HANDY

SMART SUPPORT FOR MEDICATION ADHERENCE

BRIEF

The CHI 2016 Student Design Competition challenged contestants to “do good” through Assistive Technology. I worked in a team to tackle this challenge for people who must regularly take medication, but often forget. Following a user-centred design process, we proposed the conceptual design for Handy, a device that mitigates forgetfulness by monitoring its user’s contextual cues.

NOTE

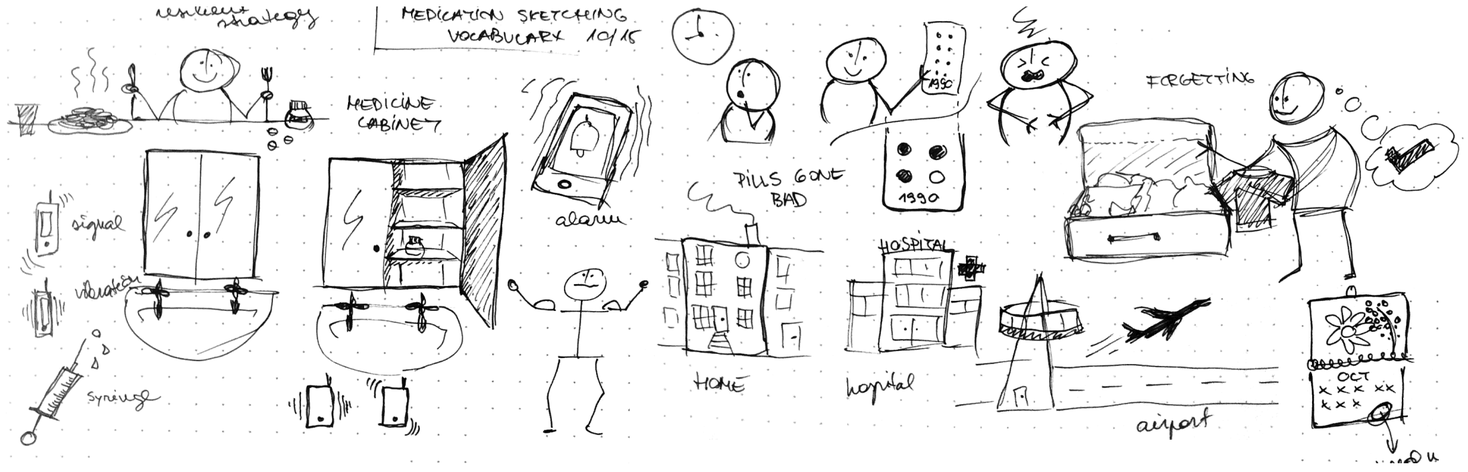
For illustrative purposes, some artefacts produced by other team members have been included in this document. In such cases, figures are marked with this icon:

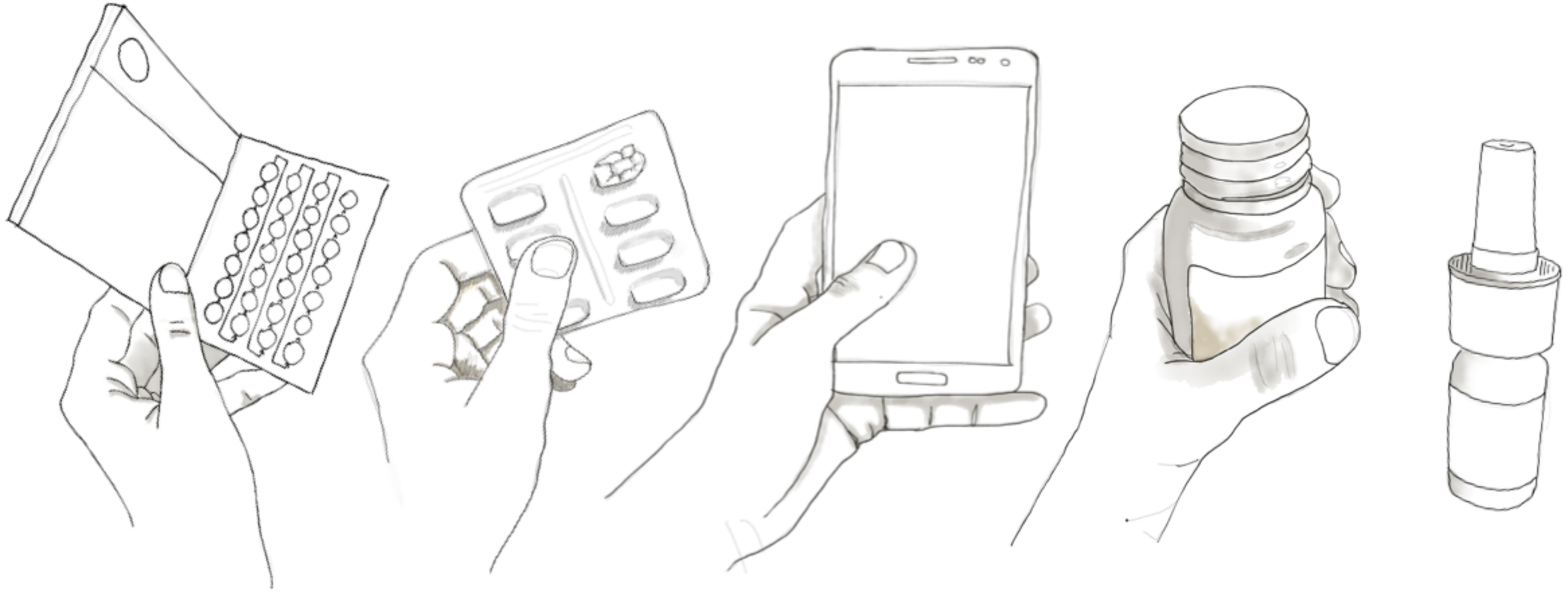
DEVELOPING A SKETCHING VOCABULARY

→ Sketching various concepts related to medication adherence

↓ Examples of photo tracing

To practise different sketching techniques in our problem domain, I prepared for the project individually with some preliminary sketching exercises. I practised rapid sketching by illustrating different concepts related to medication and medication adherence. To create a toolbox of reusable sketching elements, I took and traced photos of objects that I anticipated to recur in our artefacts.





