

INDUSTRIAL DESIGN BACHELOR THESIS
DOCUMENTATION

Alivia

Communication between patient and dentist

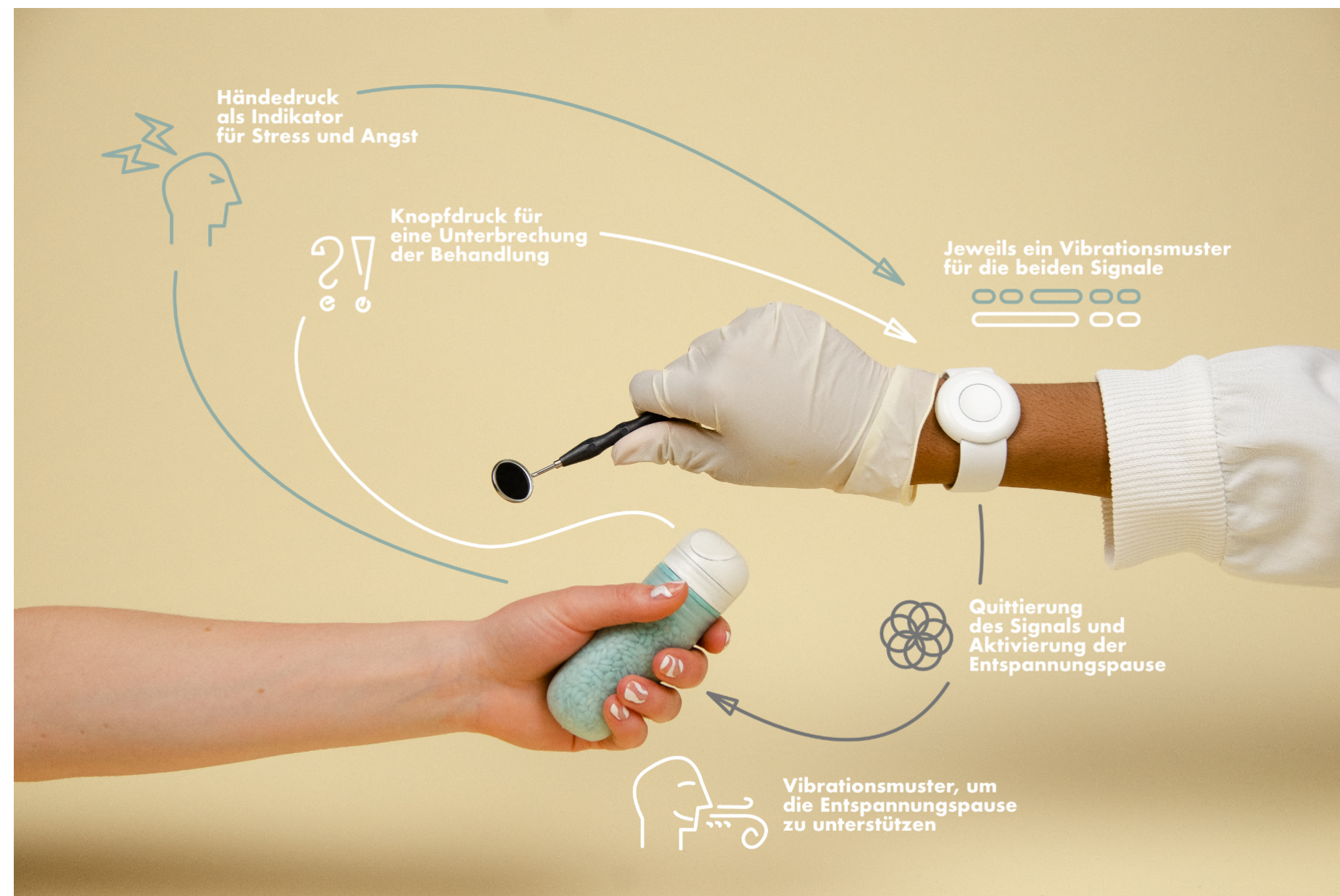
Camila Gutiérrez & Christian Barteld
Mentors: Nicole Kind & Susanne Marti

Problem

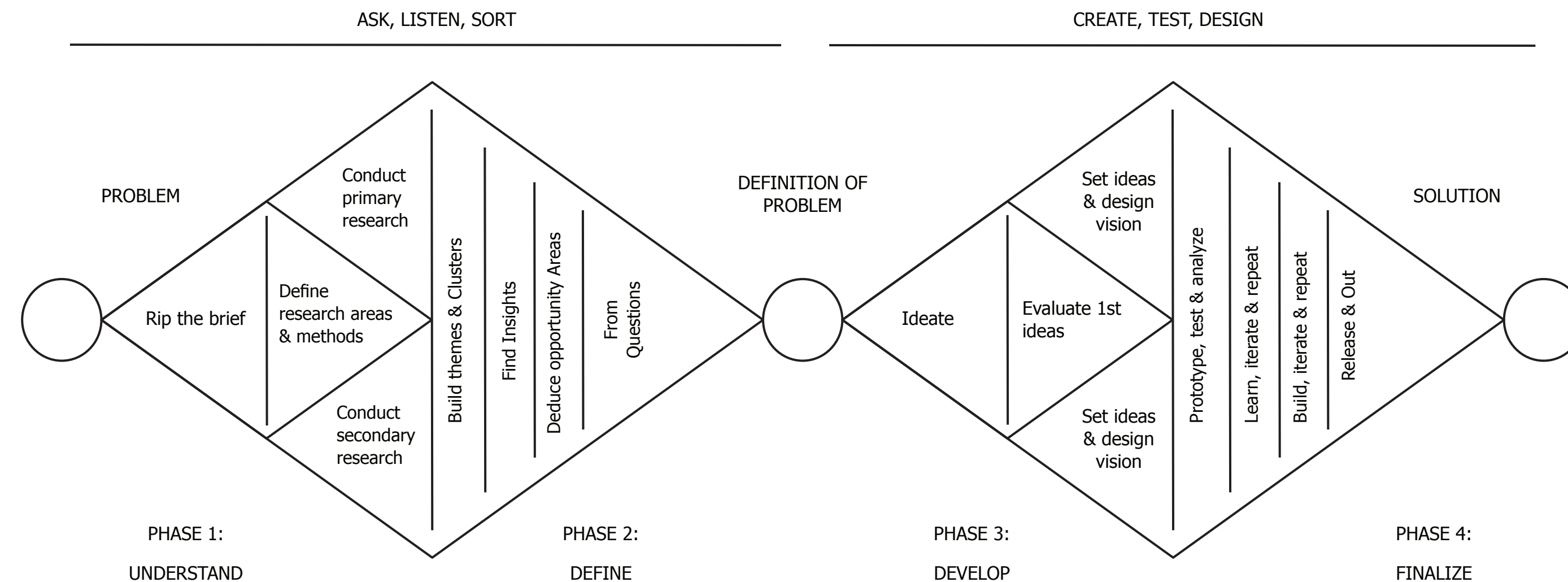
Specific fears, anxieties and phobias, often classified as behavioural problems of self-consciousness, are common among people of all ages. Fear also arises with the threat of harm, either physical, emotional, or physiological.

Considered a "negative" emotion, fear is a normal response to objects or situations and serves an important role in instinctively keeping us safe from any threat that we could perceive. Dental fear is one of the most common fears and is experienced by many people.

Dental fear stops patients from going to the dentist, which causes them long term problems. Factors such as traumatic experiences with previous dental treatment, dentist's behaviour and attitude, atmosphere of the dental office, fear of being checked for oral health neglect and fear of pain contribute to dental fear in patients.

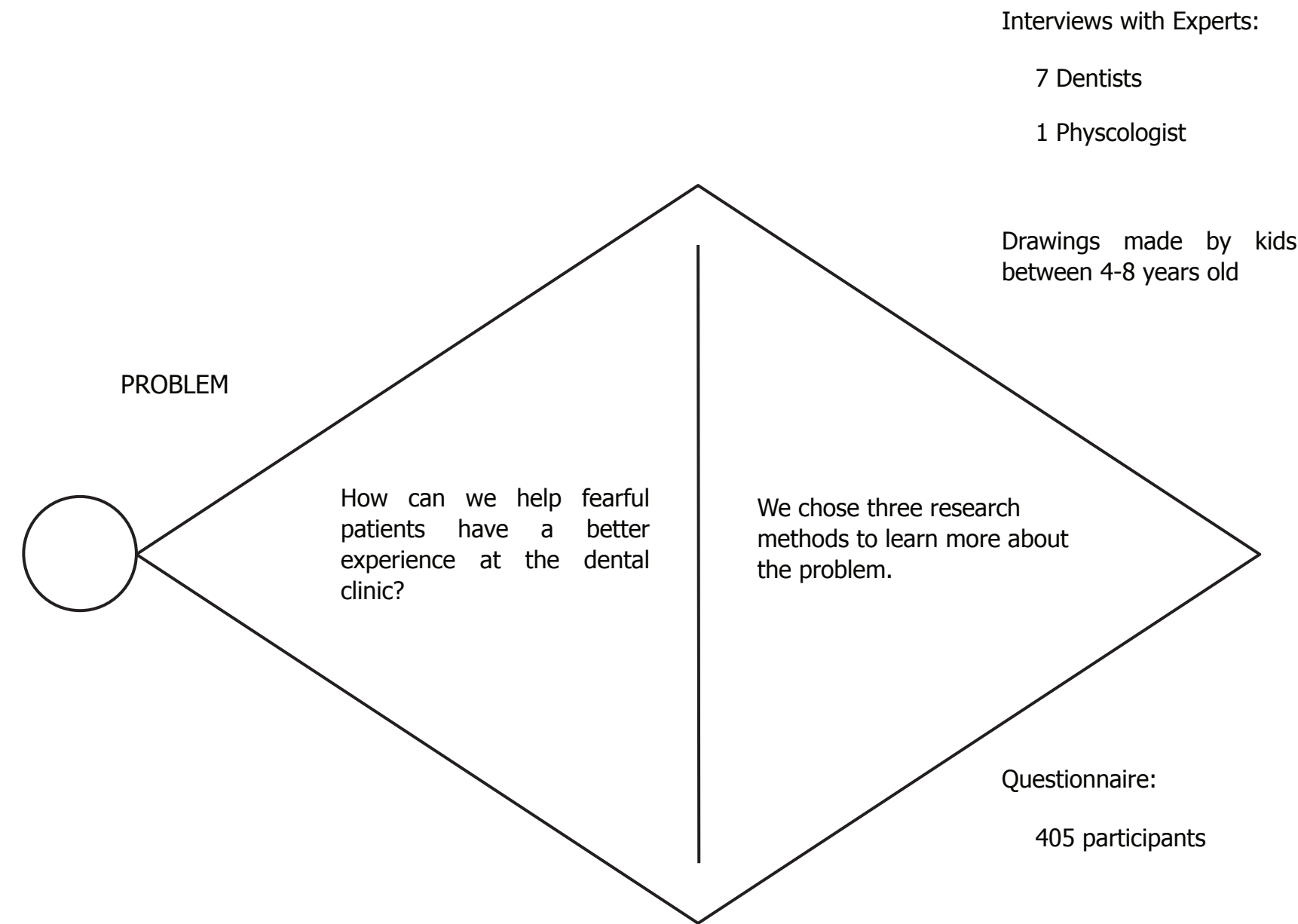


Working process: Double Diamond



We decided to work with the double diamond process in order to understand and explore the problem more widely and deeply and then take focused action of it. This documentation follows the path of the double diamond.

Phase 1: Understand



In the theoretical part of the BA-Thesis we interviewed experts on the topic to know a little more about the problem.

We made a questionnaire in order to find out more about the experience of different people when they go to the dentist. <https://findmind.ch/survey/120651/questionnaire>

The questionnaire consisted of 9 questions.

BA-Theory Findings

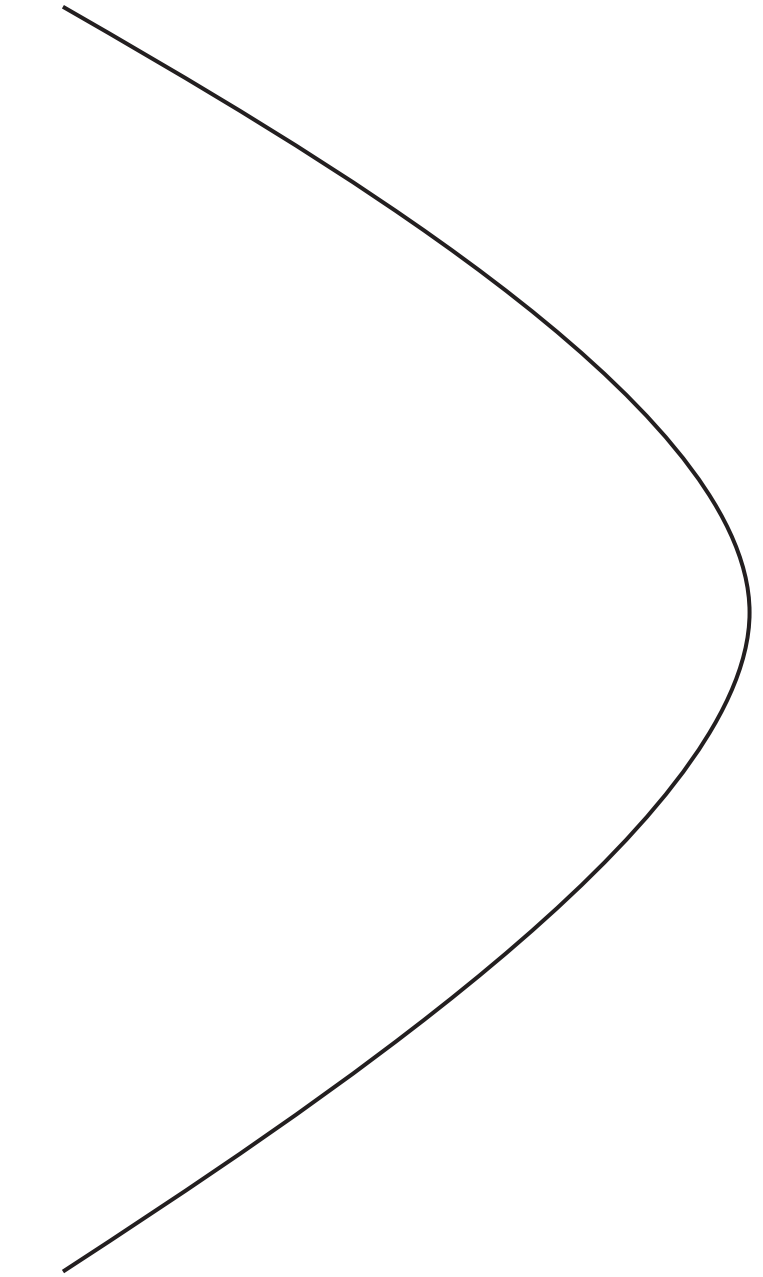
The theoretical part of the bachelor thesis deals with the identification of factors, that affect children and adults emotions in a negative way, when going to the dentist. This investigation serves as a basis for the design solution of the problem. This solution will be developed within the scope of the practical bachelor thesis.

The aim of the investigation is to determine a design solution to improve the experience of dental patients, whether it is a product or a service. For the analysis, the techniques used by dentists and the factors that generate negative emotions in children and adults are investigated. In addition we gained insights with the help of experts and an observational research of drawings carried out by children.

The interview with eight experts: Seven dentists and one psychologist served as a basis. With the observational research of children's drawings, certain existing problems were determined. As well, based on the relevant literature from the fields of odontology and psychology, some factors were defined. These were used to evaluate the field research from the dental sector and from the point of view of dental patients.

Both works show that there is a potential for optimization in improving the dental patients experience of fear when going to the dentist. It was very valuable to have done the research through the drawings with pediatric patients and the interviews with experts. They all gave us their own perspective and we were able to gain an understanding of the factors and reasons of why they are afraid of the dentist.

The results of this research led us to base our findings on 4 key elements that can help improve the patients experience:



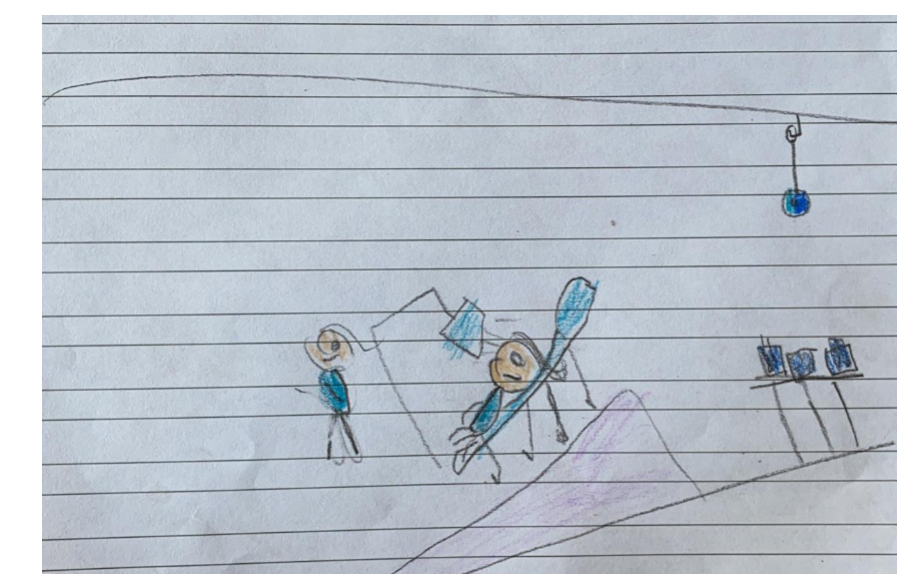
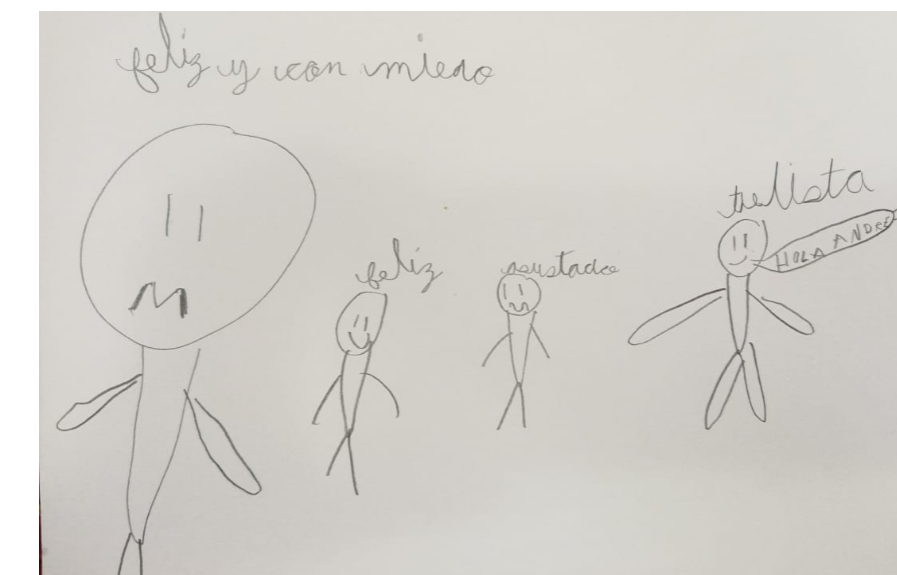
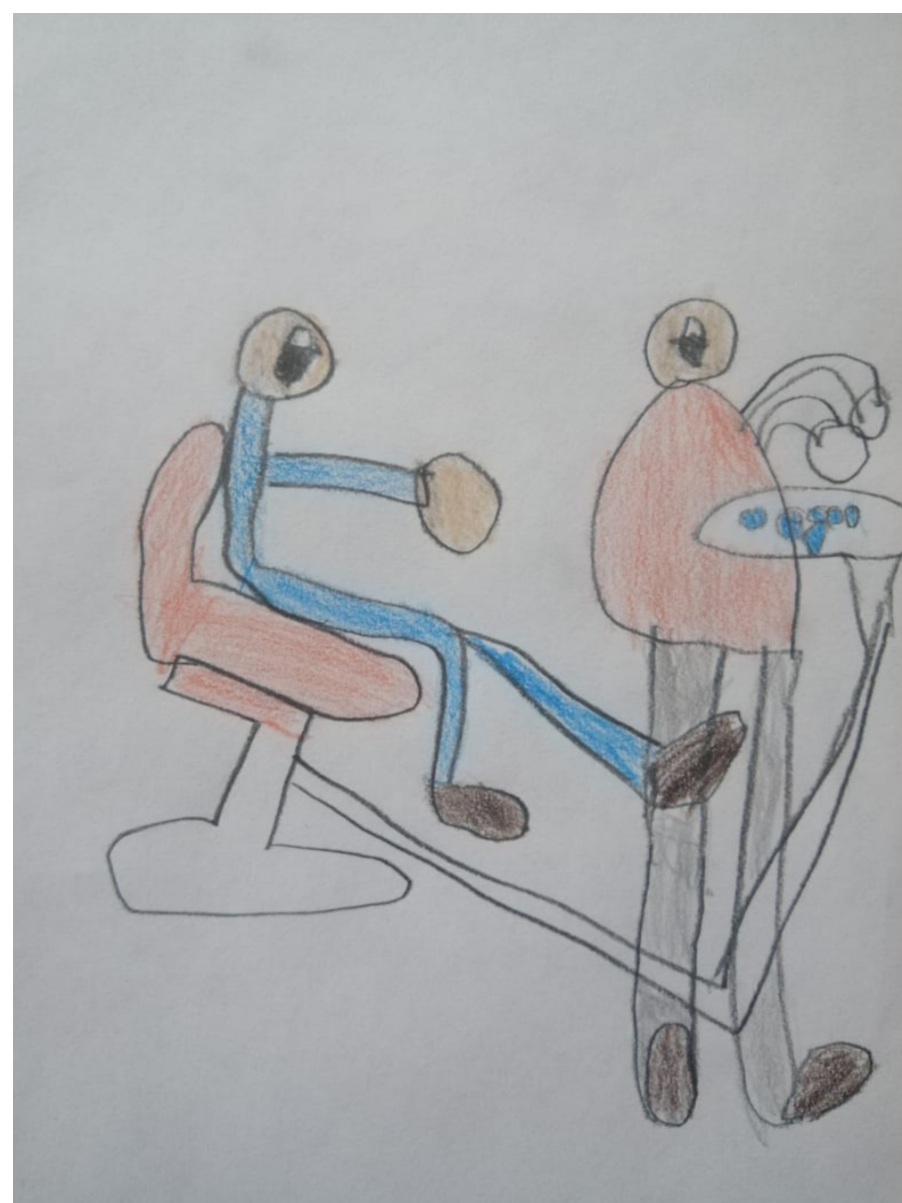
Empowerment

Relaxation

Distraction

Communication

Drawings



Survey

1. Gender

- Female / Male / Other / I prefer not to say

2. Age

- Younger
- 15-20
- 20-30
- 30-40
- 40-50
- Older

3. Nationality

- Swiss / Mexican / Other country

4. How often do you go to the dentist?

- Regular check-up's (1-2 times per year)
- At the moment I am in treatment, example: braces/implants/etc (quite often)
- When I have the feeling that I need to go
- Only when my teeth hurt

5. What made your experience good/pleasant?

- Every time I go, they take care of me
- I receive rewards afterwards
- They play the music I like
- They turn on the tv and play good shows
- I have good conversations and my dentist gives me clear explanations of my treatment
- I have a good relationship with my dentist and that makes me feel secure
- I trust my dentist
- They provide me distraction tools (stress ball, toys, something to hold)
- I don't have to wait for a long time
- The dental clinic has a nice interior design and that makes me feel comfortable (lighting, color, smell, materials, furniture)
- The dentist lets me have breaks during the treatment
- The staff treats me good
- The dentist makes me feel part of the situation (he/she is always explaining me the treatment and I know what is going on)

6. What made your experience bad/negative?

- The dental clinic looks too medical - white, glossy, cold
- It smells a lot like dentist
- I don't like the sounds (drill, suction pump, etc)
- The treatment hurts, it is causing me pain
- I don't like the feeling of not knowing what is happening around me
- I don't like to wait because I start overthinking
- I don't like having the feeling of losing control over the situation
- The dentist doesn't explain what he/she is doing
- My dentist doesn't have proper ways of communication (lack of communication from the dentist and staff)
- I had negative experiences before
- I don't like the feeling of a "stranger" being this close to me

