

Relieving gloominess through non-verbal communication and social support from loved ones at a distance.

Hey, how are you?

10:30

Relieving gloominess through non-verbal communication and social support from loved ones at a distance.

Relieving gloominess through non-verbal communication and social support from loved ones at a distance.

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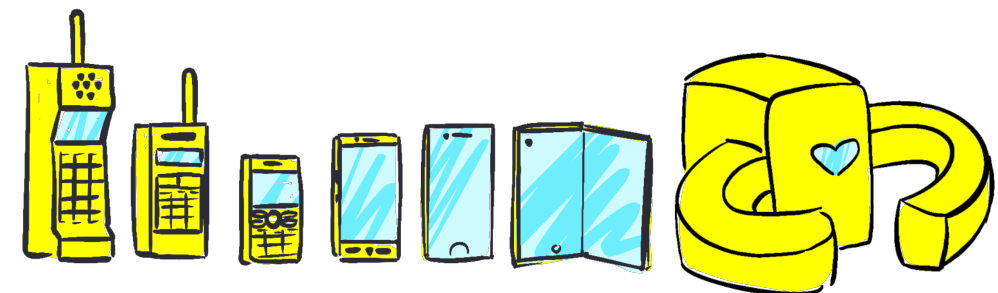




Figure 1 | Hugging Uppie

Preface

Dear reader,

This report will show the results of my graduation project; “Relieving gloominess at a distance”, a design-oriented project focusing on showing a final concept for loved ones in a gloomy mood and how they can receive support from their loved ones to start relieving this mood while being at a distance from each other. This thesis has been written as part of my graduation project for the MSc Design for Interaction at Delft University of technology.

This project was based on my own interests, as I am interested in how people communicate over a distance. I figured it would be nice to end my study with a project focused on this topic, especially after the COVID epidemic, where we all had to live more distant from each other. Therefore, I would like to thank my chair, Aadjan van der Helm, for taking on this project. As well as my mentor, Haian Xue, to show interest in guiding the project. Together we formed the initial scope for this project during several meetings before the official start. Especially the beginning of the project was difficult; as my interest reached a broad area, it was hard to define a direction for this project. This project started with the focus on making the end of a phone call between loved ones more remembering to focus on designing for loved ones to be able to regulate their gloomy mood through non-verbal communication and social support when at a distance. The start of this project was quite difficult; it was hard for me to narrow down a specific path as I wanted to yield as much as possible from this project to learn more about the behaviour of people and the mechanisms that support particular behaviour. I could say that I sometimes did lose track. Trying to deliver your last project as a student can be stressful; learn new things, and make the most out of the project. Luckily, I had good support in doing so.

First, I would like to thank my chair, Aadjan van der Helm, and mentor, Haian Xue, for their guidance during this project. Especially at the start to define the direction of this project, and for their support in still letting me continue this project, even till there might have been some doubt in if I would get back

on track to finish this project. I want to thank them for their interesting insights into the project and, finally, help me get close to writing a thesis I can be proud of.

Secondly, I would like to thank the people I worked with at StudioLab when prototyping the final design of this project. They showed great support in letting me borrow technical components, providing interesting information to help me connect, and significantly helped in finding errors in the code of the final design to make the final design function for user testing. And this helped me develop new skills that made me grow as a designer.

Thirdly, I would like to thank all the participants who participated in this project’s user research. I want you to know that I am grateful you shared your experience with me during this project, even though it was probably far from easy to dive into your gloomy experiences. Hearing and reading about this was extremely helpful for me in understanding a gloomy mood and designing to enhance the experience of loved ones connecting over a distance from each other.

Lastly, I would like to thank my family and friends for always being there for me and trying to help where possible and being a distraction from this project from time to time when a break was required. Your support motivated me to continue with this project during difficult times. Thank you all for talking with me about the project, sharing your opinion, having coffee breaks, giving moral support when necessary, and reading through the text to make it more readable. And most of all, in doing fun activities to prevent gloominess. A special thanks to Gwendolyn for modelling with the final design to create beautiful interaction images. And a special thanks to Violet; I think I would still be doing user research if you did not come back from Italy.

I am happy to share this work with you, and I hope you enjoy your reading.

Hannah



Figure 2 | Having fun while hugging Uppie

Executive summary

This report shows the design research to let a person in a gloomy mood regulate this mood by supporting their loved one over a distance. Our loved ones play a crucial role in our happiness by regulating interpersonal affect to maintain and build relationships (Niven et al., 2012). Something existing services and mediated technologies do not cover as desired: leaving out the more subtle and often non-verbal communication qualities that bring warmth and positive mood-regulating effects.

To achieve a final design, literature research and user research showed the underlying problem, which formed the following design goal: "Let a gloomy person feel more comfortable sharing their gloomy mood with their loved ones over a distance.". Next to this, the analysis showed four interesting directions for design. Mimicking the in-person way of sharing a gloomy mood through body posture (1). Receiving nonverbal cues of sympathy when initiating contact with their loved one (2). Initiating contact through fun and distracting low-effort activities by changing physical space(3). Normalising sharing of (gloomy) mood with loved ones (4). Brainstorming with two other IDE master students resulted in the final direction of "Receiving non-verbal cues of sympathy from their loved ones while sharing their need for social support in a gloomy mood.", a design direction desirable and feasible for this project.

By ideating, using the non-verbal communication methods of sympathy found during user research, and clustering these ideas, I formed three promising

concepts to enhance the comfort of a gloomy person to share this mood through receiving sympathy from loved ones. These concepts were evaluated through a Harris profile by rating the best fitting and most essential requirements. This evaluation resulted in the final concept direction, which was prototyped further into the final design of this project: Uppie (Figure 2).

Uppie enables a person in a gloomy mood to share their gloominess indirectly by asking for a hug through hugging Uppie. A loved one can respond by giving a hug back, which is felt through vibrations. These vibrations are dynamic and change depending on how the user holds Uppie. A final evaluation showed how Uppie does comfort a person in a gloomy mood to share this mood. They do not have to talk to ask for support. And in hugging Uppie, the loved one shows they have their full attention available, making the gloomy person receive the sympathy and the initial social support of the loved one at a distance. The gloomy person starts relieving their gloominess.

More user research is needed to develop Uppie further and make Uppie available for everyone who would like to hug their loved ones at a distance. Other future studies could be done in different directions of social support to enhance the understanding of how loved ones can show this social support at a distance. Enable loved ones to communicate and stay connected in the physical world, even at a distance.

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1 | Introduction

This report is a Design for Interaction graduation thesis. Design for Interaction is a Msc program at the faculty of Industrial Design Engineering at Delft University of Technology. As a Design for Interaction student I am interested in looking at the way people communicate and design for this. With this thesis I wanted to dive deeper into mainstream communication media, and show how this area can be improved to improve communication between people distant from each other. I initiated the topic for this thesis myself, which resulted in doing research into the topic before the start of the project to come up with a initial project assignment. This chapter aims to give an overview of the project background, the initial assignment, and the projects' approach.

1.1 Project background

1.2 Initial project assignment

1.3 Project approach

1.1 | Project background

This section shows why I initiated this project. Discussing the important role of loved ones, how people start living further apart, and why people keep using current communication media.

Our loved ones play a crucial role in our happiness by being irreplaceable in our daily mood regulation. By regulating interpersonal affect between each other, loved ones can maintain and build their relationship (Niven et al., 2012). Something existing services and mediated technologies do not cover as desired: leaving out the more subtle and often non-verbal communication qualities that bring warmth and positive mood-regulating effects into our lives. For example, a hug feels more wholesome than talking about the problem to regulate gloominess. Current contact over a distance between loved ones mainly consists of spoken or written verbal communication. Looking at globalisation, it is even more likely that loved ones will live further away from each other. It makes it harder or sometimes impossible for people to meet in person and rely on mainstream communication media. This medium does not focus on affective expression and can make it difficult to signal the current mood state to loved ones in their environment to evoke social support (Morris & Reilly, 1987). Something people currently must seek intentionally by using their phone or other mediated technology.

So why would we keep using our smartphones to communicate with loved ones? Besides your phone being the object you use for communication, it is an inconceivable part of everyday life; effortless in use, capable of many functional tasks related to work and private life, a source of fun, and probably even a way in itself to regulate your mood (Dolev-Cohen & Barak, 2013). It is not strange that many people seem addicted to their phones. However, there is a trend in monitoring screen time, showing that people are getting worried about screen time having a negative influence on their life. In addition, research shows that using various social media platforms in a certain way could lead to negative affect (Marty-Dugas & Smilek, 2020).

Lots of companies work on developing new and attractive services and technologies. Contributing to improving the social well-being of its users and using AI in making sure people keep using (Burhan & Moradzadeh, 2020) and buying their service. Presenting the smartphone as the exclusive means of communication. Limiting the solution space for mood-regulation between loved ones over a distance to a screen that can be touched, tilted, broken, or spoken to.

1.2 | Initial project assignment

The problem statement for this project is that current communication media are limited in regulating a mood through the social support of loved ones. Potentially problematic when looking at a person experiencing a gloomy mood. They are limited in using the current mainstream communication media when they desire social support from their loved ones to get out of this mood. These media do not focus on sharing the important non-verbal cues, and do not take into account how the contact is initiated. The initial assignment for this project was formulated as:

Design a concept that resembles a new way of non-verbal communication over a distance to enable mood regulation and enhance the intimacy in contact over a distance between loved ones.

The main research question for this project was formulated as followed:

How can loved ones support their loved one over distance in regulating their gloomy mood?

To answer the main research question, additional research questions were formulated:

- Q1 When is social support desired to regulate a gloomy mood when being at a distance?
- Q2 Which nonverbal communication channels are essential in this social support?
- Q3 Which of these channels can be possible through current media devices?
- Q4 What are the consequences of these current regulating strategies?
- Q5 What essential things are still missing not to feel limited in sharing?

1.3 | Project approach

The method used to approach this project is the double diamond design model (Council, D., 2007). Consisting of four stages: Discover, Define, Develop, and Deliver. The process starts with discovering insights into the topic through literature and user research. This information gathered is then defined

and limited to the insights most helpful for this project's scope—followed by developing multiple ideas in this direction that are finally scaled down, resulting in one concept that will be delivered and evaluated with the final user.

2 | Context analysis

This project starts with a literature study to understand how loved ones can support their loved ones in a gloomy mood over a distance. With this, insights are gained into the essential elements in this context of a person in a gloomy mood. Answering the following research questions: What is a gloomy mood? What are mood regulation strategies? How can a loved one play a part in gloomy mood regulation? What role does nonverbal communication play in regulating a gloomy mood? What consequences are there? Furthermore, how does technology influence the desire to receive and give support?

2.1 Understanding a gloomy mood

2.2 Social support in regulating a gloomy mood

2.3 Nonverbal communication in social support

2.4 Influence of technology on social support at a distance

2.5 Conclusion context analysis

2.1 | Understanding a gloomy mood

To understand what a gloomy mood is, initial research is done on when a gloomy mood is experienced, how a mood differs between emotions, and how a person in a gloomy mood behaves.

Feeling gloomy

A gloomy mood is when a person feels that they do not have the energy to do things. They are likely to isolate themselves from the world and feel down. There is no hope for improvement. A person in a gloomy mood lacks enthusiasm. They are not feeling active or outgoing, especially when others are cheerful (Xue et al., 2020). A gloomy mood is a

mood that can be a negative influence on a person’s life and is often undesired, standing in the way of someone feeling good. A gloomy mood belongs to one of the four different mood categories across languages and cultures, divided by the high and low occurrence of positive and negative affect (Watson and Tellegen, 1985). Eight basic mood types can be defined (Desmet, 2015) (Figure 3). All people experience these moods from time to time. It is something a person must deal with and overcome. To deal with moods, people have different mood-regulating strategies.

Difference between mood and emotion

It can be hard to differentiate mood from emotions as people often are more aware of their current feelings. Emotion comes from a direct action depending on the mood someone is in - and other personality or contextual factors. In contrast, a mood can take longer and build up more gradually (P. M. A. Desmet, 2015). Figure 4 shows an overview of all differences between mood and emotion retrieved from the study by P.M.A. Desmet, 2015.

Feelings during a gloomy mood

The mood circle of Watson and Tellegen 1985 also shows certain feelings related to this gloomy mood (P. M. A. Desmet, 2015). Blue, Grouchy, Lonely, Sad, Sorry, and Unhappy. As well as an overlap of feelings related to low positive affect: Drowsy, Dull, Sleepy, Sluggish. Furthermore, on the other hand, related negative affect: Distressed, Fearful, Hostile, Jittery, Nervous, and Scornful.

When feeling gloomy, not easily aroused, and not feeling pleasant, people are more likely to have a sad response when something unpleasant happens. On the other hand, when being cheerful, a person has lots of energy and feels pleasant. These feelings make a person experience different emotions towards the same action and let them behave differently.

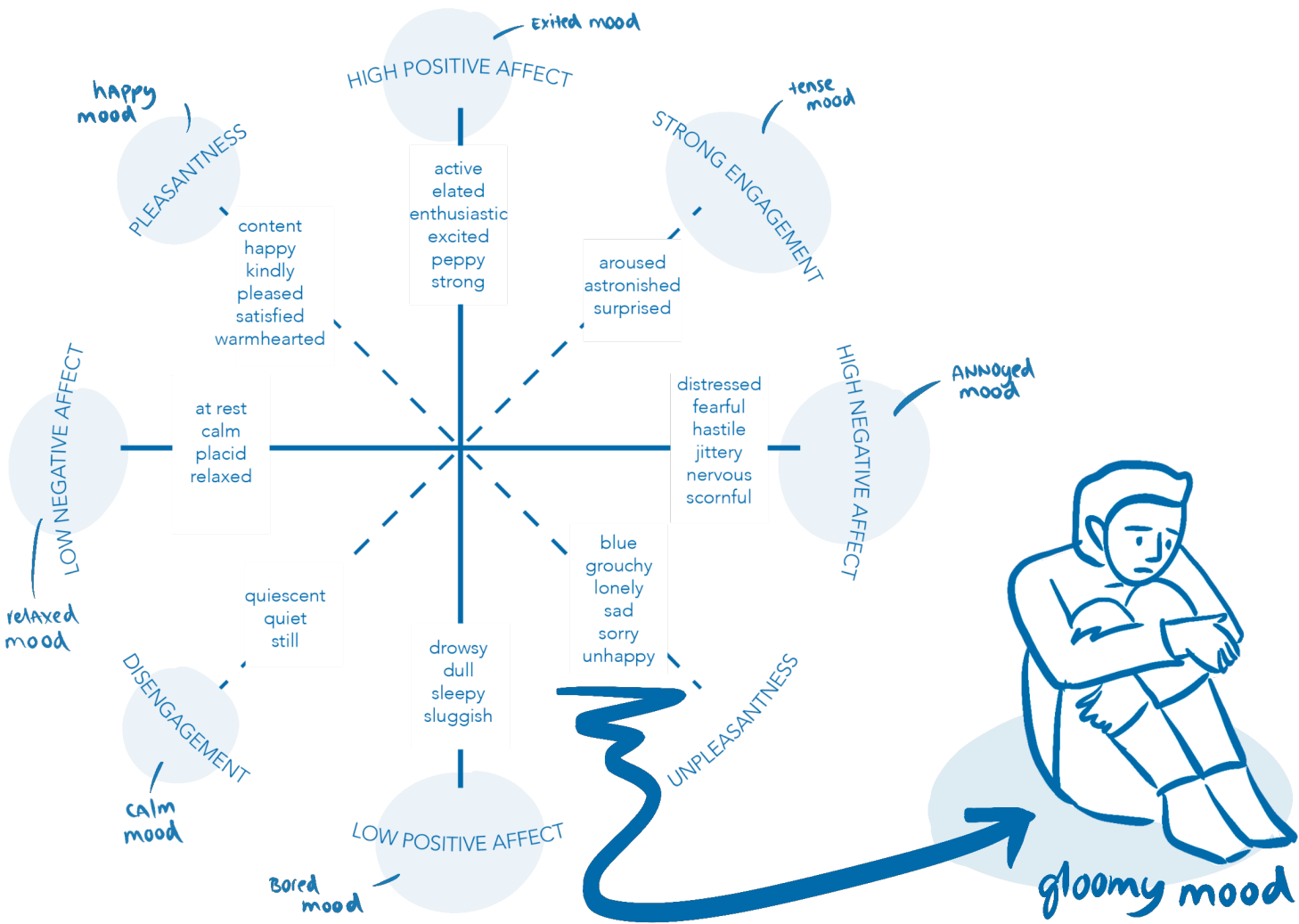


Figure 3 | Illustration of gloomy person, mood circle by Watson and Tellegen (1985), and eight basic moods by Desmet (2015).