USER RESEARCH

"The alarms can't change according to my routine every day."

GOAL

To understand the medication adherence experiences and needs of our target audience

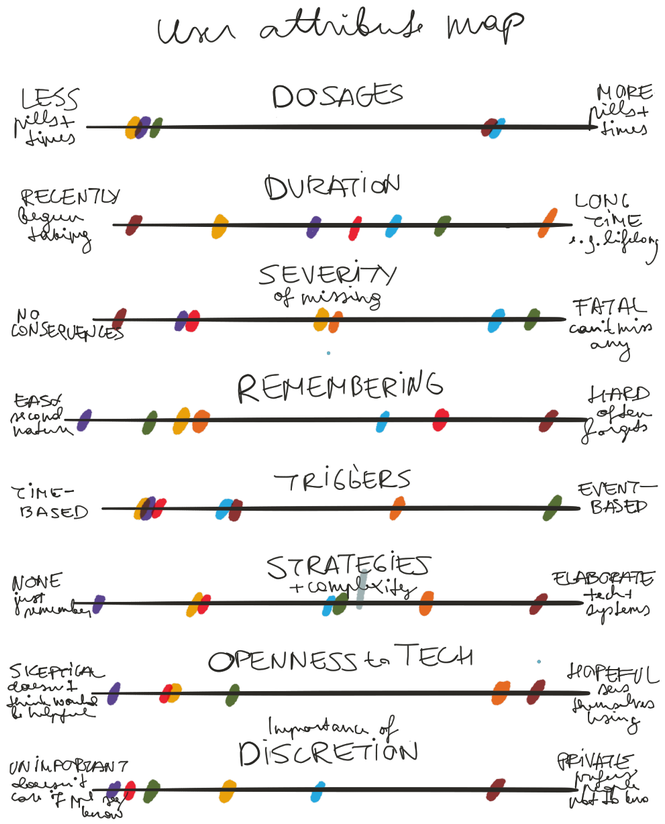
PROCESS

For our first research activity we conducted seven semi-structured interviews exploring the habits, struggles, and strategies that accompany medication adherence, and participants' experience with and attitudes towards technology. We also included an ethnographic component by documenting where our participants keep their medication (meaningful locations that play a role in adherence strategies).

The interviews highlighted the need to support existing strategies and routines: time-based reminder apps were considered both disruptive and ineffective in the context of changing routines.

MY ROLE

I took part in collectively preparing the interview questions, conducted a portion of the interviews, and analysed the data by identifying main themes and creating a user attribute map. I also created the two contrasting personas – heavy and light users of medication – that were referred to throughout the duration of the project.

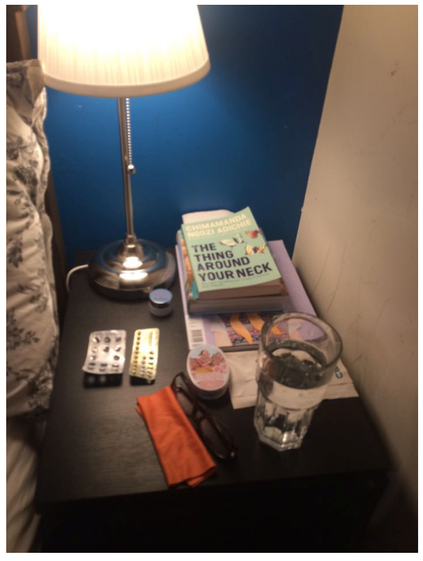


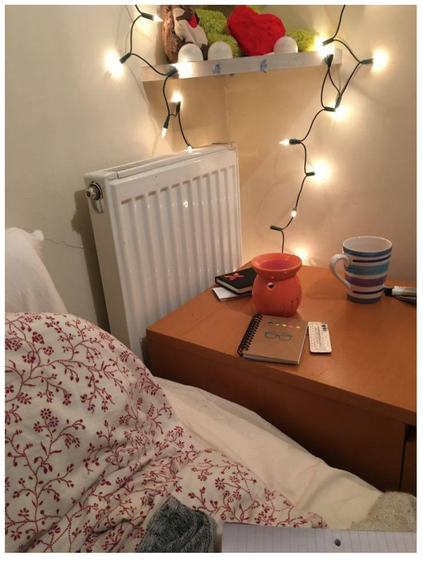
↑ A quote from one of the interviews

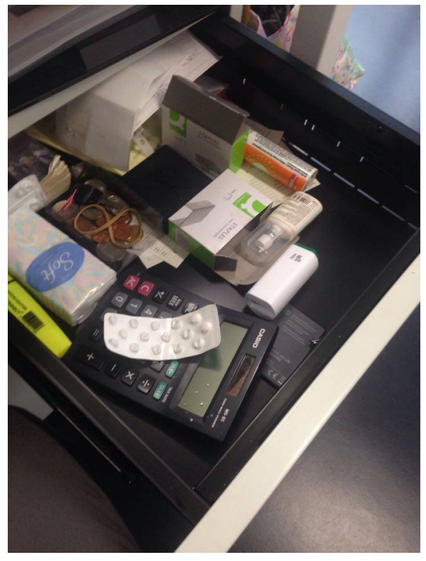
← Personas

↱ User attribute map

→ Locations meaningful to our participants







MARKET RESEARCH

↑ Product placement along the axes "portable - stationary" and "time-based - event-based"

