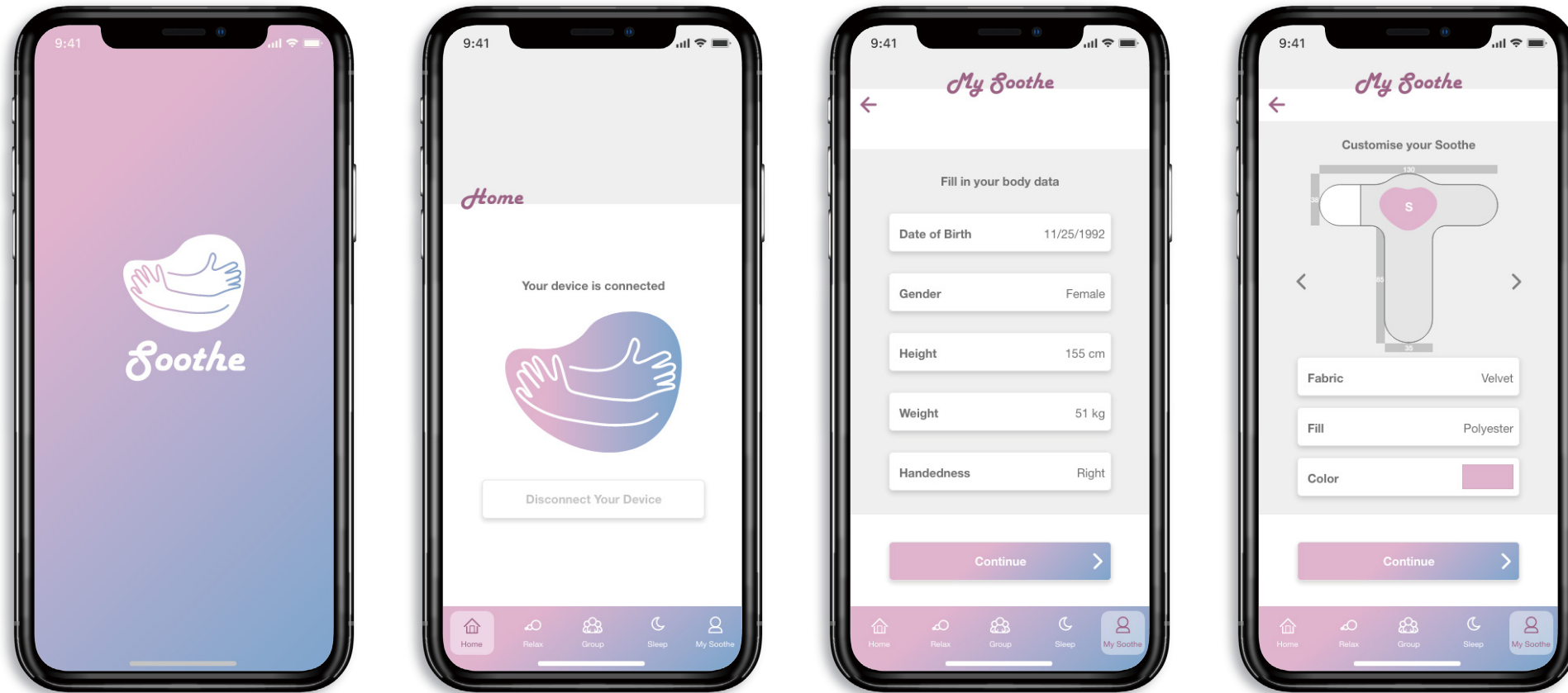
Firstly, the pillow is soft enough in our daily life. When I tested my prototype with other people, it stimulated the conversation about how they feel by hugging a cushion or a pillow when they sit in a sofa or when they sleep. Secondly, the conductive fabric can achieve a soft touchable interface instead of a cold and hard screen.

Responsiveness

When someone can respond people's emotional need, they can feel intimate. Soothe use heart rate variability to detect user's stress level, and then respond with appropriate light pattern to guide their breathing. My previous research in HRV experiment shows that slow-down breathing pattern could reduce stress level, and the light pattern will regenerate once user's stress level changes as a new response.

Warmth

Normally when we hug a people or a pet, we can feel warmth, which could soothe us. Yoder (2018) claimed that body heat is rising when people feel anxiety, and Breus (2017) found slightly warmth could disturb sleep, however, Inagaki and Human (2019) suggested that physical warmth is associated with feeling of social connection. Therefore, soothe can provide intimate feeling when people are calm down like yoga practice session, and when they are seeking social connection.



7.4 App

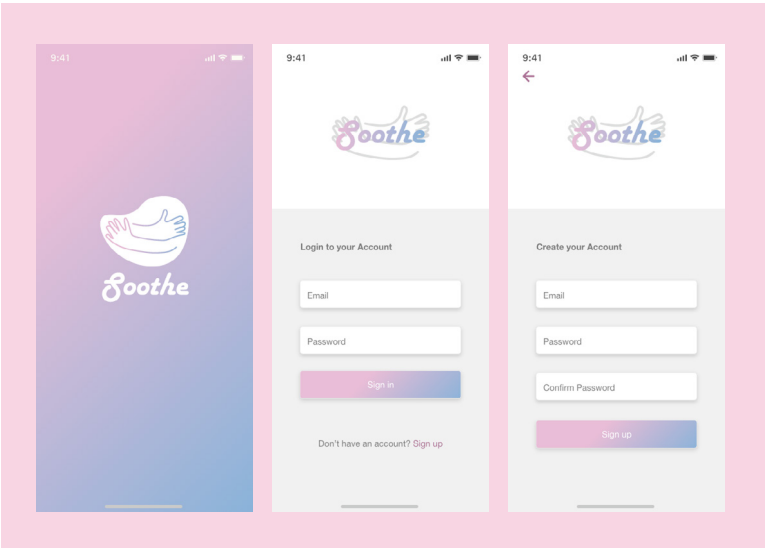
In this product-service, application is needed for product ordering, body data collection, device setting, and mode selection.

As per Castaldo et al. (2015), “high” and “low” heart rate variability is relative for each person because of different physical condition, so a basic body data collection is necessary HRV and stress detection algorithm before use. For customization possibility, Soothe also provide different fabric fill and color for personal preference. A basic instruction about how to use the pillow in different modes is also necessary before people start their first session with Soothe.

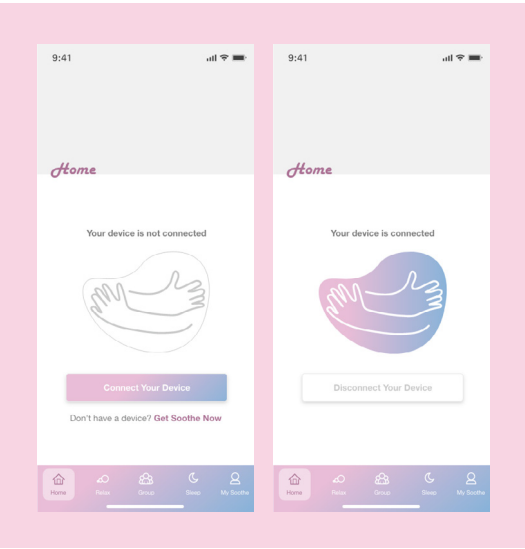
In this stage I built interfaces in different steps to test whether users can understand how to use this product-service when they play with the app prototype. Volunteers found that when they only have the pillow, it is hard to imagine how it works. After they read the instruction in the app, it became easy to start the first session. During the session, they don't need to watch screen, so it is not disturbing. In addition, they like customization a lot because they have different body size.