Emotion	Mood
Affective phenomenon that: - Has a short duration (seconds, minutes) - Has a rapid onset and is episodic - Has a strong intensity - Interrupts thought and behaviour - Is specific and targeted - Has a single identifiable cause	Affective phenomenon that: - Has a long duration (hours, days) - Has a gradual onset and is continuous - Has a weak intensity - Influences thought and behaviour - Is global and diffuse - Does not have a single identifiable cause
External focus: Signals states of the world	Internal focus: Signals states of the self
Monitors perceived threats and opportunities: - Negative emotions signal threats - Positive emotions signal opportunities	Monitors available personal resources: - Negative moods signal resource shortage - Positive moods signal resource excess
Points of reference are personal goals, needs, motives, norms, and values	Points of reference are the demands posed by the environment
Stimulates a focussed adaptive response to the immediate threat or opportunity	Increases or decreases one’s general willingness to engage (seek out or avoid demanding situations)

Figure 4 | Table showing the differences in mood and emotion (Desmet, 2015)

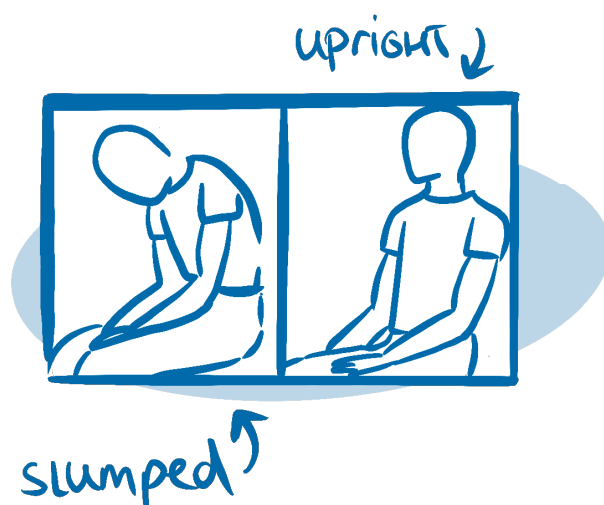
Behaviour during a gloomy mood

As shown in the mood circle in fig 2, mood influences a person's feelings and behaviour. So what is gloomy specific behaviour?



WORRY

When looking at a gloomy mood specifically, certain behavioural factors of a gloomy mood play a part. The main difference between a gloomy mood compared to other moods is that a person in a gloomy mood tends to worry, have meandering thoughts, contemplate, and is likely to be pessimistic (Xue et al., 2020).



SLOUCHED POSITION TO REDUCE A GLOOMY MOOD

A person in a gloomy mood tends to sit in a slouched position. Preferring this slouched position over an upright position during a gloomy mood reduces the gloomy feeling when compared (Riskind, 1984). There are two possible reasons why this occurs.

1. This position requires less effort.
2. With this position, someone can show their community they have a difficult time. Showing through non-verbal cues that they need help and are open to receiving support from others. In return, another person can show them sympathy and show they belong and matter to them (Watson & Tellegen, 1985).



NO DESIRE TO SHARING

A person in a gloomy mood does not like to participate in social gatherings and actively seeks out contact (Xue et al., 2020). They instead seek isolation and comfort. An important emotion in this is feeling lonely. Other research showed a balance of gloomy persons who seek isolation versus gloomy people who like to have social support (Watson & Tellegen, 1985).

2.2 | Social support in regulating a gloomy mood

In this section, I focus on how a person in a gloomy mood can change a gloomy mood to a more pleasant mood with the help of loved ones. To answer this, I looked at how to enhance the positive experience, known strategies to regulate a gloomy mood and how a loved one can play a part in this.

Enhancing positivity

In this project, I focus on enhancing a gloomy (unpleasant) mood to be more pleasant. When looking at the mood circle by Watson & Tellegen (1985) shown in figure 3, it is not necessary to change a person's engagement and energy levels; A person should change how pleasant their experience is. The difference between perceived demands and personal resources predicts if an experience of a mood is positive or negative. Figure 5 shows this balance.

Internal and external factors influence personal resources and perceived demands.

A gloomy person can change their perceived demands or perception of the available personal resources. It is possible to change only their perception or undertake any activity to change the request or the available personal resources.

Next, attention is key to experiencing pleasure, as our emotional state is largely determined by what we give attention to. Often the focus is on current activities and the immediate environment. Kahneman explains that to get pleasure from eating, you must notice that you are doing it (Kahneman, 2013). The same can be for a person in a gloomy mood. They must detect the pleasurable event and not keep hanging in their negative mind.

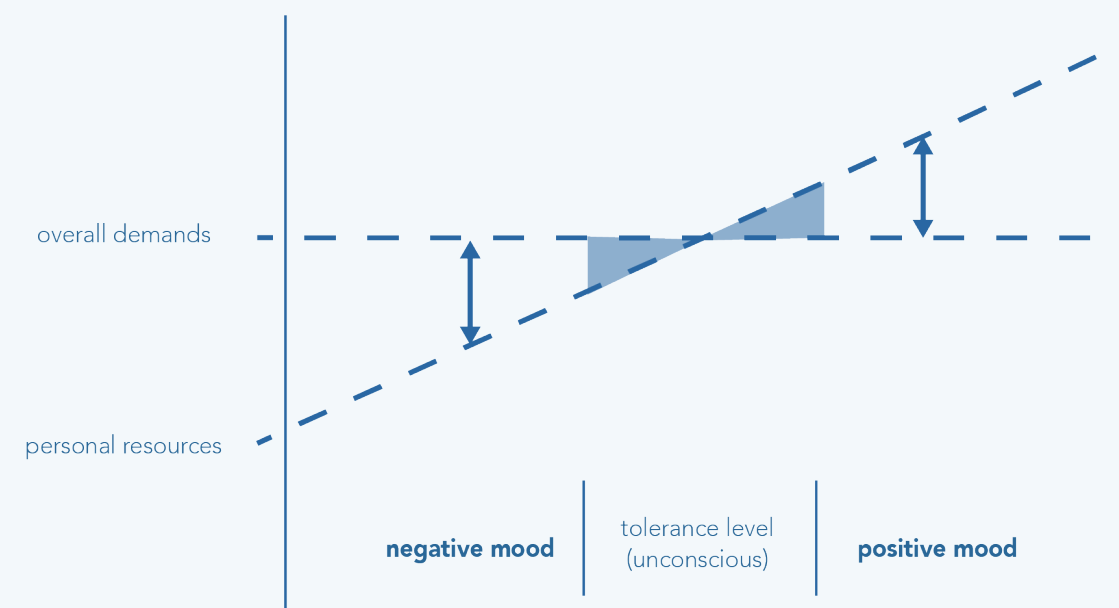


Figure 5 | Illustration of the balance of negative and positive mood based on overall demands and personal resources by Desmet (2015)

Social support as mood-regulating strategy

Our loved ones play a crucial role in our happiness by being irreplaceable in our daily mood regulation. By regulating interpersonal affect between each other, loved ones can maintain and build their relationship (Niven et al., 2012). It is essential for a person’s well-being to communicate with loved ones correctly to strengthen or maintain this relationship (Harter, 2021). And when a negative mood is not regulated, it could spiral into more negativity, potentially causing a person to get depressed (Watson & Tellegen, 1985).

There are different mood-regulating strategies people use to regulate their moods. This project’s scope will focus on regulating a gloomy mood to a more positive or neutral mood. Desmet (2015) proposed 20 mood regulation strategies (figure 6) that could regulate all moods (figure 3). There are three categories: Indicating seeking distraction, balancing, and building resilience towards a specific mood.

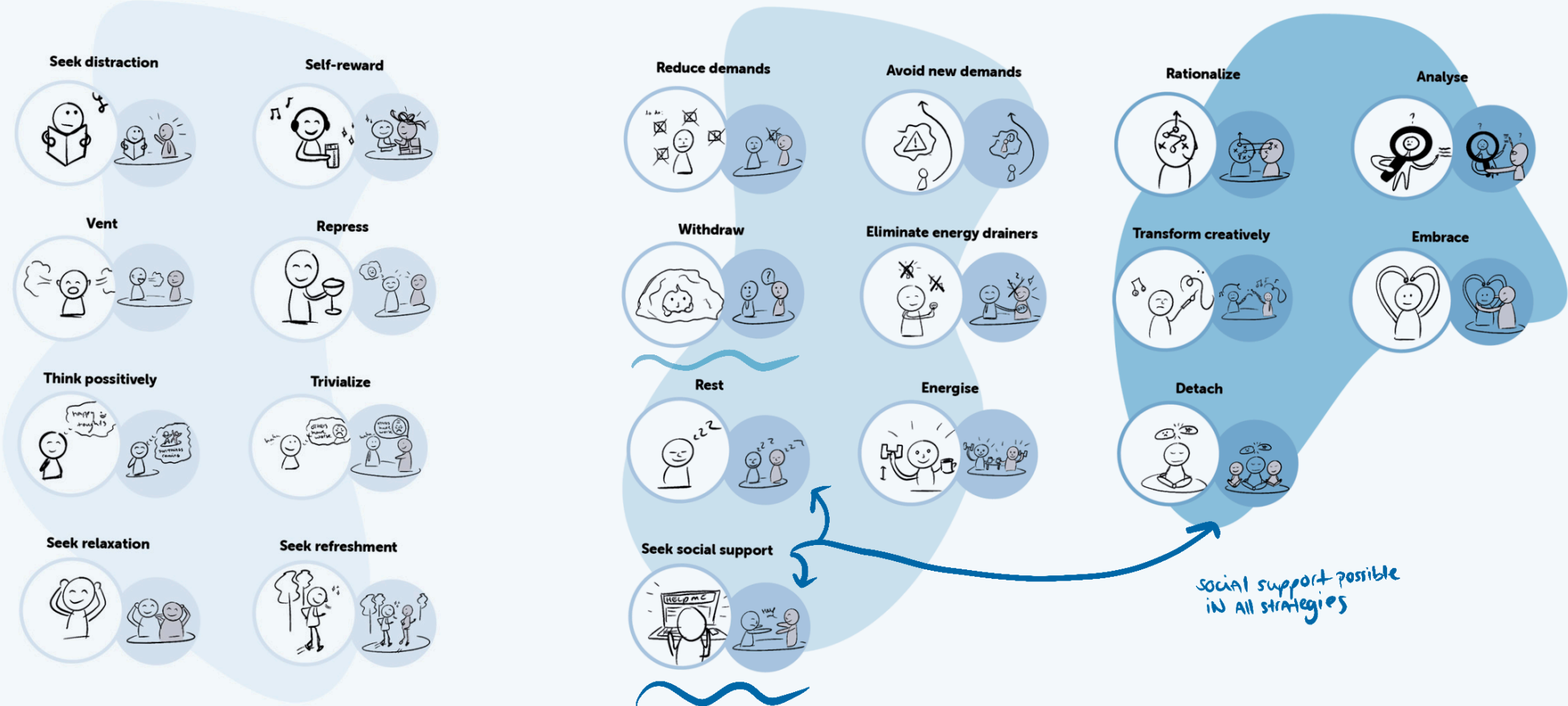


Figure 6 | Illustrations made by me, showing the 20 Mood regulating strategies by Desmet (2015)

SEEK RELIEF

Seeking relief is often seen as the easiest option. However, this regulation strategy usually only has a short-term effect (P.M.A. Desmet, 2015). Not ideal when feeling gloomy.

RESTORE BALANCE

Restoring balance is a more effective way of mood regulation and looks more at the long-term effects.

BUILD RESILIENCE

Building resilience towards a certain mood demands the most effort. However, this is seen as the most effective strategy. Enhancing awareness of a particular mood someone experiences, building up knowledge on why this is there and how to deal with it. This process makes it easier to get out of this mood or harder to fall into the particular mood again.

Therefore, to deal with a gloomy mood in the long term, a person needs to balance or seek resilience towards a specific mood.

Social support versus isolation

People in a gloomy mood differ in how they like to deal with a gloomy mood. Research shows a balance between people seeking isolation and social support during a gloomy mood (Watson & Tellegen, 1985) (Figure 7).

Both are balancing strategies when looking at the 20 mood-regulating strategies by P. M. A. Desmet (2015) in figure 6. Both approaches being balancing strategies could indicate that they can help regulate a gloomy mood in the long term.

What mood-regulating strategy a person in a gloomy mood uses depends on their personality, life situation, upbringing, traumas, cultural background, environment and what is available to them.

For this project, I will focus on people using social support. However, that some people desire social support to regulate gloomy moods does not mean that this is the strategy they always use. A study by Newman & McClain (1994) showed that when a person is in a bad mood, they will try to get out of it. Moreover, when in a good mood, a person tries to prolong this mood (Desmet, 2015).

A person regulating their gloomy mood is probably trying different strategies when being in a gloomy (negative) mood, and it is unlikely there is just one strategy that will get a person out of a gloomy mood. Therefore, more underlying strategies will help besides social support.

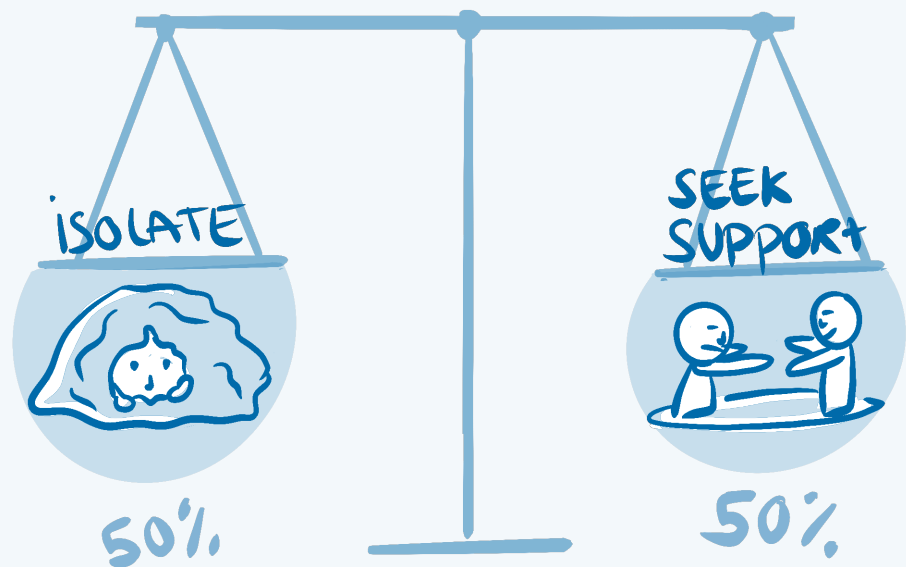


Figure 7 | Illustrating the balance between seeking support and isolating the self during a gloomy mood (Watson and Tellegen, 1985)

Three types of social support

In their study, Watson & Tellegen (1985) discussed that a person in a gloomy mood might seek social support for three reasons: 1. Seeking validation, 2. Having fun and distract, 3. Problem-solving. It is not clear which of these possibilities a person in a gloomy mood desires when seeking social support to regulate the gloomy mood. Or what personal or external factors make people long for these three strategies. The three strategies have similarities with the mood regulation strategies mentioned by Desmet, indicating that social support could happen during all 20 strategies.

VALIDATION

There are two types of validation, you can validate yourself, or someone else can validate you. In most Western countries, it is essential to get approval from loved ones to feel accepted by those who are close and mean something. Besides external validation, validation can come from validating yourself. A person needs to respect themselves (Verhaeghe, 2018). Understand and be at peace with who they are and how they act. Having a good balance between getting validation and validating yourself is crucial. By validating feelings, one can appreciate the things done and the things not done (Varsh, 2021). During confirmation, a loved one would like to show that someone does care about the gloomy person and accepts them for who they are. When one experiences a gloomy mood while the loved one is at a distance, it may be that there is not a good balance between self-validation and validation of a loved one. Or it could be that a loved one cannot give external validation.

FUN AND DISTRACTNG

Having fun with others we care about, and love improves our needs and sense of belonging. In addition, having fun often reduces stress and has a relaxing effect. Distractions are needed to help people focus on something else. Sometimes a person can get too involved in something without it necessarily helping them. Someone else can help divert attention so that a person can concentrate again later.

PROBLEM-SOLVING

Other people may need support in solving a problem. The thoughts of others can help make room for new ideas and lead to inspiring new solutions. However, this social support strategy is particularly effective when there is an apparent problem to be solved, and someone else can understand the situation, the context and the possibilities.

Conclusion on how loved ones can play a part in a gloomy mood

This chapter shows that a gloomy person does not have much effort. They overthink and show a slumped posture. The positive or negative mood experience results from a person's perceived tasks compared to their capabilities. Then, to experience pleasure, they must concentrate on this activity. When sharing a gloomy mood with loved ones, people do not like to share their gloomy mood intentionally but by using non-verbal cues. We use non-verbal communication to find out what someone means. We value non-verbal communication with others. It helps build the bond between loved ones.