↱ Affinity diagramming

→ Examples of wearable devices on the market (screenshots from www.kickstarter.com)

GOAL

To position our design appropriately among existing solutions

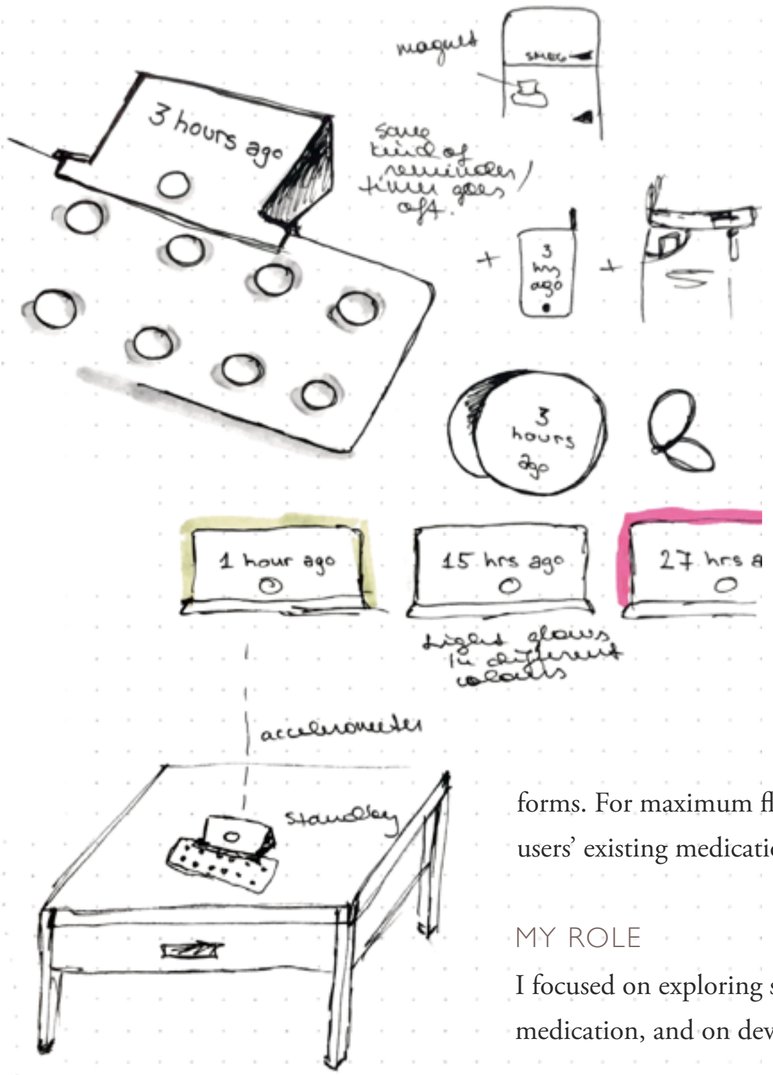
PROCESS

Many applications and devices are already available to help users cope with their regimen; a range of wearable devices not related to medication adherence but potentially relevant to our design can also be found. We surveyed the functionality on existing apps and devices; along with data from our interviews, we used this survey to create affinity diagrams. As the main outcome of our research, we identified a gap in the market where there is a lack of portable and event-based solutions.

MY ROLE

I took part in reviewing existing wearable devices on the market.