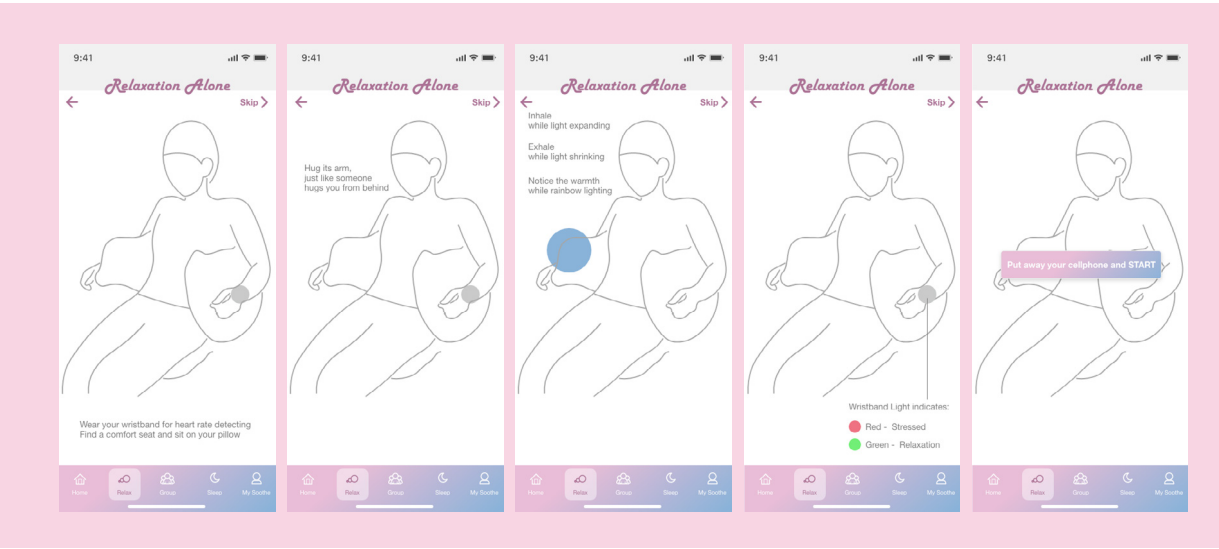
Login



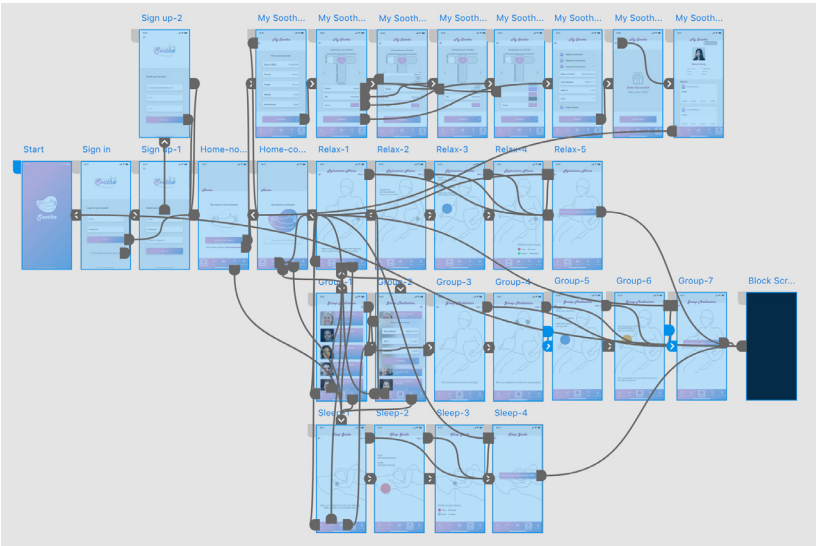
Home & device connection



Relaxation alone instruction



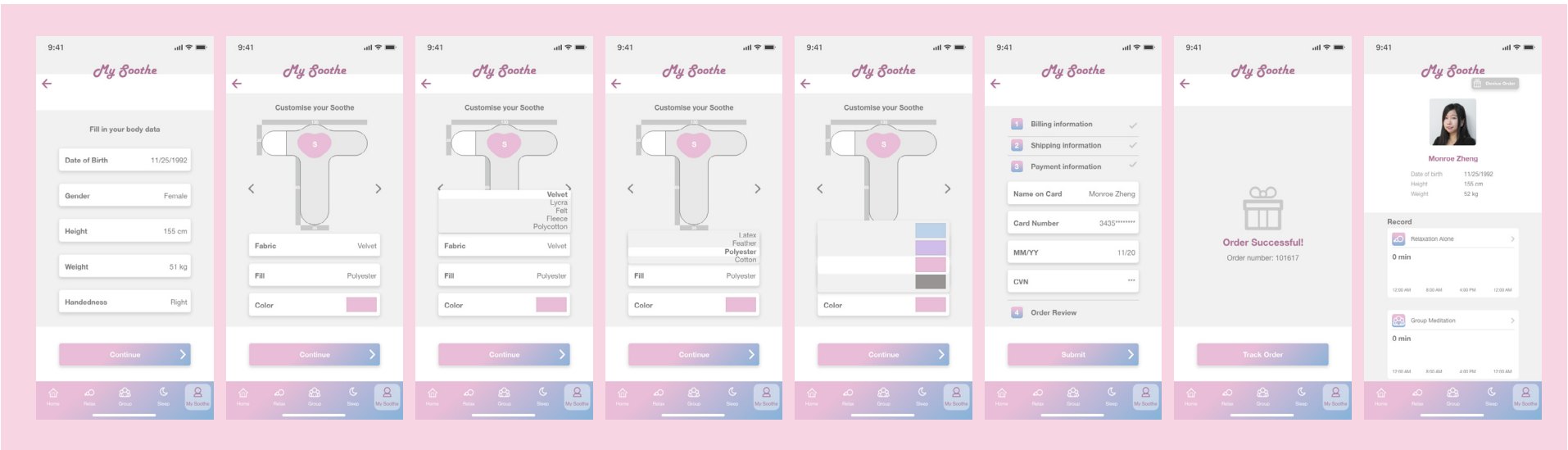
Interaction testing



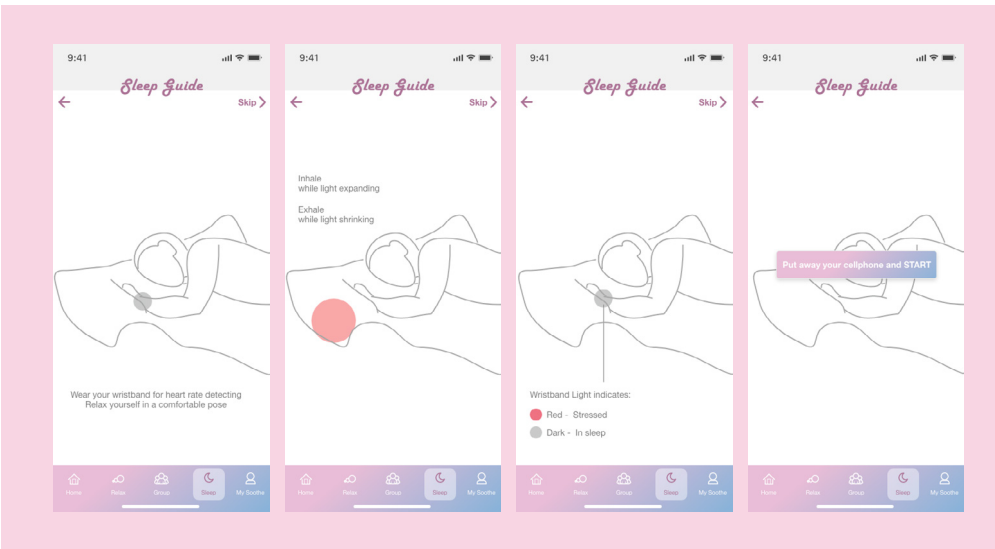
Group meditation selection & instruction



Body data collection & product ordering



Sleep guide instruction



7.5 Wristband

As per responsiveness in digital intimacy criteria of Soothe, wristband is the peripheral device connected with pillow automatically, to detect user stress level and provide appropriate light patterns. It keeps detecting user's heartbeat, heart rate and heart rate variability when he is wearing it, so that the accuracy of stress detection could increase based on machine learning in long period and user's basic body data.



How to activate

Hold down for 2s to switch on/off
Short press to show heartbeat



In stress

When the light synchronize heartbeat in red, it means the user is in stress



In relaxation

When the light synchronize heartbeat in green, it means the user is in relaxation.

7.6 Pillow

Pillow is the main component in this product-service during use. The side of the interface could be customized based on different handedness requirement. People can also choose their favorite fabric (velvet, lycra, felt, fleece and poly-cotton), fill (latex, feather, polyester and cotton), and colors.





7.7 User manual

Through the background research, I found that isolation could cause 3 problems, namely, anxiety, social disconnection and insomnia. Hence this product-service contains 3 different modes to cope with those problems.

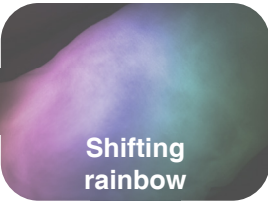
Relaxation Alone



Heart rate variability detection



No Warmth



Warmth



Slow-down breathing rhythm

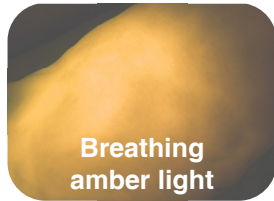


Less anxiety

Group Meditation



Touching rhythm & voice broadcasting



Warmth



Variation in breathing techniques

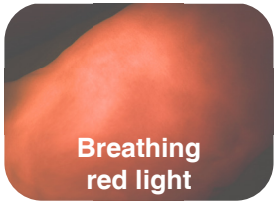


Less social disconnection

Sleep Guide



Heart rate variability detection



No Warmth



Slow-down breathing rhythm



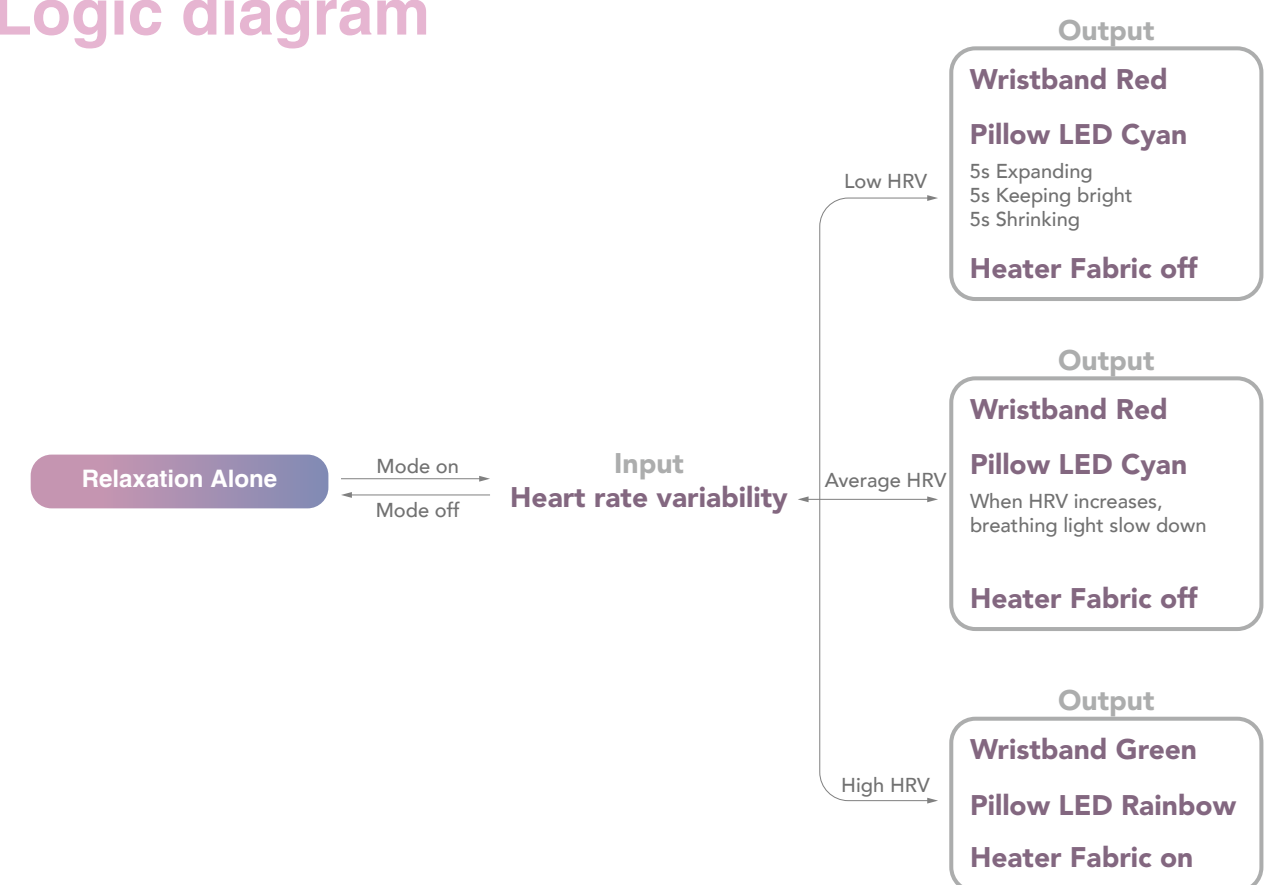
Less insomnia



7.71 User manual - relaxation alone

Relaxation alone mode aims to ease anxiety. In this mode, the wristband assesses user's stress level with heart rate variability detection. And then the pillow can help user to slow down their breathing pattern with personalized pace in breathing cyan light, which is a calming color. When user achieves relaxation, he can practice mindful seeing in shifting rainbow light and feel warmth.