When people use social support as a mood regulation strategy, it is not the only strategy they use. It is also not yet clear why people seek social support; it may be to validate, have fun, seek distraction, or solve a problem. Validation, fun and distraction require the least effort in these activities. Finally, a person in a gloomy mood must ultimately regulate a mood in the right way for a person; if this is not done well, the gloomy mood may degenerate into depression (Watson & Tellegen, 1985)

2.3 | Non-verbal communication in social support

As concluded in the previous section, a person in a gloomy mood does not share this mood intentionally; they instead show their gloominess through non-verbal communication. Therefore, it is essential to know how people can express themselves in a gloomy mood through non-verbal cues. This chapter shows what non-verbal cues are and the known literature on the role of non-verbal communication in a gloomy mood.

Types of non-verbal cues

Non-verbal communication can have five functions (Gamble & Gamble, 2013). These five different communication functions are shown in Figure 8.

Non-verbal communication can support verbal communication and substitute verbal communication. These cues show someone else our intentions and feelings behind the words without needing to make an effort to describe this in more detail. Necessary when a person has no words to describe their situation. Non-verbal cues can as well show the willingness of someone to communicate about a specific topic.

So how can a person in a gloomy mood express themselves through non-verbal communication? There are six non-verbal cues categories (4.2 Types of Nonverbal Communication – Communication in the Real World, 2016).

Function	Example
Contradicting	Your face is contorted into a grimace. Your eyes are narrowed, and eyebrows furrowed. Yet, you are yelling, "I am not upset!" You are sending a mixed/double message.
Emphasising	You wave your finger accusingly and raise your voice to demonstrate your anger as you say, "It is your fault, not mine." Your behaviour provides the italics.
Regulating	After explaining your stance on an issue, you raise and then lower your intonation as you say, "And that's why I feel the way I do." This, together with your silence, signals you are finished speaking and another person may comment. Your behaviour influences the flow of verbal interaction.
Complementing	Your head is bowed, and your body posture is slouched as your boss tells you how unhappy she is with your job performance. Your nonverbal cues provide clues to the relationship you and your boss share; they also help convey your attitude toward your boss.
Substituting	You run into a friend who asks, "So, how do you like your new job?" You just roll your eyes, using nonverbal cues in place of words.

Figure 8 | Table showing the five different functions of non-verbal communication (Gamble & Gamble, 2013)

KINESICS

Kinesics is body movement and posture; nonverbal cues involving this are 1. Gestures. Gestures are slight movements of the hands and body parts to tell something. 2. Head and body movement. The orientation of body parts is related to each other. This orientation can show agreement, interest, assertiveness, defensiveness, readiness, or intimidation. 3. Eye contact. This contact refers to eye contact with another person's features related to cognitive processing. 4. Facial expressions. The movement of facial muscles shows a specific expression and emotion. These can be emotions in our actions, thoughts, or external stimuli (Gamble & Gamble, 2013).

HAPTICS

Haptics is touch and can give extra meaning to a conversation. A person can feel temperature, heartbeat, pleasure, and pain through touch. Besides feeling these signals, haptics plays a role in building and maintaining relationships between close contacts (Gamble & Gamble, 2013).

PARALINGUISTICS

Paralanguage is the sound someone, or something can produce while speaking. This nonverbal category is often used to understand the meaning of the words, distinguishing between pitch, volume, speed, and articulation (Gamble & Gamble, 2013). All variables influence how the receiver perceives a message.

PROXEMICS

Proxemics point out the importance of space and distance within communication. Four zones indicate the different personal areas by Hall 1968, shown in figure 9. The table shows the desired interactions and people within a specific area. However, people can harras this personal space or prefer a form of intimacy that is impossible.

CHRONEMICS

Chronemics is about time used in communication (Gamble & Gamble, 2013). Time can create disagreements and can cause misunderstanding when for example, there is no mutual definition of what being on time means. Or the duration of time, for example, the time someone takes to respond can say something non-verbal.

PERSONAL PRESENTATION AND ENVIRONMENT

The clothes we put ourselves into and the objects around people communicate something about them and how they want to be perceived. Thereby the layout of a room can influence communication. Next to the function of the elements, there is odour and colour to consider. The smell goes hand in hand with memory (Olofsson et al., 2020), and smelling a scent from an intense memory can recall this moment, letting someone behave differently (Gamble & Gamble, 2013). Likewise, with smell, people have personal experiences with colours.

	Distance	Desired interaction	Desired people
Public space	> 365 cm	No physical interaction	Strangers or large groups
Social distance	120-365 cm	Rather no physical interaction	Discussions during meals or work meetings
Personal distance	45-120 cm	Personal topics	Informal connections
Intimate distance	< 45 cm	Physical touch is common	Trusted and emotionally bonded

Figure 9 | Table showing the four zones of personal spaces (Hall, 1968)

Non-verbal communication during social support

To help a loved one regulate a gloomy mood, they must be aware of it as it is not common for a gloomy person to express their gloominess intentionally. Therefore, many people show their gloomy moods through non-verbal channels. A gloomy mood goes hand in hand with worrying, overthinking, slouching and withdrawal. A person is likely to show a sad, concentrated facial expression combined with a slouching posture (Watson & Tellegen, 1985) and a slower manner of speaking. These non-verbal cues focus on expressing the gloomy mood; they do not yet address which non-verbal cues are essential during social support. The three options for social support from research by Watson & Tellegen (1985) are different and will therefore require other non-verbal cues. The different non-verbal cues are found by combining my personal experience and literature.

VALIDATION

Haptic cues play an essential role in validation. App et al. (2011) show that touch is the most desired cue after seeing someone in a gloomy mood (figure 10). Touch is essential for showing love and compassion after seeing this person (App et al., 2011). Emotions

are crucial to showing validation towards a loved one. The primary function of using non-verbal cues here is substitution.

FUN AND DISTRACTIONS

There is a mix of non-verbal cues during fun and distractions. Doing a fun activity, seeing a loved one happy or experiencing a fun event can make a person laugh and smile, which can return more positive hormones to the depressed person (Marmolejo-Ramos et al., 2020). In addition, distractions in the personal environment can trigger new memories and change a person's mood. There is no primary non-verbal function here.

PROBLEM-SOLVING

Problem-solving is mainly done with words to be able to describe the details of a problem. However, facial expression can be important to see someone's face and how serious they are. When a person is physically there to help, it shows they are taking time off. Furthermore, their body language will tell how willing they are to help or how they think. For problem-solving, loved ones can use all non-verbal functions except substitution.

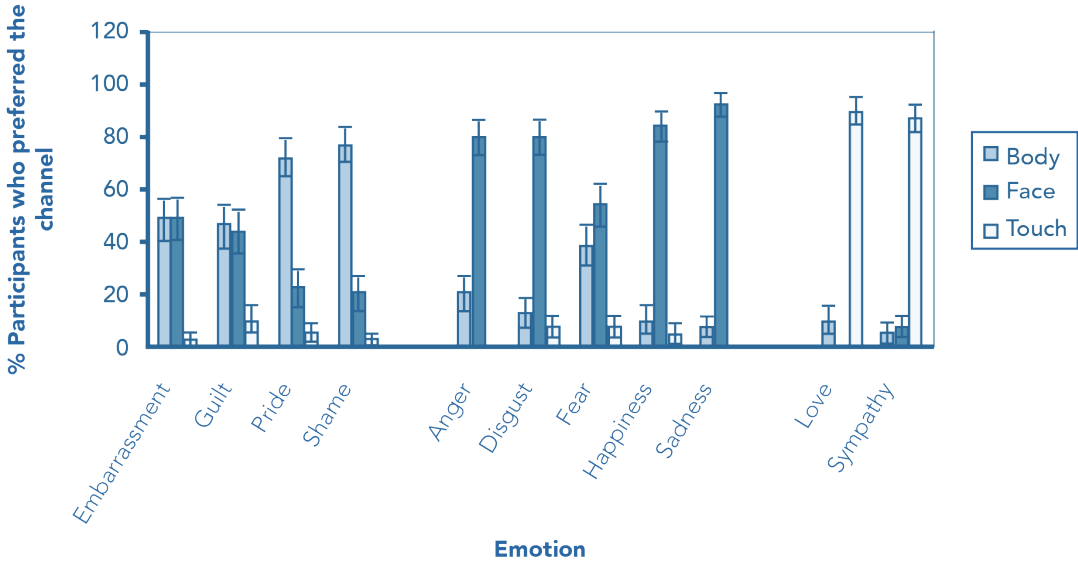


Figure 10 | Graph illustrating the preference for using touch to show sympathy (App et al., 2011)

Conclusion non-verbal communication

Research on non-verbal communication showed that the non-verbal cue of body posture is essential for communicating a gloomy feeling to loved ones. Loved ones desire haptics when expressing love and compassion towards a gloomy person. When looking at the functions of non-verbal communication, there is a difference between validation, fun, distracting activities, and problem-solving strategies. Validation and fun and distracting activities use the substitution function of non-verbal communication, whereas problem-solving support strategies cannot make use of this.

Finally, the specific desired non-verbal cues during social support are still unclear for all social support strategies (validating, fun and distracting, problem-solving) during a gloomy mood. More research needs to be done in the context of social support for a person in a gloomy mood to get a clearer picture of the specific non-verbal cues used here. Knowing this is necessary when designing for social support between distant loved ones. To understand this context further, I need to understand the role current communication media play in this.

2.4 | Influence of technology on social support at a distance

The way we use daily communication media to communicate with loved ones from a distance is becoming standard. The internet makes it easier for loved ones to move further away and keep in touch online. However, these communication devices can make it hard to maintain and strengthen an intimate relationship over distance. Priorities of both parties, distractions, time differences, miscommunication, personal qualities, and external factors can play a part.

6.4 Billion people communicate daily using their smartphones (Statista, 2021). Current contact over a distance between loved ones mainly consists of spoken or written verbal communication. This communication is occasionally supported by sharing photos, emojis, facial expressions (video calling), and tone of voice.

Therefore this subchapter will focus on the current mainstream communication media, what nonverbal channels are already possible here, what lack of non-verbal channels are missing, and how technology could influence our sharing of a gloomy mood with loved ones.

Current mainstream communication media

Current mainstream communication media are influenced by different technology and societal behavioural trends.

EXPANDING COMMUNITIES

Nowadays, we can contact whomever we want. 75% Of Dutch people use a smartphone, and 95% of young people will own a smartphone in 2019, according to Statistics Netherlands (Centraal Bureau Voor de Statistiek, 2020). Smartphone use is increasing during social interactions and is growing as a medium to connect with others. (Deloitte, 2019). There is no limit when it comes to absolute distance. We have many contacts throughout the day. It varies from work contacts, random contacts during the day, or contact with friends and family. Communication happens in person or digitally; we have contact 24/7. All these contacts can be quite stressful from time to time. This stress could occur as a social circle of more than 150 people is too large for us (Dunbar, 1992). Many people pass this number, especially when counting the digital communication people have daily.

EFFICIENT TECHNOLOGIES

Our intertwined lives are a far cry from the origins of society. In the past, people lived closer together in smaller communities (Harari, 2014). It was usual to travel and not live in a fixed place. People evolved from not having fixed homes to forming small communities, building a way to survive while making it easier to survive.

Throughout history, all inventions have made it easier for people to do things. The information age allowed people to live in physically different places and stay in touch with their families. Inventions made it easier and faster to travel the world. These inventions caused the relative distance of the world to shrink (Figure 11).

The launch of the World Wide Web made sharing even faster. It now takes even less effort to obtain and share specific information. Thereby, it becomes more critical for people to shape their online personalities and how others perceive these personalities. The desire to shape an online persona and travel further from loved ones results in communication media that allows people to share whatever they want, fast and effortless. So how do these communication media support connecting loved ones, and what are the consequences?



Figure 11 | Illustration of globalisation

How communication technology supports connecting loved ones

Expanding communities and efficient technologies have played a role in shaping the mainstream communication media available today. Communication media can connect people directly or indirectly. However, non-verbal communication

is not always possible with these technologies. I overviewed how loved ones can use non-verbal channels in social support through smartphones (figure 12) and smartwatches (figure 13). I chose to look at smartphones as 85% of the Dutch population over 12 years old use a smartphone. And activity trackers are rising; two out of 10 Dutch citizens own a Smartwatch or activity tracker (CBS, 2021).

SMARTPHONE

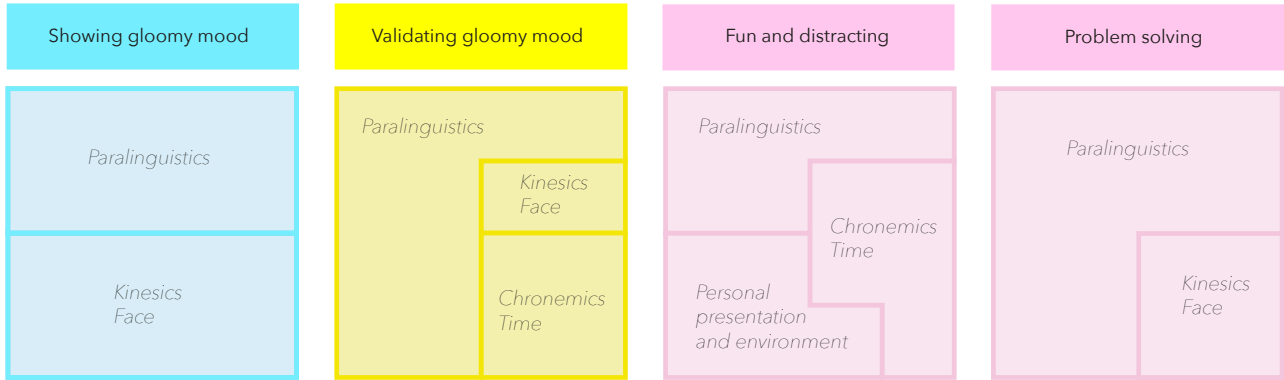


Figure 12 | Table showing the non-verbal cues possible in communicating with a smartphone

SHOW GLOOMY

A gloomy person can initiate contact by actively seeking communication. It is possible to use video calling to show their gloomy mood without saying anything. However, it is hard to make eye contact because of the camera's location on the phone. Thereby, showing the entire posture can be complicated and is not easy as a person often video calls by holding their phone.

VALIDATION

If a loved one finds out someone is gloomy. The loved one can approach the gloomy person verbally with non-verbal cues that emphasise these words by using different facial expressions and tone of voice, making time and showing validation.

FUN AND DISTRACTING

It is easy to download short games on a smartphone to play together with a loved one to distract. An interesting example is Ommetje (Hersenstichting Ommetje). This app has a point system to connect people and stimulate each other to take a walk. An app widely used in the Netherlands during COVID. Other upcoming services let people watch a movie together. However, as the person is not physically there, it can be harder to stimulate the gloomy person and ensure they are doing this activity. The non-verbal channels important here are making time, linguistics, being in the same environment and feeling proximity to the person.

PROBLEM-SOLVING

When people know the reason for their gloominess, they can talk about their feelings, and loved ones can see their facial expressions.

WEARABLE

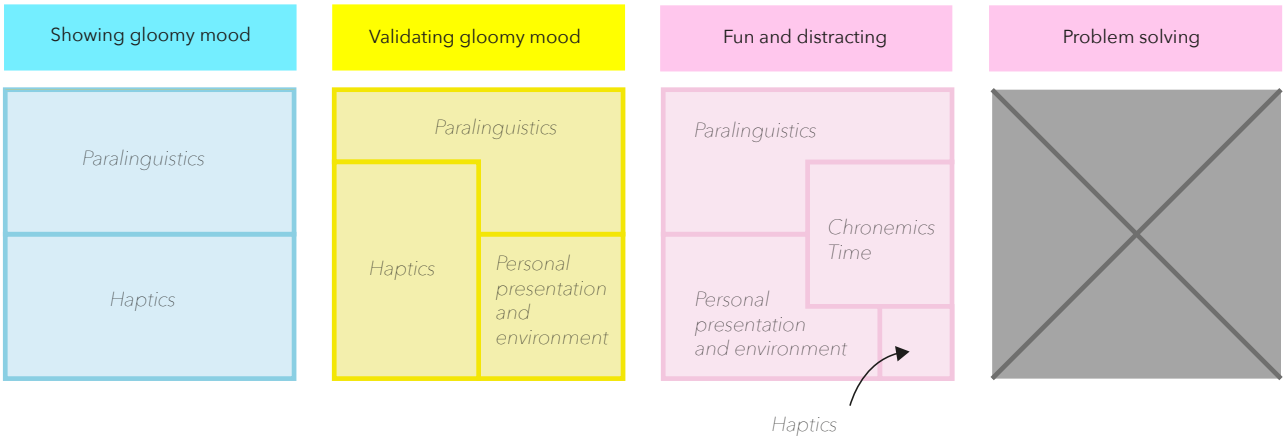


Figure 13 | Table showing the non-verbal cues possible in communicating with a wearable

SHOW GLOOMY

In a wearable, there is not yet an app that automatically sends a message to loved ones when they feel gloomy. However, wearables can measure saturation and heart rate through ECG (Apple, z.d.-a). These sensors can give a comparative example of a person's mood, and some apps can already use these sensors to measure and show this mood (Apple, z.d.). People still need to get the idea to share this mood with loved ones.