EXPLORING DESIGN DIRECTIONS



GOAL

To explore various directions for the design of a medication reminder technology

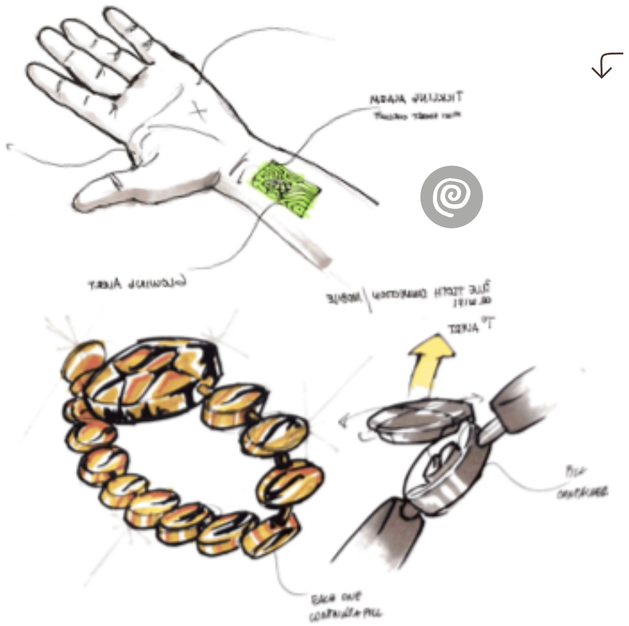
PROCESS

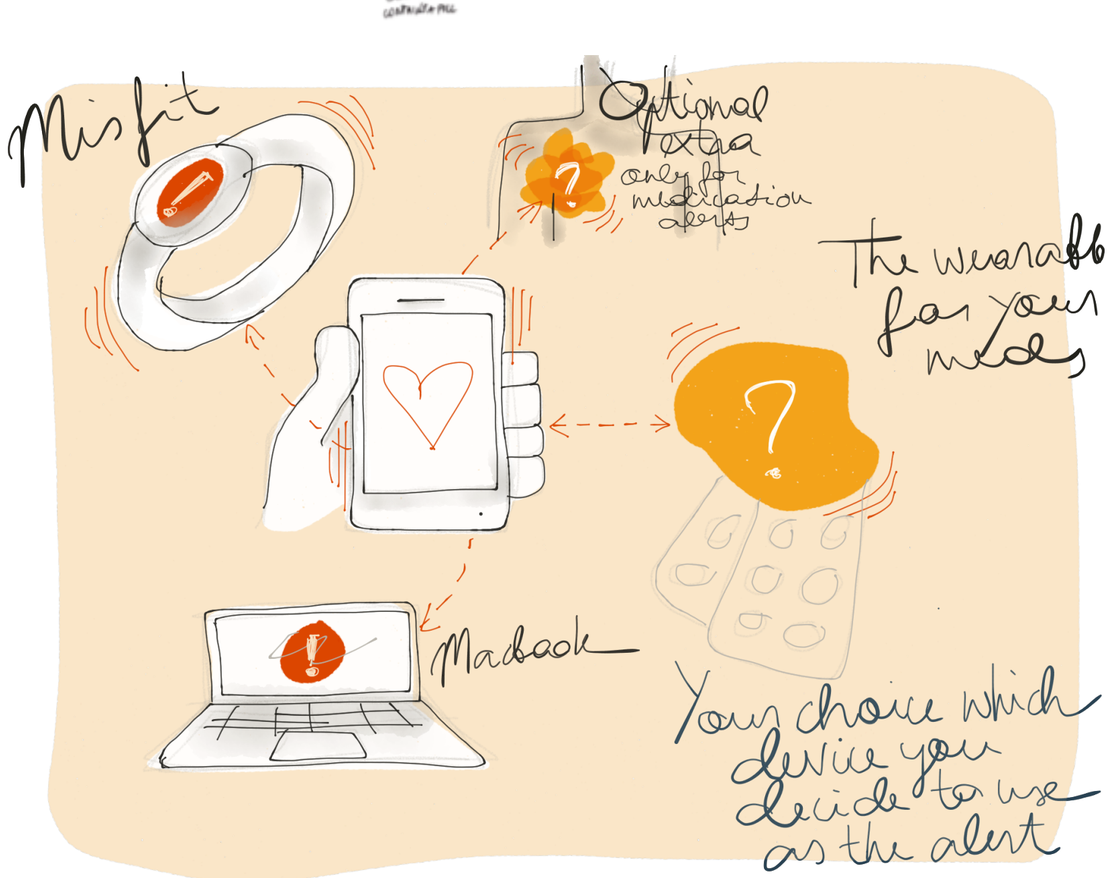
We began the design process on a highly conceptual level: we envisioned the metaphor of a "helping hand", there always and only when needed. This ensured we all had the same high-level goal in mind.

Having established the solution must be portable, we began exploring design directions for such a device, keeping also in mind how it would detect administered doses. Ideas included wearables inspired by existing alerting devices, vibrating skin patches, and smart pill boxes in various forms. For maximum flexibility, we settled on a device that attaches to users' existing medication containers, and connects to their smartphone.

MY ROLE

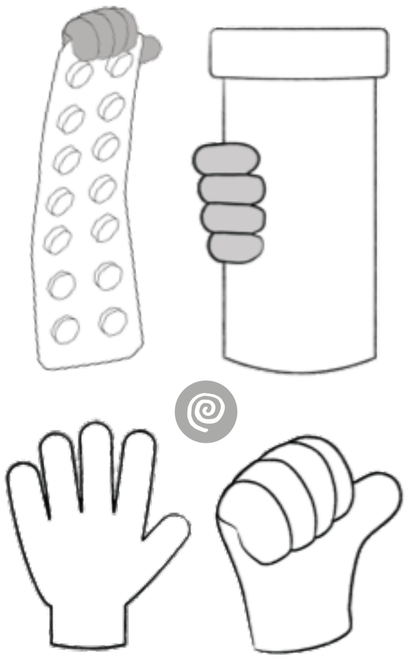
I focused on exploring solutions where a device is attached to the medication, and on developing the final component map.





Examples of different design directions

A visualisation of the component map I proposed: the device channels data to the smartphone app, which can in turn channel alerts to other devices owned by the user.