Logic diagram



User journey



01 Feel stressed

You feel stressed and touch your wristband. The wristband reads your stress level and synchronizes it in red color.



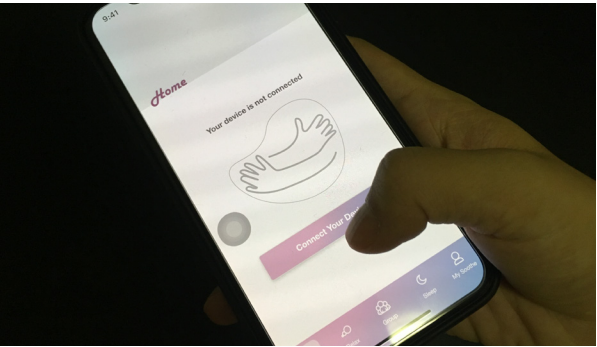
02 Switch on

Pick the pillow, unzip it and switch on it.



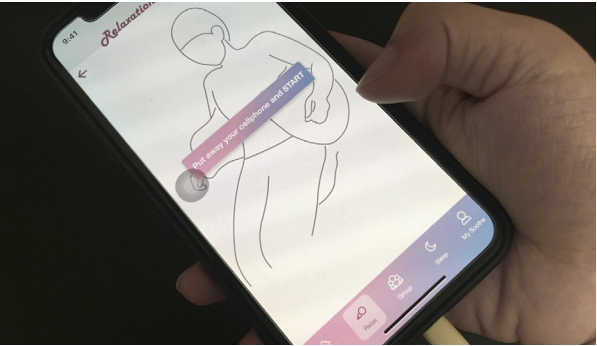
03 Sit

Find a comfort seat and sit in the pillow. Hug its arm, just like when someone is hugging you from behind.



04 Connect

Login your app, and then connect your pillow with cellphone.



05 Choose mode

Choose relax mode. If you are a new user, you can follow the instruction. If you already know how to use it, you can skip the instruction.

Then, put away your cellphone and start.



06 Inhale

Inhale while the light expanding.



07 Exhale

Exhale while the light shrinking.



08 Mindful seeing

When the wristband flashes into green, it means you are in relaxation. Just enjoy the shifting rainbow mindfully, and feel the warmth from your back.



09 End

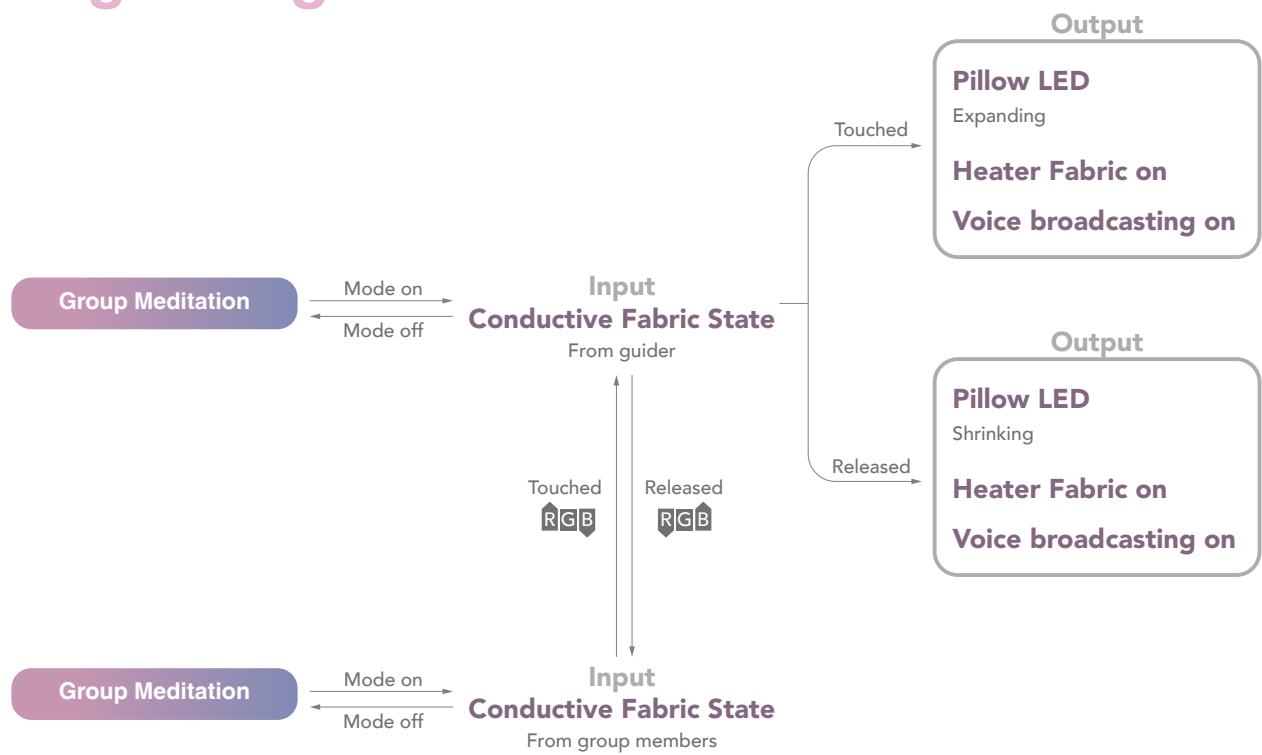
When you want to finish, just stand up, switch off and put it away.



7.72 User manual - group meditation

Group meditation mode aims to ease social disconnection and provide various breathing techniques for users who want deeper meditative practices in pranayama. A group guider can guide group members by touching and releasing conductive fabric as well as voice broadcasting in different breathing rhythm, cycle, and round. Warm amber color and warmth could provide them feeling of being connected.

Logic diagram



User journey



01 Feel lonely

Sometimes you could feel sad and lonely during isolation. You could need a group meditation to feel connected with others, and to gain in-depth breathing techniques.



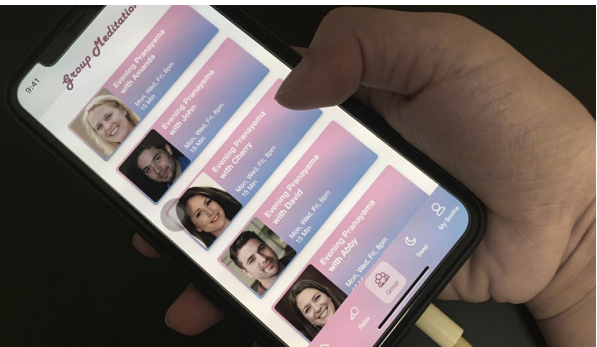
02 Switch on

Pick the pillow, unzip it and switch on it.



03 Sit

Find a comfort seat and sit in the pillow. Hug its arm, just like when someone is hugging you from behind.



04 Find a group

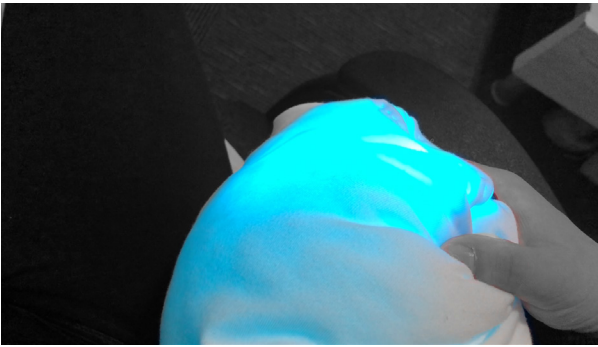
You already connected your pillow before. Choose group mode. You can join a group or setup a new group. Then, follow the instruction or skip it.



05 Wear your headphone

Guiders can explain multiple breathing techniques with voice broadcasting.

Group members can follow guider's voice guiding to practice various breathing techniques.



06-1 Following breathing

If you are following a guider, inhale while the light expanding, and exhale while the light shrinking.

All group members can feel the warmth from back.



06-2 Show presence

When you are following a guider, you can put your hand on the conductive fabric to show your connection. The more group members are connected, the warmer the color will become.



06-3 Guiding breathing

If you are a guider, touch the conductive fabric for an inhale guiding, and release it for an exhale guiding.



07 Stop guiding

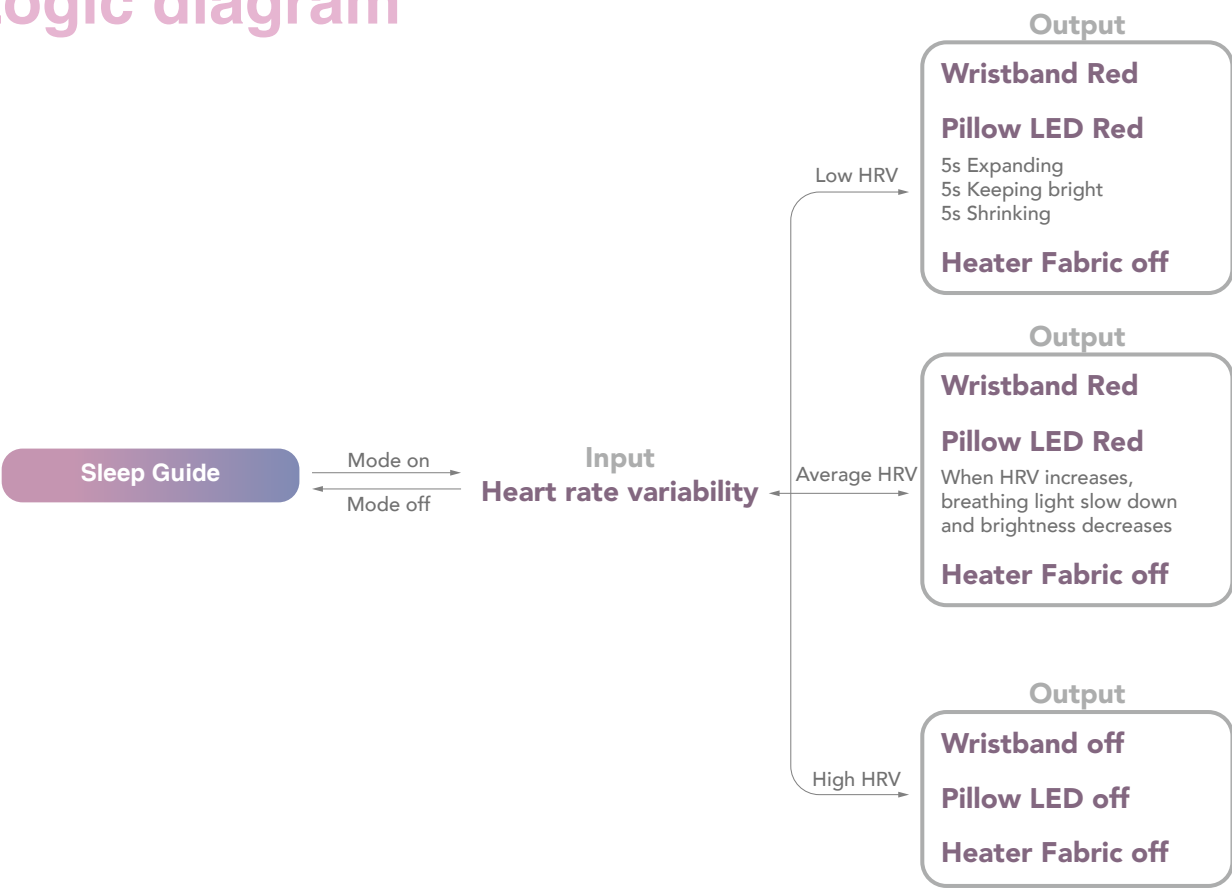
When the light stopped, the session is ended. After finish session, just stand up, switch off and put it away.