VALIDATION

Smartwatches can validate through haptics. Some apps can send others more physical signals like a heartbeat, a personalised rhythm, or a personal drawing (Apple, z.d.-b). People can only use these small messages to substitute the text or send them on their own as short signals.

FUN AND DISTRACTING

There are no significant differences between a smartwatch compared to a smartphone. However, the tiny post sent through a smartwatch can be more accessible in being fun or distracting.

PROBLEM-SOLVING

Communicating verbally to solve a problem and discussing details for a solution is essential. A wearable can only use verbal communication through calling with a smartphone. Therefore, problem-solving is not possible with just a smart wearable.

Consequences of current communication media

Communication technologies can fulfil some of the most fundamental needs of people (Appendix X). In return, they may influence people’s behaviour, especially long-term behaviour. The following paragraphs explain why a smartphone is effortless and how this effortlessness affects people’s loneliness and possibly creates three different worlds.

EFFORTLESS SMARTPHONE USE

Smartphones make it easy to get into a flow zone (Csikszentmihalyi, 2008) (figure 14). When someone is in a flow, they live in the moment and have a good time. A person can reach this state of flow when they perceive their skill level as high enough for a specific task and if there is a challenge. When this is the case, they will emerge into their activity, forgetting about time and having no consciousness of themselves. The flow state is easy to accomplish with a smartphone, as this has many different activities for different skill levels: social media, apps, games, reading, and much more. It is almost impossible not to find a task that fits the perceived skill level by having all these activities available by only reaching in a pocket.

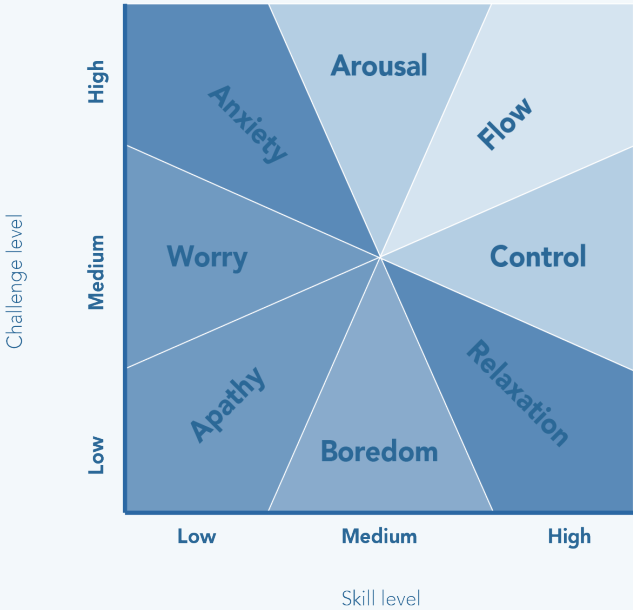


Figure 14 | Graph showing the concept of flow based on challenge level and skill level (Csikszentmihalyi, 2008)

LONELINESS THROUGH DIGITALISATION

By physically distancing from loved ones to fulfil other needs, people can get lonely as they isolate themselves and seek social connections through the internet when an in-person connection is impossible. Seeking these social contacts online while already feeling lonely does not reduce the feeling of loneliness. To mitigate this loneliness, a person needs an in-person connection (Yao & Zhong, 2014).

Another element of people getting lonelier through digitalisation is that a conversation is perceived as less meaningful when a phone is involved (Przybylski & Weinstein, 2012). Having a phone shows the possibility to reach the presence of all other people with just a click. This possible presence raises uncertainty about whether someone has a person’s full attention when being together. On top of this, the (current) epidemic of COVID-19 even increased emotional loneliness for people (Van der Velden et al., 2021).

CREATING THREE WORLDS

Technology makes it possible for one person to live in different communities simultaneously. People can have three types of connections over a distance (Figure 15). There is in-person contact, digital contact in which they represent a version of oneself or contact through games where someone can form a different character for themselves. In creating another new character, people can set their own achievable yet challenging goals, making it easy to get into the flow state. When people feel overwhelmed, they have this safe world to escape. Alternatively, when the digital world gets too challenging, they can leave.

- 1. Physical personal community
The physical community consists of people’s physical space, objects, and people, around the person in their context.
- 2. Digital personal community
A person often creates this community with their ‘real’ identity. In this community, people connect with friends and family over a distance. A society that is becoming more virtual than it is physical. A community with whom we have daily contact, checking in on our daily lives. When looking at the idea of Metaverse (Jaloza, 2022), creating a virtual space with characters based on real-life, the personal-digital community can take the shape of an entire online community. The main focus of this idea is on online living and not on having a life that is shared digitally to inform and reach others.
- 3. Online community
This fully online community is often a game or virtual world where a person does not necessarily need to act like the person. In this community, they can have different roles and play other characters.

Online communities are becoming a more significant part of daily life. It is important to note that new technologies should keep focussing on enhancing people’s connection with their physical environment, connecting them with the real world in which they live, and their actions also have influences.

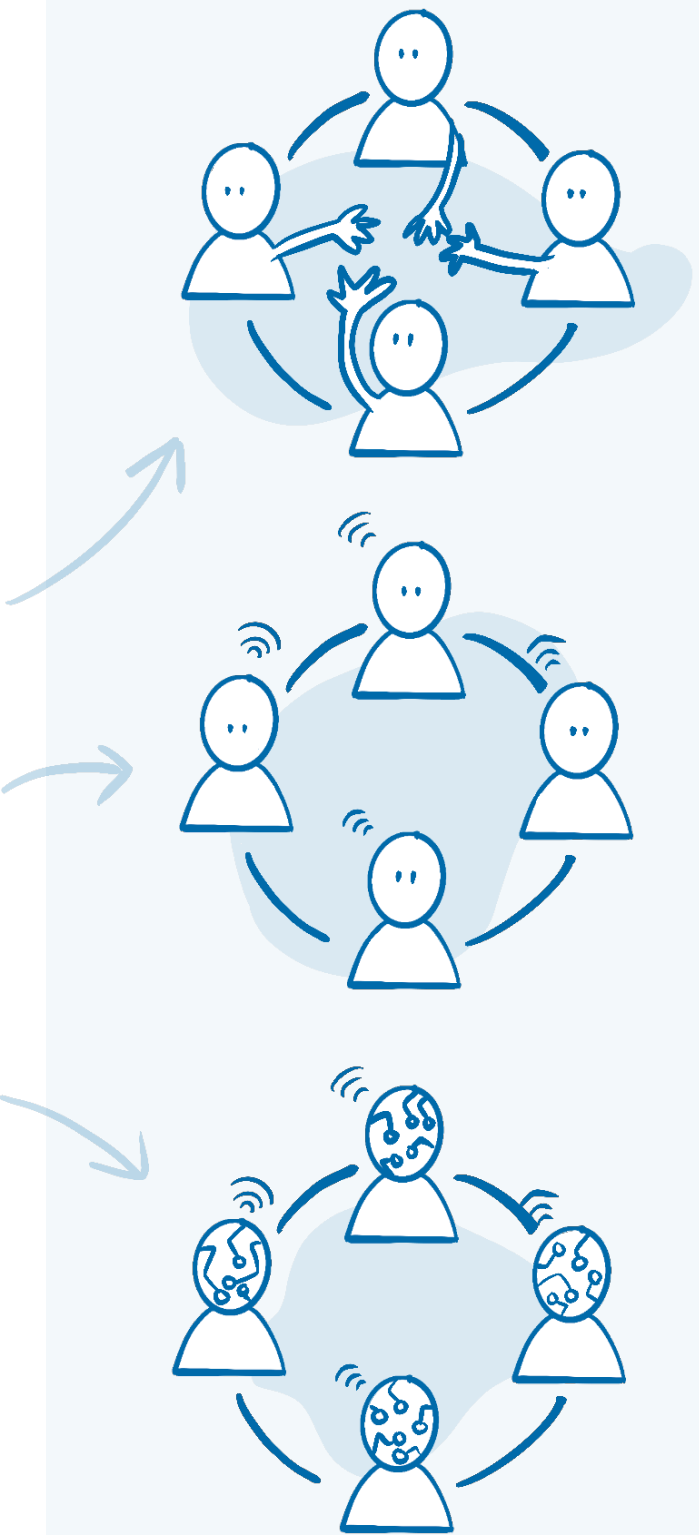


Figure 15 | Illustration of three different worlds: Physical personal community, Digital personal community, Online community (Top to bottom)

Calm technology

The technology should spark the desired and proper attention by designing a concept that fits smoothly in the physical environment of a gloomy person and their loved one. Therefore, calm technology principles are essential when creating (Case, 2015). In using calm technologies, the design fits a person’s life rather than the technology being a distraction, following the road of least effort and getting there with low mental cost. It is especially crucial to design for gloomy persons already low in effort available. Furthermore, it is essential for their loved ones as they ideally put all their effort into being with the gloomy person, not into being with the technology itself.

Principles for calm technology are:

- 1. Technology should require the smallest possible amount of attention.
- 2. Technology should inform and create calm.
- 3. Technology should make use of the periphery.
- 4. Technology should amplify the best of technology and humanity.
- 5. Technology can communicate but does not need to speak.
- 6. Technology should work even when it fails.
- 7. The right amount of technology is the minimum needed to solve the problem.
- 8. Technology should respect social norms.

Looking at a person in a gloomy mood, it is mainly important that the technology requires the slightest possible attention and inform and create calm, as the attention should be on being together. Technology should even work when it fails, not enhancing the gloomy feeling. Lastly, technology should respect social norms.

Conclusion of influence on technology

Essential insights in this chapter showed increased loneliness through digitalisation as technology trends will cause people to share fewer feelings with their loved ones. The focus of technology is to support verbal communication between people in general. Causing potential problems as increasing smartp-hone use can substitute social support between lo-ved ones over a distance. Furthermore, almost all communication happens in a digital space instead of a physical one.

2.5 | Conclusion context analysis

By analysing the context of how loved ones can play a role in gloomy mood regulation, what nonverbal communication cues can be important for this, and how current mainstream technologies influence this, this chapter has created a better understanding of the context of this project. A person is not engaged and does not feel pleasant in a gloomy mood. Their effort to undertake anything is low. To regulate this mood, a gloomy person desires to instead withdraw or seek social

support from their loved ones. This social support can be there for three reasons: 1. Validation, 2. Fun and distractions, and 3. Problem-solving. Thereby seeking social support is essential for personal well-being and building relationships. I will do user research to find what social support strategies a person desires from their loved one during a gloomy mood while being at a distance.

3 | User research

In designing for a person in a gloomy mood, it is crucial to understand their context. However, finding out about a person's experience during a gloomy mood was a difficult task as a gloomy mood is quite a private experience. Therefore, this user research consists of various user research methods used to find out all that needed to be found about a person in a gloomy mood. This chapter aims to answer the following research questions through user research; Which non-verbal cues are important to regulate a gloomy mood through social support of loved ones? When is social support desired in a gloomy mood? Which elements are important in this? How are these important over a distance? And which issues do loved ones currently have when supporting a gloomy person at a distance?

I will do this research through five user research studies; Two studies with the gloomy person and three with the loved ones supporting the gloomy person.

3.1 Questionnaire: Non-verbal cues and mood regulation strategies of a person in a gloomy mood

3.2 Questionnaire: Specific non-verbal cues between loved ones during gloomy mood regulation

3.3 Questionnaire: Actions of loved ones during social support

3.4 In-depth interview: Experience of a person in a gloomy mood

3.5 Generative session: Loved ones' experience in giving support at a distance

3.6 Conclusion user research

3.1 | Questionnaire: Non-verbal cues and mood regulation strategies of a person in a gloomy mood

Research by Watson and Tellegen (1985) showed no difference between seeking isolation or social support to regulate a gloomy mood. Therefore this section describes the first user research done to get a clearer insight into when social support is desired and which non-verbal cues are essential during this social support.

Methodology

A questionnaire is chosen to reach a high population to get varying data. Thereby with this method, people can be in their environment and not have to talk with a researcher about their gloomy mood (Appendix B). Previous conversations about gloomy moods showed how uncomfortable people were to talk about this, let alone talk about the specific actions they do then.

Participants in this questionnaire are Dutch adults who are familiar with a smartphone. Participants are between 17-65 years of age. There are no specific demographic details of the participants. A total of 16 participants responded by answering a poster I distributed to an MBO College, teachers in special needs education, family, and students at Delft University of Technology. I retrieved another 20 responses through participants from SurveySwap.

The questionnaire consisted of 13 questions, of which the first five aimed at sensitising the participants and reducing their gloomy mood. Sensitising questions include: Can you describe what happened? Who was around you during that moment? The other seven questions are about how they experienced the gloomy mood, what strategies were essential for them, and what role their loved ones played. I used open questions to gain insight into the non-verbal elements and closed questions to let the participant choose essential strategies. The questionnaire showed information on non-verbal cues and mood regulation strategies before the related question. Appendix C shows the complete questionnaire.

The questionnaire started with an introduction to the scope of this research, followed by asking for the participant's consent. This questionnaire's final questions result from three pilot tests and iterations to ensure the participants filled in the correct information.

Results

The questionnaire showed the preferred mood-regulating strategy, how a gloomy person notices support, the beginning of non-verbal cues in social support cues, and the non-verbal cues a gloomy person expresses during their gloomy mood.

PREFERRED MOOD-REGULATING STRATEGY

This questionnaire showed that a person in a gloomy mood prefers to regulate his gloomy mood by; looking for distraction (37.5%), rationalising (27.5%) and seeking social support (17.5%) (Figure 16).

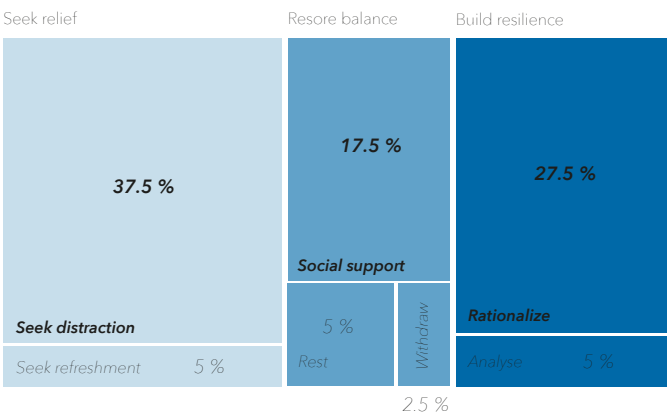


Figure 16 | Table showing the most critical mood regulation strategies in a gloomy mood (Seek distraction, Social support and Rationalise)

NOTICE SUPPORT THROUGH VALIDATION

Looking at social support, people in gloomy moods found that their loved ones helped their gloomy mood by showing social support in acknowledging their mood by hugging and listening to them or talking about it.

"A hug in itself can be good."

"We talked about it and talked it through."

TOUCH AS NON-VERBAL CUE

Non-verbal cues that showed the gloominess to their loved ones were mostly about touch, non-verbal cues were not specific, and answers were usually just "a touch" or "a hug". These answers could indicate that it was difficult for a gloomy person to remember the impact of the loved one during a gloomy mood.

SHOWING GLOOMINESS THROUGH KINESICS

Gloomy participants described different non-verbal signals they noticed in themselves that they were in a gloomy mood. These non-verbal signals were mainly kinesic. An overview of all non-verbal cues participants mentioned showing a gloomy mood is shown in Figure 17. The complete overview of all non-verbal cues found during the questionnaire can be found in Appendix H.

The signals included relaxing their body parts, drooping eyebrows, slumping shoulders, and lying down. In addition to these results, the participants showed non-verbal cues that described how they supported themselves. For example, they held their

heads with their hands and squeezed their hands to form a fist.

This study provides insight into which non-verbal cues a person in a gloomy mood uses to show this. A person in a gloomy mood finds touch, hugging and talking about the problem essential in receiving social support. However, it remains unclear through which specific non-verbal cues loved ones can support a gloomy person and whether loved ones can help by distracting them as they find this distraction most helpful for mood regulation. Therefore, another questionnaire is done to provide more insights.