7. At which point do you feel the most anxious/scared?

- Before taking an appointment
- On my way to the dentist
- At the reception
- In the waiting room
- In the treatment room

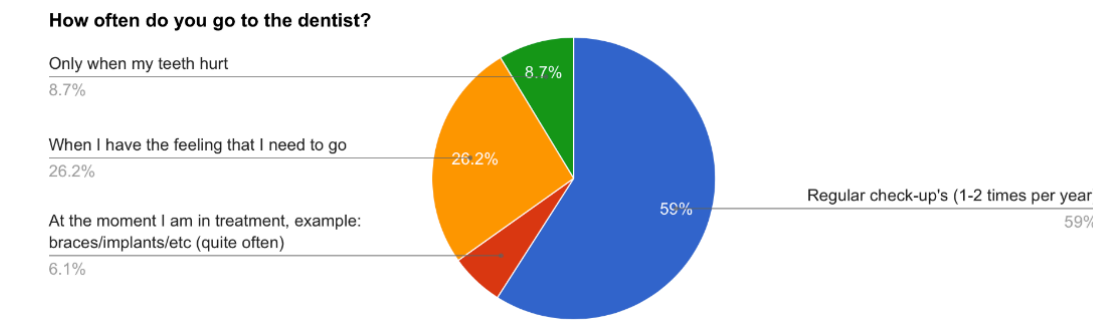
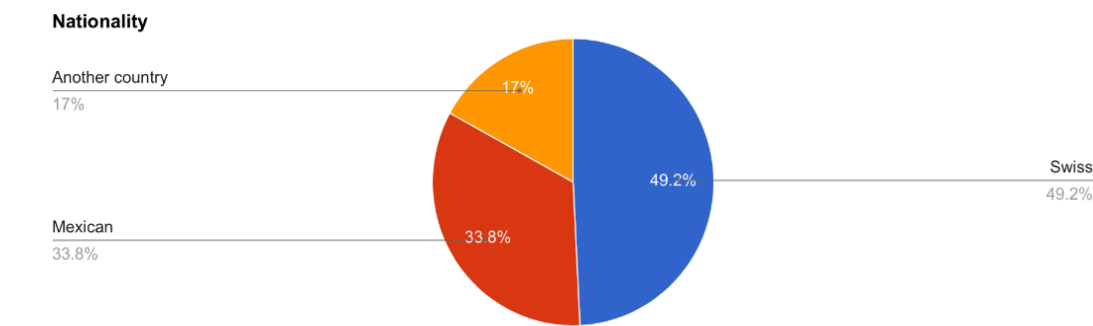
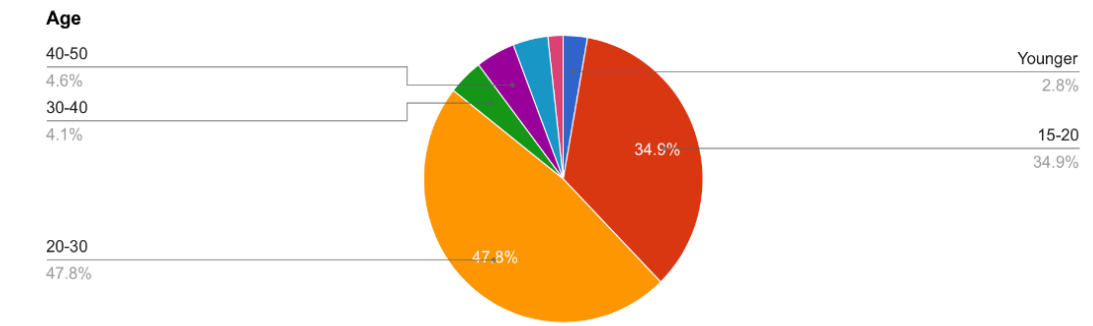
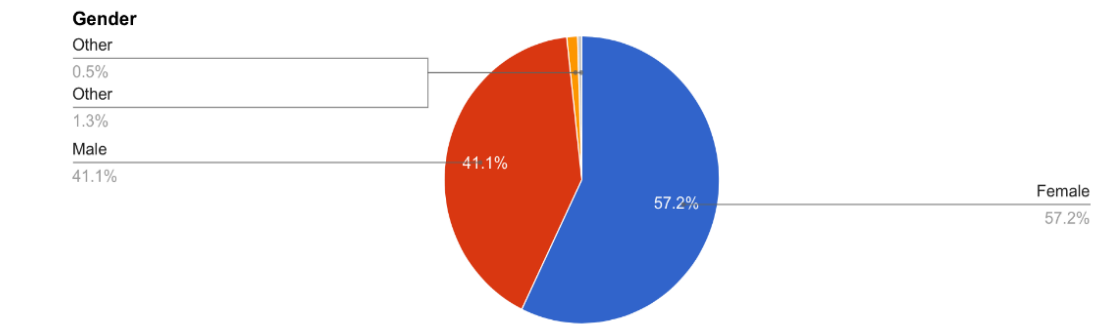
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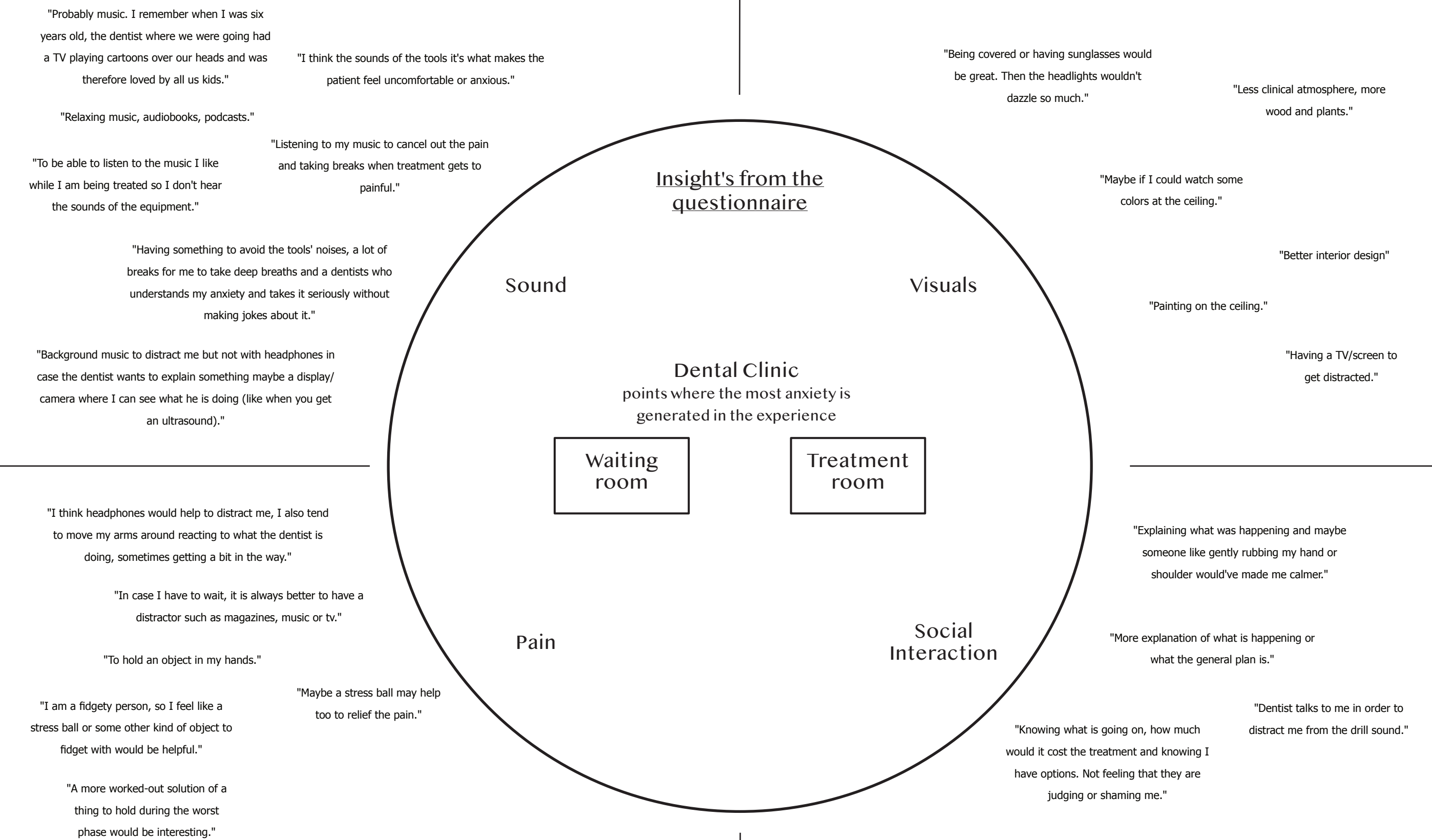
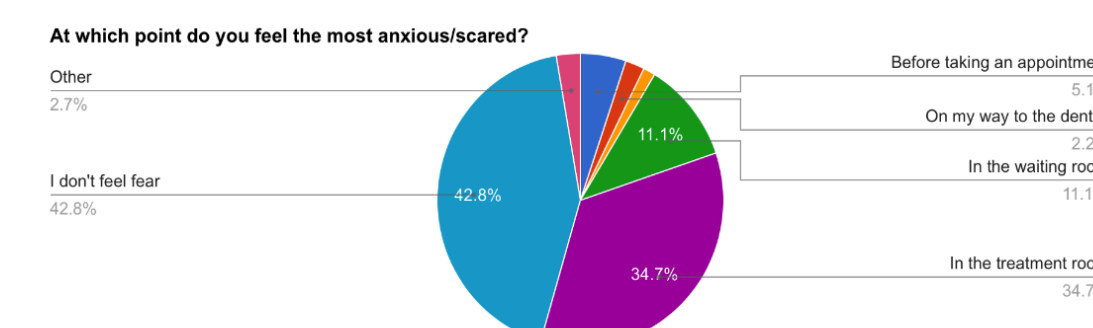
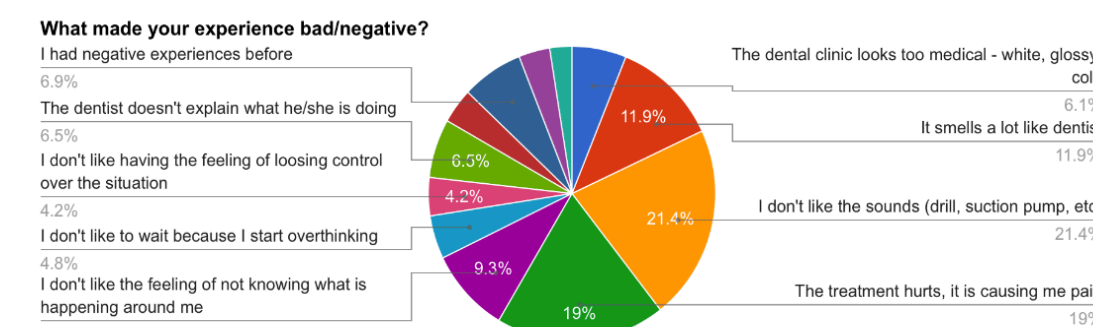
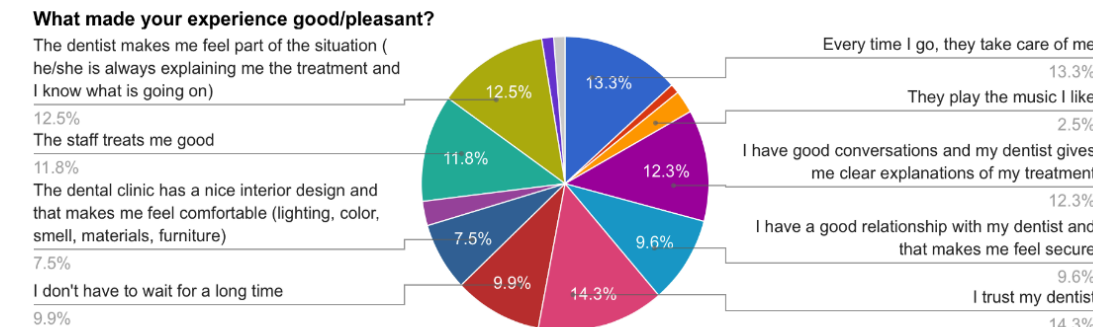
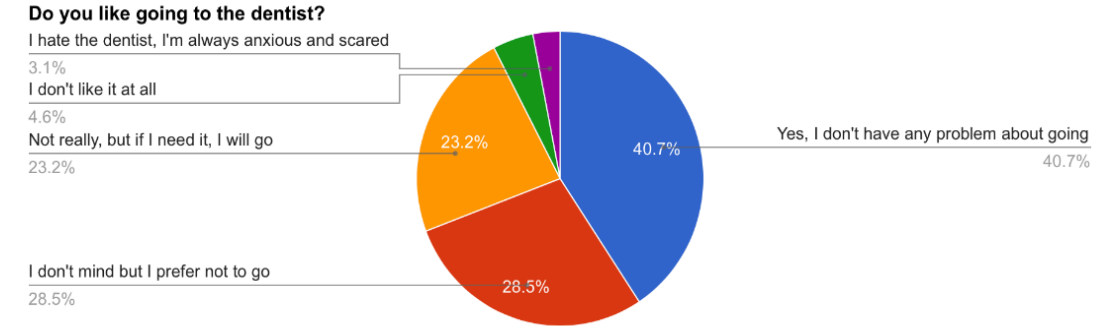
9. What would make your experience of the dentist clinic more pleasant? Example: better interior design, having something to hold on to, smell, noise, etc.

Answers

Total participants: 405



Camila Gutiérrez & Christian Barteld



Opportunity Areas

Pain

- Something to control the climate for the patient
- Creating a micro climate for the patient

Dental Chair

- Creating key points to hold on to
- Something to push against (feet)

Squeezable Object to relieve Pain

- Something big, heavy, like a cushion, to lay in the lap
- Object that can be adjusted in softness
- Different materials
- Different textures

Massage

- Included in the dental chair
- from a separate object

Sound

Reduce initial sound source

- Damper for the suction pump/drill
- Something preventive, so that noisy treatments are unnecessary

Damping Sound

- Use interior design
- Cushion to reduce resonance in the head
- Sound dampening material directly on the teeth

Block initial sound with more sound

- Headphones
- Bone transmitting headphones

Add sth to the vibrations to get people to like them

- Vary the rpm of the drill to create a melody
- Massaging mask

Visuals

VR Experience

- Show different sceneries

Audiovisual immersive experience

- Projections of different light scenes
- Images/Videos
- Hypnosis

Projections

- On the ceiling

Social interaction

App

- For the dentist to know the patient better
- o set preferences before the treatment
- To inform about the treatment

Communication Device during the treatment

- Integrated to the dental Chair
- Visual control for the dentist
- Easy and intuitive controls for the functions

Projections

- On the ceiling

Screen

- To see the treatment
- Distraction ways of use

Less disturbing light source

- Glasses that have light filters
- Directed light, laser light on cars
- Light directly on the tools

Definition of the Problem

After brainstorming concepts and checking the areas of opportunity where we can implement a solution. We realized that the main problem of this issue is the lack of communication and the difficulty to talk and express from the patient to the dentist during the treatment.

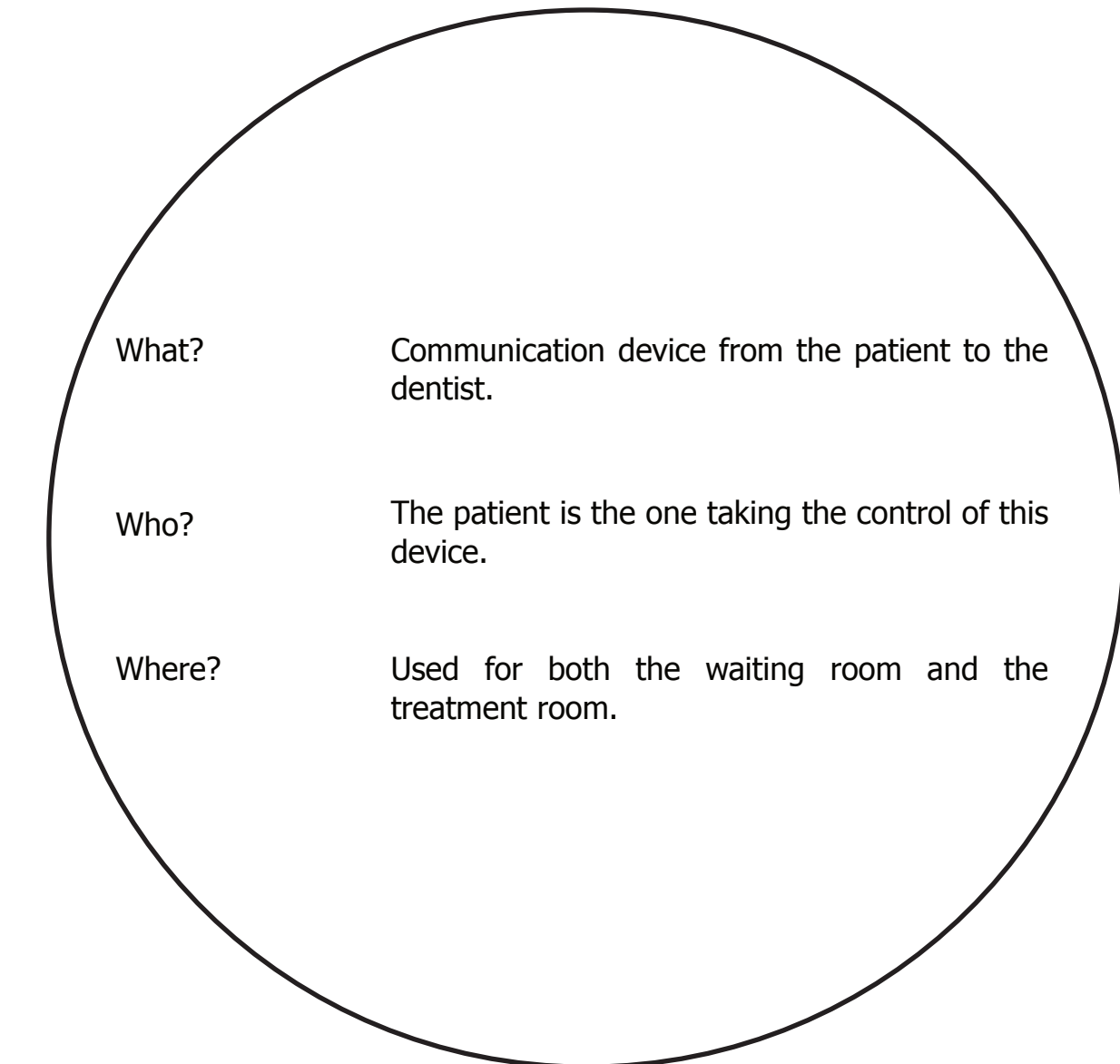
How can we help on doing the communication between the patient and dentist more easy?

How can we achieve this communication?

What does the patient want to communicate to the dentist?

How can we get the dentist to notice this signal from part of the patient?

How can we implement the 4 key elements to make the experience more pleasant for the patients?



Persona



Dentist: Carmen

Pediatric patient: Ana

Age: 38 years old

Age: 6 years old

Characteristics: She says that the dentist-patient relationship is very important. That's why she tries to treat all her patients in a good way. However, she finds it difficult from time to time to please all of them with different techniques.

Reason of visiting the dentist: She has a dark spot in one of her teeth.

Characteristics: She had a bad past experience before. For the same reason she is afraid of the tools, the noise and all the surroundings.

It is important that she goes to the dentist from an early age to take care of her teeth. To prevent problems in the future.



Female patient: Cristina

Age: 30 years old

Reason of visiting the dentist: Regular check-up.

Characteristics: She doesn't like the sound of the tools and says that the light is sometimes very uncomfortable for her eyes. However, since she wants to have a nice smile she will never miss an appointment.



Male patient: Thomas

Age: 43 years old

Reason of visiting the dentist: Has cavities and should be treated otherwise it will get worse.

Characteristics: Most of the times avoids going to the dentist, he doesn't like it at all.

For that same reason that's why he got cavities, for not taking care of himself.

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Scenario

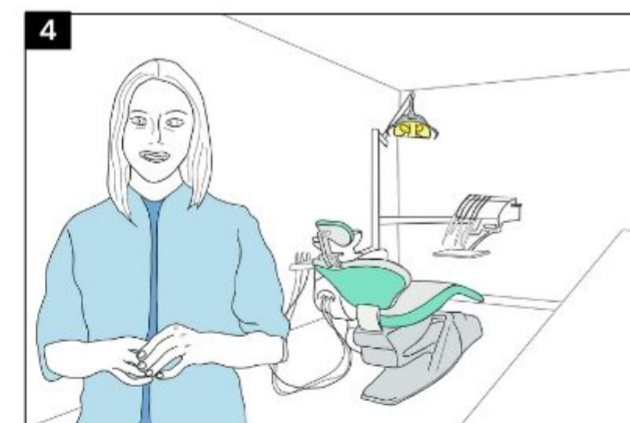
Pre story: Ana had her first examination at the school dentist in her second year of kindergarten. They found a small dark spot on one of her teeth and advised Ana's parents to take her to their private dentist.



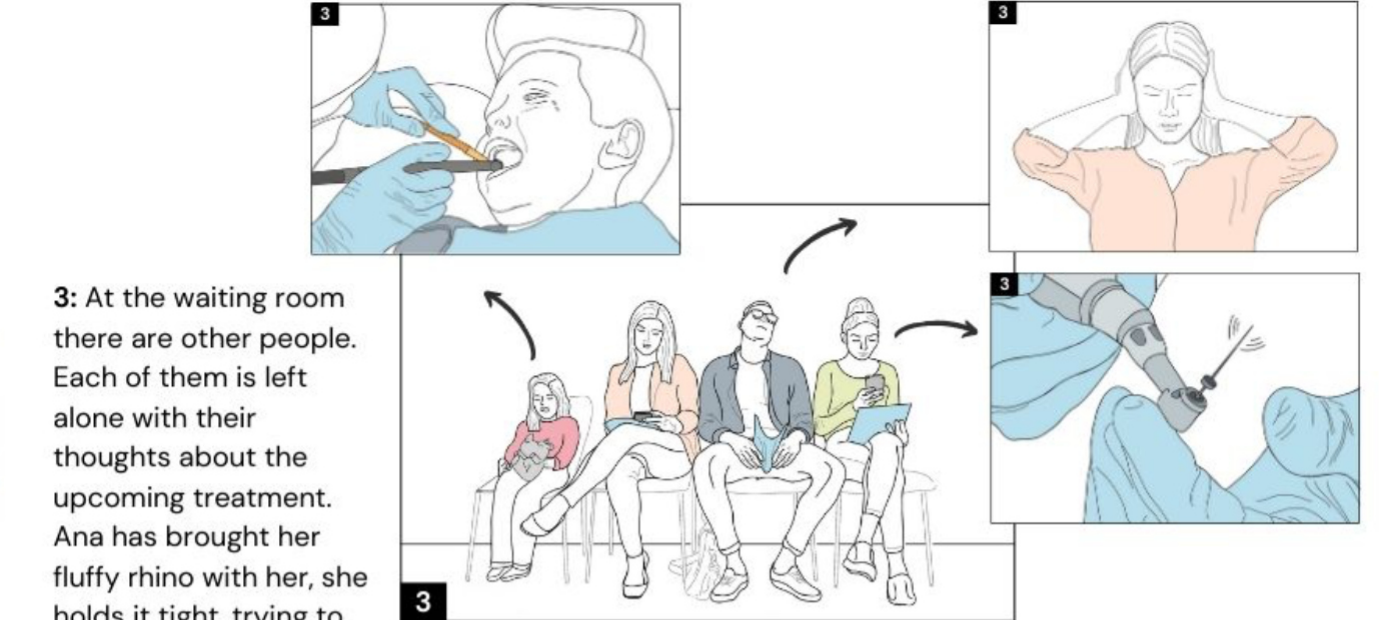
1: Ana's mother made an appointment at the dentist and the two make their way there.



2: Ana is a bit scared to go there. At the dental school, she was not given any explanation about the procedure. Having a bad experience because of the sharp tool that hurt her. At least, the woman at the front desk seems nice. She guides the two to the waiting room.