FURTHER EXPLORATION

GOAL

To explore designs for a device that can attach to any medication container

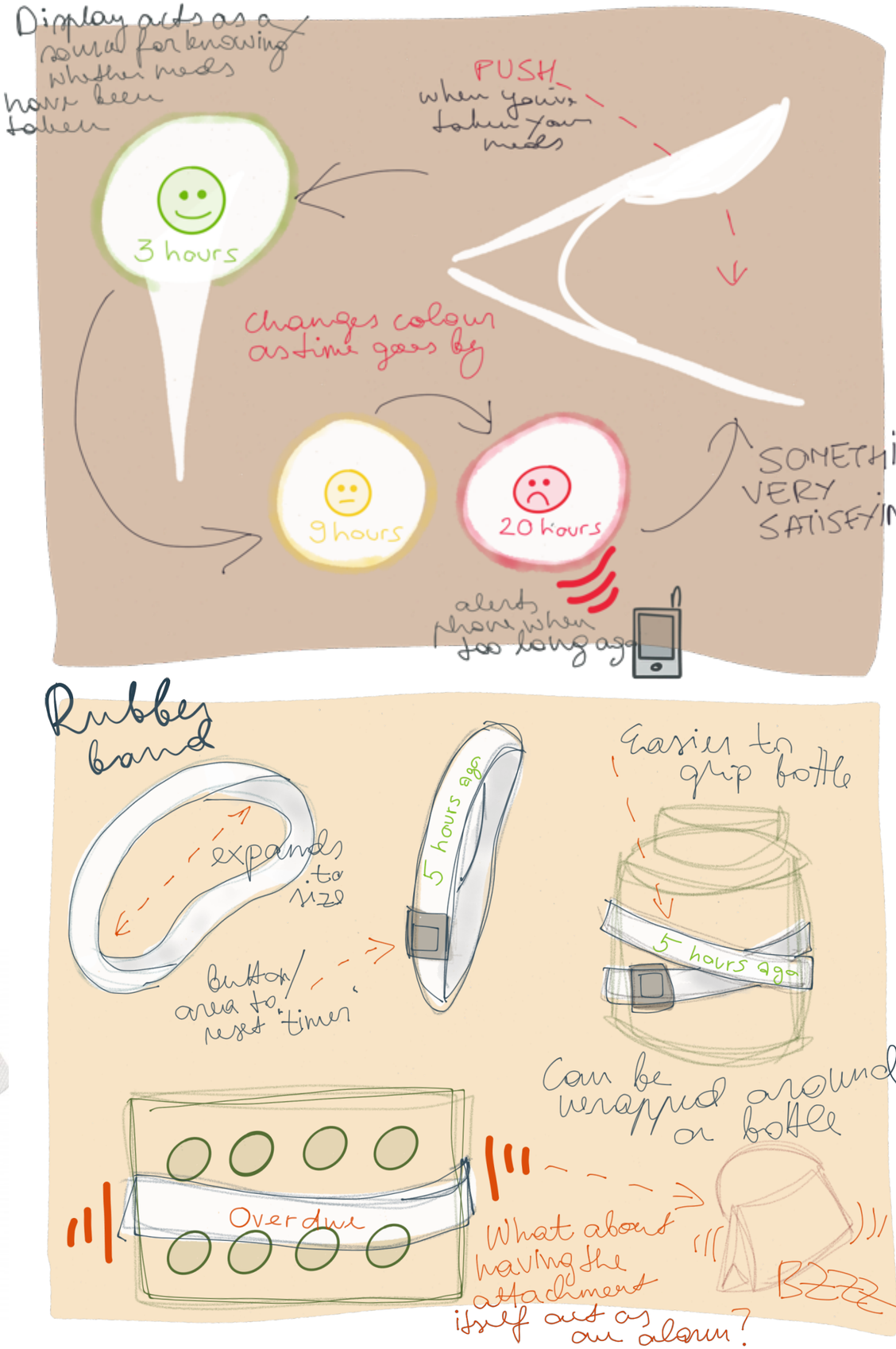
PROCESS

Our research made us aware of the variety in the medication people take and how they keep their doses organised. The challenge here was to design something that could be affixed to any container.

MY ROLE

I surveyed the most common types of medication containers and administration devices, exploring different attachment methods.

↳ ↱ ↑ Exploring ways of attaching various elements to pill containers, including clips, pins, stickers, and the first occurrence of the sticky hand concept



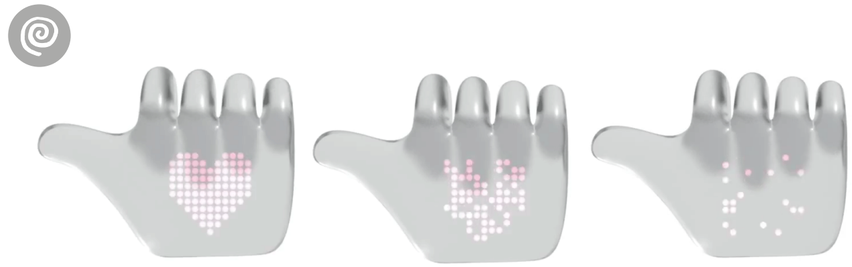
→ Stills from an animated digital prototype illustrating one of the feedback visualisations

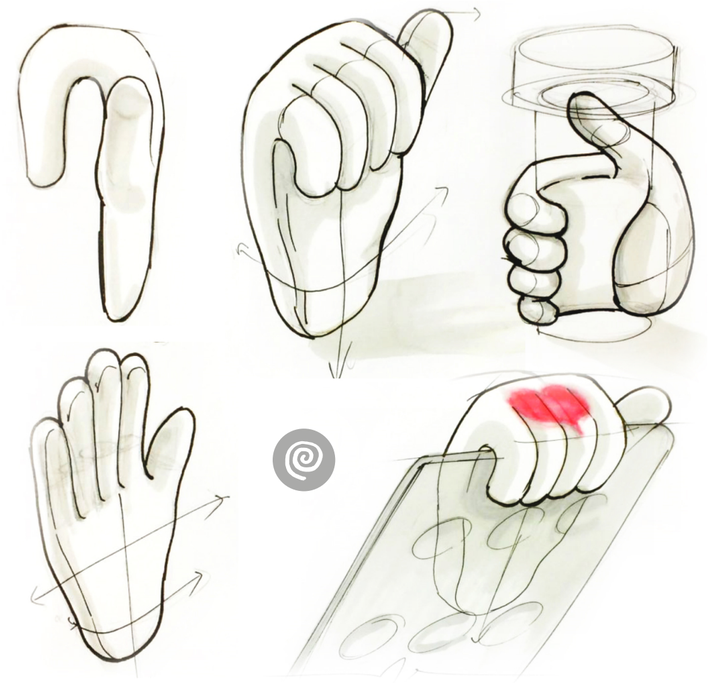
⤵ Examples of feedback visualisations

↓ A refined representation of Handy

⤷ Physical prototypes sculpted from thermoplastic

SELECTION + REFINEMENT





GOAL

To refine the design of Handy; to think about look & feel, and secondary functionality