7.73 User manual - sleep guide

Sleep guide mode aims to ease insomnia. The wristband detects HRV and help the pillow guide a slow-down breathing pattern. In this mode, the light is red for melatonin reproduction and avoids blue light disturbing sleep quality. Also, warmth is not allowed in this mode to avoid sleep-disturbing temperature.

Logic diagram



User journey



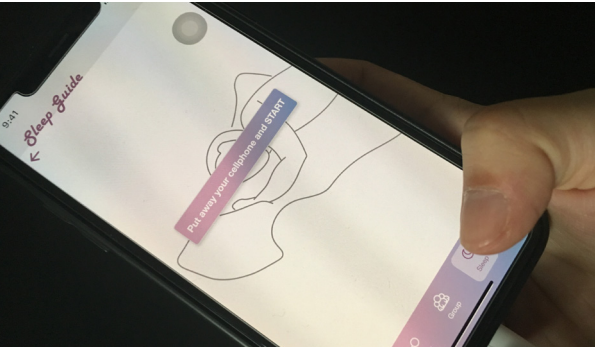
01 Cannot sleep

Insomnia is always annoying in high stress.



02 Switch on

Unzip the pillow and switch on it.



03 Choose Mode

You already connected your pillow before.

Choose sleep mode. You can follow the instruction or skip it. Then, put away your cellphone and start.



04 Inhale

Inhale while the light expanding.



05 Exhale

Exhale while the light shrinking.



06 Heartbeat detecting

Your wristband is detecting your heartbeat. When your heart rate variability become higher, the brightness of the pillow will slowly darken.



07 End

When you fall asleep, your wristband detect that your heart beat variability is high enough. The sleep guide mode stops.



Conclusion

8.1 Reflection

8.2 Further possibilities

8.1 Reflection

This project started with self-care possibilities during Covid-19 and then developed into mental wellbeing in multiple isolation circumstances. Previously I always focused on medical data and symptoms in a rational thinking, but ignored people's emotional need. Through deeply exploring mental issues, I gain more empathy and acquired potential of design to make a broader contribution to individuals and the society in an intangible way. Therefore in my further career I should keep sympathy about people's mental wellbeing aside from simply caring efficiency in usability and manufacturability.

Moreover, I start to change my attitude about academic research. I was used to expand my research as much as I can, show my effort and failure. But after this project I realized how overwhelming information could disturb communication. This experience triggered me to filter unnecessary information even with tears. There is still a lot to be improved, but it is a meaningful start.

In terms of my concept, I am surprised that the volunteers who I discussed like Soothe more than my expectation. The participants played with Soothe pillow in posture beyond my expectation when I didn't tell them how to use. And also, it triggered new topic of conversation. This inspired me to develop it in the long run to ease their loneliness during isolation, and, most importantly, do not limit potential in my own imaginary failure.

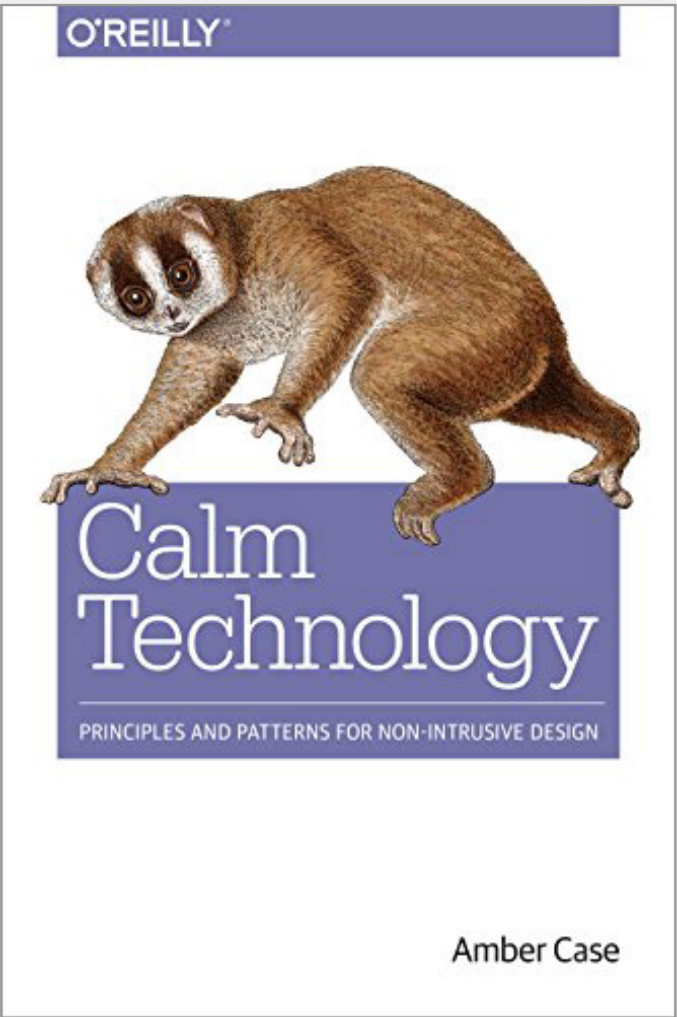


Participants played with Soothe in unexpected postures



8.2 Further possibilities

Currently Soothe is still a concept with several technical demos. There are still a lot to be tested and improved. In this project I realized how important mental wellbeing is, and my current progress already showed potential. Hence I hope to develop it more in the future. Possibilities include two aspects: technology and materials.



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About technology

In short-term perspective, I still need more user testing, because currently it is hard for me to organize more face-to-face interview during covid-19 restrictions. Also, as per Chuan’s feedback, more lighting patterns still could be tested such as timing and saturation.

In long-term perspective, I was inspired a lot by Calm technology (Case 2015) and ubiquitous computing (Ekman 2013). Learn from those principles, I could need deeper research for potential possibilities to achieve proactive detection of user’s need, so that Soothe could automatically operate appropriate modes according to user’s emotional state. Considering whether my concept is really achieving digital intimacy, proactive detection could provide a better emotional responsiveness.

The Weight
by Mia Cinelli



© 2014 M. Nyquist

Skin-On Interfaces
by Marc Teyssier



© 2019 Marc Teyssier

About materials

Inspired by Mia Cinelli (2014), who uses weight of a heavy blanket to simulate the feeling of being hugged, and Marc Teyssier (2019), who use silicon glue to create a skin-like texture mediating intimacy, I still need further exploration in pressure, weight and texture.

I discussed whether those ingredients could trigger intimate feeling with my participants. Some of them regard it as interesting, but some think it is weird. Currently I tested a lot about technical feasibility, but I still have no chance to experiment those materials. I dare not to make assumptions now with these debatable issues, so in further development I need to experiment and seek feedbacks about pressure, weight and skin-like texture, after participants touch them with haptic experience.



Appendix

- 9.1 Meditation and neuroscience
- 9.2 Pranayama – techniques in breathing control
- 9.3 Chromatherapy
- 9.4 Precedents - designing sensory experience to de-stress
- 9.5 Highlights of sensory experiences research
- 9.6 Application based interactive meditation
- 9.7 Hardware based de-stress products