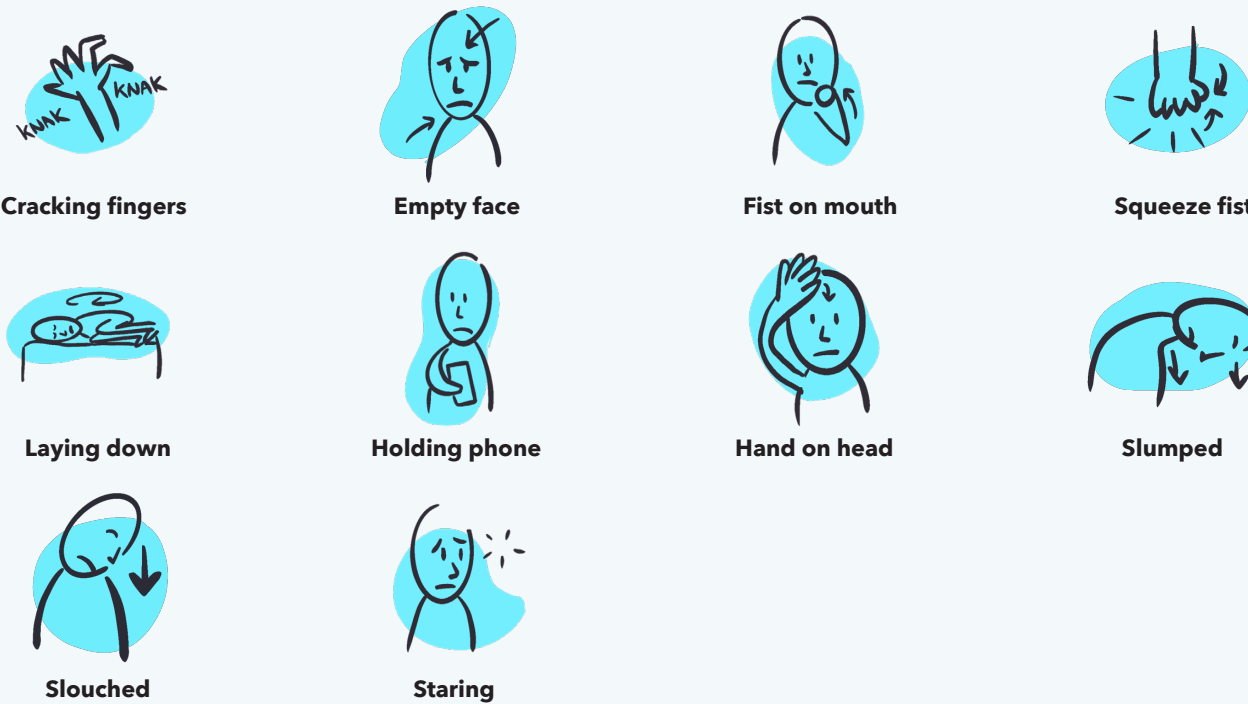


Figure 17 | Illustration of different non-verbal cues a person shows a gloomy mood as derived from questionnaire

3.2 | Questionnaire: Specific non-verbal cues between loves ones during gloomy mood regulation

This subchapter gives more specific insights into the nonverbal cues between loved ones and a person in a gloomy mood that help regulate this mood and when each non-verbal cue is desired. The focus will be on loved ones instead of people in a gloomy mood, as previous interviews showed that a person in a gloomy mood finds it difficult to talk about this. It can be challenging for a person in a gloomy mood to talk about this personal experience, remembering this unpleasant experience, the actions that took place, and how their loved ones helped with this.

Methodology

A secondary questionnaire is done to determine the specific non-verbal cues between loved ones during gloomy mood regulation. The reason for using a questionnaire over other research methods was that a questionnaire could reach a high population, get varying data, and a loved one can fill this in in their environment whenever they remember helping a loved one in a gloomy mood. A questionnaire allows them to report their experiences when they just helped their loved one in a gloomy mood, not restricting them to a specific moment.

Participants in this questionnaire were Dutch adults (age 18-65) familiar with a smartphone. Participants were asked to fill in the questionnaire if they met the requirements and sometimes supported their loved ones in a gloomy mood. A total of 14 participants responded by answering a poster I distributed to a senior secondary vocational educational institute, teachers in special needs education, family, and students at TU Delft. I retrieved another 20 responses from SurveySwap.

The questionnaire consists of 14 questions divided into three parts. Before starting the questionnaire, there was an introduction to this study. I explained that by continuing this questionnaire, participants gave consent to the data being used in this report. Appendix D shows the complete questionnaire.

The first part focused on retrieving the event, asking open questions about what they did when they saw their loved one in a gloomy mood and their relation to the loved one.

The second part focused on their response in non-verbal communication and how they noticed the effectiveness of their actions. How they responded was asked through open questions, and non-verbal communication was divided into facial expression, body language and physical contact. I explained non-verbal communication at the start of this part. The third part was to get a broader overview of the context, focussing on their actions after the contact. I asked this through open questions. In the last part, participants could leave a response to the questionnaire.

Specified non-verbal cues important

This questionnaire showed what non-verbal cues loved ones used in social support for loved ones to help regulate gloomy moods after seeing them. 1. There was a greater understanding of where touch was appropriate.

"I put a hand on her shoulder while asking how it is going."

Or 2. there was more specific information about the intensity of touch and actions:

"Put two strong arms around them."

All the non-verbal cues to show validation are shown in Figure 18.

Hugging

The questionnaire showed that 60% of loved ones use a hug when validating a gloomy mood. 11% Of these people do this through a tight hug. Studies showed that a tight hug could reduce the cortisol hormone, decrease the experienced stress (Yoshida et al., 2020) and change someone's mood to a more relaxed state. A person in a gloomy mood does not necessarily have to experience stress. However, there are links that stress can negatively influence experienced mood (Ogden & Mtandabari, 1997). Thereby, a person in a gloomy mood can worry and overthink (Xue et al., 2020), which could be stressful. Showing how hugs might already help reduce the gloomy mood to a more relaxed one, besides validating.

"Sometimes a hug is all I need"

Initial validation from loved ones

The non-verbal signals after seeing the gloomy person corresponded to the non-verbal cues that relatives indicated as important. A loved one confirmed the gloomy person's feelings by hugging and asking how they were doing.

"I tried to calm the person down, gave a hug and said it would get better."

Showing the effect

Loved ones understood the non-verbal cues a gloomy person uses to indicate the effect of their social support. The gloomy person mainly expressed these non-verbal cues through facial expression and body language (Figure 20).

Actions after validation

After the non-verbal actions to show initial validation, loved ones did not stop there. When asked what loved ones did after their support, the general response was to ask if they could do something or take the initiative to do an activity together.

"Distracting with fun activities, playing games, shopping, or going for a walk."

Other activities were more focused on solving the problem:

"I listen, ask what is going well, and think about a solution to their problem."

Another study is done to validate this and find out if there is a pattern in the gloomy mood - validating - doing an activity - and seeing the result of the support. This study will focus less on guiding the user to write specific non-verbal actions.

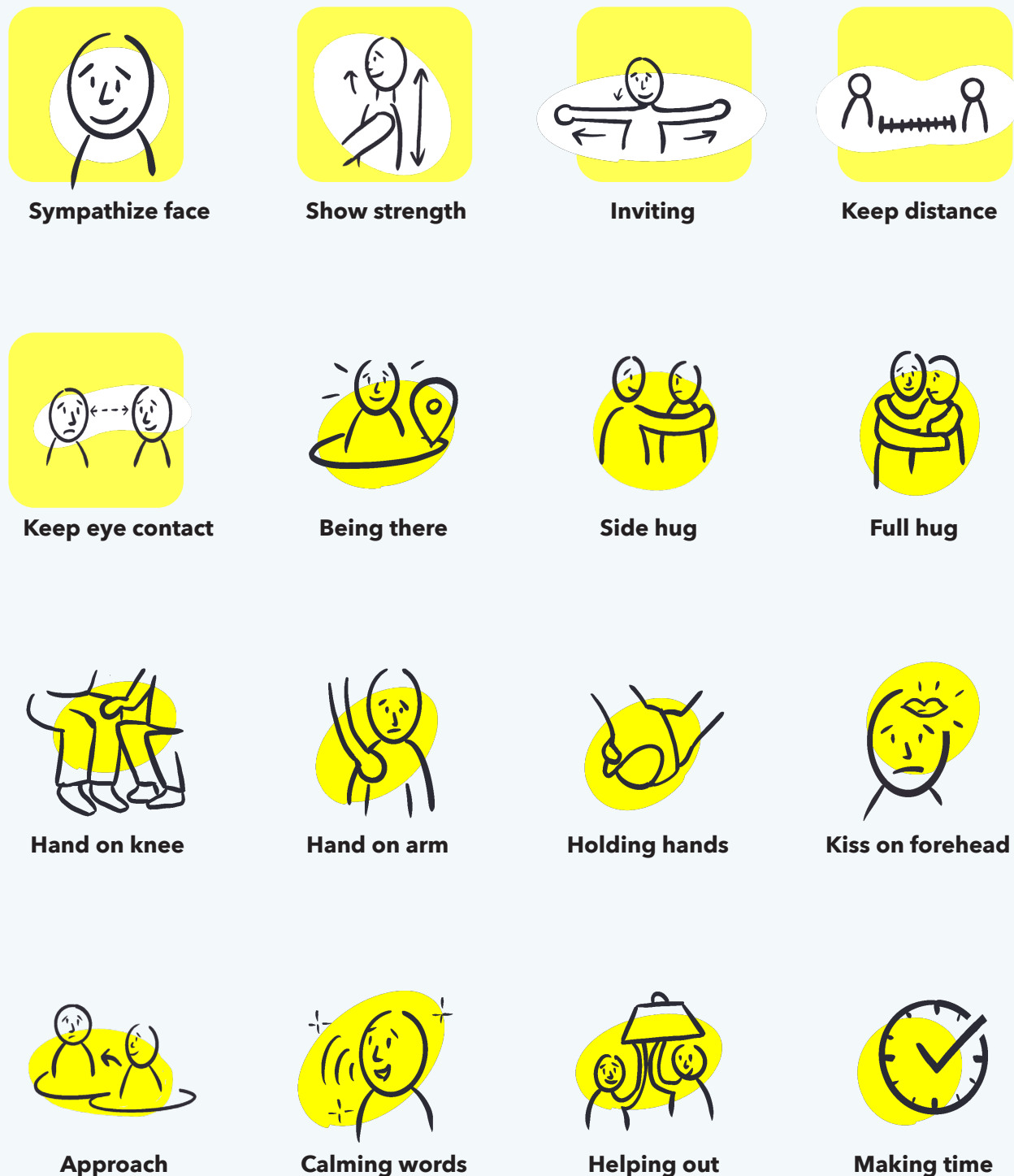


Figure 18 | Illustration of different non-verbal cues a loved one shows to find out if social support is desired (white circle background) and how loved ones show validation (yellow circle background)

3.3 | Questionnaire: Actions of loved ones during social support

To find out whether there is a pattern in the non-verbal signals loved ones express, a third questionnaire is completed with loved ones. In addition, this questionnaire generates more data about the different non-verbal activities during social support between loved ones.

Methodology

I chose a questionnaire to get as many responses as possible to determine if this pattern exists and to get more data on the specific nonverbal cues.

Participants in this questionnaire are Dutch and use a smartphone in their daily lives. I shared this questionnaire over social media. Participants who completed the questionnaire are between 19-65 years old. In total, nine participants mentioned their ages. Their age ranged from 19 to 25 (22.2%), 26 to 35 (44.4%), and 35 to 65 (33.3%). In total, 21 participants completed the questionnaire.

There are a total of 6 questions in this questionnaire. The questionnaire began with an introduction to the topic and informed the potential participants of their consent. As this questionnaire was distributed through social media, there is less control over who completes the questionnaire. Therefore the first question is about the age of the participants. An open question asks how they help their loved one in a depressed mood. Space is left for them to fill in their process. Other questions ensured that the participant had personal contact and was asked about the effort and effect of their actions. By asking these questions, let the participant think more about their experience. Appendix E shows the complete questionnaire.

Results

This questionnaire validated the four stages and gave insight into the non-verbal cues and how loved ones help distract.

FOUR DIFFERENT STAGES

This questionnaire showed that a percentage of people had the three steps in their process of social support: validating through touch and words, doing an activity, and making sure the activity helped them and if they wanted anything else (Figure 19). A complete overview of the non-verbal cues in the four stages can be found in Appendix H.

"I will give a hug, listen to their story, and cheer them up by doing something fun together."

LOVED ONES HELP TO DISTRACT

Other responses mainly focused on doing a distracting activity, something gloomy people themselves were unaware of loved ones does help them with. Showing how loved ones do help in distracting as well.

"I try to get them out of a gloomy mood by taking them to do something active and get out of the house."

In addition, this questionnaire gave more specific actions on what people do when they support their loved ones when feeling down (Figure 20).

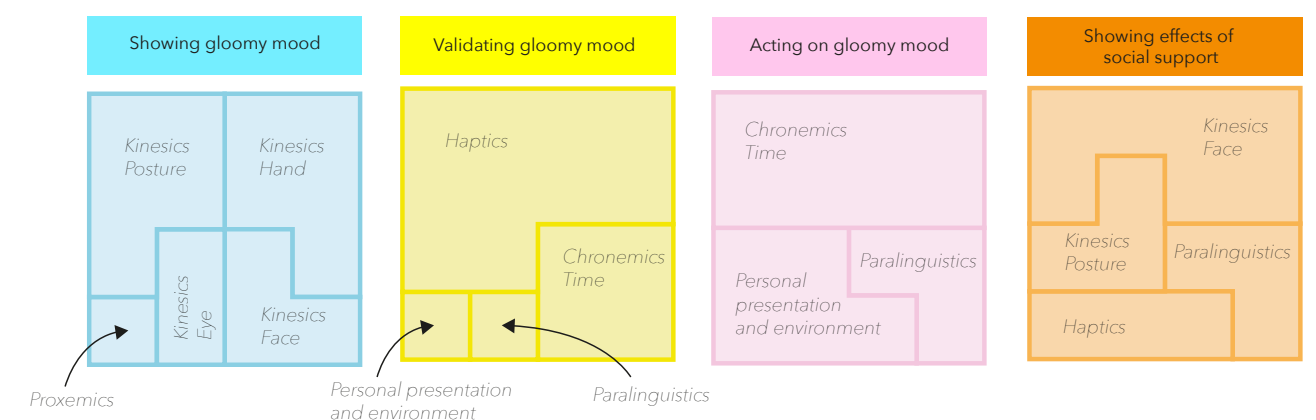


Figure 19 | Graph showing the four different stages of non-verbal cues during social support in person



Figure 20 | Illustrations showing non-verbal cues of actions (pink background) and non-verbal cues of effect (orange background)

3.4 | In-depth interview: Experience of a person in a gloomy mood

Through in-depth interviews, I wanted to find out when a person desires social support in a gloomy mood, which elements are important in their context and how these elements play a role when they are at a distance from their loved ones.

Methodology

An in-depth interview is conducted to determine when the gloomy person desires social support. This interview will determine what participants consider essential in their context in a gloomy mood, the influence of these elements and their past experience. Asking about their past makes it easier to ask what would be essential for their future with remote social support and how the factors mentioned earlier play a role in this. Using the model of The Path of Expression by Sanders and Stappers (2012 (Figure 21).

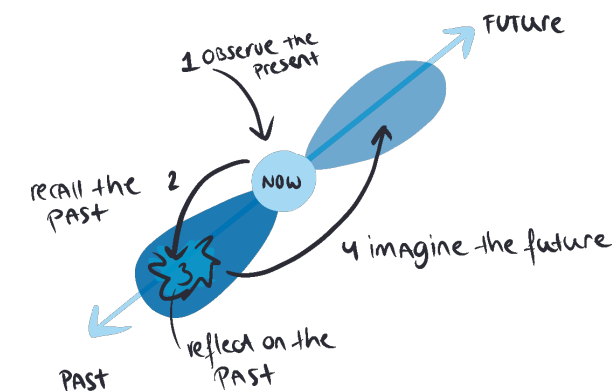


Figure 21 | Path of Expression by Sanders and Stappers (2012)

Participants are sensitised with a photo assignment before the interview to make it easier for them to talk about gloomy moods. During the interview, participants are instructed to make collages to visualise their ideal context for remote social support. The visualisations help the participants to talk more openly about their desired support. They can make the gloomy mood more distant by directly talking about the collages instead of their personal experience. I selected the images for this collage assignment before the study (Appendix F3). Eight participants were asked to participate in the

in-depth interviews. Of whom participants aged 18-25 years (25%), 25-35 years (37.5%), 35-65 years (25%), and >65 years (12.5%). I interviewed one participant outside the target group (>65) to gain insight into the sombre mood of someone not involved with technology.