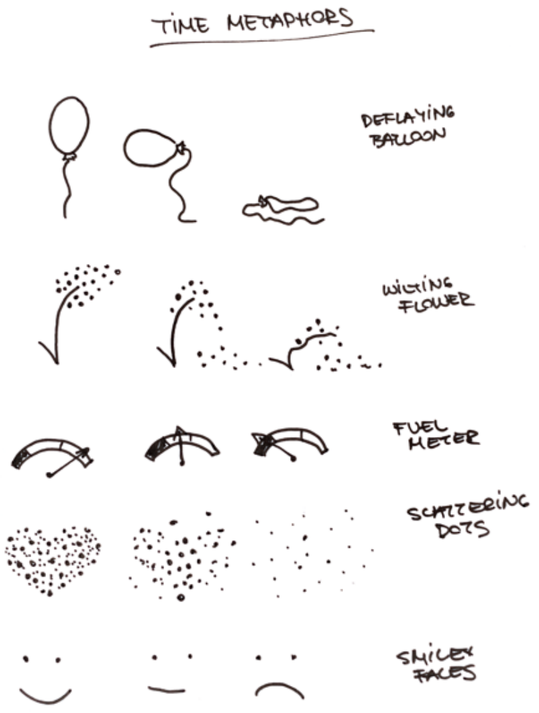
PROCESS

We were now at the stage to begin refining the design of an attachable hand: how the adhesive would work, what kind of display it would use, what information the display would show, and how the user could interact with the device.

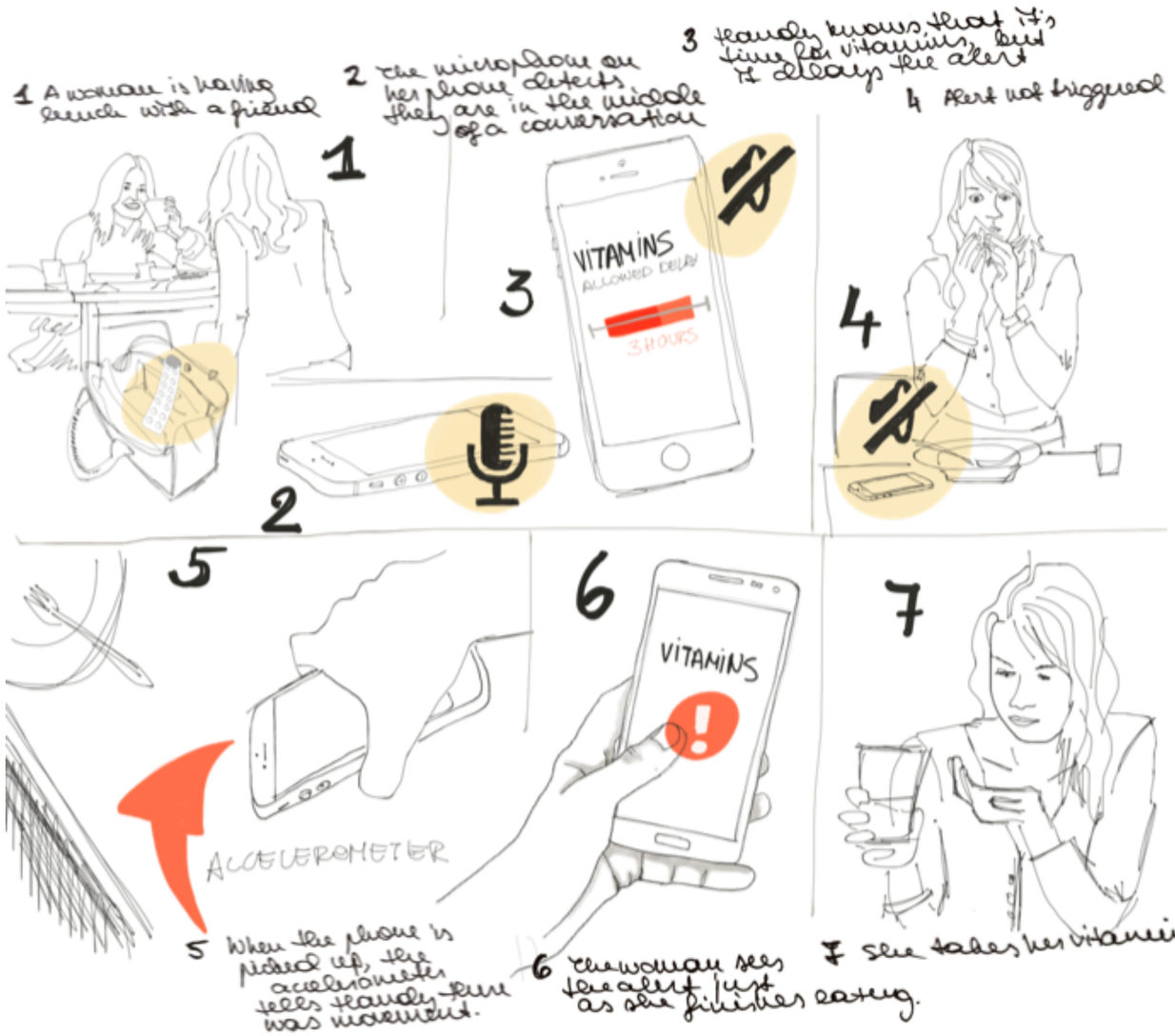
MY ROLE

I collated examples of visual metaphors for time and duration that would at a glance convey whether a dose is due or has recently been taken.