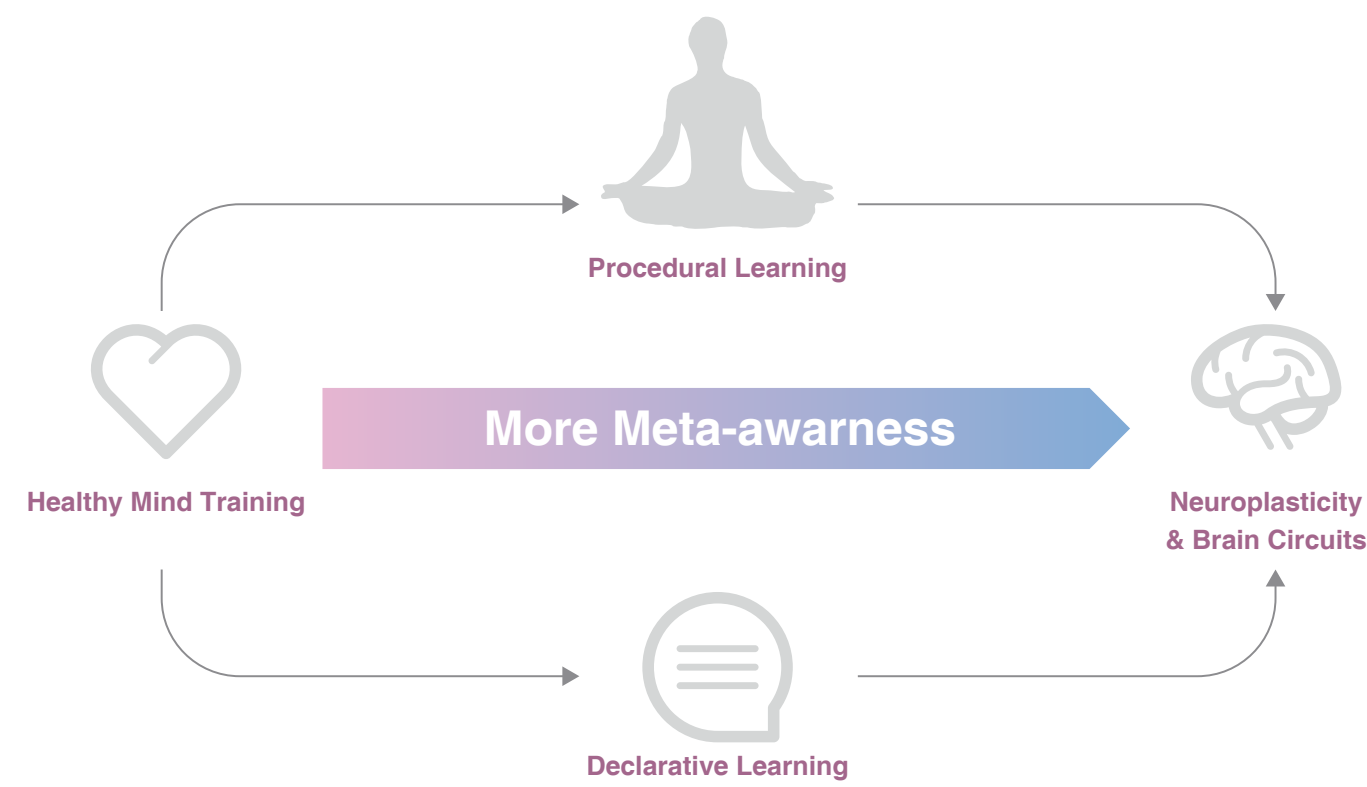
9.1 Meditation and neuroscience

In the early stage, quantitative data in literature review and questionnaire reveals that meditative has strong effectiveness for stress reduction, but it is not popularized. To understand how could meditative practice help mental regulation, here is the study about basic principle and experimental evidence in neuroscience.

About materials

Meditation is an approach to train our meta-awareness, which means awareness about how people’s awareness is. When people learn something, they always need declarative learning and procedural learning. During declarative learning people understand theoretical information, while during procedural learning they gain muscle memory.

According to Davidson (2019) and Vago (2017), mindfulness and meditation is a kind of procedural learning, which is similar like muscle training for athletes. With the intention of healthy mind training, people gain more meta-awareness during meditation, by trying to focus on their awareness and sensation at present time after time. So that people gain more neuroplasticity, which could adjust their brain circuit easier. Finally the brain becomes strong enough to manage mental wellbeing.

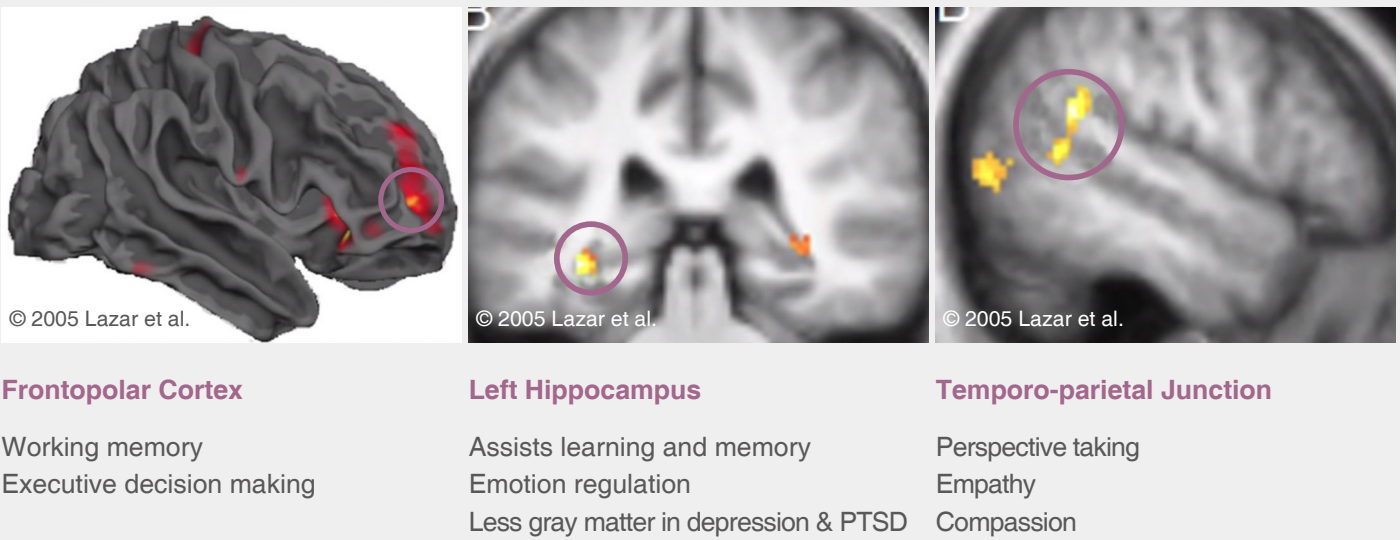


Experimental evidence

Neuroscientist Sara Lazar organized a quantitative research about whether meditation can change our brain structure in 2005. They recruited a bunch of people from Boston Area to practice meditation in an average level for 30-40 minutes per day. Then they compared the brain of people who took meditation practices with a control group without meditation practices, by scanning their brain with magnetic resonance imaging.

According to MRI data report by Lazar (2011), meditation can have positive influence on frontopolar cortex, where the neuron help us reshape our working memory and make executive decision. Activated area also became larger in left hippocampus, where assist learning and memory and emotional regulation. Less grey matter also shows in left hippocampus reveals a decreasing hazard into depression and PTSD. In temporo-parietal junction, the area for perspective taking, empathy and compassion became stronger.

These quantitative data shows the evidence that meditation can reshape brain against mental problems.



9.2 Pranayama – techniques in breathing control

Yoga Breathing or Pranayama is the foundation of yoga practice.

When I first started practice yoga, I found that every meditation tutorial start to guide people breathing, hence breath became the key meditative exercise in my project. Then my friends Tria and Suri, as experienced yogis, suggested me to practice pranayama to seek multiple possibilities, such as permutation and combination of different techniques in some sessions, aside from simple deep breath. Their suggestion is valuable for me to improve my group meditation mode in user experience.



Tria Amalia Ningsih

Because you are focusing on the breathing, a part from inhales and exhales, interesting is that you can get your body warm and get your body calm just doing breathing techniques in pranayama practices. One of my masters can guide me with pranayama in different mindful level with different breathing. So it will be cool if this product can combine different pranayama techniques.



Suri Adlina Ilham

Besides complex posture, in yoga there is a type focus on breathing, just one pose for ten minutes each. In yoga class they can use a pillow just like yours, what we use that pose is to hug the pillow to practice mindfulness. I think here is a opportunity you can take one level up.



Abdominal Breath

Abdominal breath moves the diaphragm down and up during inhalation and exhalation. It can reduce stress and make people feel massaged, stimulated and relaxed.



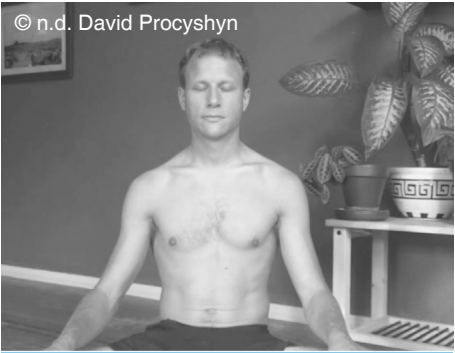
Mid-chest Breath

Mid-chest breath focuses on the rib cage, and expands the rib cage out to the sides, the front and the back. The movement channels air into the middle lobes of the lungs.



Upper-chest Breath

This technique can help to loosen the upper chest area, and brings awareness to tension in the shoulders, chest and neck, when the air is drawn into the upper-most lobes of the lungs.



Complete 3-Part Breath

This practice is a combination of abdominal, mid-chest and upper-chest breath. It could expand people's ability to breath deeply as a foundation of most yogic breathing techniques.



Alternate Nostril Breath

This is a relaxing breathing technique that soothes the nervous system by balancing the right and left - sympathetic and parasympathetic, activating and relaxing - aspects of our being.



The Ujjayi Breath

Ujjayi is a key part of yoga practice. It can help maintain energy level throughout a class and helps people stay focused and calm, even when people is doing difficult yoga poses.



Skull Cleanser

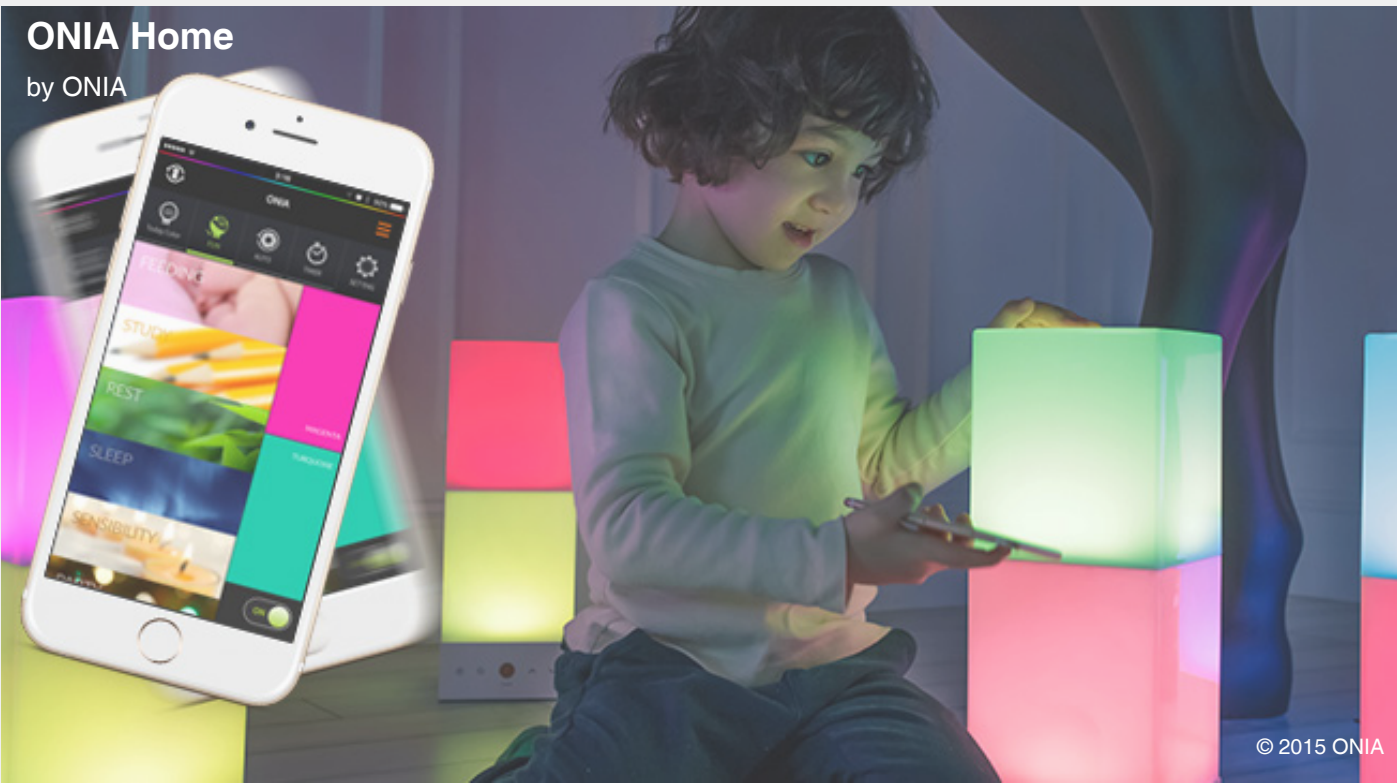
Skull cleanser is more like a cleansing technique than a breathing technique as an energizing for total-body wake-up. It is often used as a preparation for the pranayama.