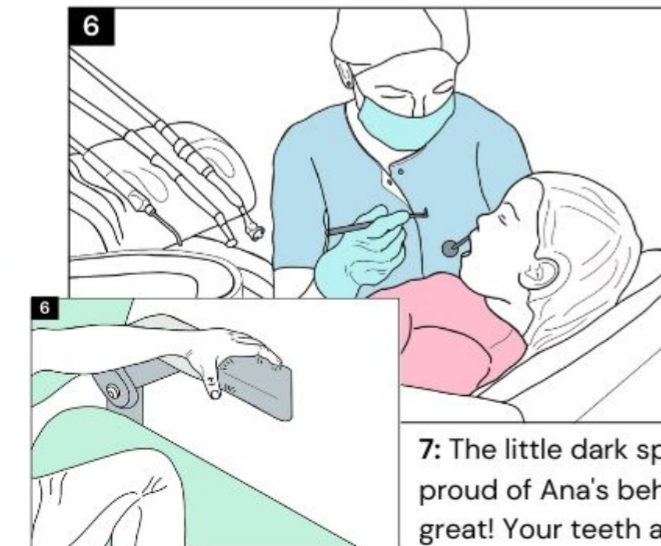


5: But No! There is the sharp tool! She does not want that in her mouth again! That hurts! The dentist explains to Ana what the tool is for, telling her that she will be very careful and gentle. She also tells her that if she cooperates, at the end of the treatment she will give her a reward for her good behaviour. However, Ana is still very nervous and squeezes the armchair very hard. Finally, the treatment ends and she realizes that it was not as bad as the last experience.



3: At the waiting room there are other people. Each of them is left alone with their thoughts about the upcoming treatment. Ana has brought her fluffy rhino with her, she holds it tight, trying to relieve her anxiousness.

4: Finally they take Ana to the treatment room. Right there the dentist is waiting for her. The dentist doesn't look as grumpy as usual they seem in dental school. Nevertheless, Ana is scared and hides behind her mother. The dentist bends down to greet Ana and make her feel that she is in a safe place. She explains the procedure she will be doing and why it is important to do it. Finally Ana decides to cooperate and be treated.



7: The little dark spot on Ana's tooth was not harmful and the dentist is proud of Ana's behaviour and how she overcame her fear. "You did great! Your teeth are perfect, keep taking care of them."

Communication from the patient to the dentist

What is communicated?

The Patient wants to...

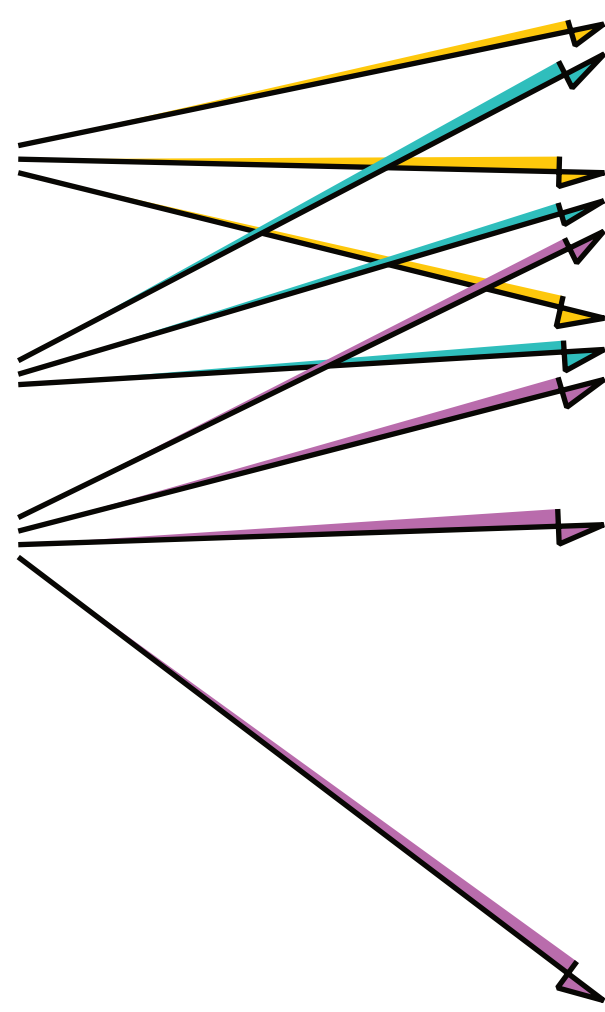
...have a break (sitting up, flushing, swallowing, relieving pain)

...ask a question

...say, that something is hurting/feeling not right

...answer a question that is related to the treatment

...answer a question that is not related to the treatment



How is it communicated?

gagging

using his/her voice

raising a hand

moving around

pulling away

themselves
instruments

pushing away

the dentist
instruments
standing up

When is it communicated?

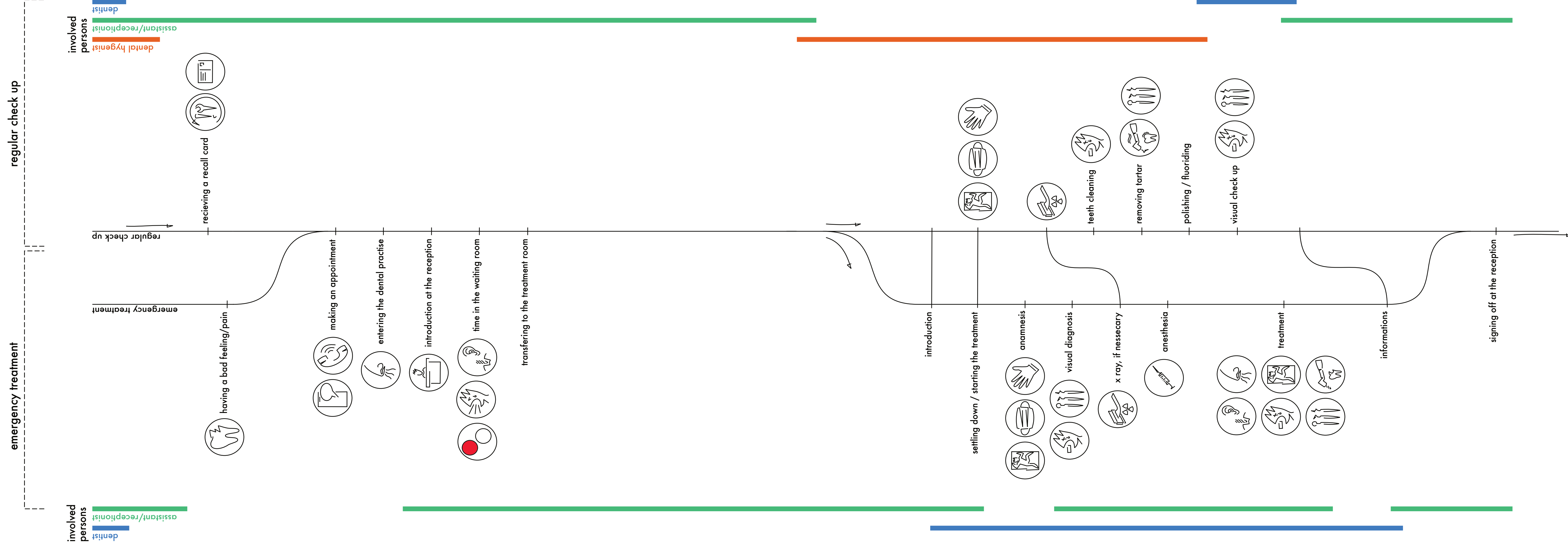
as soon as the situation occurs

when the situation gets unbearable

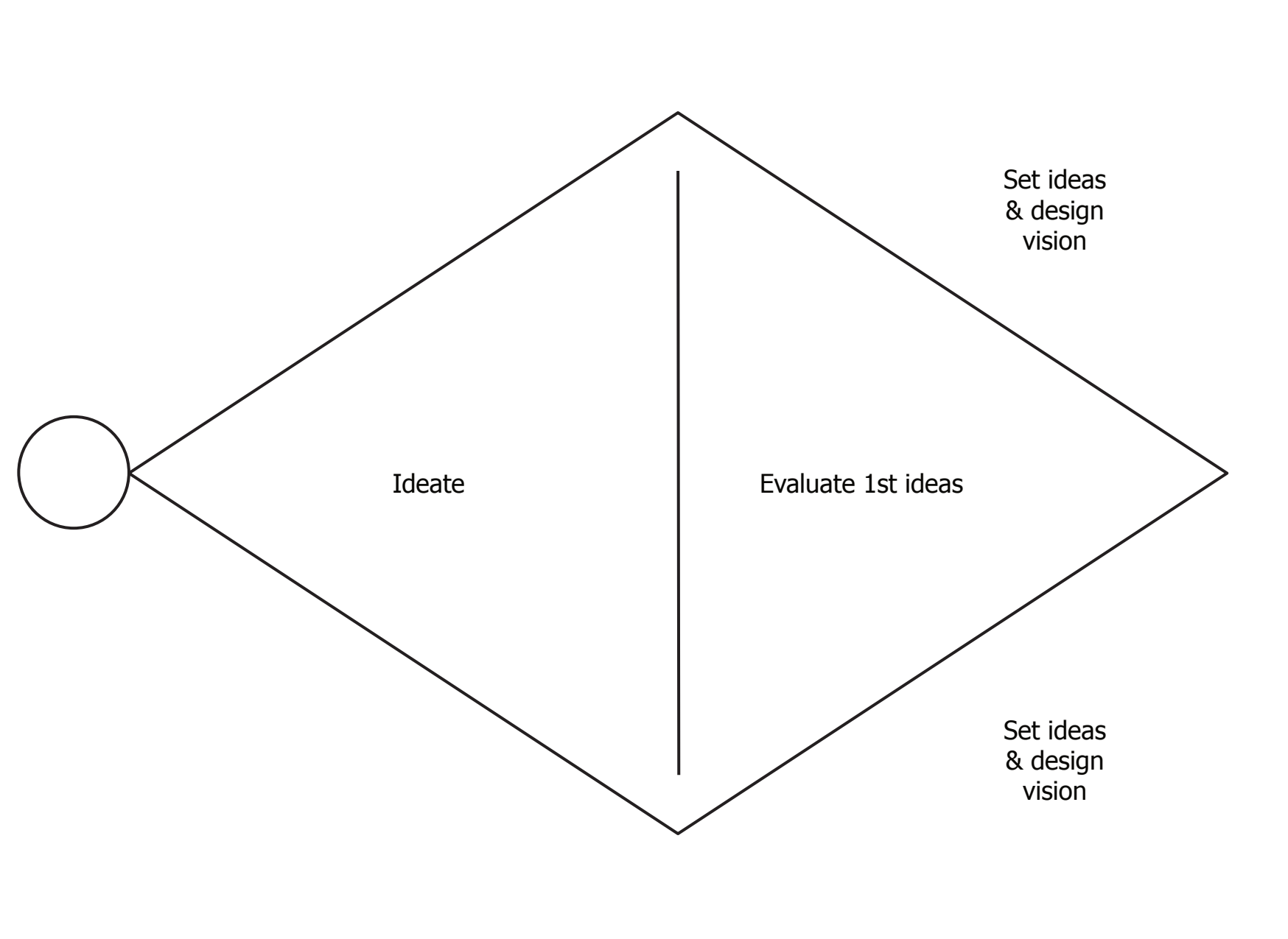


After doing some research, we found out that most of the times the patients tend to hold on to the armrest of the dental sofa or to hold both of their hands and lay them in their lap.

"Blueprint" Dental Practice



Phase 3: Develop



Camila Gutiérrez & Christian Barteld

Features & Characteristics

FUNCTIONS | Gerhard Häufler

PRACTICAL FUNCTION

- handling
- safety
- maintenance
- reparability
- ergonomics
- usability

AESTHETIC FUNCTION

SIGN FUNCTION

SYMBOLIC FUNCTION

PRODUCT LANGUAGE

VISION OF OUR DEVICE

ERGONOMIC modular ergonomics, possibility to adapt the size of the device to the user

INTUITIVE INTERACTION the patient knows how to hold it
functions of the device are:
the device leaves only one way to interpret the practical functions
interaction is possible without looking at the device
having the possibility of a single handed interaction and a both handed interaction
exposed parts can be replaced easy

MATERIALS different materials for different preferences
different tactile experiences
seperating practical functions with different materials
medical approved
fitting in the dental practise BUT
not reminding of the medical environment
has no holes and grooves
can be whiped with a towel

COLORS friendly colours
calm colours
no vibrant colours

visible
touchable
the device encourages the user to interact in the way we want

EXPECTATIONS OF THE DEVICE

the form...
...is right for different hand sizes
...gives defined haptic response, i know that i hold it
...is comfortable to hold even for a long time
...has a good form to squeeze, it does not slip away
(..."sends" strong signs for correct handling, i know how i am supposed to hold it)
...provides good single handed use
...is suitable for two handed use

the material...
round edges
not slippery
water proof

technology
device
sensors
power supply

Concepts

Idea 6 Futuristic	Idea 7 High Tech	Idea 8 Low Tech	Idea 9 Low Tech	Idea 1 Low Tech	Idea 2 High Tech	Idea 3 Futuristic	Idea 4 High Tech	Idea 5 Futuristic
<p>What?</p> <p>In the future a big part of the communication between the dentist and the patient is overtaken by smart devices. Because of that, a lot of time for introducing each other and talking about the patient's preferences is saved. Also the dentist has an easily accessible list of things to watch out for.</p> <p>The new experience starts even before you enter the dental practise. Your smartphone and wearables know a lot of things about you (e.g. your music taste, colours that you like, the temperature that you feel comfortable in, if you like coffee or tea etc.), some of them are useful for the visit at the dentist. There will be an option to share your taste, so that you feel at home at the dentist's office.</p> <p>In the waiting room you can answer some more questions that are relevant for the upcoming treatment (e.g. your past experiences, if you want anesthesia, or even what taste of mouthwash water you like, etc.). In the treatment room everything is set to your wishes and the dentist knows exactly what you like and what you are afraid off.</p> <p>Why?</p> <p>We are already in a world where digital devices help us interact with our surroundings, with people and with objects (e.g. smart homes, semi autonomous cars, dating platforms, etc.). It's a realistic scenario that algorithms take over even more fields, so that we don't have to think about them anymore.</p> <p>With a system like that the patient is less dependent from the will of the dentist to communicate and ask about their needs. A system of smart devices takes over a lot of this work, and the dentist can focus better on his main task, to treat teeth.</p> <p>the form...</p> <p>...is not different from the smart devices we know. The system depends on the devices we already have. Therefore it only needs your smartphone and smartwatch, smartglasses or other wearables. In the waiting room there could be an additional tablet computer and light, music and temperature are controlled by smart home devices.</p> <p>communication & empowerment</p> <p>...presure sensors in the chair detect body movement (e.g. pushing into the chair,</p> <p>...temperature sensors detect the room temperature and the body temperature of the patient</p> <p>...sensors that can detect a change of surface current (??) measure changes in humidity close to the chair, respectively if the patient is sweating</p> <p>...the signals are processed in a computer that sits within the housing of the chair</p> <p>...then they are transmitted wirelessly to the wristband of the dentist and per cable to the audio output and visual indicator, that is also placed on the chair</p> <p>...comfort functions are similarly organised as in car seats</p> <p>...power supply is per cable through the connection that is used for the dental chair</p> <p>relaxation & distraction</p> <p>there are three different possibilities:</p> <p>...a screen or projection where scenes, movies, series are played. Of course you decide what you want</p> <p>...music, according to your taste, that is played</p> <p>...a fidget toy, you can decide which one you want, what it should do, what material it has, what size it has, etc.</p>	<p>What?</p> <p>A chair that is designed to communicate better. It's not only an ergonomic workspace for the dentist but designed to enhance communication from the patient to the dentist.</p> <p>It's not only the dentist who can interact with the chair, but also the patient. On one hand there are sensors that detect the movement, body temperature and transpiration level of the patient. On the other hand the chair is equipped with controls to express the needs of the patient to the dentist.</p> <p>The dentist receives the signals of the sensors through a wristband that for example tightens or loosens, depending on the stresslevel of the patient. Signals coming from the controls that the patient can actuate are transmitted visually and through a non disturbing audiosignal.</p> <p>For better comfort that can result in a more relaxed attitude of the patient, the dental chair is fitted with functions similar to car seats. Seat heating and seat cooling, massage functions and an adjustable lumbar support are included.</p> <p>Why?</p> <p>The easiest an most cost efficient way to enhance the experience of the patients during their treatment, is to add a new device, rather than redesigning whole components in the treatment room. That way the dentist does not need to buy new expensive equipment.</p> <p>the form</p> <p>...is right for different hand sizes</p> <p>...gives defined haptic response, i know that i hold it</p> <p>...is comfortable to hold even for a long time</p> <p>...has a good form to squeeze, it does not slip away</p> <p>(...sends strong signs for correct handling, i know how i am supposed to hold it)</p> <p>...provides good single handed use</p> <p>...is suitable for two handed use</p> <p>communication & empowerment</p> <p>the technology</p> <p>...presure sensors in the chair detect body movement (e.g. pushing into the chair,</p> <p>...temperature sensors detect the room temperature and the body temperature of the patient</p> <p>...sensors that can detect a change of surface current (??) measure changes in humidity close to the chair, respectively if the patient is sweating</p> <p>...the signals are processed in a computer that sits within the housing of the chair</p> <p>...then they are transmitted wirelessly to the wristband of the dentist and per cable to the audio output and visual indicator, that is also placed on the chair</p> <p>...comfort functions are similarly organised as in car seats</p> <p>...power supply is per cable through the connection that is used for the dental chair</p> <p>relaxation & distraction</p> <p>the material</p> <p>...be soft and kind to the skin</p> <p>...be hygienic and suitable for a medical environment</p> <p>...give good haptic feedback</p> <p>the texture</p> <p>...gives a sensual feedback</p>	<p>What?</p> <p>Most of the times the patient only wants to express that something is hurting, ask a question or request a break from the treatment. For these three simple functions a handheld device that levels out the hurdles of communication from the patient to the dentist, could help the patient to feel less at their mercy.</p> <p>It is operatable without looking at it, so the patient can hold it in his hand during the treatment. The different functions can be easily distinguished from each other, because each controle feels different.</p> <p>The dentist receives the signal both visually and through a non disturbing auditive alarm.</p> <p>In addition a fidget toy can be added to the device, either on the device itself or seperately. The texture and form of that toy distracts the patient from the treatment.</p> <p>Why?</p> <p>Why should we create something new, when there are devices out there, that are already familiar and accepted. We know how to use them and the technology is proven. It's on us to use these possibilities to our favor.</p> <p>the form</p> <p>...is right for different hand sizes</p> <p>...gives defined haptic response, i know that i hold it</p> <p>...is comfortable to hold even for a long time</p> <p>...has a good form to squeeze, it does not slip away</p> <p>(...sends strong signs for correct handling, i know how i am supposed to hold it)</p> <p>...provides good single handed use</p> <p>...is suitable for two handed use</p> <p>communication & empowerment</p> <p>the technology</p> <p>The setup consists of either two smart watches, or one smart watch and a signal processor and a device that visualises them.</p> <p>That can happen through a set of leds ranging from green to red, a small warning sign, some jingles, changing light colour in the treatmet room, a wristband that tightens or loosens, or heats up, cools down, vibrates, gives light electrical impulses, etc.</p> <p>The patient must not interact with the device after setting it up. The connection can be made during the time in the waiting room. There the patient is led through the process of setting up the device and connecting</p> <p>The dentist receives the signal through a wristband or non disturbing audiovisual alarms.</p> <p>relaxation & distraction</p> <p>the material of the handheld device must...</p> <p>...be soft and kind to the skin</p> <p>...be hygienic and suitable for a medical environment</p> <p>...give good haptic feedback</p> <p>the texture...</p> <p>...gives a sensual feedback</p>	<p>What?</p> <p>Nowadays a lot of people have smart watches. They can detect body functions like heartrate, bloodpressure and body temperature. If the patient has such a device, it can be connected to a system in the treatment room, that interprets the signals from the watch to use them as indicator for stress and pain.</p> <p>The dentist is then gently reminded, that the patient is uncomfortable and can react accordingly.</p> <p>For the patient there is the possibility to select a fidget toy out of a range of products, so that he can distract himself from the treatment by playing with it.</p> <p>Why?</p> <p>Why should we create something new, when there are devices out there, that are already familiar and accepted. We know how to use them and the technology is proven. It's on us to use these possibilities to our favor.</p> <p>the form</p> <p>...is right for different hand sizes</p> <p>...gives defined haptic response, i know that i hold it</p> <p>...is comfortable to hold even for a long time</p> <p>...has a good form to squeeze, it does not slip away</p> <p>(...sends strong signs for correct handling, i know how i am supposed to hold it)</p> <p>...provides good single handed use</p> <p>...is suitable for two handed use</p> <p>communication & empowerment</p> <p>the technology</p> <p>The setup consists of either two smart watches, or one smart watch and a signal processor and a device that visualises them.</p> <p>That can happen through a set of leds ranging from green to red, a small warning sign, some jingles, changing light colour in the treatmet room, a wristband that tightens or loosens, or heats up, cools down, vibrates, gives light electrical impulses, etc.</p> <p>The patient must not interact with the device after setting it up. The connection can be made during the time in the waiting room. There the patient is led through the process of setting up the device and connecting</p> <p>The dentist receives the signal through a wristband or non disturbing audiovisual alarms.</p> <p>relaxation & distraction</p> <p>the material of the handheld device must...</p> <p>...be soft and kind to the skin</p> <p>...be hygienic and suitable for a medical environment</p> <p>...give good haptic feedback</p> <p>the texture...</p> <p>...gives a sensual feedback</p>	<p>What?</p> <p>- Who is using this: patient</p> <p>- Device that could be hold with both hands. It could be possible that you could separate them and have 1 for each hand. Or to keep them together, just as 1 device.</p> <p>Why?</p> <p>- We notice that most of the times the patients are holding their hands or laying their hands in their lap, squeezing them.</p> <p>Also most of the times they use the hands in order to give a signal to the dentist: stop or any other requirement.</p> <p>The Form</p> <p>- I imagine the form of this device as a mix of something circular and a cylinder. Perhaps half of a torus connected to a cylinder form. Being able to connect them and use them like a 1 device for both hands or disconnect them and have 2 different devices for each hand. The design must be designed for: left and right handed.</p> <p>I also imagine having some parts of this device being modular, for example: the squeezing part being able to change it for different textures. As well, being able to adapt it to any size of hands (kids-adults).</p> <p>communication & empowerment</p> <p>The Technology</p> <p>- One idea: just being able to change the squeezing parts in order to fulfill each patient needs. The dentist noticing how tense the patient is getting.</p> <p>- Second idea: Having an extra button for the thumb finger that they could press in order to alert the dentist to stop for a while. PLUS: having a band or something in the head. The device is connected to the band and this band transmits lights so that the dentist notices that a pause is needed.</p> <p>- Taking into consideration the power/how to charge it. I think about having a USB-C connection.</p> <p>- Patient device: once the dentist stops, automatically the device will make a small vibration in order to help them take some breaths (1 min of inhale/exhale). This will help the patient relieve their stress and try to calm.</p> <p>relaxation & distraction</p> <p>The Material</p> <p>- I imagine having different materials for the whole device:</p> <p>- The main case/shell of the device being made out of a hard/soft plastic (sweat-proof/medical plastic).</p> <p>- The squeezing part is exchangeable, therefore it's made out of different materials: super soft or super</p> <p>relaxation & distraction</p> <p>The Texture</p> <p>- Main casing/shell: completely smooth (the device where the button is).</p> <p>- Button: is intuitive for the people to click/touch/press.</p> <p>- Main casing/shell (second device): having different textures, being able to change them.</p> <p>- Squeezing part: slime texture - squeeze.</p>	<p>What?</p> <p>- A device that could connect the relation/ communication between the dentist and patient.</p> <p>The patient having a device with which they can communicate to the dentist that they need to take a break. For this the dentist would have a connection to the device (example a band, etc) with which he/she would be aware of "this signal" from the patient.</p> <p>Why?</p> <p>- Thinking in a futuristic idea, technology is advancing more and more. Therefore, it would be interesting to redesign the dental chair and change the whole experience of going to the dentist. That is to say, to integrate a new method of communication between the patient and the dentist. Helping the patient to be able to communicate what they want and help the dentist to do his job in a less stressful way.</p> <p>- Most of the time when you are at the dentist and you want to communicate to the dentist that you need a break, what you do is try to talk + yumble with your mouth open - this is sometimes uncomfortable because the dentist doesn't understand exactly what you want.</p> <p>The Form</p> <p>- I imagine the shape of this device as a control that is connected to a band for the wrist, which the patient would be wearing. On the other hand, I imagine that the dentist would have a type of bracelet or a small device that could be hung on the dentist's gown, with which he would be aware of the signals that the patient is asking for.</p> <p>- I would design the shape of these two devices, similar. Complementing each other.</p> <p>communication & empowerment</p> <p>The Technology</p> <p>- Patient device: having sensors that could detect your pulse (heart rate). This will send a signal to the device of the dentist which will vibrate or start sending a sound alert in order to stop.</p> <p>- Patient device: once the dentist stops, automatically the device will make a small vibration in order to help them take some breaths (1 min of inhale/exhale). This will help the patient relieve their stress and try to calm.</p> <p>relaxation & distraction</p> <p>The Material</p> <p>- Medical material</p> <p>relaxation & distraction</p> <p>The Texture</p> <p>- Buttons or points where the patient tends to grip/ squeeze may have different textures.</p> <p>The Texture</p> <p>- The material of both devices must be made of plastic for medical devices. They should be sweat-proof and easy to clean.</p> <p>- Perhaps a part of the patient's device can be made of soft material that can be squeezed and nothing happens.</p> <p>The Texture</p> <p>- The texture of both devices would be smooth.</p> <p>- The texture of the squeezing part could be made out of silicon or any other material you could grab and squeeze.</p>	<p>What?</p> <p>- Redesign the dental chair and integrate a communication device into the armchair of the dental sofa. Another option could be to have a separate device which you can install in the dental chair and adjust it depending on the patient needs.</p> <p>Why?</p> <p>- Thinking in a futuristic idea, technology is advancing more and more. Therefore, it would be interesting to redesign the dental chair and change the whole experience of going to the dentist. That is to say, to integrate a new method of communication between the patient and the dentist. Helping the patient to be able to communicate what they want and help the dentist to do his job in a less stressful way.</p> <p>- How can we integrate a new communication device in the dental chair?</p> <p>- Thinking about the form, this device could be modular, taking into account the shape of the dental sofa armchair. Having the option of removing it if it's not needed.</p> <p>- It could have the option to be adjusted depending on any patient.</p> <p>- It could have integrated controls or buttons that the patient can use to press or to communicate a pause to the dentist.</p> <p>communication & empowerment</p> <p>The Technology</p> <p>- Taking into account the redesign of the whole dental sofa. We could add sensors/light system all over the sofa (important parts: the overhead light or the contour of the chair) which are connected to the integrated device.</p> <p>- Once the patient has a request the lights/sensors would turn on and alert the dentist to stop.</p> <p>relaxation & distraction</p> <p>The Material</p> <p>- Medical material</p> <p>relaxation & distraction</p> <p>The Texture</p> <p>- Buttons or points where the patient tends to grip/ squeeze may have different textures.</p> <p>The Texture</p> <p>- The material of both devices must be made of plastic for medical devices. 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(having a button/fidget for the thumb)</p> <p>- Having a part of this torus (the part that is touching your palm) a bit more thicker (imagine it like a ball)</p> <p>- In the other hand the patient could have a wrist sensor that could detect their heart beat.</p> <p>communication & empowerment</p> <p>The Technology</p> <p>- How are we gonna make in order for the dentist to notice when the patient is nervous/tension?</p> <p>We could implement a separate display that could be installed somewhere on the dental chair. This display would communicate to the dentist how the patient is feeling - perhaps and alert in the tv to show the dentist to take a break.</p> <p>The display and the wrist sensor would be connected. All the information collected could be transferred to the patient's record so the dentist would know how to treat the patient at the next appointment.</p> <p>relaxation & distraction</p> <p>The Material</p> <p>- Medical material</p> <p>- Soft, smooth, hard.</p> <p>- The wrist sensor could be elastic in order to fit all types of sizes. Otherwise it could be exchangeable.</p> <p>The Texture</p> <p>- Take into account the areas where you percieve pressure when you're holding someone's hand. Perhaps those areas could have a different texture.</p> <p>relaxation & distraction</p> <p>The Material</p> <p>- The listen and sight senses are all connected in one device: a headset with glasses (VR) that already have integrated bone transmission.</p> <p>- creating an application for the waiting room in which you can put your information and what you want to have in the treatment room : music/visuals. Also showing you how the hand device works with the buttons.</p> <p>- Being able to adjust the hand device the way you want it. Perhaps you want to have a more squeezable texture or nothing at all. Just the buttons.</p> <p>-Everything is connected by bluetooth.</p> <p>- With the bone transmission, you're still aloud to listen your surroundings. So if the dentist ask you to open your mouth you will be still aloud to follow the orders.</p> <p>relaxation & distraction</p> <p>The Material</p> <p>-A material that is easy to clean and sweat-proof. That does not end up sticky at the end.</p> <p>- The buttons are intuitive to follow and to use, a catchy color and a different texture for them.</p> <p>The Texture</p>	<p>What?</p> <p>- Sensory experience</p> <p>Calming device, taking into consideration 3 senses: touch listen, sight. Different devices but all connected between each other.</p> <p>Touch: Having a device to hold - control with buttons/ fidget. OR havinif this device already integrated in the dental chair.</p> <p>Listen: Bone transmission headphones</p> <p>Sight: VR - able to watch whatever you want.</p> <p>-Waiting room</p> <p>-When the patient is in the waiting room, they would be given an iPad (or something similar) to fill out their record. Giving them the option of being able to choose what music they want to listen to, what video they want to watch and what control with different types of texture/shape they want.</p> <p>Why?</p> <p>- Being able to provide a totally different experience when going to the dentist will help patients make their experience more pleasant.</p> <p>- The patient want something to avoid the noise and the pain.</p> <p>The Form</p> <p>-Touch: Integrate an armchair into the dental chair (imagine it as a game control device with different buttons).</p> <p>All this buttons having a different function. Thumb finger: pressing a button in order to make a break / Index finger: pressing a button in order to talk. With the thumb and index finger pressing them at the same time you're able to change the music/image</p> <p>communication & empowerment</p> <p>The Technology</p> <p>- The listen and sight senses are all connected in one device: a headset with glasses (VR) that already have integrated bone transmission.</p> <p>- creating an application for the waiting room in which you can put your information and what you want to have in the treatment room : music/visuals. Also showing you how the hand device works with the buttons.</p> <p>- Being able to adjust the hand device the way you want it. Perhaps you want to have a more squeezable texture or nothing at all. Just the buttons.</p> <p>-Everything is connected by bluetooth.</p> <p>- With the bone transmission, you're still aloud to listen your surroundings. So if the dentist ask you to open your mouth you will be still aloud to follow the orders.</p> <p>relaxation & distraction</p> <p>The Material</p> <p>-A material that is easy to clean and sweat-proof. That does not end up sticky at the end.</p> <p>- The buttons are intuitive to follow and to use, a catchy color and a different texture for them.</p> <p>The Texture</p>