Using thermoplastic, I also built physical prototypes with the main aim of testing the feel and fit of the device at different sizes.



CONTEXTUAL SENSING SCENARIOS



↑ Audio and movement detection so that alerts are not triggered in the middle of lunch with a friend

→ Proactive alarm triggers on a long-term flight where the user is unsure of the current time

GOAL

To explore how machine learning features can be applied to trigger just-in-time alerts

PROCESS

From our research we had determined that alerts must be non-invasive and timed to individual routines.

These are non-physical features; we therefore opted to explore designs using storytelling.

MY ROLE

I wrote various use case scenarios for Handy's contextual sensing features, and created storyboards to accompany some of them.

"I think it's really great, because you don't think, it thinks for you."

"I'm just not keen on the shape... It's a bit weird, the hand, but I think the rest is good."

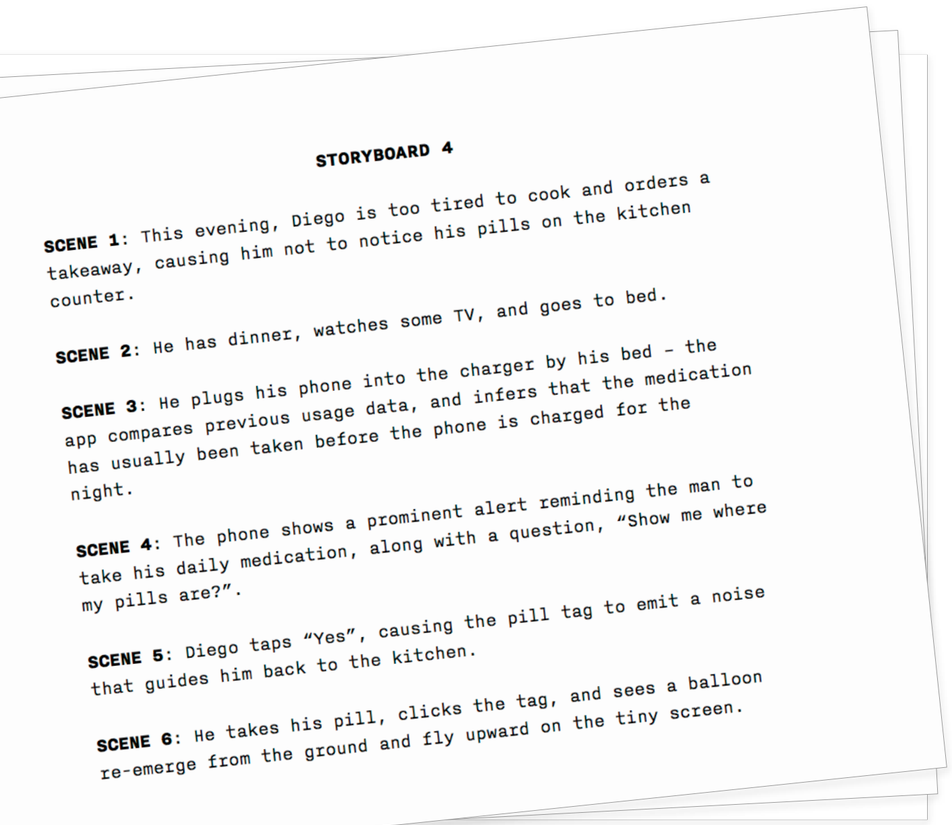
EVALUATION

GOAL

To validate our preliminary design ideas, and to obtain a direction for future work

PROCESS

Because our work until this point had been mainly conceptual, we opted to evaluate it using storyboards (physical prototypes had not yet been created at this point). By helping our participants visualise how Handy could be useful in everyday situations, and have them reflect on these situations from their own point of view, we were able to understand how it would fit into existing strategies, as well as where it is lacking.



STORYBOARD 4

SCENE 1: This evening, Diego is too tired to cook and orders a takeaway, causing him not to notice his pills on the kitchen counter.

SCENE 2: He has dinner, watches some TV, and goes to bed.

SCENE 3: He plugs his phone into the charger by his bed - the app compares previous usage data, and infers that the medication has usually been taken before the phone is charged for the night.

SCENE 4: The phone shows a prominent alert reminding the man to take his daily medication, along with a question, "Show me where my pills are?".

SCENE 5: Diego taps "Yes", causing the pill tag to emit a noise that guides him back to the kitchen.

SCENE 6: He takes his pill, clicks the tag, and sees a balloon re-emerge from the ground and fly upward on the tiny screen.

MY ROLE

I was responsible for creating the scenarios used in the storyboards we presented to participants, and conducted a portion of the evaluations.