9.3 Chromatherapy

Chromotherapy is a method that uses the visible spectrum (colors) of electromagnetic radiation to treat health problems. A study from Azeemi and Raza (2005) describes that it is a centuries-old concept used successfully over the years to cure various diseases. In modern psychiatric treatment, chromotherapy is also used for regulation of neurohormonal balance in human brain (Radeljak et al. 2008).

Color	Emotion	Therapeutic Effect
Violet	Creativity Spirituality Misery	Violet has meditative qualities and is often used to treat conditions of the lymphatic system and spleen, as well as urinary disorders and psychosis.
Indigo	Integrity Intuition Wisdom	Indigo addresses conditions involving the eyes, ears and nose. It has a calming, sedative effect.
Blue	Calmness Trust Sadness	Blue stimulates muscles and skin cells, but could disturb sleep. Used to treat liver conditions and break down bilirubin.
Green	Growth Refreshing Balance	Creating calming and relaxing experience, it is used in conjunction with blue lights for Seasonal Affected Disorder sufferers.
Yellow	Optimism Confidence Warmth	Yellow works on internal tissues. It can reactivates and purify skin.
Orange	Enthusiasm Attention Energy	Orange enhances overall mood. It also aids in stomach and digestion issues, as well as asthma and bronchitis.
Red	Love Excitement Passion	Red activates and improves circulatory and nervous systems. And it could also help melatonin reproduction for sleep quality.

Precedents in commercial products



9.4 Precedents - designing sensory experience to de-stress

Mind Wandering Bloom



- Designer** Caroline Angiulo
- Concept** A playful collection of interactive toys provide people with a momentary escape into the fantastical
- Sense** Sigt, touch
- Pro** The project offers tactile relief from the distractions of technology and the digital world
- Con** It is unsustainable and unrealistic during self-isolation

Sleep Balance Lamp



- Designer** Hyeona Yang, Kristjana Guðjónsdóttir, Mette Lyckegaard
- Concept** It depicts hours slept and hours of light and deep sleep over a 7-day period. Thereby giving an overview of how balanced the user's sleep pattern is.
- Sense** Sight
- Pro** Visualize sleep quality for user
- Con** Detect data using motion sensor in smartphone, so the user must keep their distractive phone by their side

Chew on seaweed



- Designer** Carolien Niebling
- Concept** Jellifying qualities and textures of seaweeds with other ingredients, such as lavender, Ginkgo biloba and passionflower, which have stress-relieving qualities
- Sense** Taste
- Pro** Innovative and portable
- Con** Unrealistic for supplement during self-isolation

VR Cheshire cat



- Designer** Allison Crank
- Concept** A hypnotherapeutic dream world in which user is guided to focus on finding balance and whose virtual-reality component is affected by your physiological senses.
- Sense** Sight
- Pro** It is reasonable for breath adjustment and calming experience according to hypnotherapy
- Con** Opening eyes could conflict with sleep

Sonic Cradle



- Designer** Jay Vidyarthi, Bernhard Riecke, Diane Gromala
- Concept** It is a HCI designed to help people have an experience of mindfulness meditation. The user is suspended in a dark sound chamber to shape a peaceful soundscape simply through breathing.
- Sense** Hearing, sight
- Pro** Brain wave detector showed an effective outcome of calming experience
- Con** Some sounds were disturbing and distorted for some people

9.5 Highlights of sensory experiences research

Seeking opportunities in sensory augmentation, this research aims to reframe a deeper understanding about traditional sensory intervention and potential of technology implementation.

Taste

In terms of experience, the raisin exercise, also called mindful eating, is normally regarded as an introductory exercise for beginners to start practicing mindfulness. In those exercise, participants are asked to focus on the taste of the single object aside with other senses, so that they can bring their mind to the present.

In addition, lots of human-computer interaction researchers are exploring how to mediate taste in virtual reality and augmented reality. Because the trigger of gustatory experience is chemical substance in our daily life, it is hard to stimulate chemical response in HCI technology. Hence in HCI research, scientists prefer to stimulate taste by electrical signal, which they call “digital lollipop”. Recent days a new progress in this area is published called Norimaki Synthesizer.



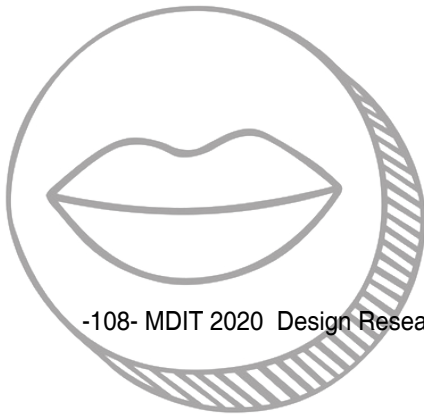
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Norimaki Synthesizer

Developed by Japanese researcher Homei Miyashita from Meiji University, Norimaki Synthesizer is a device that uses five gel nodules made of dissolved electrolytes to simulate different flavors of food tastes, so that without the users don't need to ingest anything.



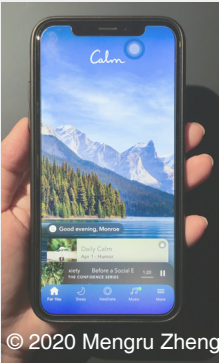
Sight

Sight it the most important sense for mindfulness practices. Majority of mindfulness exercises promote people to notice patterns, such as slowly moving shadow, texture, shape, color, shape and scene in mindful seeing and mindful walking. Especially natural scenes are could positively affect acute-mental stress (Brown, Barton and Gladwell 2013).

Development of modern electronic technology makes it easy to create sight in an interior space or in mobile devices. Current industry markets includes a bunch of different devices such as cellphones, tablets, projector, AR and VR. After comparing existing visual components for stress-reductive services, I found there are 4 types of sight simulation:

- 1. Natural sight in videos
- 2. Virtual sight in 3d model
- 3. Abstract graphic patterns
- 4. Light & color

Natural sight in videos



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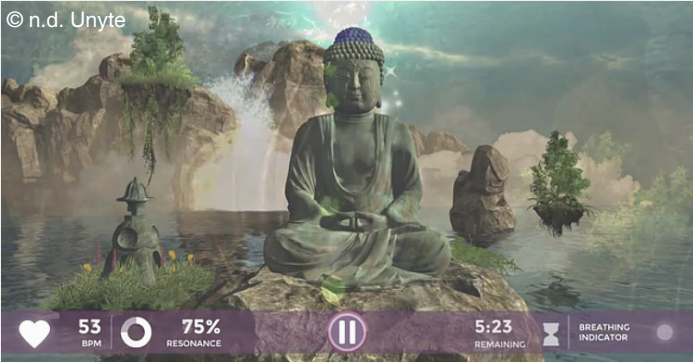
Calm



© 2016 Johnnie Lawson

Soundscape video on YouTube

Virtual sight in 3d model



© n.d. Unyte

Unyte

Abstract graphic patterns



© 2016 Michael Tobin

Breathe on Apple Watch



© 2011 Kevin Faraday

Stare at the center

Light & color



© 2015 Tony Cenicola

Dream house in New York



© 2010 Brion Gysin

Dream machine

Hearing

Most of meditations are based on hearing since thousands of years ago. Sound contains various patterns such as timbre, pitch, rhythm, dynamics and speaking. Modern meditation tutorials combine different layers of sound such as soundscapes, music and verbal voice guiding. Compared with that, in traditional meditation, specific instruments could create repeating or dynamic sound patterns without language to help meditation trainer focus on presence in sound bath meditation.

Also, audio is ease to transmit with modern electronic technology. There are more platforms creating audio streaming to help meditation than platforms in visual experience. The competing platforms and applications all are in high similarity.

I hesitated a lot about how could I engage sound in my project, but there are too many types for me to assess their effectiveness. Hence in my final proposal, I don't create new sound, but use sound to mediate information only when it is necessary.

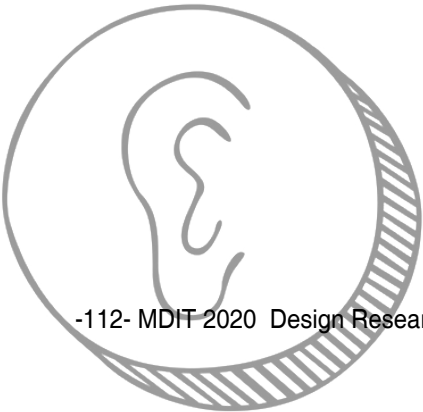
Meditation chime



Meditation chime



Ocean Drum



Smell

Aromatherapy is an approach uses scent in essential oils calm people down. Essentials such as lavender, lemon, grapefruit, bergamot, and clary sage are effective for stress relief and sleep.

Smells also have strong connections brain function-specifically, memory, and fear. Evidence shows that breathing rhythm induces electrical activity that enhances both memory recall and emotional judgments (Chalicheemala, Priya and Devi 2018). To understand how smell trigger emotion in personal perspective, I organized a focus group discussion. Firstly, the smell preferences of different people are very elusive. Even the same scent can trigger various imaginations among different people. Secondly, smells normally reframe their memory unconsciously, however they still intentionally use the same fragrance to link old and new memory.