Idea 7

High Tech

What?

A chair that is designed to communicate better. It's not only an ergonomical workspace for the dentist but designed to enhance communication from the patient to the dentist.

It's not only the dentist who can interact with the chair, but also the patient. On one hand there are sensors that detect the movement, body temperature and transpiration level of the patient. On the other hand the chair is equipped with controls to express the needs of the patient to the dentist.

The dentist receives the signals of the sensors through a wristband that for example tightens or loosens, depending on the stress level of the patient. Signals coming from the controls that the patient can actuate are transmitted visually and through a non-disturbing audio signal.

For better comfort that can result in a more relaxed attitude of the patient, the dental chair is fitted with functions similar to car seats. Seat heating and seat cooling, massage functions and an adjustable lumbar support are included.

Why?

The dental chair is the place where the patient lays during the whole treatment. He can easily access handles and upper surfaces of the chair. That makes the dental chair a good place to integrate the required functions for communication.

Also the dental chair has a big internal volume which leaves enough space to hide signal processing devices and transmitters.

the form

...will probably look still more or less the same. The integration of the sensors do not require a big change, the importance that the dentist can work properly is considered higher than the comfort of the patient.

communication & empowerment

the technology

- ...pressure sensors in the chair detect body movement (e.g. pushing into the chair,
- ...temperature sensors detect the room temperature and the body temperature of the patient
- ...sensors that can detect a change of surface current (??) measure changes in humidity close to the chair, respectively if the patient is sweating
- ...the signals are processed in a computer that sits within the housing of the chair
- ...then they are transmitted wirelessly to the wristband of the dentist and per cable to the audio output and visual indicator, that is also placed on the chair
- ...comfort functions are similarly organised as in car seats
- ...power supply is per cable through the connection that is used for the dental chair

relaxation & distraction

the material

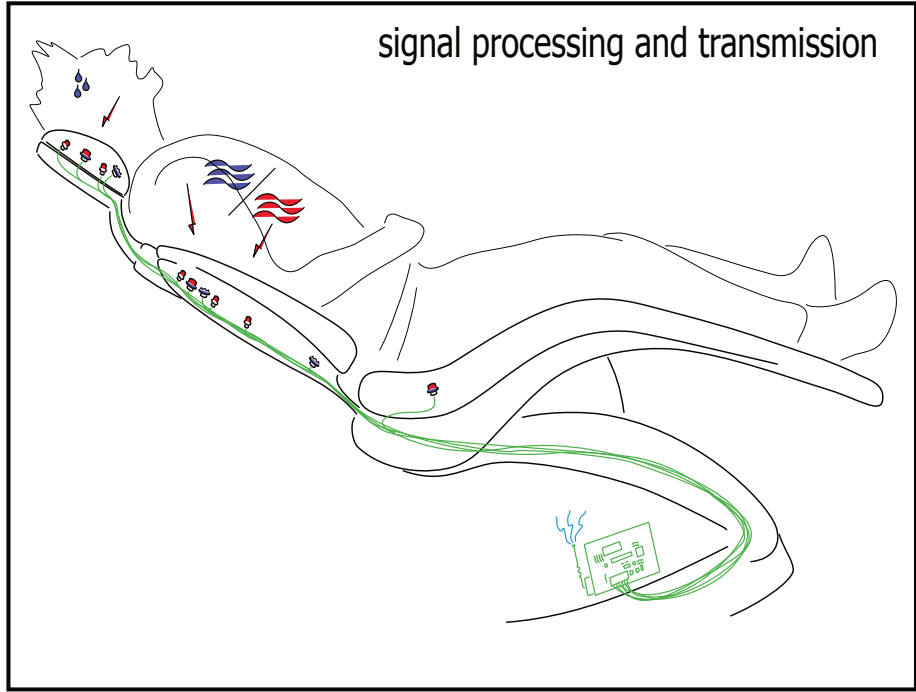
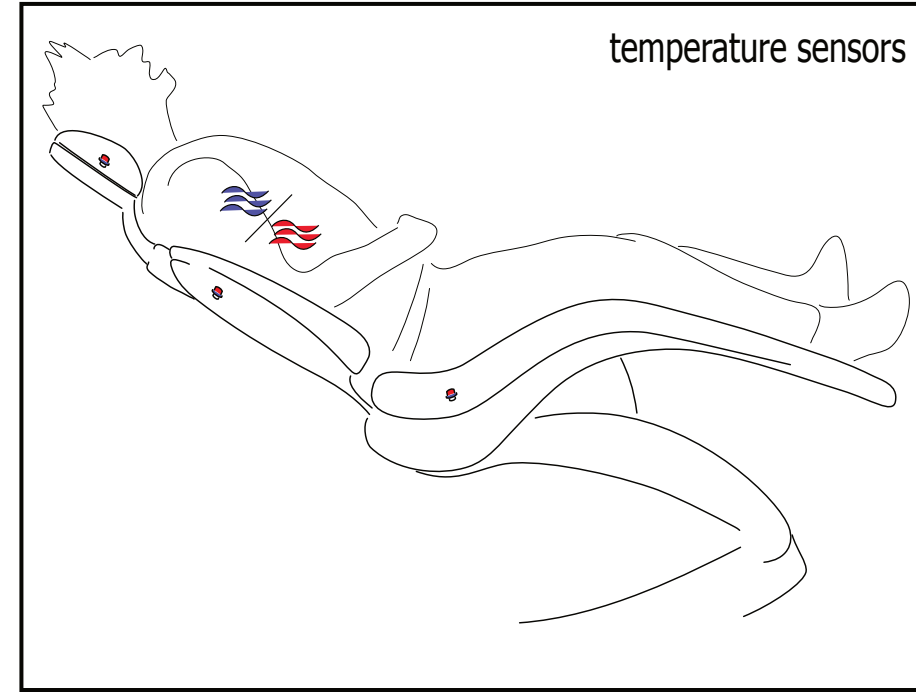
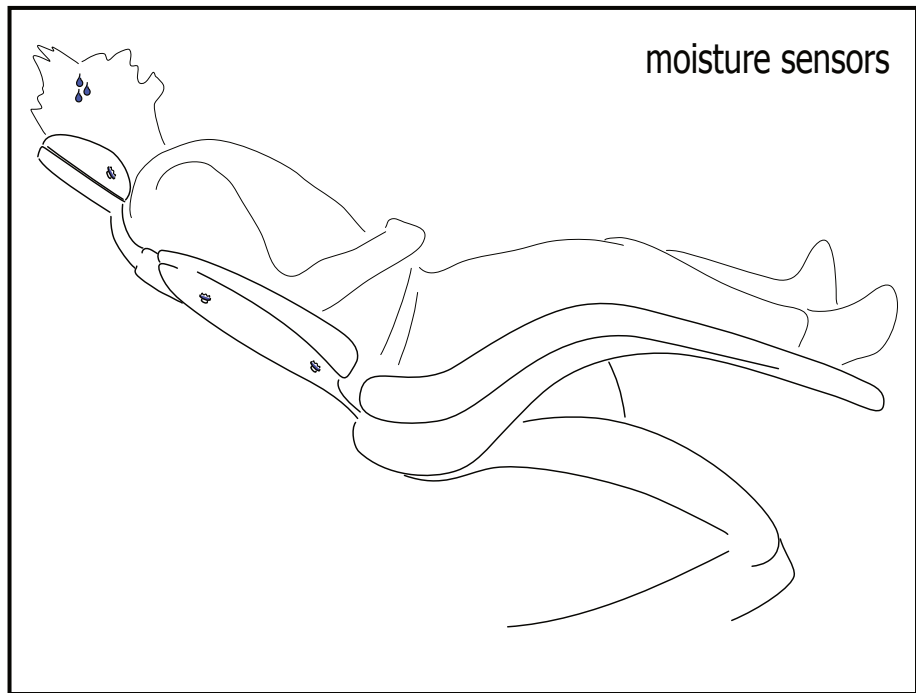
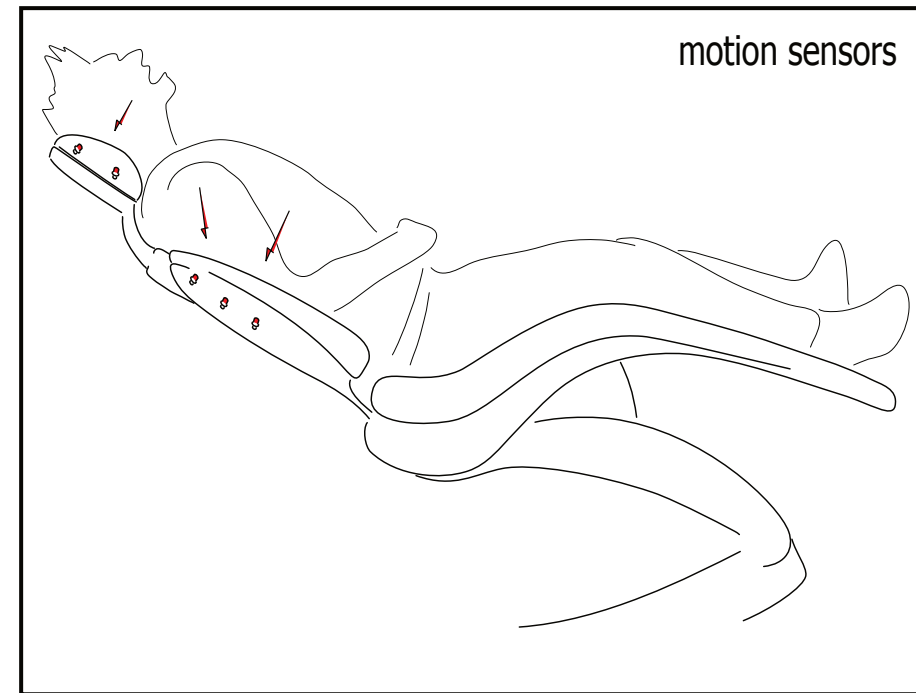
- ...be soft and kind to the skin
- ...be hygienic and suitable for a medical environment
- ...give good haptic feedback

the texture

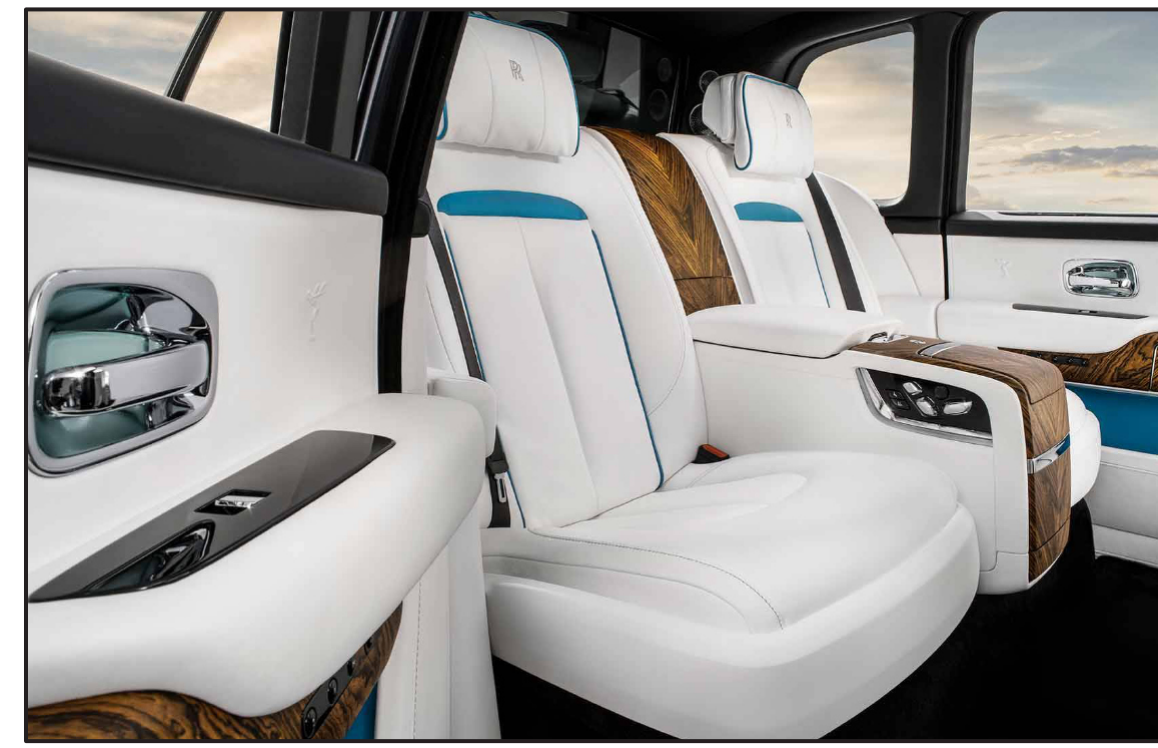
- ...gives a sensual feedback

Camila Gutiérrez & Christian Barteld

High tech - fitting the dental chair with sensors that detect body functions to know the stress level of the patient



High tech - fitting the dental chair with comfort functions like in car seats e.g. seat heating, seat ventilation, comfort related adjustability



Idea 8

Low Tech

What?

Most of the times the patient only wants to express that something is hurting, ask a question or request a break from the treatment. For these three simple functions a handheld device that levels out the hurdles of communication from the patient to the dentist, could help the patient to feel less at their mercy.

It is operatable without looking at it, so the patient can hold it in his hand during the treatent. The different functions can be easily distinguished from eachother, because each controle feels different.

The dentist recieves the signal both visually and throught a non disturbing auditive alarm.

In addition a fidget toy can be added to the device, either on the device itself or seperately.

Why?

The easiest an most cost efficient way to enhance the experience of the patients during their treatment, is to add a new device, rather than redesigning whole components in the treatment room. That way he dentist does not need to buy new expensive equipment.

the form

...is right for different hand sizes

...gives defined haptic response, i know that i hold it

...is comfortable to hold even for a long time

...has a good form to squeeze, it does not slip away

(..."sends" strong signs for correct handling, i know how i am supposed to hold it)

...provides good single handed use

...is suitable for two handed use

communication & empowerment

the technology

The device works as a simple remote controle. It has a set of buttons, that transmtt a signal, either trough a cable for a reliable connection or with infrared or radio.

The user interface must be operatable blind. The controles must be placed ergonomically correct and have to be instantly distinguishable.

If signal transmitting is throught a cable, the power supply is ensured the same way. Another option would be batteries or an accumulator.

The dentist recieves the signal trough a wristband or non disturbing audiovisual alarms.

relaxation & distraction

the material of the handheld device must...

...be soft and kind to the skin

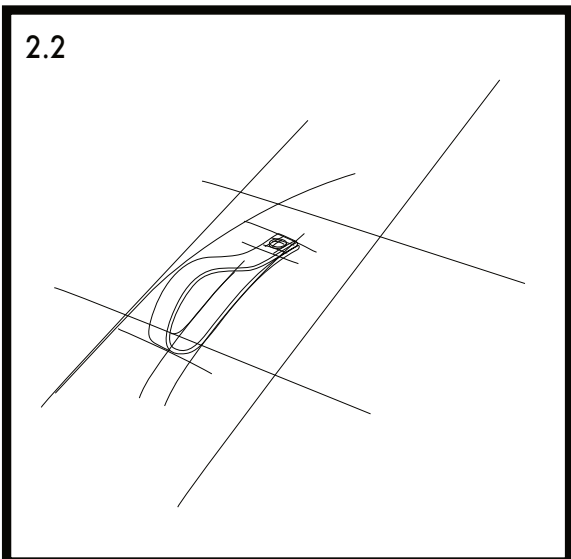
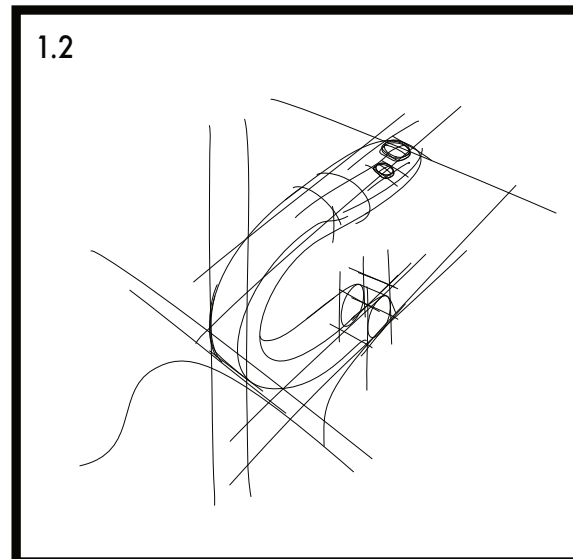
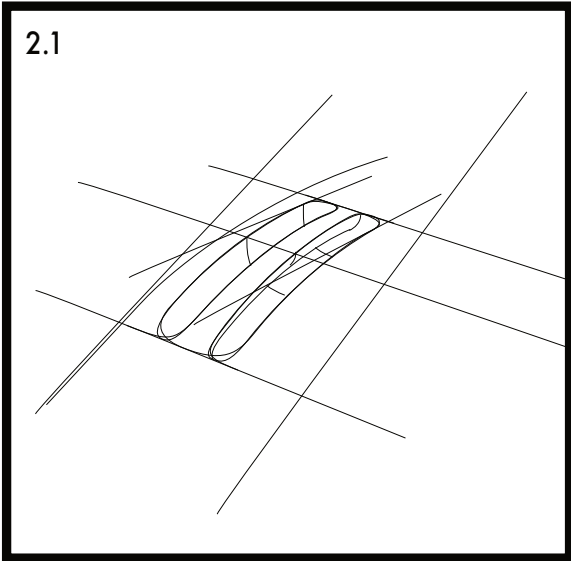
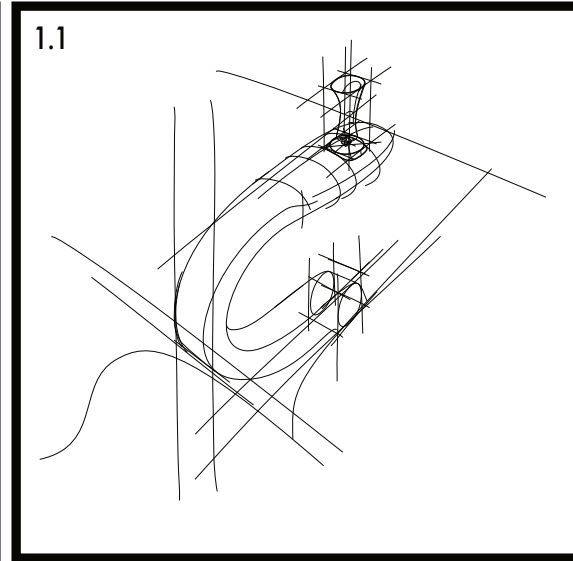
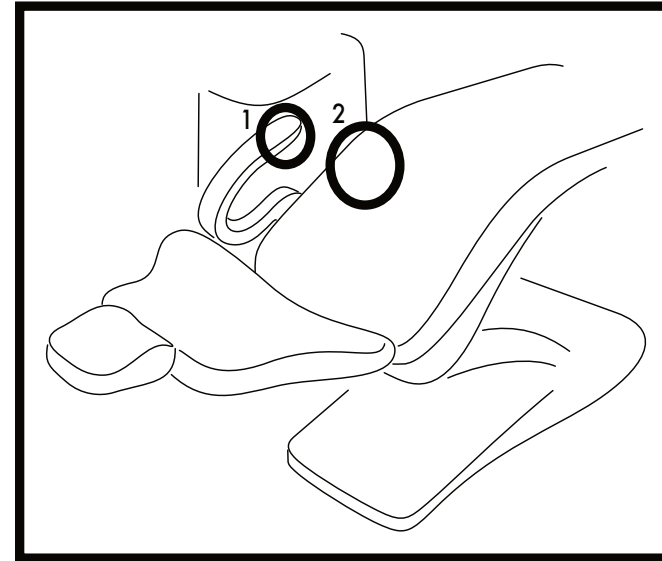
...be hygenic and suitable for a medical environment

...give good haptic feedback

the texture...