↑ Quotes from evaluation interviews

← Scripts written by me to inform storyboard scenarios

← A still from the video

↓ Organising the canvas for filming

PRODUCT VIDEO

GOAL

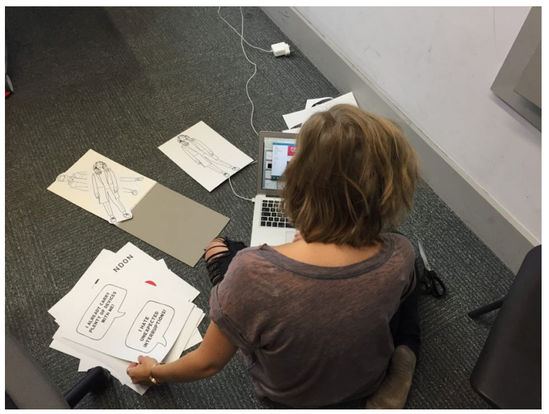
To present out design proposal in an engaging and informative video

PROCESS

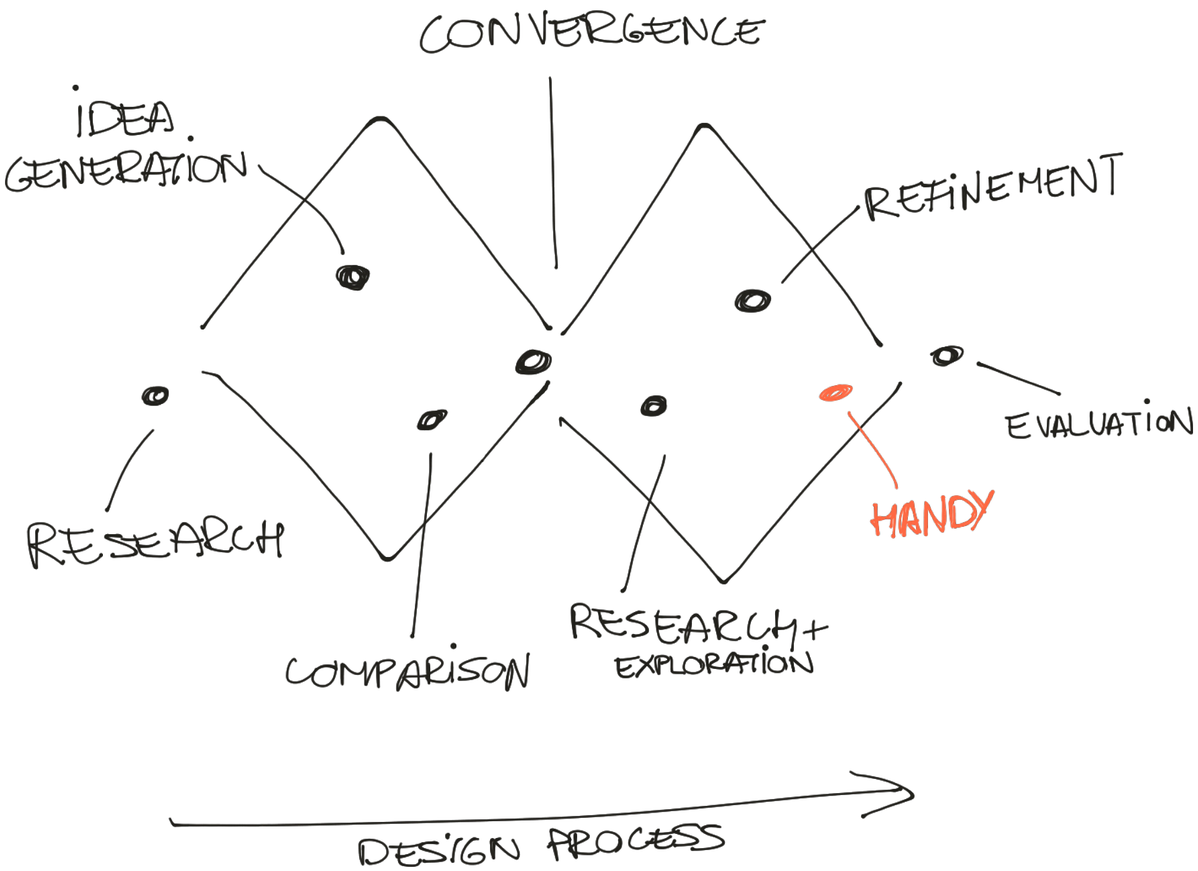
For the design proposal video, we opted to go for a sketchy look where instead of human actors paper-personas explain the use of Handy in various situations.

MY ROLE

I refined the script for our video and took part in the filming process.



THOUGHTS ON PROCESS



Our teamwork was organised such that a diverge-converge double diamond workflow emerged quite organically. Diverse ideas and design approaches were put forward during meetings: we were committed to have the right design before attempting to get the design right.

Even so, our workflow would have benefited from more iterations during not only idea generation, but research and evaluation, too. Retrospectively, some iteration, such as quick and dirty validation of design ideas with few participants, could have been undertaken even within our tight time constraints.

In addition, 3D prototypes of even the lowest fidelity would have been useful earlier in the process, giving us (1) more expressive artefacts for evaluation with participants, and (2) guidance for thinking about materials and technical feasibility. The lack of detailed understanding of how the device would physically attach to containers was a distraction for many of our participants when evaluating more high-level features.

← An overview of the design process we undertook, representing in the first diamond idea generation for the type of device we would design; in the convergence point, a consensus to design a device that attaches to existing containers; and in the second diamond, further diverging ideas for the various forms such a device could take.