Olfactory experience is also based on chemical molecule, which makes it hard to be engaged in human-computer interaction. Similar like taste, electronic trigger could be a possibility, but there is still no mature technology precedent. In chemical industry, algorithmic perfumery provides a fragrance customization service according to customers' personality. Also headspace technology is a traditional technique to collect specific scent, analyze molecule construction and resynthesize the same smell. There is a service proposal uses headspace technology to collect personal memory with smell from a designer.

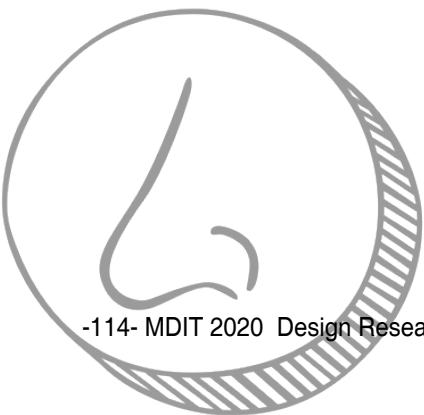
Algorithmic perfumery



Headspace technology



Odor camera designed by Amy Radcliffe



Touch

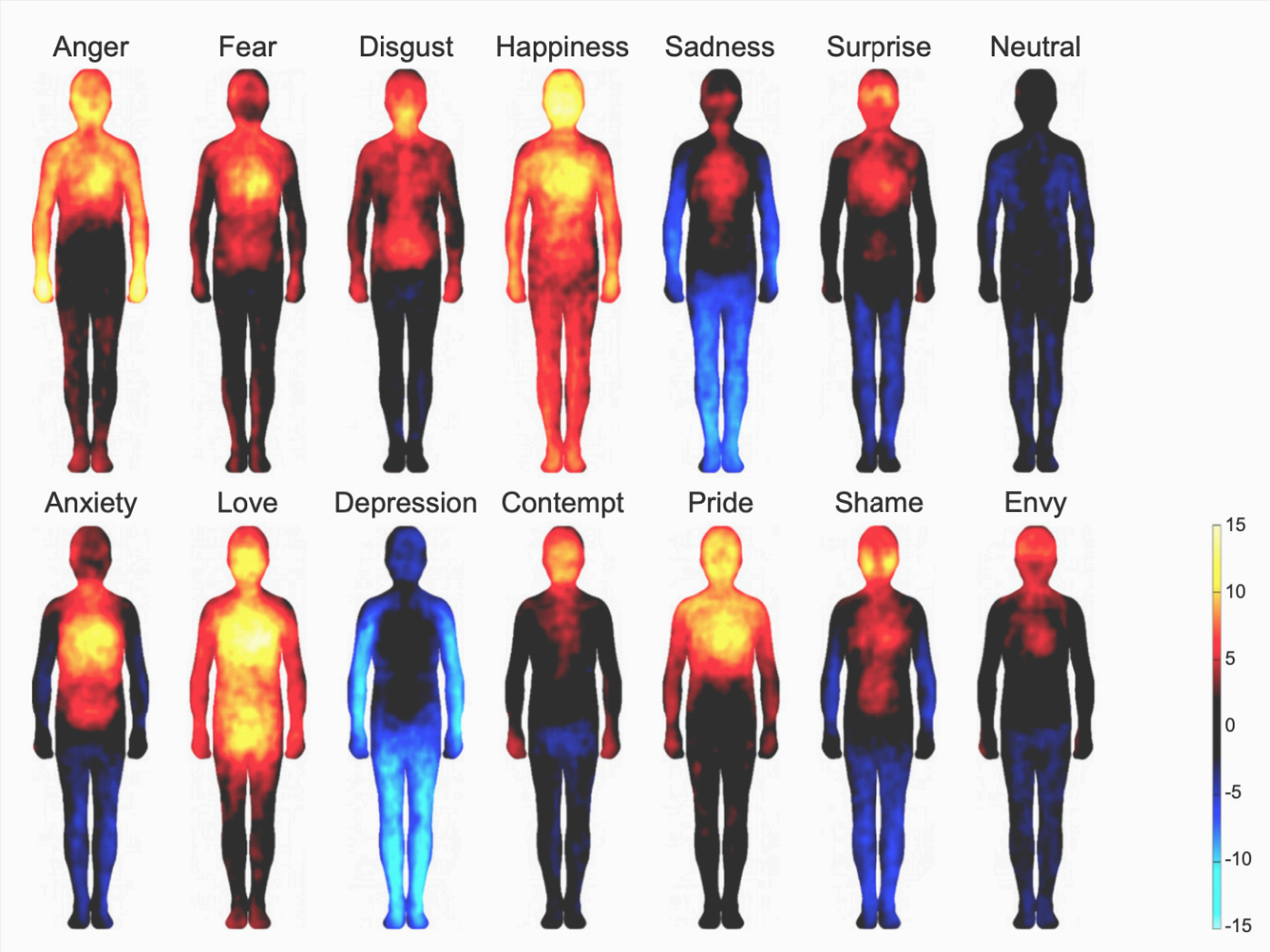
Touch can convey numerous emotions even without seeing the touch (Hertenstein et al. 2006). However, isolation reduced physical contact with other people, hence physical sensations and how haptic objects we touch influence our abstract feelings are also important in this research.

In my questionnaires, it is described that soft materials and fluffy fabric could reduce people’s stress. In terms of gesture, my interview responses shows that tapping, stroking and squeezing are most likely to communicate sympathy. Some self-touch experiences also could reduce stress, such like playing with hair, rubbing hands, stroking neck and massaging forehead.

In HCI field, haptic patterns could be created by vibration and heater, and be detected by pressure sensor and temperature sensor. The technology for haptic experience is feasible enough already, however, how can we map potential sensory experience is more important than feasibility. A study from Nummenmaa et al. (2014) shows how the activation changes in different body parts when people feel each emotion, which helped me a lot to create the soft haptic experience in my project.

Physical sensation & emotion map

The body maps show regions whose activation increased (warm colors) or decreased (cool colors) when feeling each emotion. (P < 0.05 FDR corrected; t > 1.94). The colorbar indicates the t-statistic range.



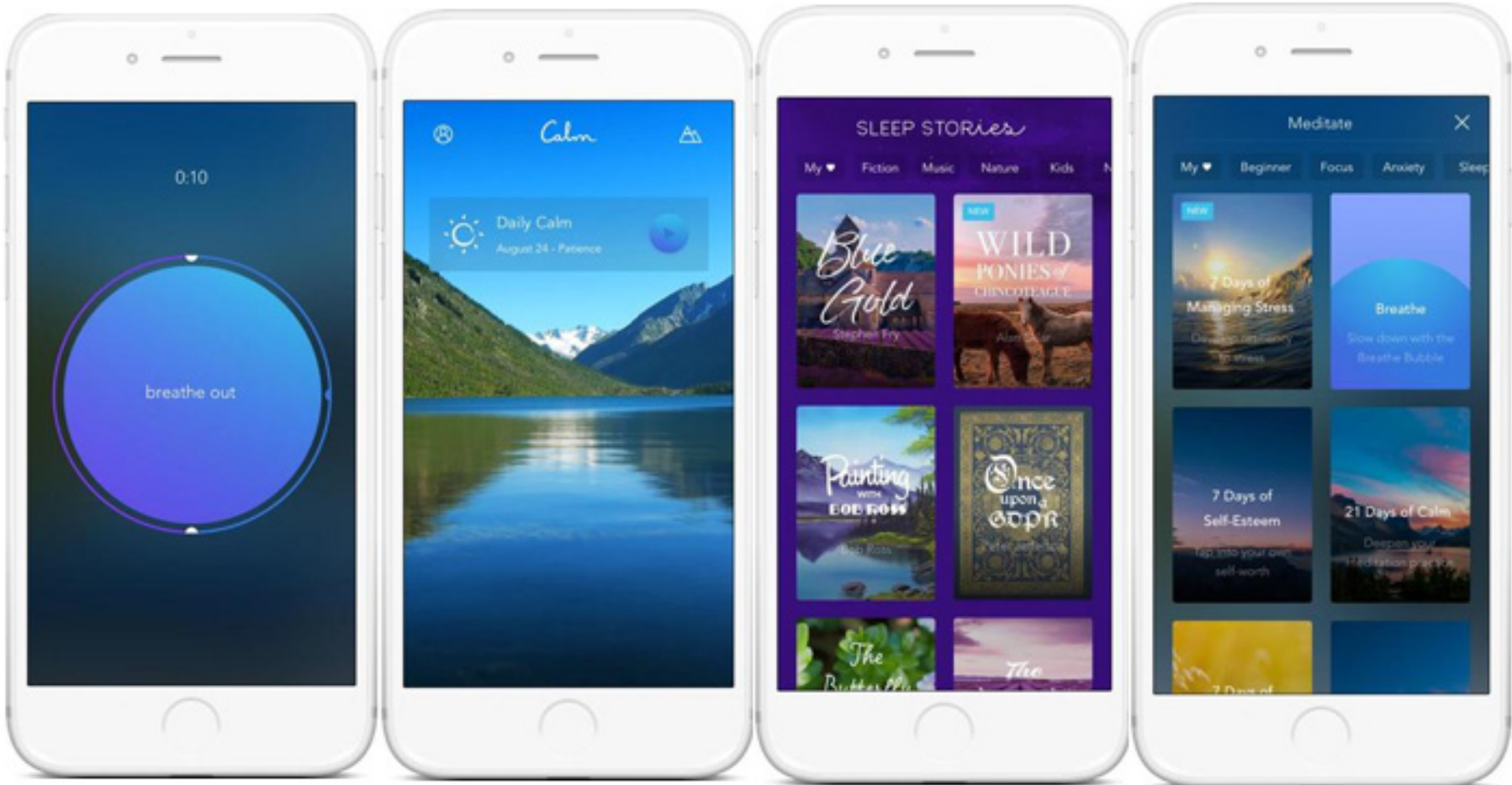
9.6 Application based interactive meditation

There are a lot of meditation apps on the user interface market. Majority of them have dramatic similarity with audio streaming and basic sound elements. Here I will introduce 2 representative precedents based on sound, and another 2 interesting precedents based on movement.