...gives a sensual feedback

High tech -
fitting the dental chair with controls that the patient can use for
expressing pain, requesting a pause or to ask a question



Idea 3

Futuristic

What?

-Redesign the dental chair and integrate a communication device into the armchair of the dental sofa. Another option could be to have a separate device which you can install in the dental chair and adjust it depending on the patient needs.

Why?

- Thinking in a futuristic idea, technology is advancing more and more. Therefore, it would be interesting to redesign the dental chair and change the whole experience of going to the dentist. That is to say, to integrate a new method of communication between the patient and the dentist. Helping the patient to be able to communicate what they want and help the dentist to do his job in a less stressful way.

The Form

- How can we integrate a new communication device in the dental chair?

- Thinking about the form, this device could be modular, taking into account the shape of the dental sofa armchair. Having the option of removing it if it's not needed.

- It could have the option to be adjusted depending on any patient.

- It could have integrated controls or buttons that the patient can use to press or to communicate a pause to the dentist.

communication & empowerment

The Technology

- Taking into account the redesign of the whole dental sofa. We could add sensors/light system all over the sofa (important parts: the overhead light or the contour of the chair) which are connected to the integrated device.
- Once the patient has a request the lights/sensors would turn on and alert the dentist to stop.

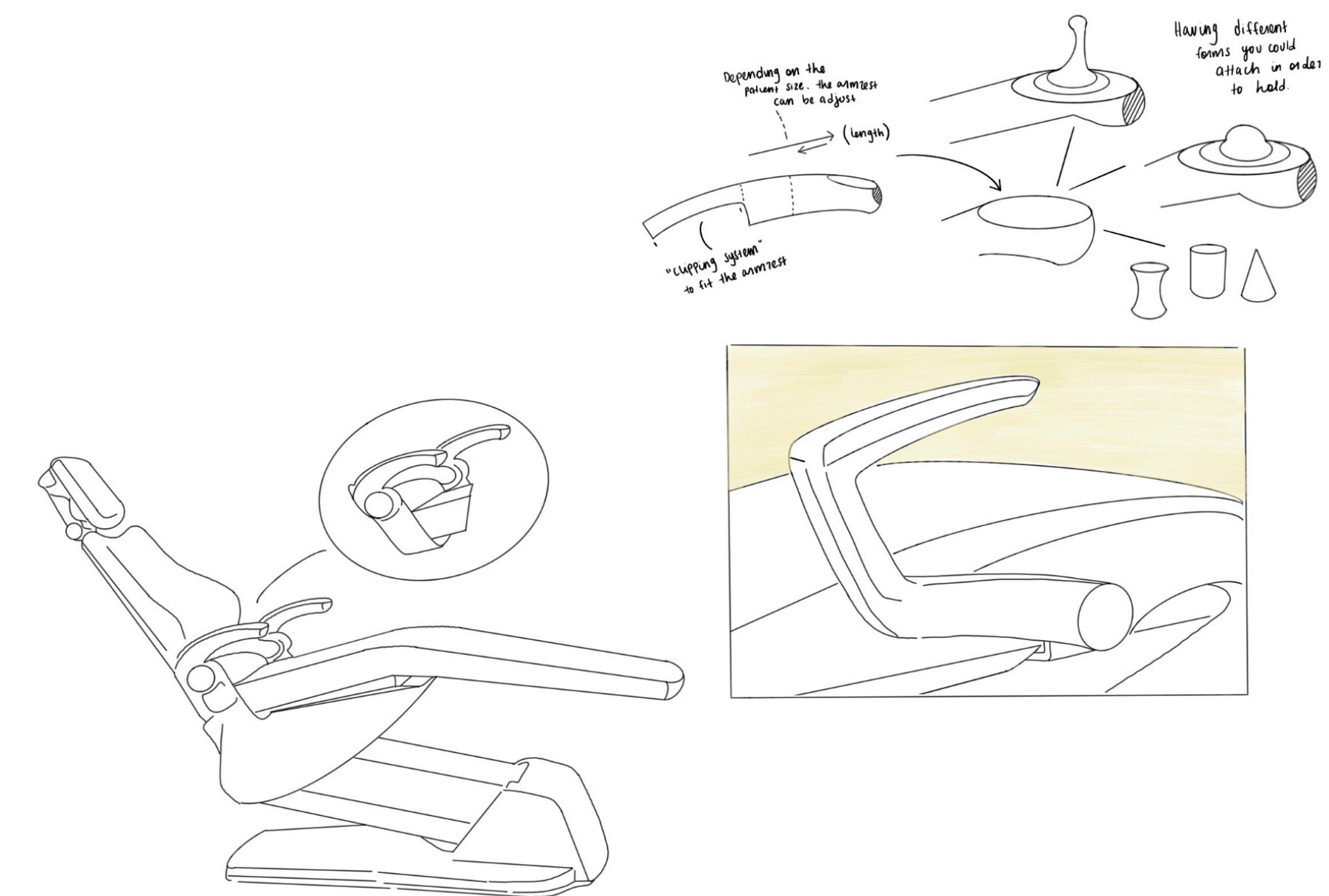
relaxation & distraction

The Material

- Medical material

The Texture

- Buttons or points where the patient tends to grip/ squeeze may have different textures.



Idea 4

High Tech

What?

- Calming sensory experience

- Recalling the perception of holding someone's hand when you're stress/anxious at the dental clinic.

Why?

- Sometimes people feel more secure/calm when they have someone next to them in a difficult or anxious situation.

Distraction/breathing/control of the situation.

The Form

- Form of a flat torus/ring that you could hold in your hand. Holding it with your 4 fingers and keeping the thumb outside it. (having a button/fidget for the thumb)
- Having a part of this torus (the part that is touching your palm) a bit more thicker (imagine it like a ball)
- In the other hand the patient could have a wrist sensor that could detect their heart beat.

communication & empowerment

The Technology

- How are we gonna make in order for the dentist to notice when the patient is nervous/tension?

We could implement a separate display that could be installed somewhere on the dental chair. This display would communicate to the dentist how the patient is feeling - perhaps and alert in the tv to show the dentist to take a break. The display and the wrist sensor would be connected. All the information collected could be transferred to the patient's record so the dentist would know how to treat the patient at the next appointment.

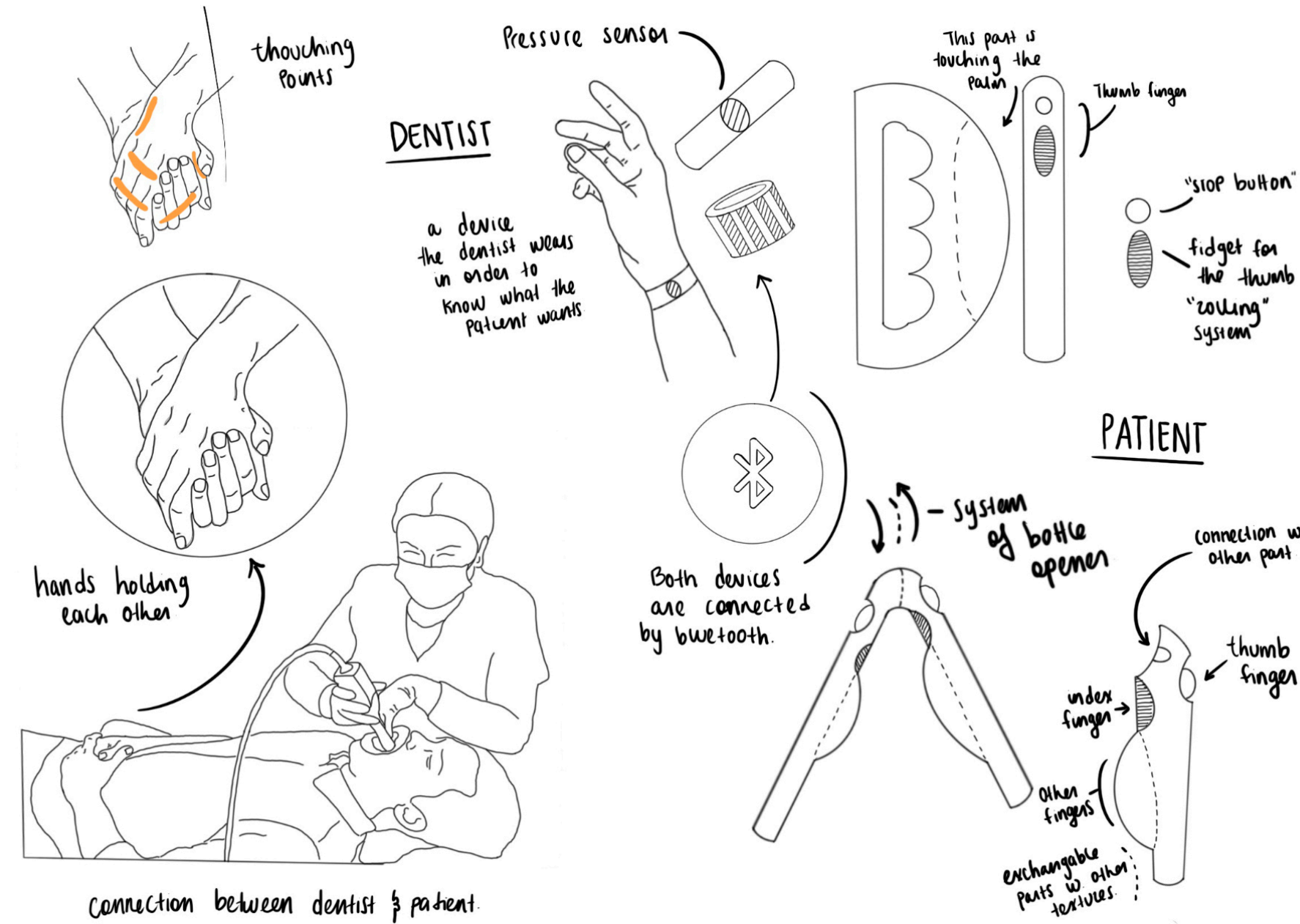
relaxation & distraction

The Material

- Medical material
- Soft, smooth, hard.
- The wrist sensor could be elastic in order to fit all types of sizes. Otherwise it could be exchangeable.

The Texture

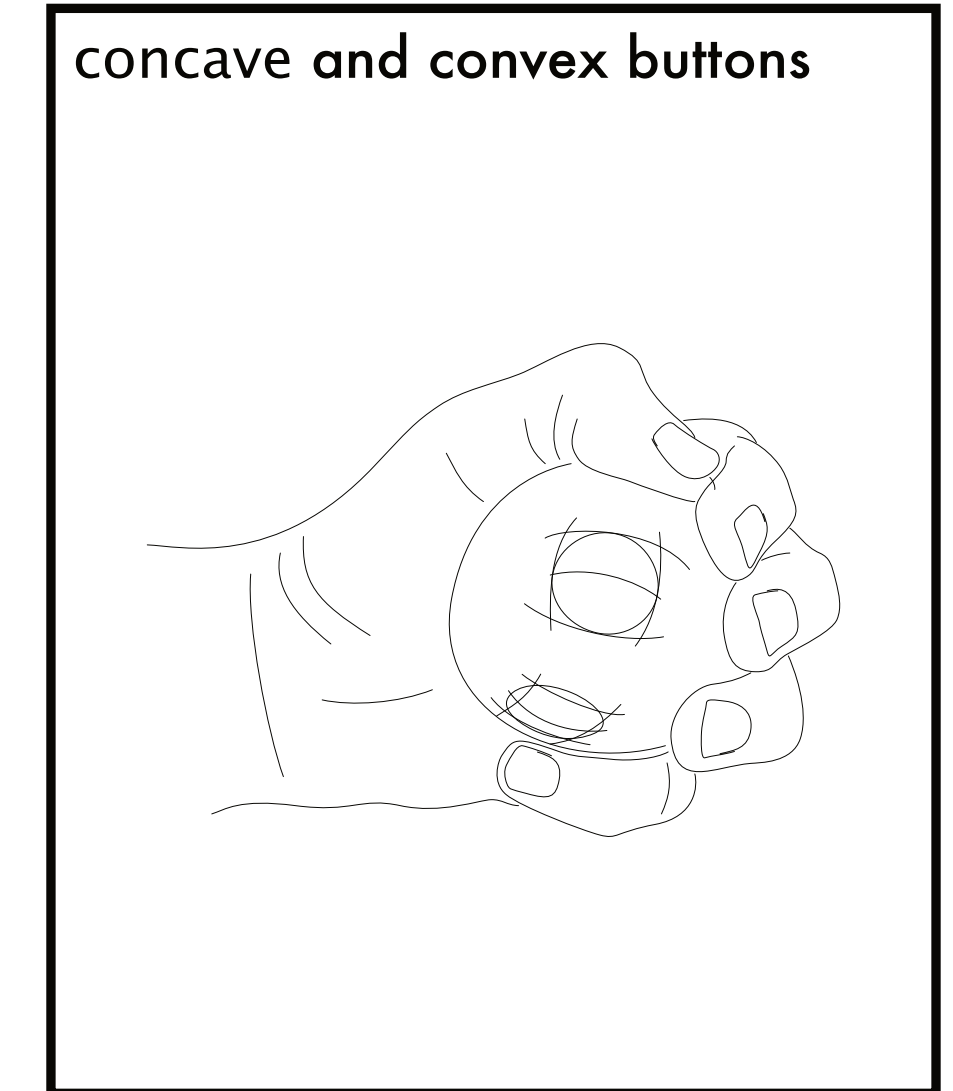
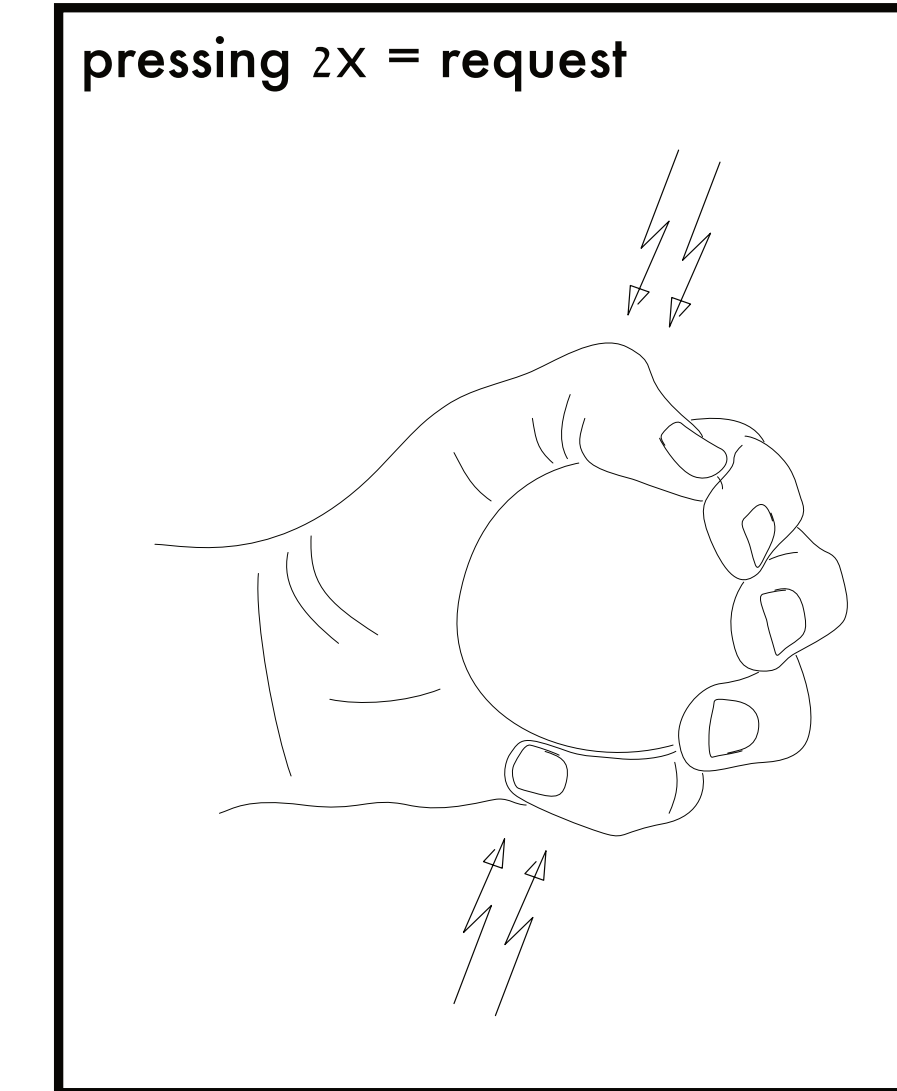
- Take into account the areas where you perceive pressure when you're holding someone's hand. Perhaps those areas could have a different texture.



Low tech -

a hand held device

to request a brake, ask a question or to say stop/express pain



Low tech -
using smart watches
to detect body functions of the patient and warn the dentist if the stress level rises



using the smart watch to calm down



recording body functions with a smart watch

Camila Gutiérrez & Christian Barteld

Idea 5

Futuristic

What?

- Sensory experience

Calming device, taking into consideration 3 senses: touch listen, sight. Different devices but all connected between each other.

Touch: Having a device to hold - control with buttons/fidget OR havinf this device already integrated in the dental chair.

Listen: Bone transmission headphones

Sight: VR - able to watch whatever you want.

- Waiting room

- When the patient is in the waiting room, they would be given an iPad (or something similar) to fill out their record. Giving them the option of being able to choose what music they want to listen to, what video they want to watch and what control with different types of texture/shape they want.

Why?

- Being able to provide a totally different experience when going to the dentist will help patients make their experience more pleasant.

- The patient want something to avoid the noise and the pain.

The Form

-Touch: Integrate an armchair into the dental chair (imagine it as a game control device with different buttons). All this buttons having a different function. Thumb finger: pressing a button in order to make a break / Index finger pressing a button in order to talk. With the thumb and index finger pressing them at the same time you're able to change the music/image

communication & empowerment

The Technology

- The listen and sight senses are all connected in one device: a headset with glasses (VR) that already have integrated bone transmission.

- creating an application for the waiting room in which you can put your information and what you want to have in the treatment room : music/visuals. Also showing you how the hand device works with the buttons.

- Being able to adjust the hand device the way you want it. Perhaps you want to have a more squeezable texture or nothing at all. Just the buttons.

-Everything is connected by bluetooth.

- With the bone transmission, you're still aloud to listen your surroundings. So if the dentist ask you to open your mouth you will be still aloud to follow the orders.

relaxation & distraction

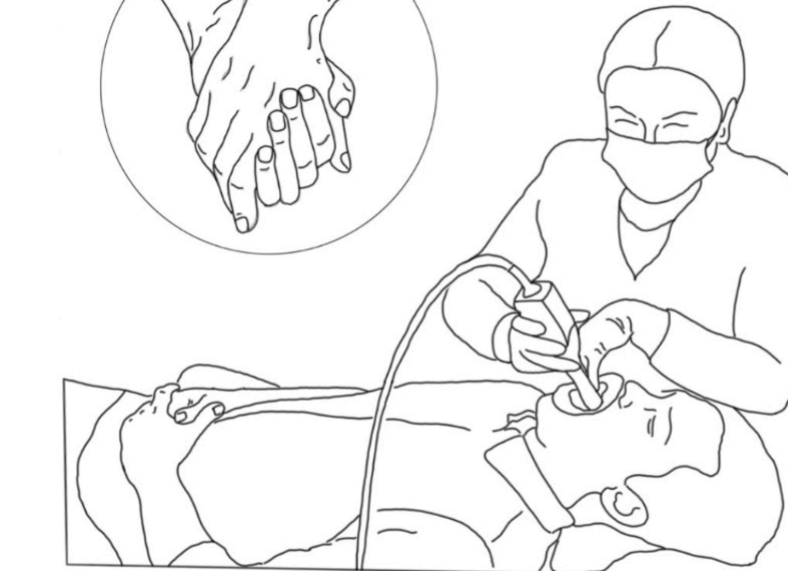
The Material

-A material that is easy to clean and sweat-proof. That does not end up sticky at the end.
- The buttons are intuitive to follow and to use, a catchy color and a different texture for them.

How can we make
the experience of
the dentist pleasant?

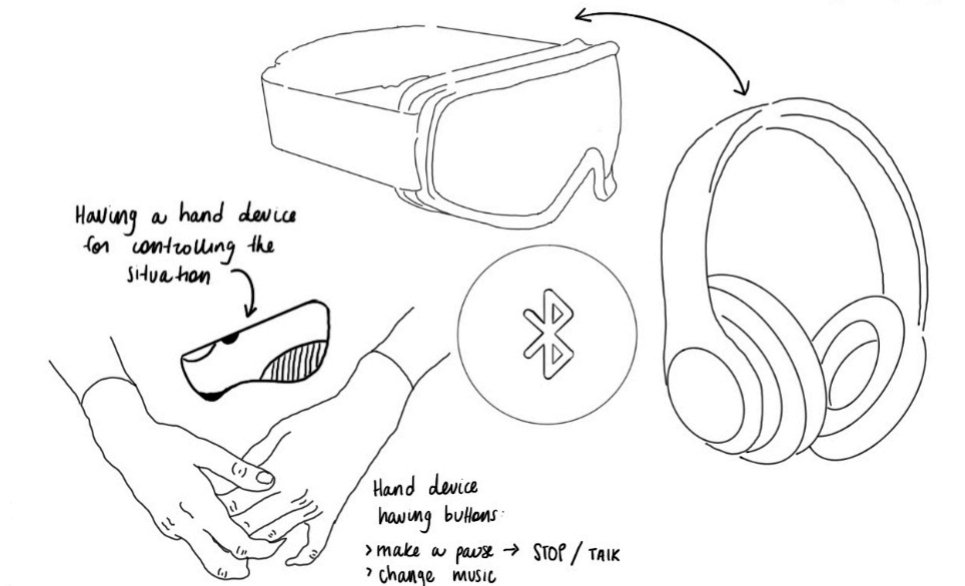
- > distraction
- > relaxation
- > communication
- > empowerment

Most of the times when
you go to the dentist
you tend to close your
eyes & to squeeze
your hands.