The interview started in the participants' homes with a photo assignment to sensitise them to the interview, making it easier for them to talk about the gloomy mood. To sensitise the participants, they were asked to take pictures of themselves and the crucial elements in their context when they felt gloomy. They were given a booklet on how to do the task, what they could take pictures of, how to notice a gloomy mood, what non-verbal communication is, and what possible strategies are available to regulate this mood (Appendix F2).

The interview consisted of two parts; 1. discussing the photo task with the participant, and 2, making a collage of the desired context when one is gloomy and far away from loved ones (Appendix F1). The first task gives more insight into how people act during a depressed mood, what is important in their context, and when a depressed person would like the support of a loved one to help regulate this mood. With the collage assignment, the aim was to determine what the crucial elements are to feel comfortable sharing when you are depressed and away from loved ones. The collage assignment was done in Miro (An online brainstorming tool). The whole interview lasted one hour.

Results

The in-depth interviews led to exciting insights into the process of regulating gloomy moods and when support from a loved one can help (Appendix F4, F6). The interviews showed that this varies from person to person, but I could form four general personas from the interviews to continue within this project (Appendix F5). Furthermore, the interviews provided insight into the needs of this persona to improve their regulation through remote social support.

PROCESS OF REGULATING A GLOOMY MOOD

The interviews revealed that seven steps are crucial for regulating gloomy moods (Figure 22). Changing the environment and doing a new activity to clear the mind and body is the essential step to complete the final mood regulation. For each of these steps, there are different activities to complete. The activities can be alone or with social support. The choice of action is based on personal preference, experience, and available resources. The four stages of social support are also reflected here. However, three main social support activities showed to be crucial in regulating gloomy moods.

1. Social support can only occur when someone in a gloomy mood shares their mood with loved ones.
2. Loved ones can support by giving the energy to increase the available effort of the person in a gloomy mood.
3. Loved ones can plan an activity and take the person in a gloomy mood.
- Loved ones can be crucial in these parts because it can be difficult for a person in a gloomy mood to consciously show their mood, find the available effort, and start an activity that clears their mind and body.

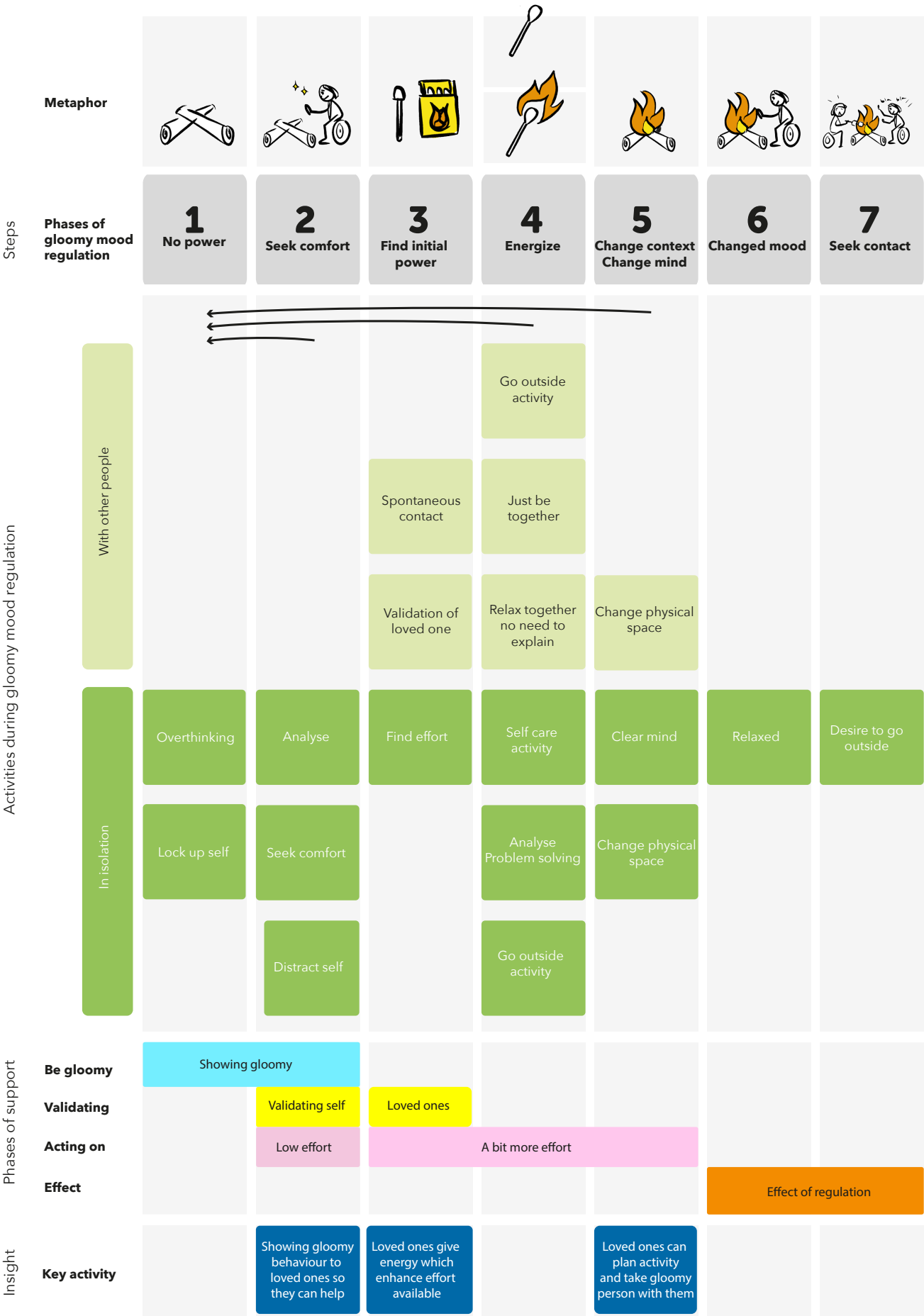


Figure 22 | Graph showing the phases of mood regulation and the important factors, derived from in-depth interview

USING SOCIAL SUPPORT AS REGULATING STRATEGY OVER A DISTANCE

During the second part of the interview, participants were asked to make a collage about their preferred context for social support in a gloomy mood. Interviewing these collages led to four different personas that shaped how four kinds of people deal with this at the moment (Figure 23).

HIDER

For a person who hides their gloomy mood at a distance, it can be challenging to find the effort to regulate this mood themselves. But they do not want to burden others with their gloomy mood. They will seek short distractions and fun activities that require little effort and temporarily make it easier to deal with the mood.

FAILURE

Some people try to share their moods to seek social support but do not get the help they want. This behaviour is counterproductive and leaves them feeling gloomy and not understood by their loved ones. They will feel better for a brief moment when they receive a little compassion from their loved ones.

FAKER

Some people have contact with their loved ones when they feel gloomy but do not show their true feelings. Like the person hiding, they do not want others to help them because they do not believe loved ones have the right capabilities. By feigning their mood, they feel some control and comfort in not sharing their personal feelings and are assured that their mood does not affect the mood of their loved ones.

REGULATOR

When the cause of the gloomy mood is known, a person in a gloomy mood can share this mood with their loved ones. They can then talk about the source of the problem and find a solution. However, this only works if the loved ones feel comfortable sharing this and are already aware of the source.

TOWARDS A HIDER PERSONA

Most of the people interviewed showed elements of a hiding personality. For some, this was due to previous experiences of not being able to regulate their moods well. Only two people showed that they could sometimes regulate their mood, even when no loved ones were around. For one of the participants who had no technology available, there was no other option, and they have learned in their lives not to overthink too much and to keep looking for ways to make an effort to change their mood. For the other participant, the mood could be regulated over a distance when the cause was known, and they could talk it through.

Given the current trend of using smartphones more and more and of social media taking the place of actual contact, it is essential to find a solution for someone who hides their gloomy mood—finding a way for them to make the initial effort to regulate their gloomy mood through the support of a loved one rather than trying to get this support through social media.

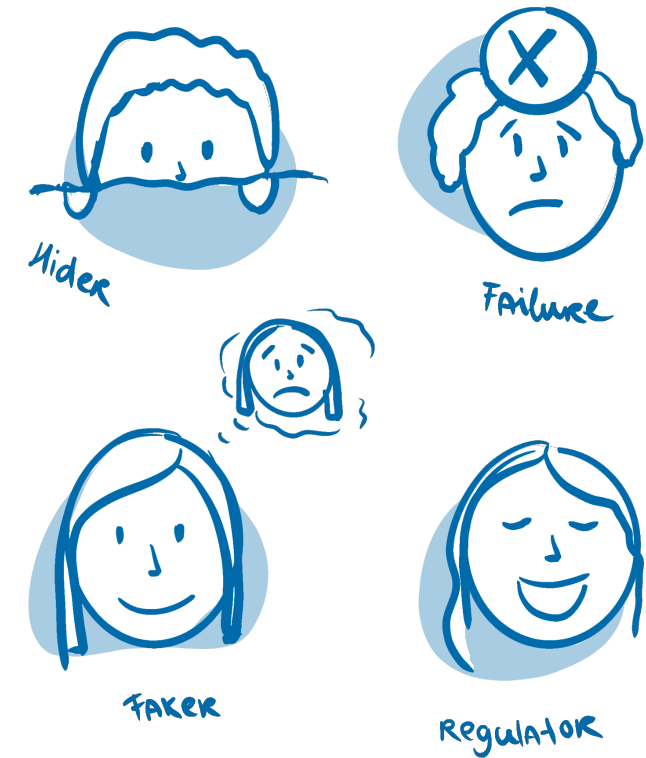


Figure 23 | Illustration showing the four different personas (left to right, top to bottom: Hider, Failure, Faker, Regulator) found during in-depth interviews

ESSENTIAL ELEMENTS FOR A HIDER PERSONA FOR NOT SHARING A GLOOMY MOOD OVER A DISTANCE

Conversations with participants about how they would ideally receive social support and their experience led to interesting insights into what someone in a gloomy mood needs before sharing their gloomy mood. And when what actions are desirable.

These insights are broken down into three categories of social support found during mood regulation: showing gloom, validating gloom, acting on the gloomy mood and showing the effect of the support. Demonstrating the effect was not mentioned during the interviews and will therefore not be discussed here, as it appeared unnecessary for the gloomy person.

The following insights show why someone hides their gloominess instead of sharing it with their loved ones when being at a distance.



TIMING

A gloomy person needs to feel okay with social support, expressed through nonverbal signals. Before interacting, a person needs to feel a bit more zen at first.



PHONE MAKES THINGS WORSE

During the first phase of being gloomy, when the effort is low, but people try to get out of their mood, many participants use their smartphones. However, a smartphone is not ideal in this context as it can lead to extra overthinking and comparing.



NO DESIRE TO TALK ABOUT GLOOMINESS

The only option is to show loved ones about gloominess over a distance. Something not desired. To begin with, it can be too tricky, requiring too much effort from the gloomy person to find the words to say what they would desire or how they are even feeling.



FEELING UNDESIRED

A gloomy person that fits the hider persona does not know the cause of their mood, does not believe their loved one can help them through support, does not desire to open up as they do not see any possibilities and do have little effort available. They thereby do not want to bother their loved ones with them.



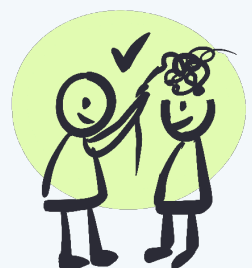
MISSING TRUST

When seeking contact over a distance, participants desired to be sure of their loved ones' full attention and availability towards them and that this is honest. They do not always have the trust that their loved ones do have this.



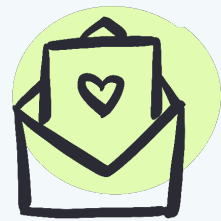
MISSING ASSURANCE OF AVAILABILITY

A gloomy person is even more scared to share their gloomy mood when they are unaware when the other person will read it or if they even have time to respond. They do not like to call someone and be scared their loved one has no time and cannot pick up. Same for sending a message. When someone is not responding immediately, it might not be needed anymore when they finally see it.



VALIDATION TO STOP OVERTHINKING

A person can regulate their mood by themselves depending on the effort available, their perceived intensity, and knowing the cause of their mood. When their effort is low, and they keep hanging in the first stage, loved ones can help by showing



FEELS BETTER WHEN SOMEONE LOOKS FOR CONTACT WITH YOU

It can feel better when a loved one looks for communication with the person in a gloomy mood during a gloomy mood. By reaching out to the gloomy person, they will know that some people would like to do activities with them and make plans.



NO DESIRE FOR PROBLEM-SOLVING STRATEGIES

The gloomy person only desires to rationalise and receive support through problem-solving when they know the problem and feel there is more to solve. The gloomy person will indicate they would like to get support with problem-solving. However, it now happens the other way around at a distance, with the loved one initiating the problem-solving strategy.

support by validating their feeling and transmitting their energy. Desire to have the energy to skip overthinking. It showed how hugs and pressure help relax and open their minds to other possibilities.

"I want others to act like a dog"

3.5 | Generative session: Loved ones' experience in giving support at a distance

A generative session with loved ones is done to understand the potential current problems loved ones already experience when they try to support their loved ones in a gloomy mood.

The context analysis of the technology available showed that there is technology available to validate. Therefore, it is essential to understand more in-depth the potential problems loved ones already experience with these technologies, as the in-depth interviews showed the lack of trust from gloomy people in their loved ones in being able to support them in regulating a mood correctly.

Generative session with loved ones

A generative session is used for this study to get inspiring insights as loved ones can discuss their strategies with each other. And finally, come up with potential solutions to the problem.

In total, two participants participated in the generative session, two women aged 18 and 25 years.

I did the generative session online over Miro. Both participants had experience in using Miro to design. A short explanation (Appendix G1) of how to use Miro at the start ensured that the software did not limit the participants. The session consists of three parts: 1. Warm-up assignment, 2. Collage-making assignment, 3. Ideation (Appendix G2). The session took an hour, and participants had time to discuss

their creations after each assignment. Thereby they were encouraged to talk during the session.

WARM-UP EXERCISE

This exercise revealed how the participants helped their loved ones in a gloomy mood. I did not necessarily need data to gather more insights but to start thinking about mood and get used to ideating in Miro.

COLLAGE-ASSIGNMENT

Collage assignment on how the loved ones would desire to support their loved ones in a gloomy mood while at a distance. Find out how people would ideally like to help their loved ones and their current problems regarding this.

IDEATION SESSION

They were ideating together on different possibilities to fix their perceived problems. Finding out what elements loved ones find important and could struggle with when trying to support over a distance. Find if there is a difficulty in one of the found strategies for social support during the previous user tests.

Results

Results of the generative session showed insights into the actions loved ones undertake to regulate a gloomy mood of loved ones and their reasons behind this (Appendix G3, G4, G5).



AFRAID TO MAKE MISTAKES

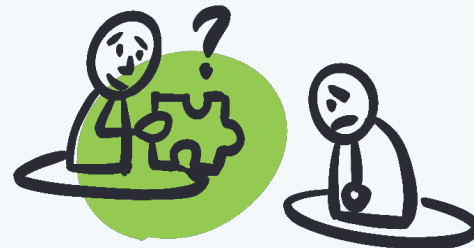
Most ideas generated (Appendix G4) helped the loved one figure out what it is the person in a gloomy mood would like. Showing how they are careful in doing the right thing but, on the other hand, making it harder even to do something. Especially when being at a distance. It can be too hard to do something when nothing is physically close.



REDUCE THE EFFORT OF THE GLOOMY PERSON

Ideas also focused on lowering the gloomy person's effort, making it easier to pick what they wanted. Make sure to the gloomy person that it is okay to share this feeling. Assuring their loved ones that they are loved ones for a reason.

"I want to let my friends know we are friends for a reason. I want to be there for them, and I often tell them to ensure they can come to me with their problems if they like."



START WITH PROBLEM-SOLVING

Loved ones start with problem-solving over a distance. Loved ones in a gloomy mood do like to find out the problem before they can help a loved one in a gloomy mood. Probably as this is one of the few activities loved ones think they can do.



LOVED ONES DO NOT FEEL LIKE THEY CAN DO SOMETHING

Loved ones made clear that they wished they could do something for them. Desiring to hug them or do an in-person activity together, even wanting to change their brain chemicals.



CREATING A SAFE ENVIRONMENT

The loved ones focused on ensuring the gloomy person felt safe, letting them know they could tell everything they wanted. Make sure they have the time and try to find a place where they can be comfortable to give them the desired attention.