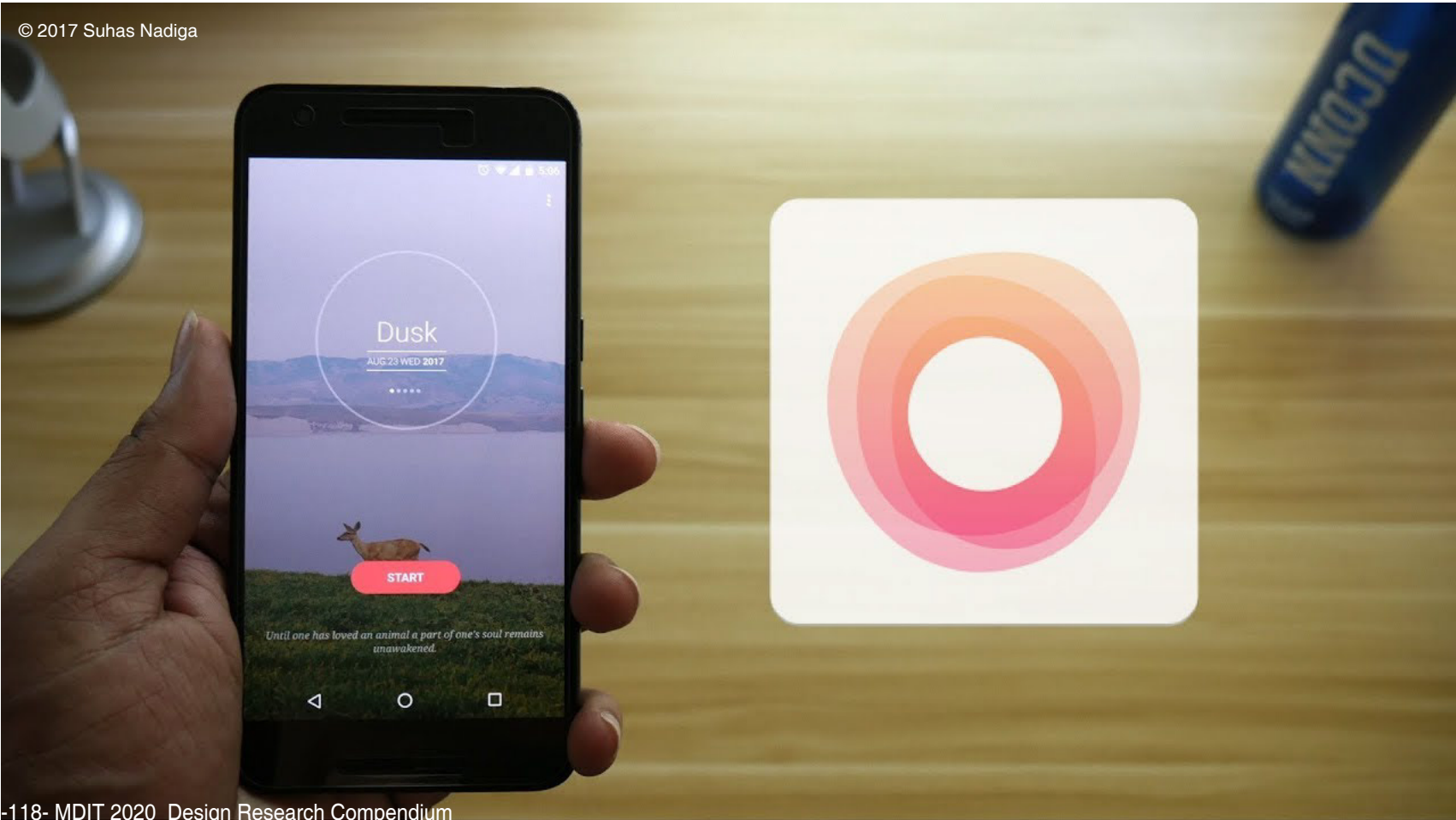
Calm

Calm is a meditation app packaging audio guiding tutorials as their main product-service, associated with natural sight and breathing metaphoric guiding.

- Pro** There are flourish choices on this platform.
- Con** Sometimes overflowing choices make me waste a lot of time find a effective one.



© n.d. Calm

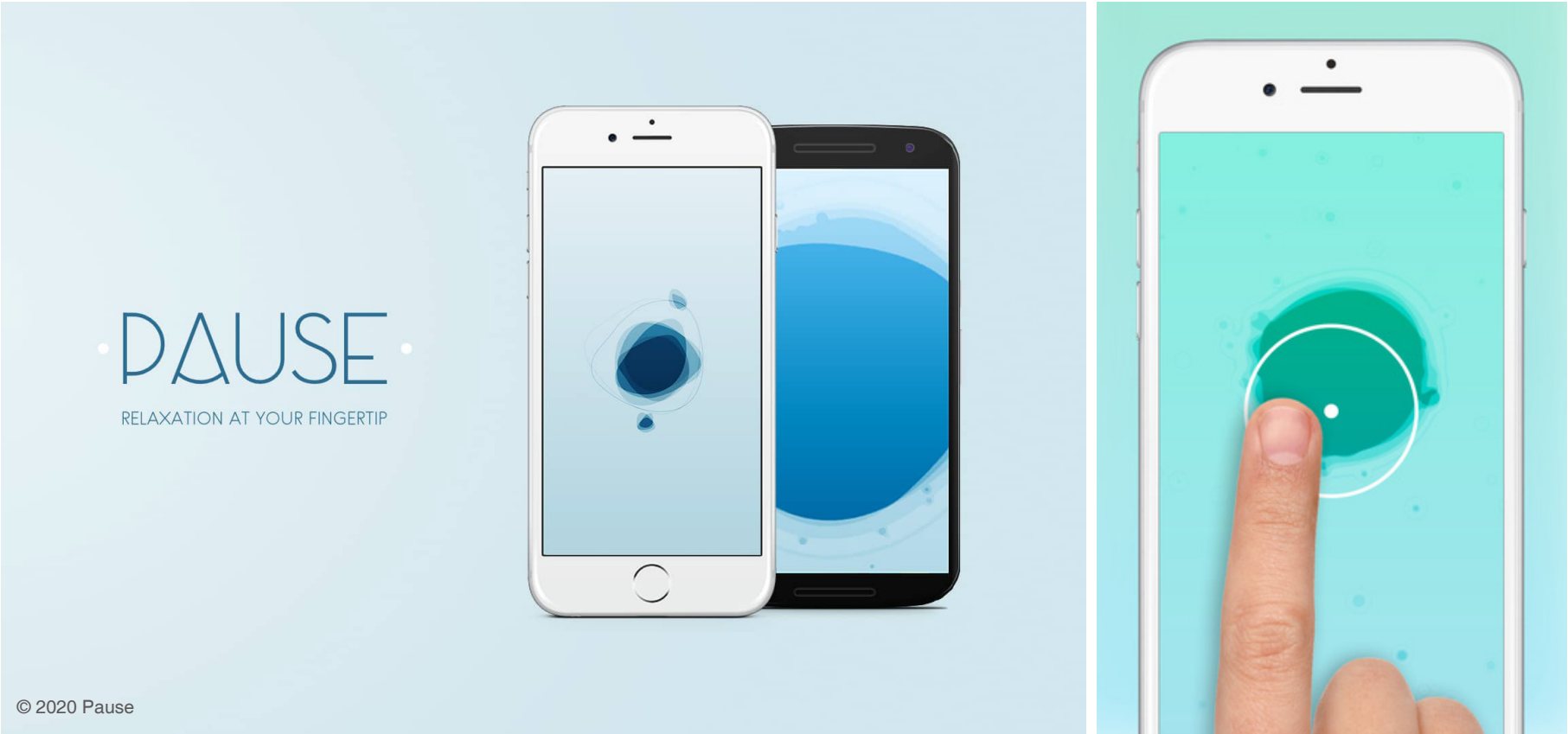


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Tide

Only four patterns are offered in this app, namely focus, sleep, nap and breath. Then the data from the four patterns can be detected and visualized. Audio association such as soundscape and inhale & exhale guiding are also offered, and background pictures are soundscape support.

- Pro** The choice-amount is appropriate, and complexity could be expended by users' need.
- Con** When I fall in sleep, the soundscape still keeps broadcasting, in that case it could decrease sleep quality.



Pause

Simplify slow and continuous movement to reduce stress based on Taiji and meditation. Sound and soundscape are feedback association with the screen based shifting pattern.

- Pro** The simplified interface makes it easy to use, and the animation is beautiful.
- Con** It is not effortless enough, especially for some people with a little shanking hand. People could feel frustrated when they cannot follow the movement in appropriate pace.

Sway

Use accelerometer to detect users' movement with hand or while walking. The visualization wave and sound feedback are categorized in 6 patterns, namely attention, presence, discover, balance, harmonize and explore.

- Pro** People can put cellphone into pocket, so that they can notice they body movement in a calming experience.
- Con** Another posture like moving wrist to move the cellphone in a slow pace is tiring after several minutes.



9.7 Hardware based de-stress products



Muse S
Muse S is a wearable device detects the brain wave of users. In application it guides peoples’ mindfulness and sleep with audio tutorials. It provides real-time biofeedback on user’s brain activity, heart rate, breathing, and body movements to help you build a consistent meditation practice

Sense Sound



Unyte
This is a device detects the heartbeats at users’ ear. It aims to engage immersive experiences to lead user to wellness and relaxation. The guiding experience includes audiovisual feedback from a 3-dimensional game based on screen and VR.

Sense Sound, sight



Tjacket
This hug jacket use wearable technology to stimulate deep touch pressure on the body using inflated air pressure controlled via a mobile app, which helps to provide sensory input, and calm children facing sensory modulation difficulties, stress and anxiety.

Sense Touch



Omnipemf NeoRhythm
This is a wearable headband to entrain users’ brain for improved mental wellbeing. The main technology is to use electromagnetic input to adjust brainwave. Different simulation positions are for different user need such as focus & energy, chronic pain, meditation, sleep & relax, and back pain.

Technology Electromagnetic input



Thync
Using safe electric vibes (low-energy wave forms), Thync interestingly stimulates the same nerves that are stimulated during kissing, a soothing massage, or when cold water splashes on your face. This product could be attached at different body parts according to users physical symptoms.

Technology Transcranial direct-current simulation



Spire Health Stone & Health Tag
This brand produces mindfulness tracker that fits easily on waistband. It records breathing, sleep, stress, activity, pulse rate and conveys it on its corresponding app.

Technology Respiratory measurement

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Mental Wellbeing in Isolation

the 'information' and 'communication' fields. The 'information' field is defined as:

...the study of the processes of information production, distribution, access, use and evaluation, and the study of the social, cultural, economic and political contexts in which these processes take place. (p. 10)

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...the study of the processes of communication production, distribution, access, use and evaluation, and the study of the social, cultural, economic and political contexts in which these processes take place. (p. 10)

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...the study of the processes of information production, distribution, access, use and evaluation, and the study of the social, cultural, economic and political contexts in which these processes take place. (p. 10)

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