TREATMENT ROOM

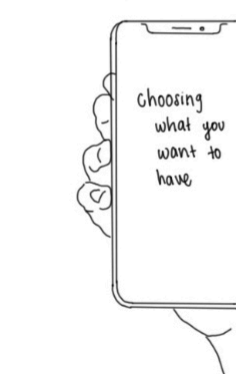
device that can have : 2 in 1
headphones & "goggles/glasses"



Having a hand device
for controlling the
situation

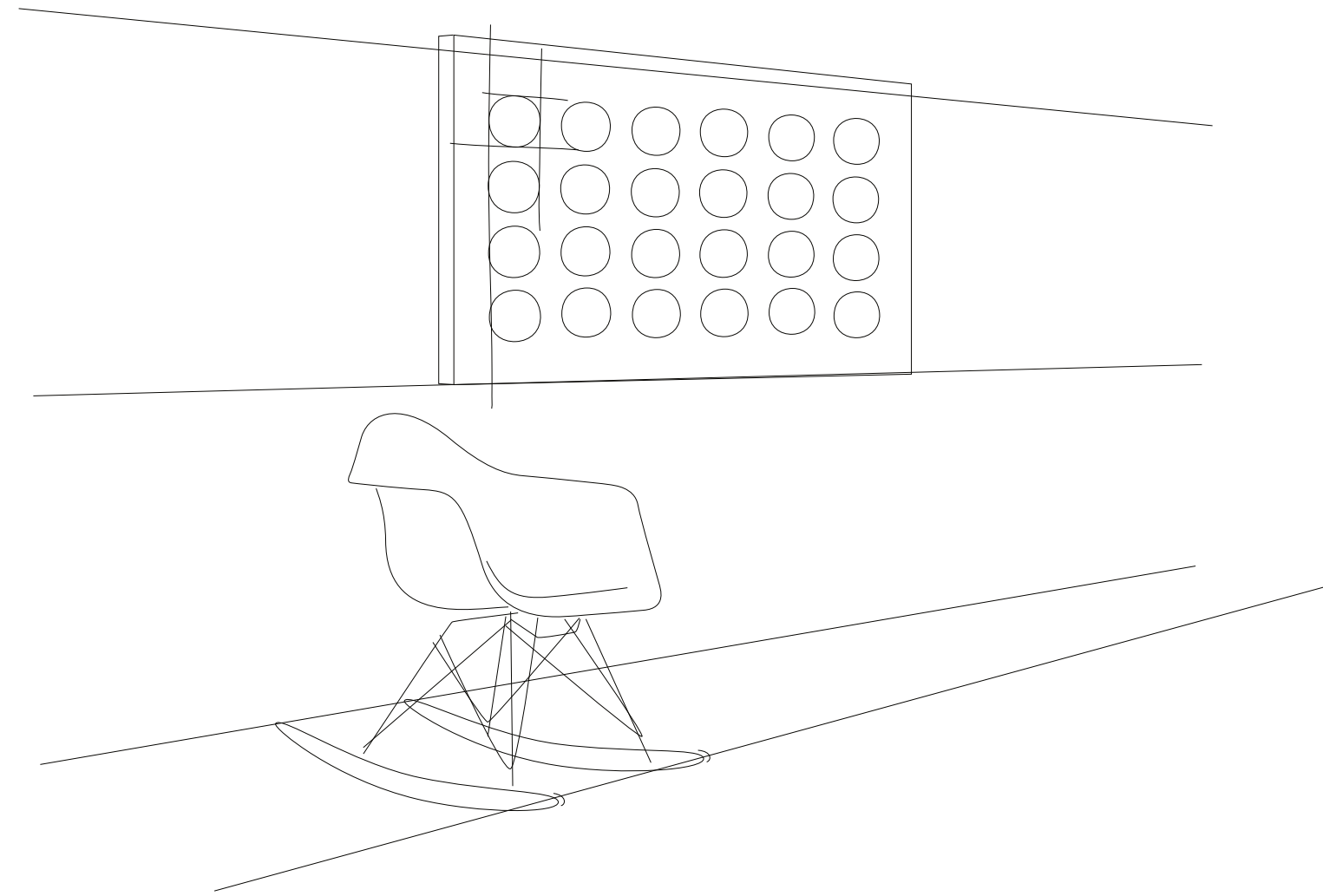
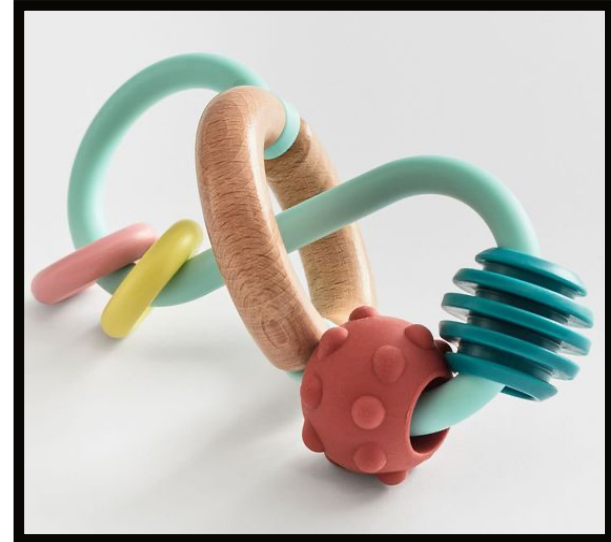
Hand device
having buttons:
> make a pause -> STOP / talk
> change music

WAITING ROOM

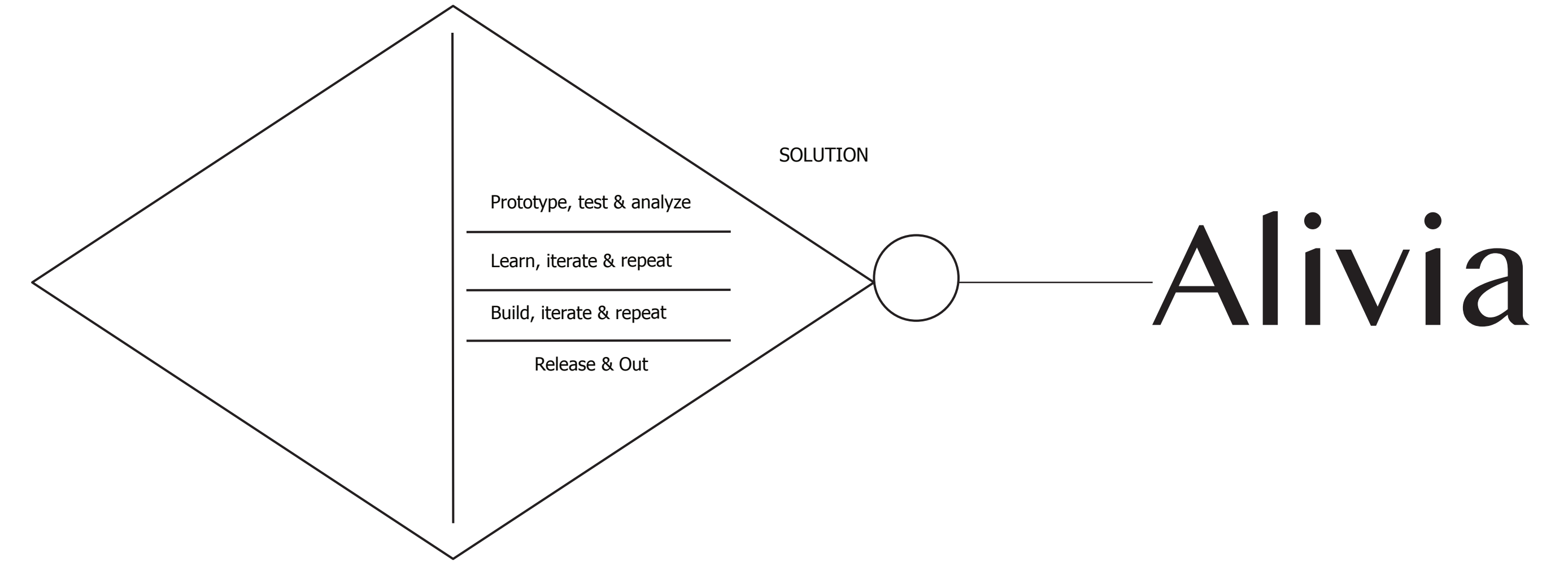


Sounds
Visuals
texture: hand device

Low tech -
distract the patient
with a fidget toy, which he can choose in the waiting room



Phase 4: Finalize



Idea 4

High Tech

What?

-Calming sensory experience

- Recalling the perception of holding someone's hand when you're stress/anxious at the dental clinic.

Why

- Sometimes people feel more secure/calm when they have someone next to them in a difficult or anxious situation.

Distraction/breathing/control of the situation.

The Form

- Form of a flat torus/ring that you could hold in your hand. Holding it with your 4 fingers and keeping the thumb outside it. (having a button/fidget for the thumb)
 - Having a part of this torus (the part that is touching your palm) a bit more thicker (imagine it like a ball)
 - In the other hand the patient could have a wrist sensor that could detect their heart beat.

communication & empowerment

The Technology

- How are we gonna make in order for the dentist to notice when the patient is nervous/tension?

We could implement a separate display that could be installed somewhere on the dental chair. This display would communicate to the dentist how the patient is feeling - perhaps and alert in the tv to show the dentist to take a break.
 The display and the wrist sensor would be connected.
 All the information collected could be transferred to the patient's record so the dentist would know how to treat the patient at the next appointment.

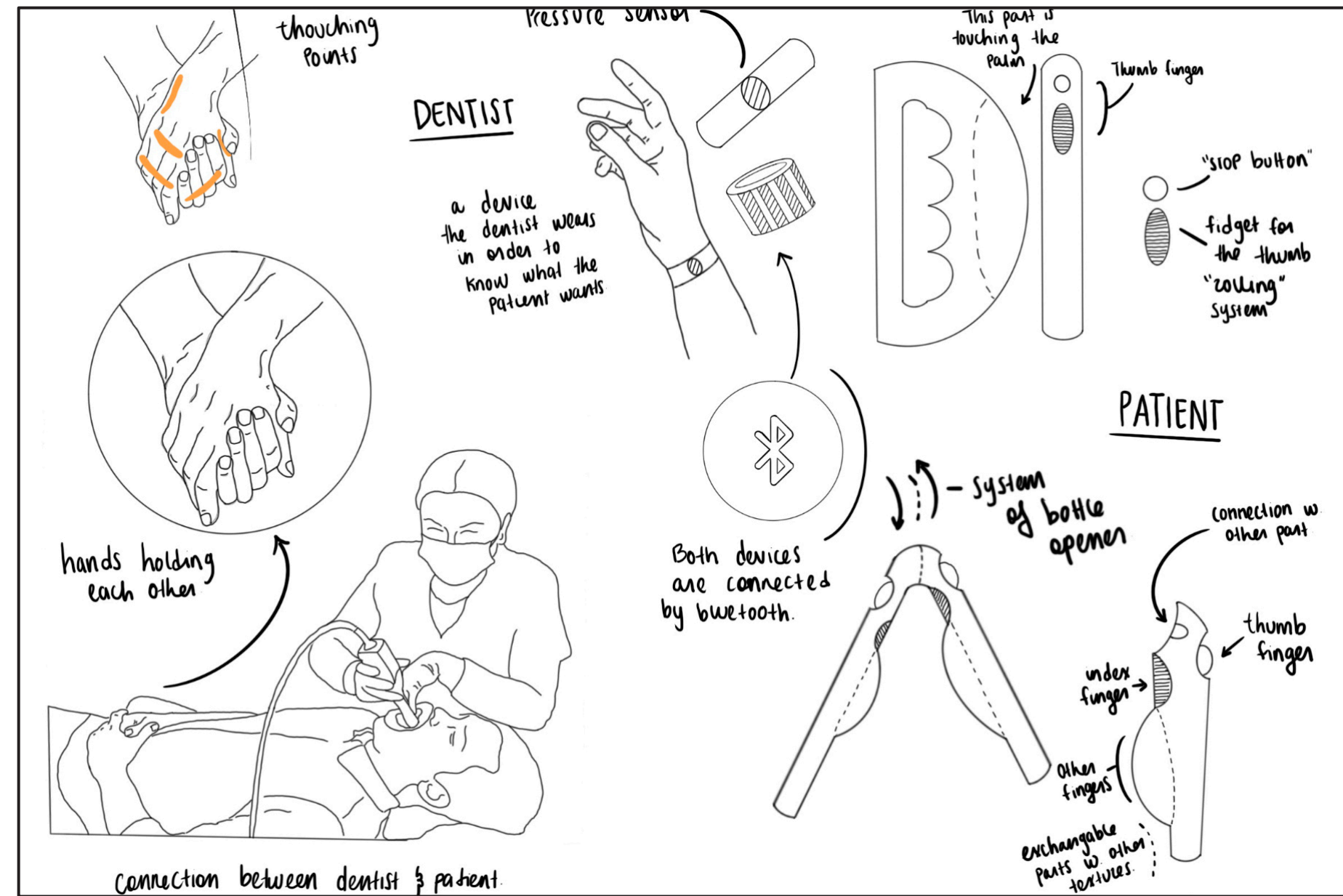
relaxation & distraction

The Material

- Medical material
 - Soft, smooth, hard.
 - The wrist sensor could be elastic in order to fit all types of sizes. Otherwise it could be exchangeable.

The Texture

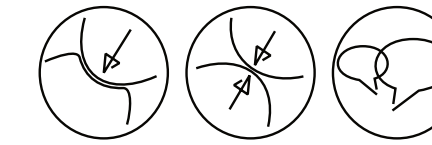
- Take into account the areas where you percieve pressure when you're holding someone's hand. Perhaps those areas could have a different texture.



The Importance of Holding Hands

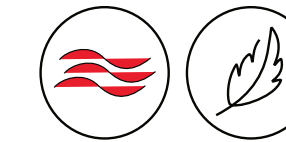
As children we grab our parents hand when we are scared. It gives us the feeling of security if we are facing a situation we don't like or we don't feel comfortable.

Physical



Movement:

- pressure
- resistance to my pressure
- response to my own movement



Sensation:

- warmth
- softness

Emotional



Not being alone:

- I feel more secure
- I feel protected if someone is (going trough this) with me
- I can ask for help, because someone is near me

Having a connection with someone:

- I can let someone else feel, how i feel
- I have support



Reasons to grab a hand in the childhood (that could be important in the dental practise):

- Talking to strangers
- Being in an environment that I don't know
- seeing something for the first time
- Something hurts
- Something scares me

What we want:

1. Reduce the stress that comes with responsibility:

Medical professions are structured hierarchic, in consequence the doctor, or in our case the dentist, is the person with the last word. He or she decides on what the practise is focusing, how it is designed, how tasks are distributed, and at the end how patients are treated.

Of course this hierarchy comes with advantages, but one drawback is, that the dentist can't just concentrate on treating cavities. He also needs to fulfill loads of other tasks, including to ensure the wellbeing of the patient.

Practising dentists are not trained in patients psychology and mostly act intuitively. Some do it better, some worse. This situation can result in stress, not only in the patient, but also in the dentist.

With our device we want to give the dentist the opportunity to hand over parts of his task to monitor and interpret the patients behaviour.

2. Pave the way for empathy:

The dentist can comfort the patient if he has an understanding attitude for the patients problems. Of course he has to ask for the patients needs, in order to create a calming setting.

As a patient you want to feel in good hands. But not every person can create an environment where you can comfort yourself in the desired manner.

Dentists that have a hard time to get in touch with their patients, can try our device. It sets up a nonverbal communication path between the patient and the dentist and makes sure the dentist does not miss signs of stress and pain.

With a firm handshake the dentist can create an environment of empathy and trust from the beginning. Our device can keep up this connection between the dentist and the patient during the treatment.

3. Enhance communication:

Good communication is a key element in comforting the patient. Every step of the treatment has to be explained, so that the patient knows what is laying in front of him.

But even if the dentist gives his best in explaining all the instruments and treatment techniques, the patient probably still has a question.

To express the need to talk during the treatment is a bit awkward for the patient, since his mouth is quite too full to talk properly. Our device features a function to put a hand up (not literally, but virtually) and thus to ask for a brake to relieve his inquisitiveness.

4. Create a connection:

The patient probably wants to be brave and suppress his pain. But that does not help to enhance the quality of the experience. The better the dentist knows about the patients state of mind, the better he can react, and comfort the patient.

We want to address this dilemma with the second future, that creates a connection between the patient and the dentist. It transports the stress and pain level of the patient to the dentist. Then he knows about it and can grant a brake or direct some kind words to the patient.

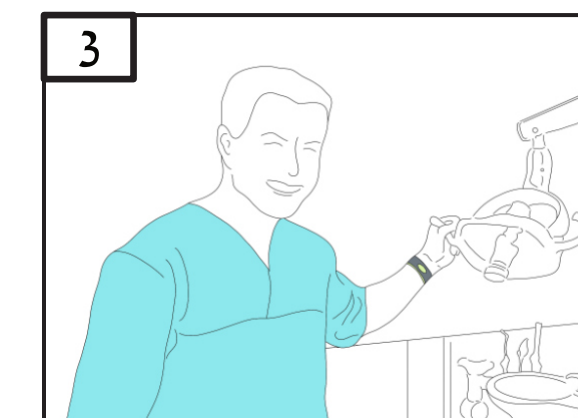
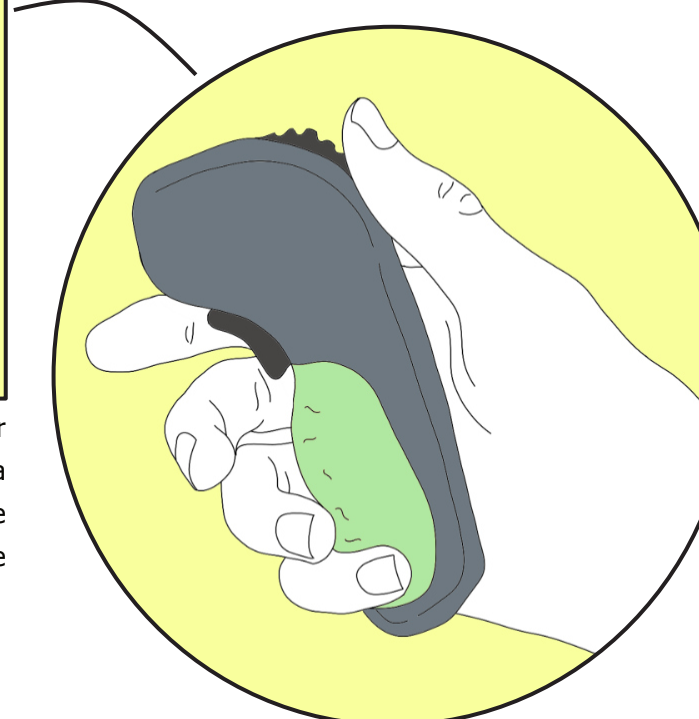
Scenario using device



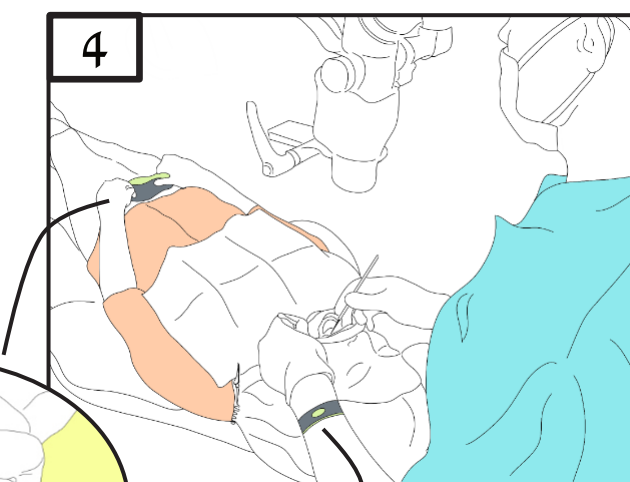
1 Cristina arrives at the dentist. The secretary asks her to wait in the waiting room, the doctor's assistant will come for her.



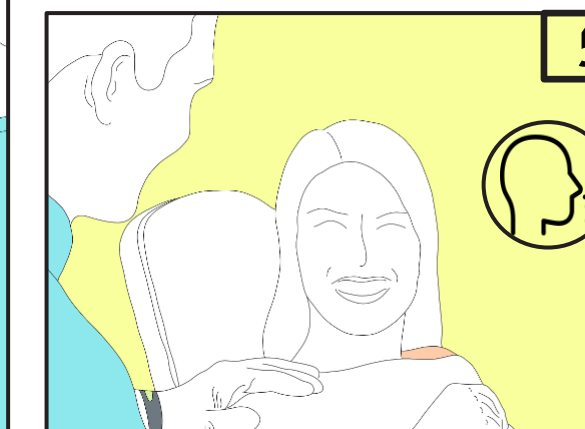
2 The assistant goes with Cristina. She sits down next to her and explains the new device that will help her have a better experience while in treatment. She explains the functions of the device and asks her to feel comfortable with it before entering the room.



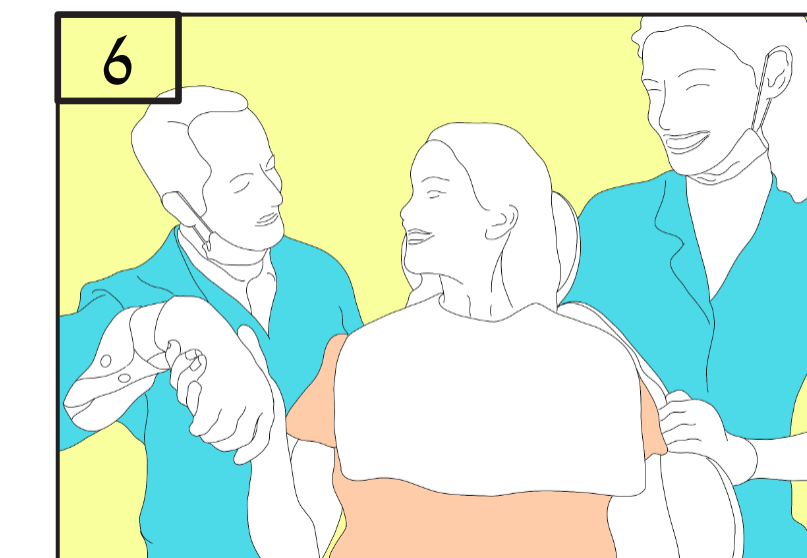
3 Dentist Martin gives Cristina a warm welcome and explains the procedure he will perform.



4 Martin starts the procedure. After a few minutes Cristina begins to feel pain and uses the device for relief. The hand device sends signals to Martin's bracelet, squeezing his wrist. Making him stop the treatment and let Cristina calm down.



5 After two minutes break, Cristina tells Martin that she is feeling better and that they can continue with the treatment.



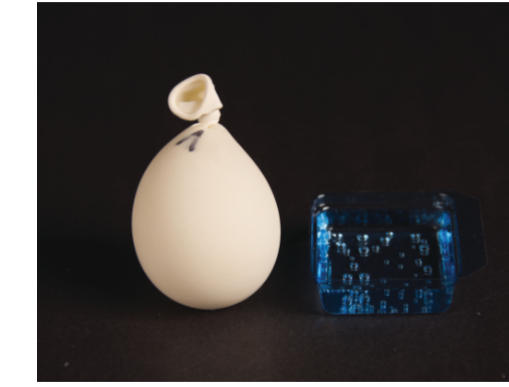
6 After finish the treatment, Cristina notices that the new device makes a connection between her and the dentist. Making the experience more personal.

The device acts as if it were someone's hand. Making the patient feel that he/she is not alone. On the other hand, the dentist's bracelet acts as if he can feel what his patient is feeling. Making a closer connection between dentist-patient.