3.6 | Conclusion user research

What non-verbal cues are important to regulate a gloomy mood through the social support of loved ones?

There are four stages in which non-verbal cues of social support are important during a gloomy mood. A person in a gloomy mood needs to show their mood, loved ones need to validate this mood, loved ones will start an activity, and finally, the gloomy person needs to show the loved ones that their support helped them.

In showing a gloomy mood, kinesics is primarily essential. A gloomy person shows their mood through body posture and facial expression, something currently not possible with the current technologies.

Validation is mainly shown through haptics, touching a shoulder, and giving a hug. Small cues indicate to the gloomy person that their mood is validated.

In undertaking actions, there is a differentiation between knowing the cause and not knowing the cause of the gloomy mood. When the cause is known, loved ones can help solve the problem. However, when this is not known, loved ones help by initiating distracting and fun activities. The person in a gloomy mood is not always aware of these distracting activities loved ones initiate, but it does help in regulating their mood.

Finally, the loved ones need to see the effect of the regulation. Seeing this effect lets them feel assured again that their loved one is not feeling gloomy anymore.

When is social support desired in a gloomy mood? What elements are essential in this? And how are these important over a distance?

There are three key moments where the support of loved ones can be crucial for mood regulation.

1. A gloomy person should show the gloomy mood to their loved ones to give any support, to begin with.
2. Loved ones can give the needed energy to start regulating their gloomy mood by validating this mood.
3. Loved ones can initiate the activity that changes their mood entirely and let the gloomy person change their mind and body.

What issues do loved ones currently have when supporting a gloomy person over a distance, and how would they ideally see this?

Loved ones are currently not aware of the possibilities. Thereby, they struggle with being able to find out what it is that would help their loved ones in a gloomy mood. Loved ones struggle because a person in a gloomy mood does not tell them what they would like, or when they tell them, it can be hard to initiate an activity over a distance. However, it is a struggle as the person in a gloomy find it hard to think of what it is that would help them.

4 | Design definitions

In this chapter, a final design framework is formed from the insights of the context analysis and the user research. This chapter aims to provide insight into the ultimately chosen design direction.

4.1 Framing the solution space

4.2 Design goal

4.3 Design directions

4.3 Brainstorm: Choosing a design direction

4.5 Final design direction

4.6 Requierements

4.7 Limitations

4.1 | Framing the solution space

Current mainstream communication media are not comfortable for everyone to share their gloomy mood with loved ones. Especially as people in a gloomy mood often have no effort available to regulate their gloomy mood. This threshold is even enhanced when the cause is unknown to them. Now they find that there is nothing the other person can do for them. They believe that their gloomy mood is undesired by their loved ones. They must solve it all by themselves, assuming this is the only option to help them. As effort is low, a gloomy person hiding their mood from their loved ones could start doing mindless activities.

An example of this is endless scrolling on the phone, which is proven to possibly enhance depression, making it even harder for a person in a gloomy mood to break out of this negative spiral by themselves. Next, exchanging social support and non-verbal connections with loved ones is essential to our well-being. If trends continue in this direction, there is the possibility of creating an even more distant society where loved ones cannot talk about this anymore. Sharing this gloomy mood and feeling comfortable in doing so should be normalised. Figure 24 shows the solution space, Figure 25 shows the solution space in context.

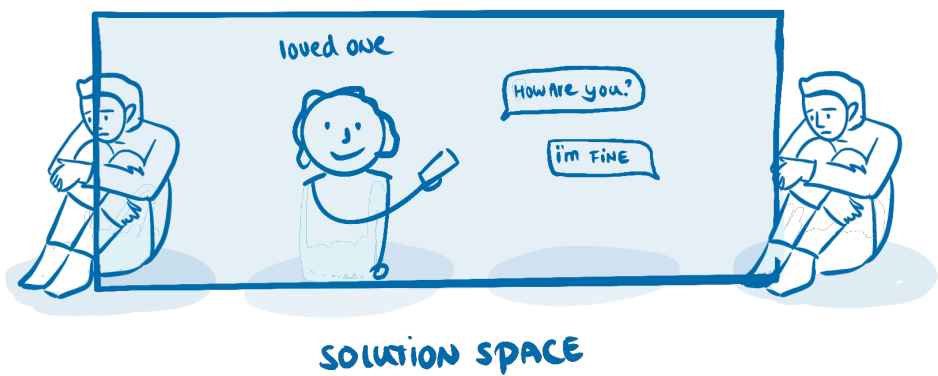


Figure 24 | Illustration showing the solution space of this project, focussing on that it currently is not possible to share the gloomy mood as desired when being apart.

4.2 | Design goal

“Let a gloomy person feel more comfortable sharing their gloomy mood with their loved ones over a distance.”



Figure 25 | A person in a gloomy mood not feeling comfortable to share their mood with loved ones

4.3 | Design directions

The context analysis and the user research led to four interesting design directions (Figure 26). The three key roles of social support in a gloomy mood found during the user testing in chapter 2 form the basis of three of these directions. These key roles were: 1, Showing gloomy behaviour to loved ones so they can help. 2, Loved ones give energy which

enhances the effort available. 3, Loved ones can plan activities and take the loved one with them. The fourth direction is formed after the generative session with loved ones. However, various insights from the context analysis and the user research add to these directions.



Figure 26 | Illustration showing the different possible design directions during this project (From left to right and top to bottom: 1. Mimicking contact, 2. Receiving non-verbal validation, 3. Share through a low effort activity, 4. Normalising a gloomy mood)

DESIGN DIRECTION 1

"By mimicking the in-person way of sharing a gloomy mood through body posture."

Not being comfortable with sharing a gloomy mood through current communication media can come from the inability to communicate body posture of a gloomy mood. During in-person contact, body posture is often the key to notifying a loved one about their feelings and not needing to find the energy to describe their problem or situation with words. They can use as little effort as possible to demonstrate their gloominess. Current technologies do not support sharing body postures; phone cameras make it difficult to share this posture - when a person is even video calling. When the loved one is not aware of the gloomy mood, there is nothing they can do to show support when being distant from each other, even though current technologies are available to start doing activities over a distance - or show validation.

DESIGN DIRECTION 2

"By receiving nonverbal cues of sympathy when initiating contact with their loved one."

Not knowing how a person will respond to their gloominess can make it uncomfortable to share being gloomy. People in a gloomy mood want to feel assured in getting the full attention of their loved ones - something hard to know as it is easy to do multiple things at once on your smartphone.

Having in-person contact with a loved one can directly respond by validating the gloomy mood of the person through touch or calming words. While the person in a gloomy mood sees and feels the full attention. With this initial validation, a person in a gloomy mood gets new energy and can start regulating a gloomy mood, helping them to get out of the spiral of overthinking and not finding enough effort to start regulating their mood. Current technologies might show the same result in transmitting energy through touch; however, people are currently not using these technologies to receive this energy. And it is essential to show the full attention, something these technologies do not support.

DESIGN DIRECTION 3

"By initiating contact through fun and distracting low effort activities by changing physical space."

User research found that a gloomy mood is often regulated when a person can finally change their perspective. Loved ones can be crucial by pushing the gloomy person to do an activity. The loved one initiating this activity lowers the effort needed from the person in a gloomy mood, making it easier to change their mood by getting support from loved ones. User research showed that a person in a gloomy mood is not always aware of how loved ones can help them in undertaking this crucial activity, making it harder for them to regulate a gloomy mood when at a distance from loved ones. Focusing on doing a fun activity with loved ones could make a person in a gloomy mood feel more comfortable sharing their mood. Doing a fun activity that requires little effort already helps in regulating the mood and makes the gloomy person aware that there is something their loved ones can do.

DESIGN DIRECTION 4

"By normalising sharing of (gloomy) mood with loved ones."

User research with loved ones showed that they are afraid to make mistakes and do the wrong things when showing social support to their loved ones in a gloomy mood at a distance. Normalising the sharing of a gloomy mood and sharing what the person in a gloomy mood would like could make it easier for loved ones to act. And for a person in a gloomy mood, it would be easier to ask for support. When it is not normalised to seek help from loved ones, it could lead to a world where people only seek anonymous support in their digital world. Context analysis showed how this digital living could result in people distancing and living in their bubbles, not trusting anymore.

4.4 | Brainstorm: Choosing a design direction

Mimicking the in-person way of sharing a gloomy mood through body posture could be the most important direction for this project. People currently show their gloominess to loved ones by showing body posture to let them initiate social support. Current mainstream communication media do not yet support this, making it difficult to start any social support at a distance. As context analysis already showed a possibility for showing support at a distance, the third direction could be less new and exciting. Therefore, I did a generative brainstorming session to validate the desire for the first design direction that focuses on mimicking the in-person way of sharing a gloomy mood. I did this brainstorming session among people who sometimes experience a gloomy mood to find if they found this direction helpful. Next, I did the brainstorming session to see if the direction would be an exciting session to continue designing for in this project.

Methodology

I chose a generative brainstorming session with design students to get insights into the design direction and if the design direction is inspiring and exciting. Besides, a productive brainstorming with design students could give a fresh opinion on the best design direction to fit the current design goal.

Participants in this brainstorming session were two other students with a background in industrial design engineering and me. One of the participants is doing a master's in Strategic Product Design, and the other student is doing a master's in Design for Interaction. I deliberately chose this to get different perspectives on the design direction. The participants and I are all women aged between 20-25 years.

The brainstorming consisted of three tasks. 1. A warm-up exercise to get used to the how-to method. 2. A how-to brainstorm on the essential elements for answering the design goal and the design direction. 3. Brainstorm final ideas for answering the design goal and the design direction.

1. WARM-UP

During the warm-up, I introduced the participants to think about solutions and the use of the how-to method. How-to questions focused on how to

catch a fish. I wrote three different questions on an A3 sheet: How to catch, how to keep a fish, and how to look underwater. The exercise consisted of 3 rounds, in which the participant had one minute to think of ideas for the question and write them down or draw them. After each minute, I rotated the sheet.

2. HOW-TO BRAINSTORM

For this brainstorming, I formed how-to questions to find possibilities to achieve the design goal and the chosen design direction. Let a gloomy person hiding their mood feel more comfortable sharing their gloomy mood with loved ones over a distance to receive social support by mimicking the in-person way of sharing a gloomy mood through body posture. The how-to questions that are important for this are:

- How can you relax?
- How can you feel safe?
- How can you show emotion over a distance?
- How can you capture your body posture?

The questions were written on an A3 paper and rotated. The participants had 1.5 minutes per question to write down ideas using text or drawings.

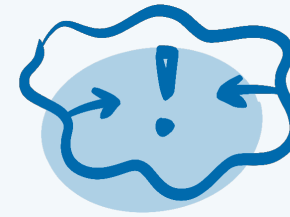
3. IDEA BRAINSTORMING

The how-to questions' most inspiring or exciting solutions were discussed and highlighted. The participants had 5 minutes for this. Then a short idea session was held of 5 minutes in which the participants generated ideas on their piece of paper based on the inspiring and exciting solutions. Participants of the brainstorm then discussed the ideas for another 5 minutes to determine why certain choices had been made and what other students thought of the chosen design direction.

After the brainstorming session, I formed insights concerning the chosen design direction.

Results

Analysis of the brainstorming session, ideation and discussion resulted in the following insights regarding the suitability of the chosen design direction for this project. The results of the generative brainstorming session can be found in Appendix I.



LIMITATIONS IN MEASURING POSTURE

The discussion of the ideas showed that most do not foresee the automatic sharing of a gloomy mood with their loved ones. Ideas and most desired how-to's indicated that a gloomy person wants control over what they send to other people. In contrast, many ideas for the solution to the how-to measuring body posture consisted of sensors that constantly measure body posture. This contrast shows that someone does not want to lose control in sharing their gloomy mood. Not even when this data informs a loved one of the gloomy mood. The only option would be to design an object to match a body posture in a gloomy mood. With this, the gloomy person can consciously choose whether or not to make contact. This solution is restrictive in coming up with a suitable solution for the selected design direction: Mimicking the in-person way of sharing a gloomy mood through body posture.



PERSON IN A GLOOMY MOOD PREFERS TO COMMUNICATE THEIR NEED OVER THEIR GLOOMY MOOD

The gloomy mood is shared directly in the final ideas and most how-to answers. The person in a gloomy mood does not need to show the gloomy mood directly but can do this through a fun and relaxing activity. Therefore the focus should be more on directly regulating this gloomy mood by letting the person in the gloomy mood express their need for social support. In doing so, the person in the gloomy mood would also let the loved one know what they need.



NEED FOR RELAXATION DURING SHARING

Ideas from all participants included a need to actively use a designated object to help regulate mood and immediately relax while sharing with loved ones. This relaxation often included distracting elements. Elements of how to do this ranged from the playing of music to the opportunity to sit down.



FAST RESPONSE TO SHARING THE GLOOMY MOOD

When sharing a gloomy mood, a quick response from the loved one was desired in all ideas. When sharing a gloomy mood, a person does not want to wait in suspense for their loved one's response or action. To receive a quick response from a loved one, the loved one needs time available: responding fast can be more of a hustle for the loved one when it is a distracting activity that will take a long time or a loved one needs to prepare.

4.5 | Final design direction

With the results of the generative brainstorming session, it can be concluded that the initially most promising direction is not the most appropriate for this project. Technologies to measure, monitor and communicate with loved ones are found to be intimidating. Someone in a gloomy mood is not prepared to have their attitude measured 24/7 to get the desired social support from their loved ones. And, as a designer, I don't find the idea of people being constantly measured attractive. These results limit the solution space to sharing a specific body posture or to a design that could change people's behaviour by presenting them with their potentially undesirable future.

In addition, it was more beneficial for people in a gloomy mood to ask for a specific response rather

than just sharing the gloominess in itself. As people did not desire to share their gloomy mood, other design directions would be more favourable to proceed with this project. Combining the additional insights about the desire for relaxation while sharing and the understanding that a distracting activity might take too much of a loved one's time to respond quickly.

These insights resulted in the following final design direction:

"By receiving non-verbal cues of sympathy from their loved ones while sharing their need for social support in a gloomy mood."



Figure 27 | Showing the importance of non-verbal cues in showing external validation

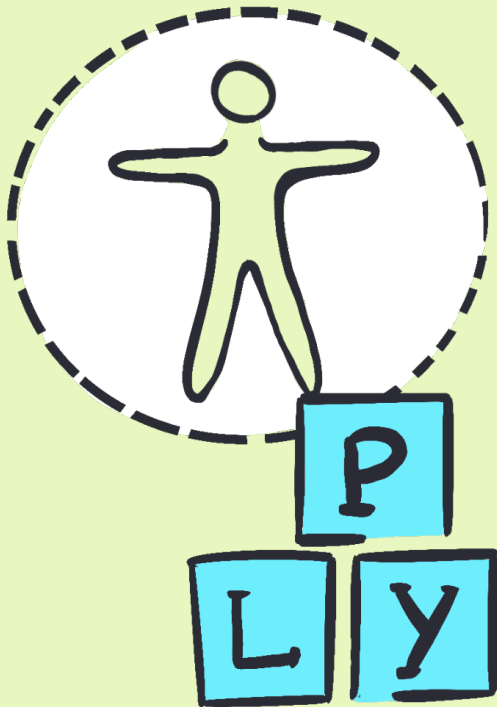
4.6 | Concept requirements

Requirements are a combination of previous research into a gloomy mood, non-verbal communication, technology trends, user research, brainstorming and research through the prototype. These requirements are essential to fulfilling the design goal and final design direction.



1. Low effort

The mental and physical effort needed for a person in a gloomy mood should be as low as possible.



2. Physical space

Interactions should happen in the physical space to make a person in a gloomy mood aware that they have loved ones that care for them.



4. Less tech

The concept should try to contribute to the person's experience in a gloomy mood, even when technology fails.

3. Playful

The concept should invite the person in a gloomy mood to play with, making it easier for them to get familiar with it.



5. Small change

In using the concept, people should not have to make a significant change in their current daily life. This concept should make it easier for them to use and adjust to the new interaction.



6. No talking

Let a person in a gloomy mood be able to share their gloomy mood without needing to talk.



7. Validate through touch

External validation should be experienced through haptics, as touch is the preferred way to give and receive external validation.

Requirements retrieved from 2.1, 2.2, 2.3, 3.4

8. Own actions

People who do not share their gloomy moods at a distance like their own actions to affect their mood regulation.



9. Control in sharing mood

People would like to keep control when they share something with loved ones. Therefore, the person in a gloomy mood needs to feel in control of sharing their gloomy mood.



10. Attention of loved ones

A person in a gloomy mood needs to feel assured by receiving the full attention of a loved one in sharing their gloominess over a distance.