Testing Textures



Camila Gutiérrez & Christian Barteld



Water



Clay with water



Packaging of Foam



Mashed Foam



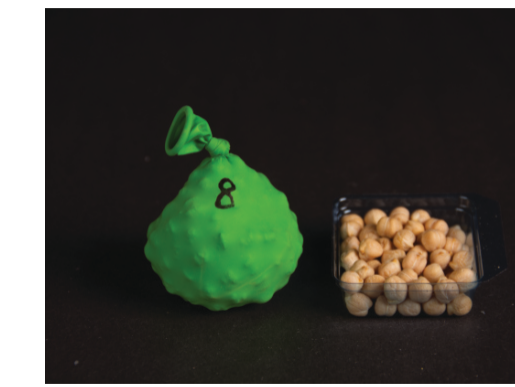
Lead Salls



Chia



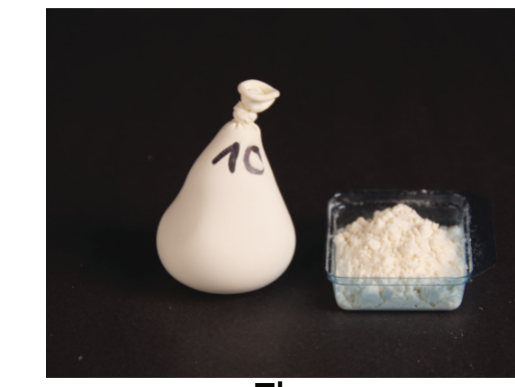
Nylon Textile



Kirchen Ebsen



Maiz



Flour



Rice

This experiment was to find out which texture is more pleasant to hold. We gave the balloons to different people to give us their opinion about which one they liked the most.

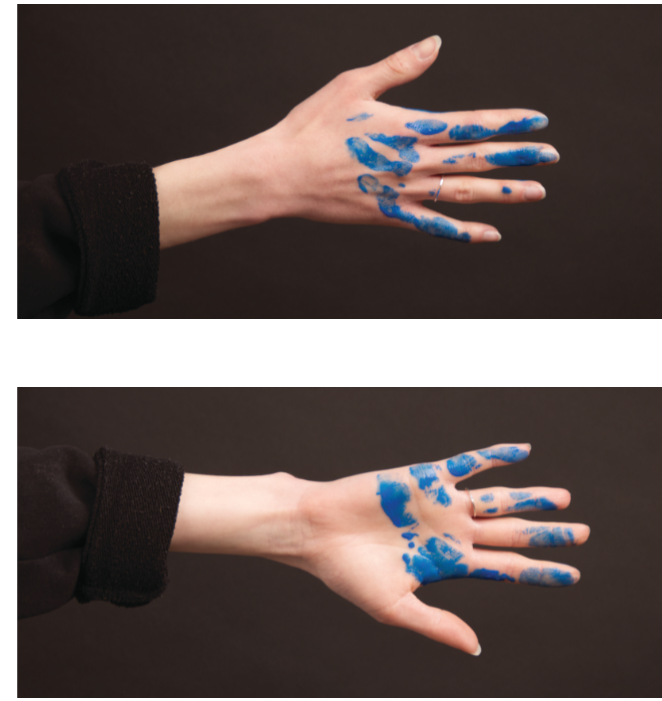
The majority voted for the rice balloon (No. 11)

Hand experiment

We did this experiment with the purpose of being able to recognize which parts of the hand tend to be more sensitive when holding another hand.

This experiment served as inspiration for the design of the device shape.

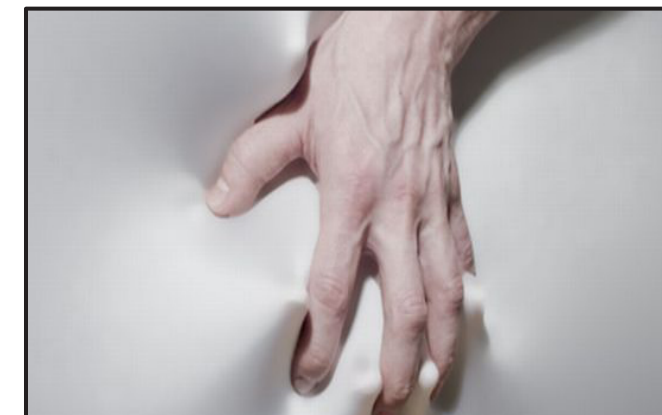
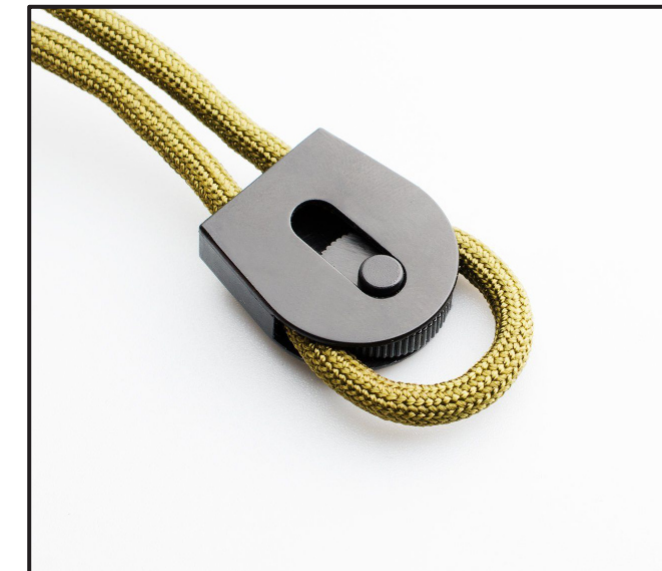
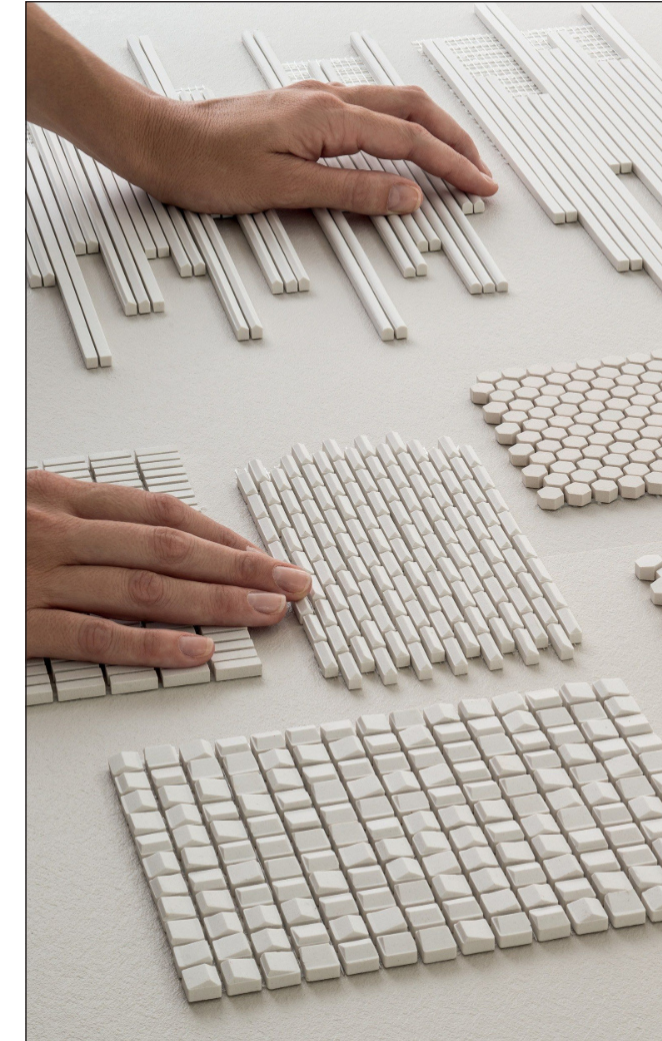
Based on the samples obtained from both the texture and the key points of the hands, we started to design the shape of our device.



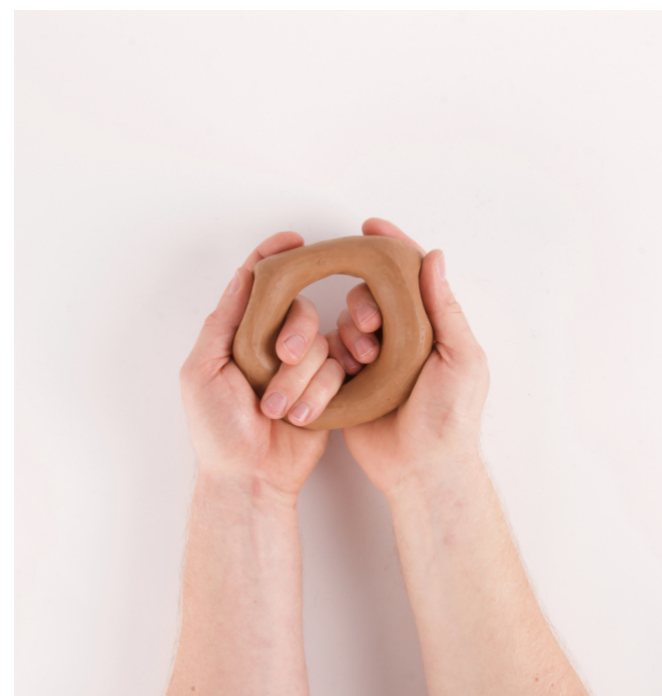


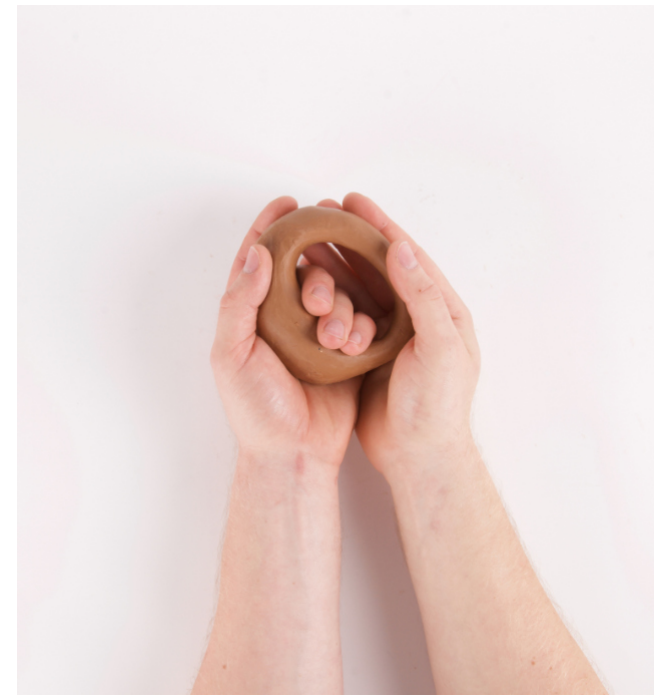
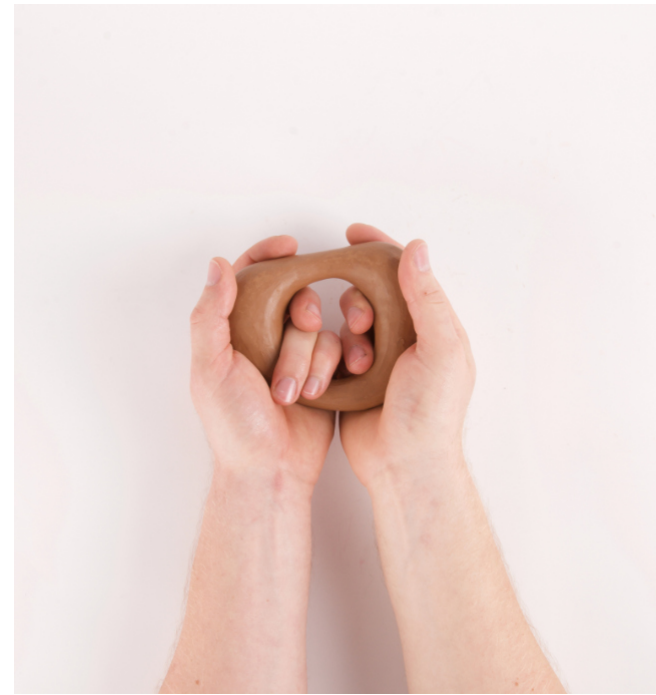
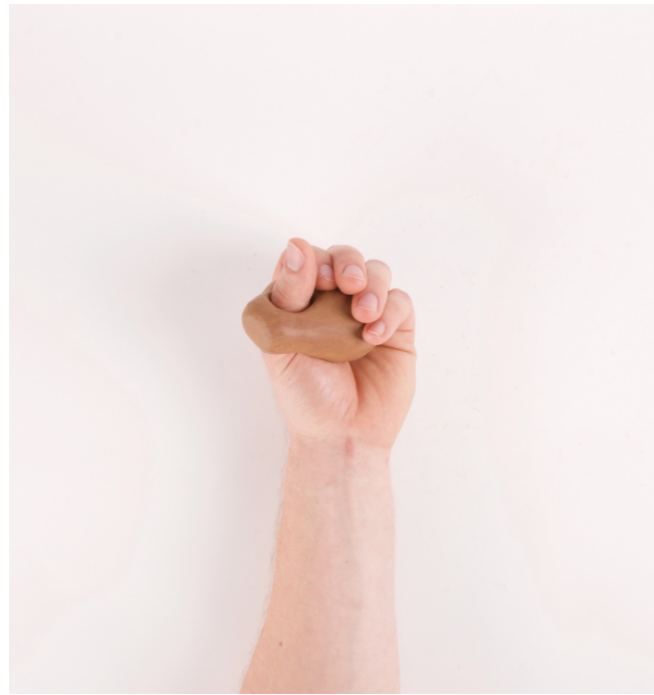
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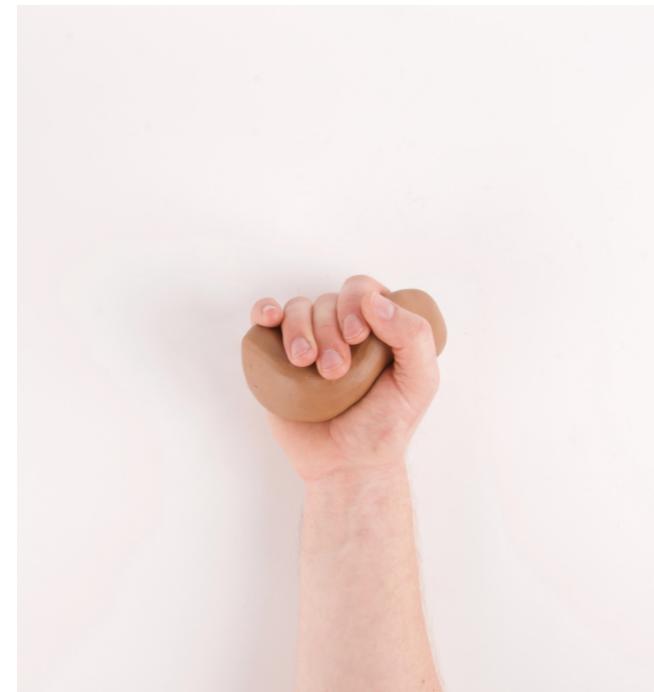
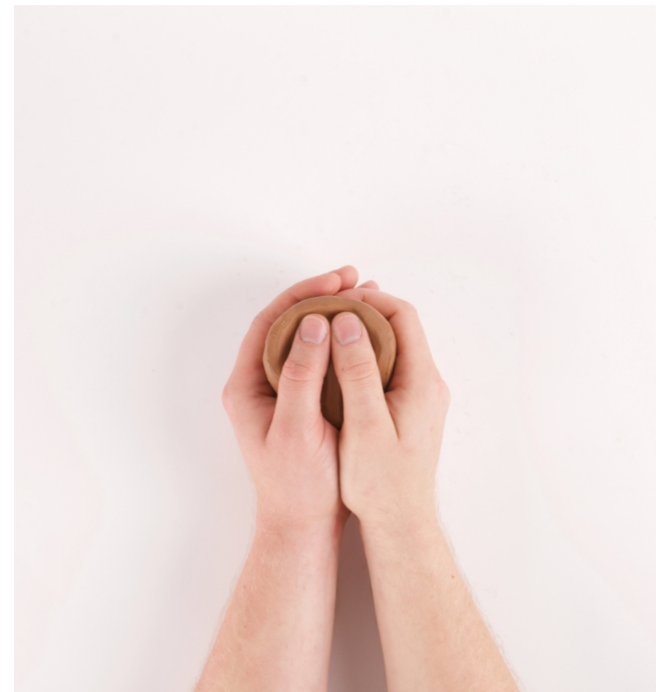
Aesthetics Moodboard

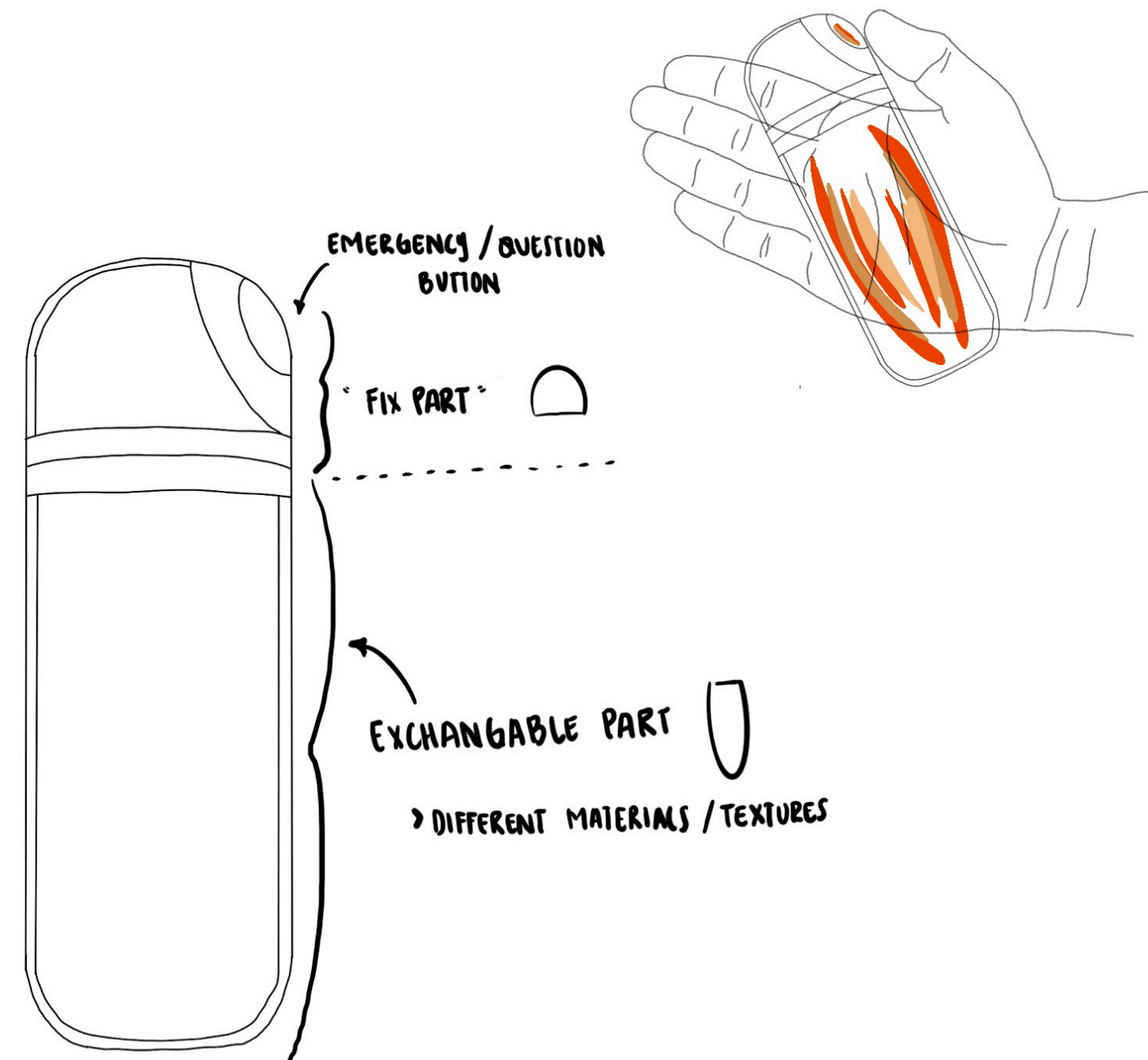
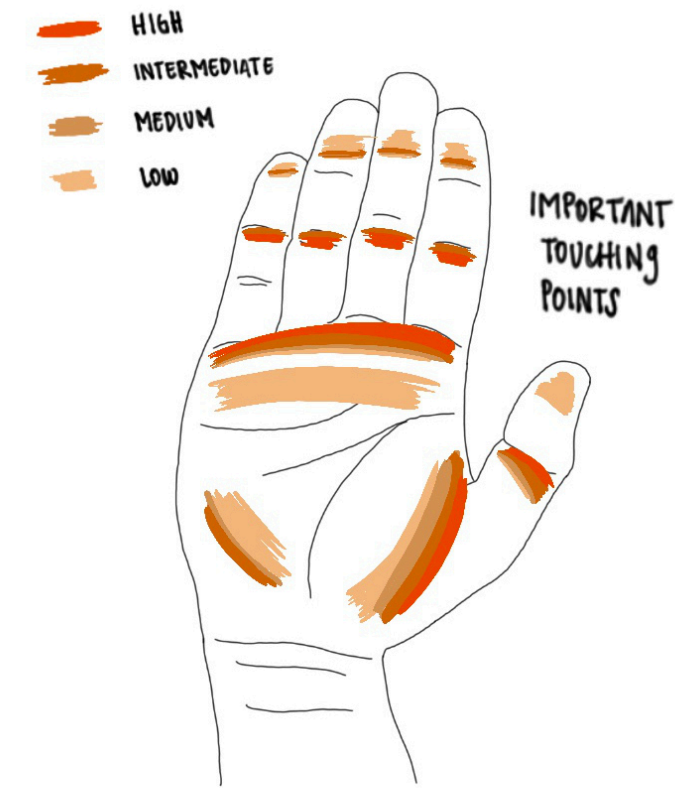


Exploring Forms









After experimenting with several forms, we decided to go one step back and use a basic form, a modified cylinder.

We realized that this shape would suit different types of hand, large, medium or small.

Our goal from the beginning was that the thumb could have the power to press the button, while the remaining 4 fingers could squeeze the other part of the device.

We consider that this form really fits our ideas and needs.

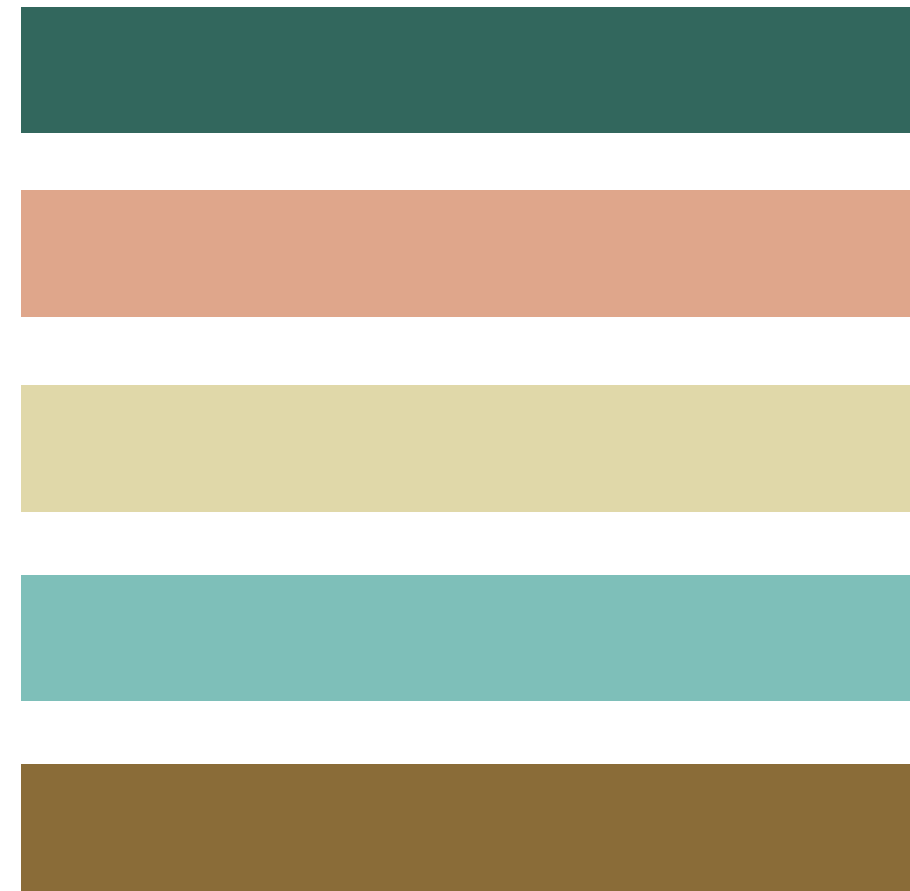
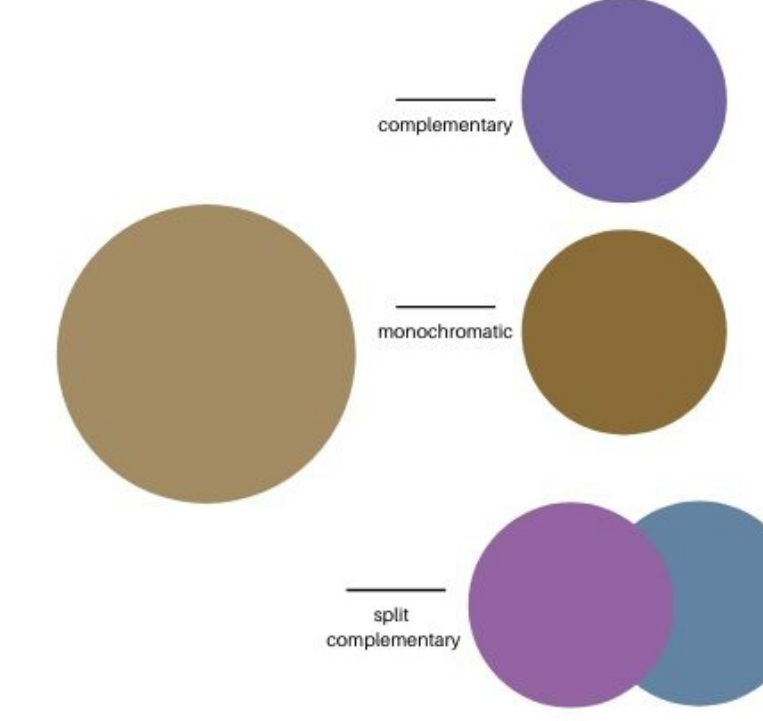
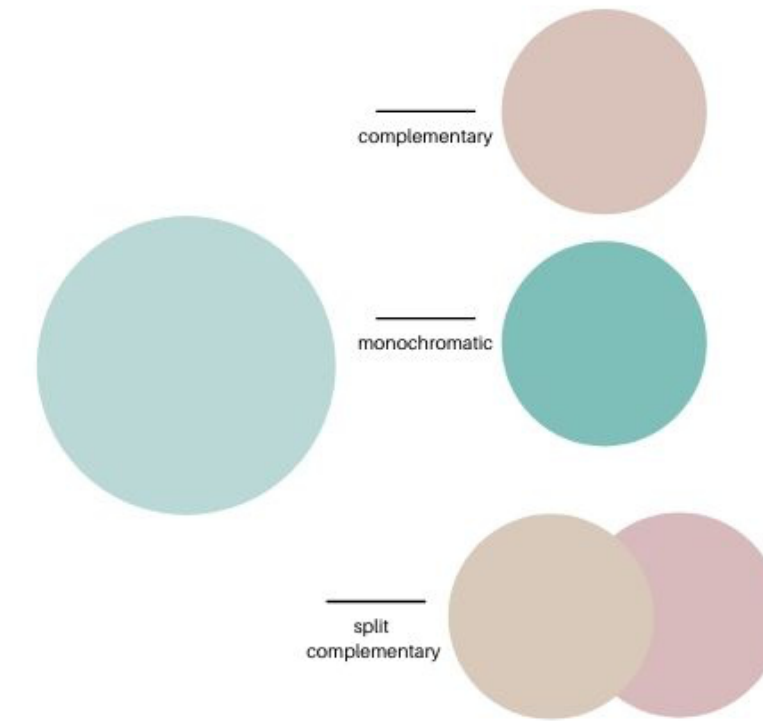
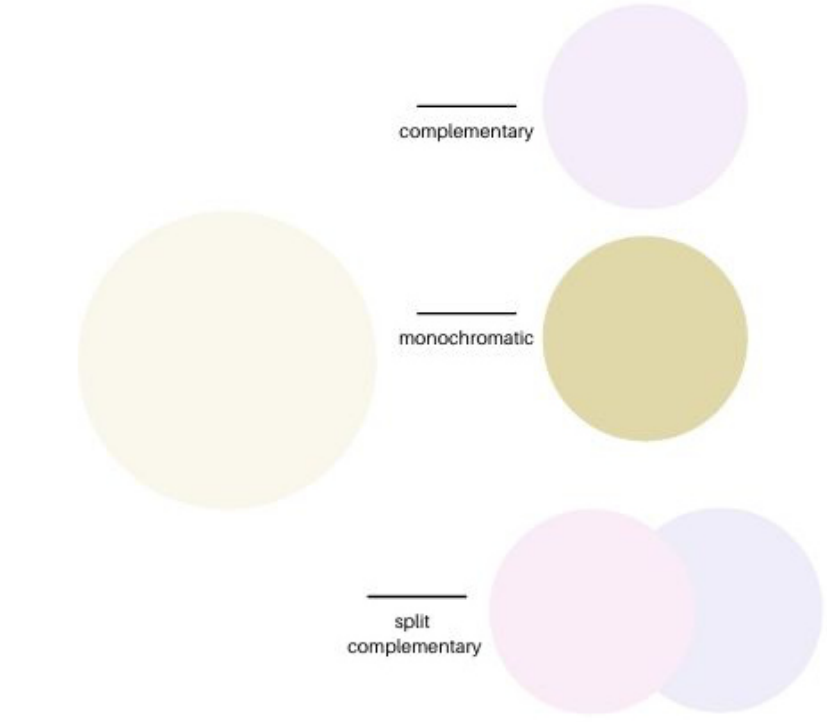
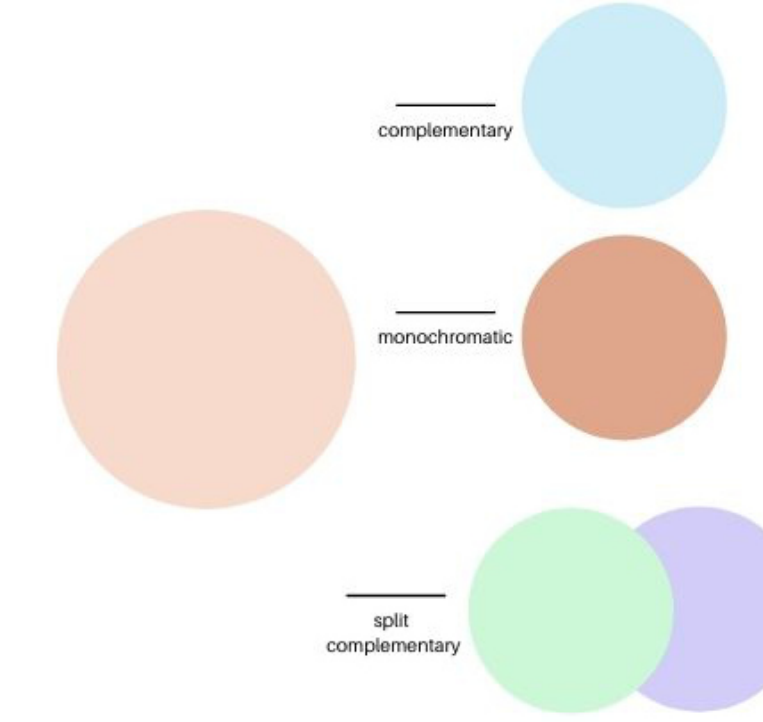
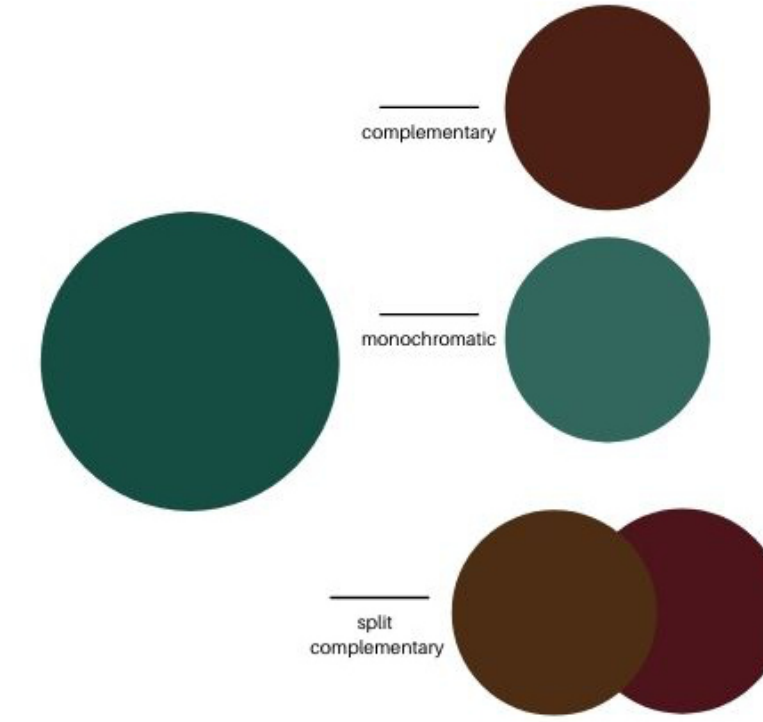
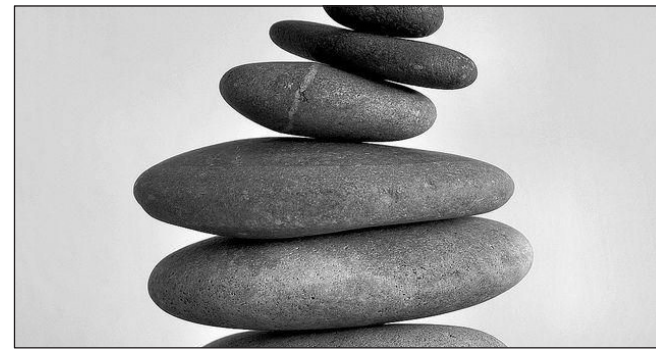
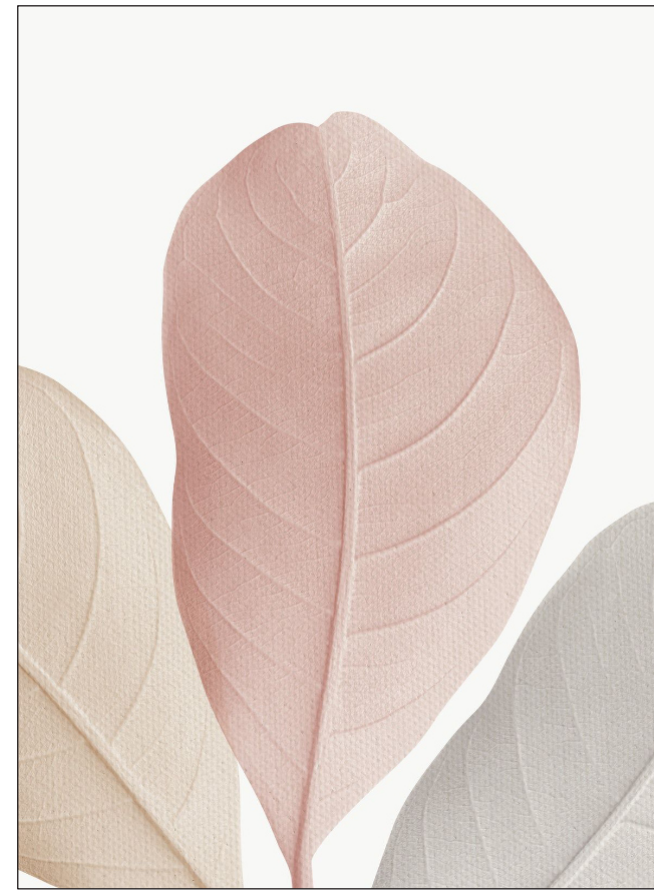
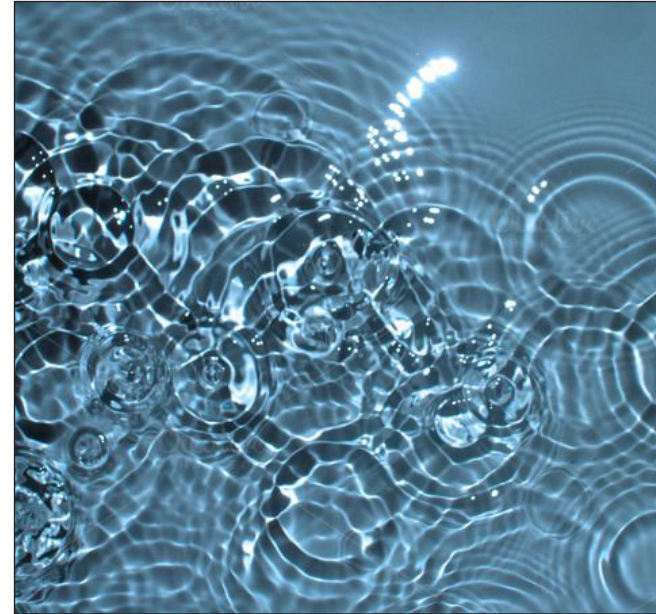
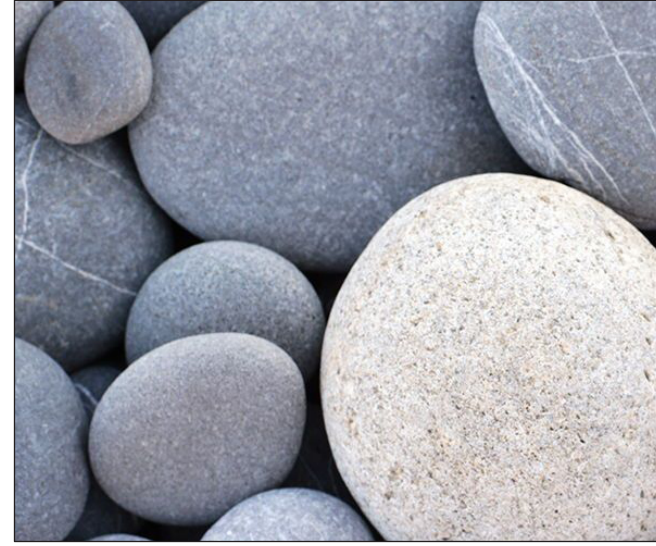
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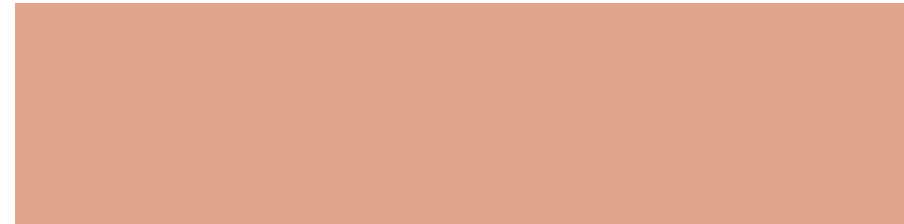
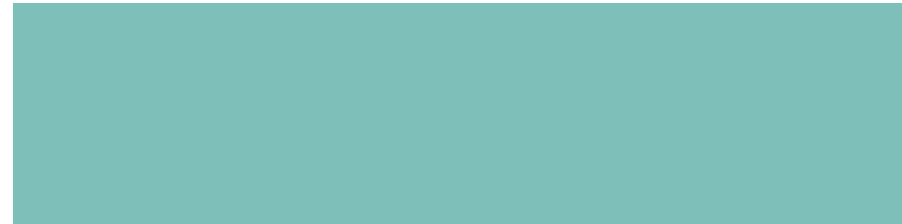
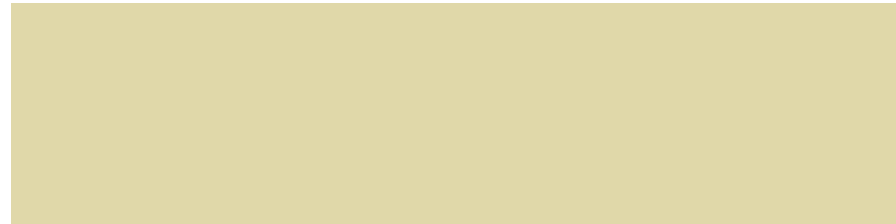


Prototype experimentation: 3d printing the top and baby socks for the bottom.

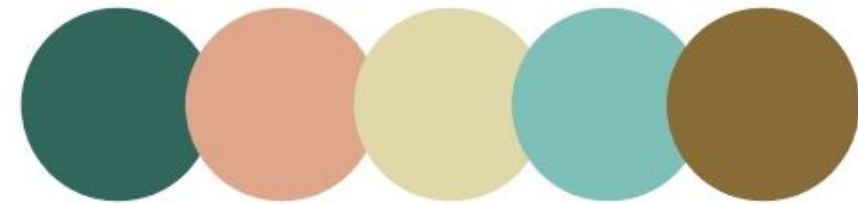
This prototype helped us to get a clearer picture of our idea, the feeling of having something soft on the bottom and a hard part with a button on the top.

Colour Moodboard



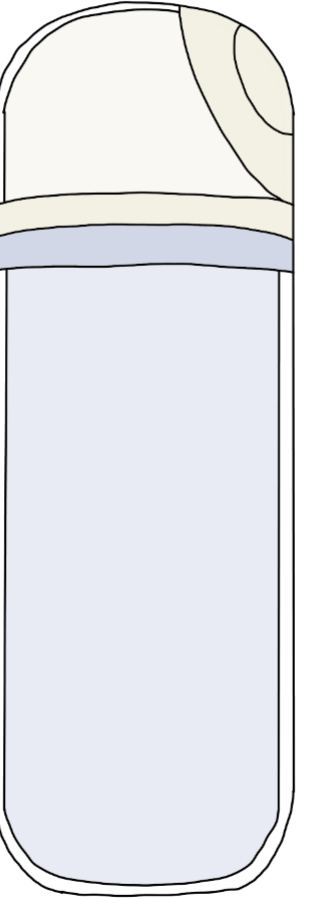
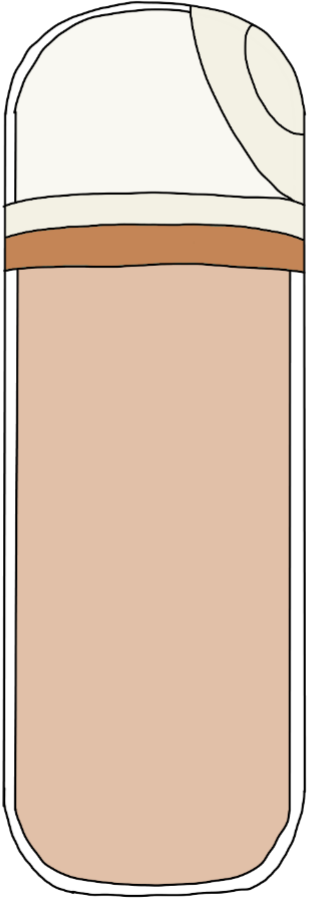
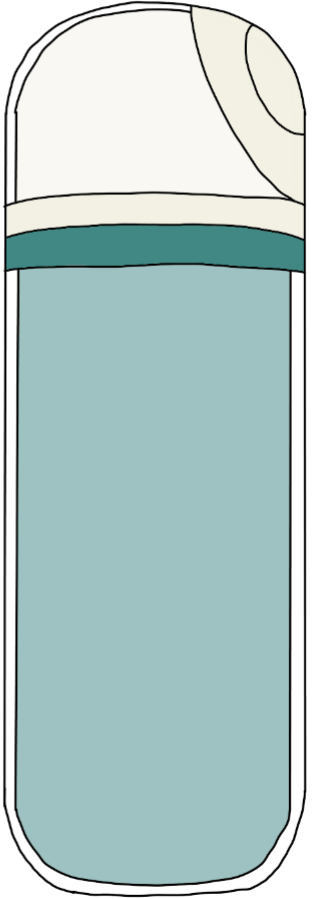


Our color palette is friendly and approachable. Warm, muted colors creating a sense of calm. At the same time considering the medical area.



We chose 3 colours for the device: turquoise blue, light pastel purple and a sandy yellowish brown.

The idea was that the material that is inside the silicone (bottom) has these colours. The colour is blurred and desaturated a little bit by the silicone. While the fixed part with the button (top) is white. At the connection of the upper and the bottom part, we decided to leave a ring without silicon cover, so that the colour can reveal its true tone there.



Process of the final model

First we tried to produce the silicon molding forms on the lathe, since they are all rotationsymmetric. But that turned out to be trickier than we thought and we had to change plans.

Therefore we produced the forms as 3D prints. The prints are neat and only needed some sandblasting to get the desired surface quality in the silicon forms.

A lot of fiddling around and testing out different additives and procedures for the molding process, provided us with three usable models.

Lasercutting and painting the Display plate and the inductive charger was routine work, also the painting of the filling materials.

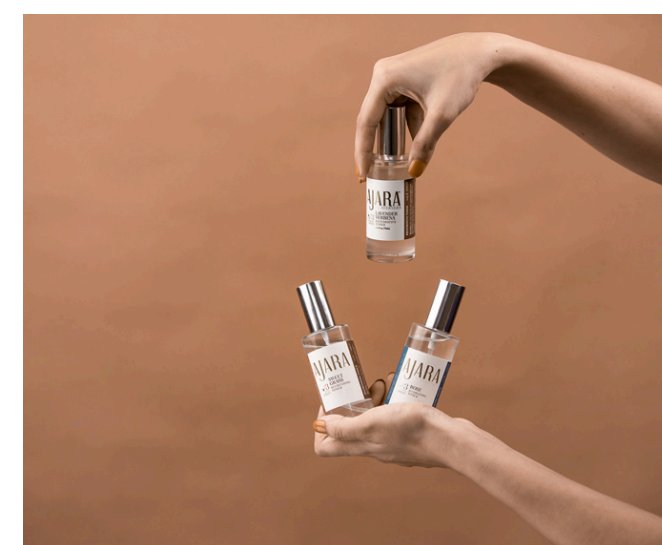
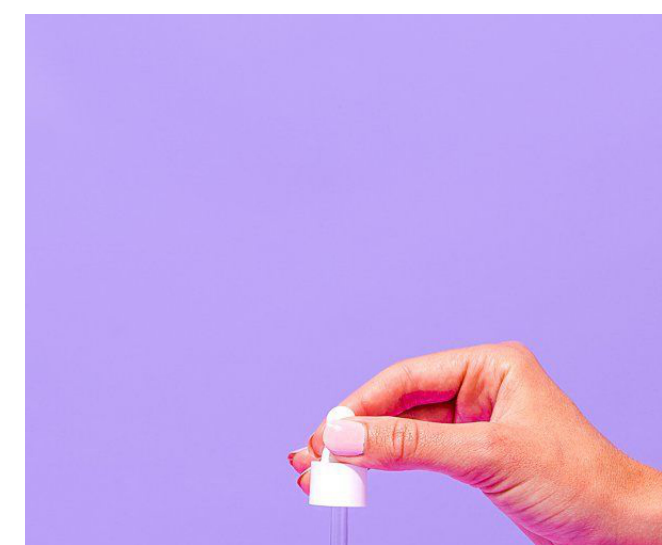
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Video Scenario

<p>*In the background we can hear the sound of the tools.*</p>	<p>Introducing Alivia</p>	<p>To ease the pain, affected patients are provided with Alivia...</p>	<p>Patients can relax and distract themselves by being able to squeeze it the way they want it.</p>
<p>It communicates the degree of pain to the dentist. By activating the stop signal to request an immediate interruption of treatment.</p>	<p>This signal is deliver by small vibrations to the wrist band of the dentist, letting the dentist know the request.</p>	<p>Once the dentist stops the treatment, Alivia will activate a one-minute breathing system. Giving the patient a break to relax.</p>	<p>Once the break is over, the dentist may return to continue treatment.</p>
<p>We designed Alivia with fearful patients in mind. To make them feel secure and comfortable.</p>	<p>It has an easy assembling system using magnets...</p>	<p>and comes with three different interchangeable textures. In addition, it also counts with a wireless charger and an easy material to clean...</p>	<p>With Alivia, we improve the dentist-patient relationship and encourage dental health.</p>

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