11. Relaxing

The goal of regulating a gloomy mood is to feel relaxed; the concept should be relaxing.

Requirements retrieved from 2.4 and 3.4



12. Not alone

It is important for a person in a gloomy mood to not feel alone in experiencing this mood. Loved ones should know from each other that it is something they both deal with from time to time.

Requirements retrieved from 2.5

4.7 | Limitations

Normalising a gloomy mood is still crucial for people to feel comfortable sharing this. In this project, I focus on designing specifically for a person being gloomy. By designing for a gloomy mood, there is already a focus on normalising sharing this gloominess and mood in general. I am making

something people can use when experiencing this. Even when the focus is not on sharing the gloominess but on desiring a specific effect for this mood. However, for future development of this project, there could be more focus on normalising sharing of moods in general.

5 | Ideation and conceptualisation

In the previous chapter, I determined a design direction. For designing a final concept, this chapter determines the concept direction based on the design direction and defines this concept direction in more detail. This chapter gives insight into the methods used in forming ideas, developing three concepts, evaluating one concept direction, and the methods used for elaborating this concept direction.

5.1 Concept ideation

5.2 Concept evaluation

5.3 Prototyping: Closer through touch

5.4 Prototyping: Relaxation through pressure

5.5 Defining: Notifying the loved one

5.6 Conclusion

5.1 | Concept ideation

A brainstorming session was firstly conducted in which I developed three different concepts. These concepts are explained in this section through a short storyboard.

The brainstorming started with the formulation of how-to questions based on the final design direction and design goal. The ideas to these questions allowed partial solutions to be found

before looking at the bigger picture. The most potential partial solutions were selected and placed on a morphological map. With this map, I formed ten complete ideas. The three ideas that inspired me the most were further developed into the three concepts: Rad of Fun, Blossom, and Huggow. The complete brainstorming session can be found in Appendix J.

Rad of fun



Figure 28 | User scenario of a gloomy person using Rad of Fun with their loved one

Concept 1: Rad of Fun

This first concept revolves around getting affirmation from a loved one as they make time for activities together (Figure 28). These activities are discussed in advance, based on each other's likes and dislikes during a gloomy mood and being at a distance from each other.

Rad of fun starts with opening a discussion on possible activities to do at a distance when one of them is in a gloomy mood—giving a start to making it more normal to talk about needs when experiencing a gloomy mood over a distance. Rad

of Fun is a physical object placed somewhere in a home, connected to an app to mark activities and keep track of them. This tracking stimulates people to do activities and make time for each other. The rad of fun will display the chosen activities on the physical rad. When one of the loved ones would like to do an activity, they can press the button. The Rad of Fun will pick one of the discussed activities for them to do. The rad of fun highlights the chosen activity at both homes of the loved ones. The other loved one can press the button to notify they read the sign and are available to do the exercise. With this, they show validation in making time for the chosen activity.

Blossom

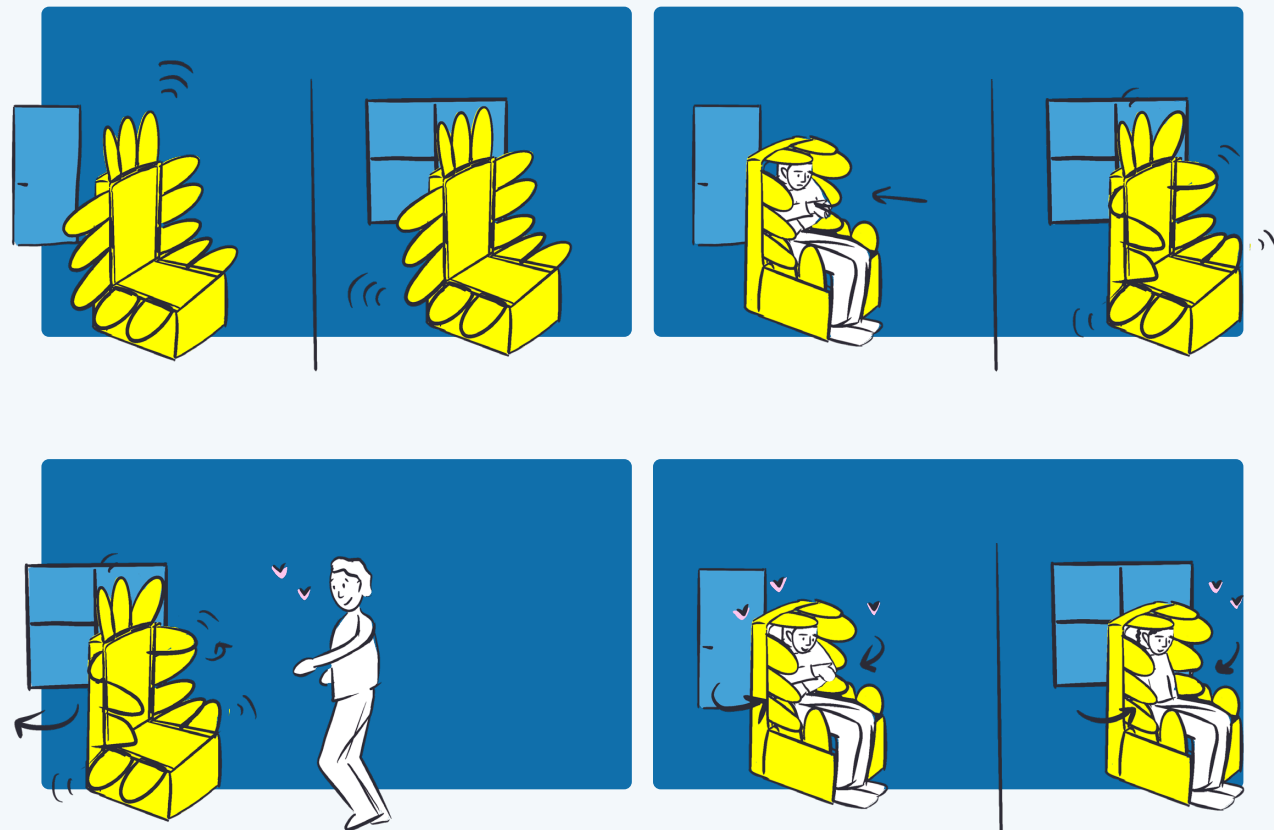


Figure 29 | User scenario of a gloomy person using Blossom with their loved one

Concept 2: Blossom

This second concept is about spontaneously receiving validation through pressure when sitting down, literally feeling the other person close (Figure 29).

Blossom is a chair someone can sit in to receive sympathy from a loved one. The chair comes in a duo placed at both houses. The chairs connect through Wi-Fi. When a person sits on the chair, the chair comforts its user by already folding the leaves around them. At the same time, the other

chair will start moving, signalling a loved one that someone is sitting on the chair. When the loved one moves to the chair, the leaves will open to guide them to sitting on it. When both loved ones sit on the chairs, the leaves enclose them and give a safe and pressured feeling, mimicking the closeness. Blossom does not focus on being only used during a gloomy mood. However, being able to signal a loved one by sitting lowers the effort to initiate contact when in a gloomy mood. It helps as they both have a chair available, so the person in a gloomy mood does not feel special.

Huggow

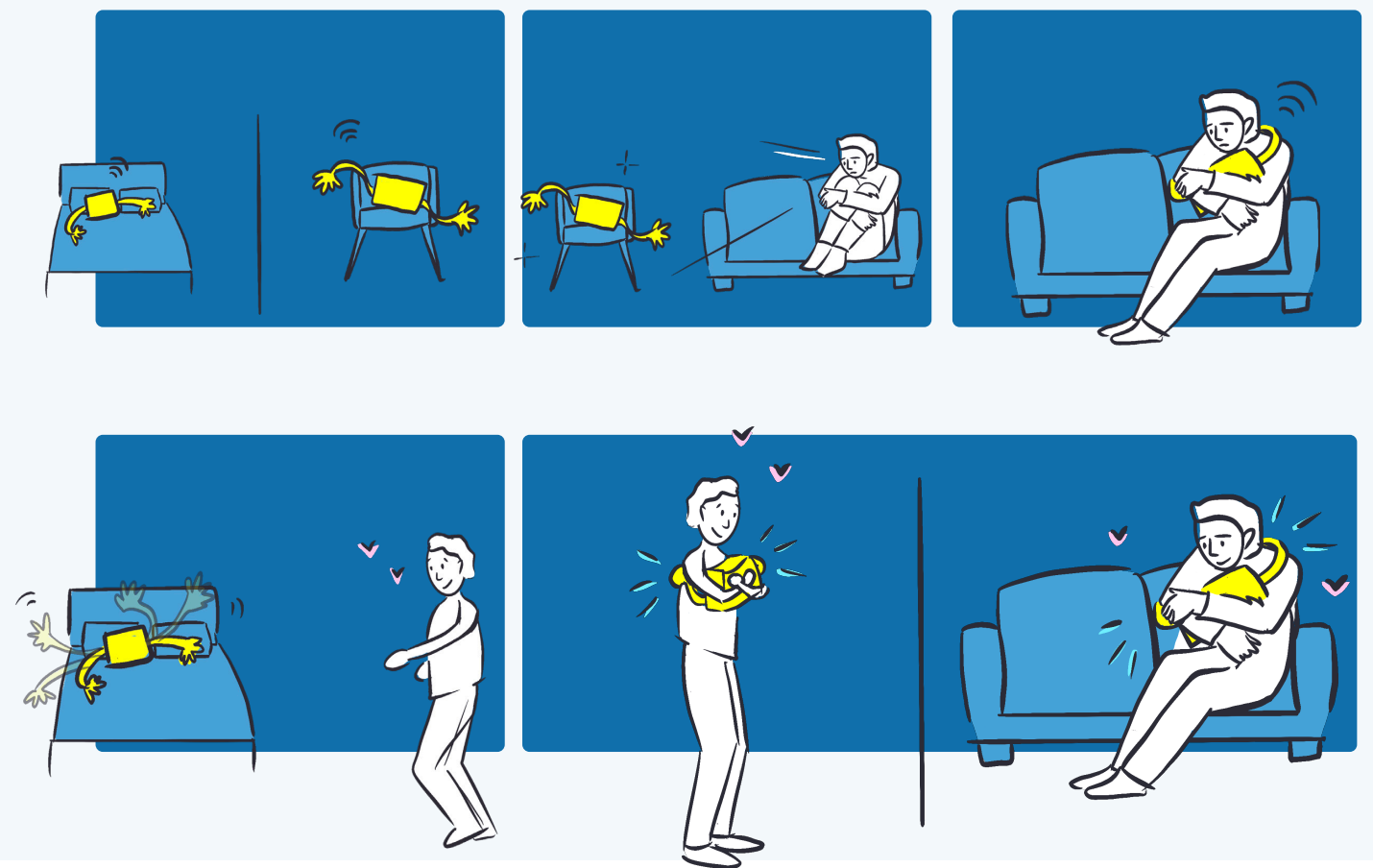


Figure 30 | User scenario of a gloomy person using Huggow with their loved one

Concept 3: Huggow

This third concept is all about hugging. Being able to give a physical hug to a loved one and get one back, receiving the energy to start regulating and get the gloomy feeling validated (Figure 30).

Huggow is an interactive pillow simulating the arms of a loved one. When a person desires a hug in a gloomy mood or feels like giving or receiving a hug no matter the mood, Huggow is there for them. Even at a distance. Huggow will give a hug in return by enclosing the arms directly when hugging. At

the same time, the Huggow of the other person will start moving their arms, indicating a loved one is currently desiring a hug. When both loved ones are hugging through Huggow, their arms will enclose more to signal the connection between them—focussing more on the need for a hug in a gloomy mood and being able to ask for this. Thereby Huggow stands for normalising that it is okay to be gloomy, that people are not alone in this, and that it is acceptable to seek comfort through loved ones. Keep building and maintaining a great relationship, even over a distance.

5.2 | Concept evaluation

This section describes the selection of a final concept direction and what developments must be done to get to a final concept.

Choosing a concept direction

The three concepts are evaluated with a Harris profile to decide the best fitting concept direction to achieve the design direction and design goal when looking at the desirability and viability of this concept for the user. The Harris profile uses the design requirements shown in Chapter 4. These are combinations of conditions focussed on user experience and needs for the concept to fit the user for the long term and be a positive influence. I ordered these design requirements from most important to least important. This importance scale is based on the insight of the interviews on how essential people appeared to find these requirements and my personal experience. In theory, all designs should fit the requirements as I ideated the concepts from questions based on the design direction and goal. However, some ideas can serve a need better than others. Therefore each requirement has a ranking (-2,-1,1,2), and a description of this ranking makes it possible to evaluate the concepts honestly. Appendix J4 shows the descriptions of the rankings for each requirement.

The Harris profile is evaluated by looking at what 'tower' has the most weight on the right side and is most likely to fall to the right. The Harris profile (Figure 31) shows how Blossom and Huggow both lean towards the right side. However, Huggow appears to be falling quicker, having more weight to the right at the top. This weight at the top indicates that the most critical requirements are more prominent here than the other concepts. Huggow stands out in letting a person in a gloomy mood not feel alone, enabling validation through touch, and showing comfort when no tech is available. On the other hand, Huggow can be improved compared to the other two concepts in the following requirements; the effort, showing the full attention of a loved one, physical space, fixing mood by themselves, and being a small change. However, these requirements are still okay in the current design. When looking at these insights, this makes Huggow the best concept when looking at desirability and viability.

Next to being best when looking at desirability and viability, it is the most feasible concept direction for this project's scope and the time available to work out a prototype and test it with users thoroughly. Therefore, huggow will be the concept direction developed further.

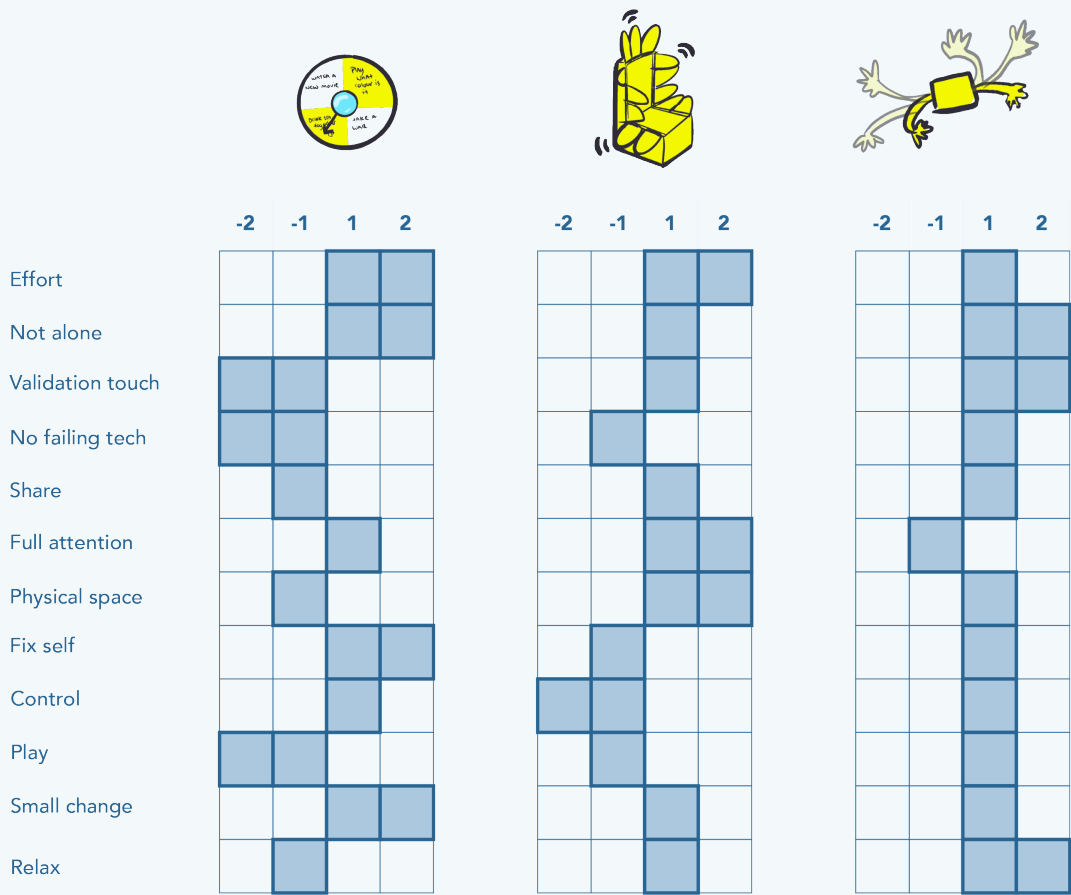
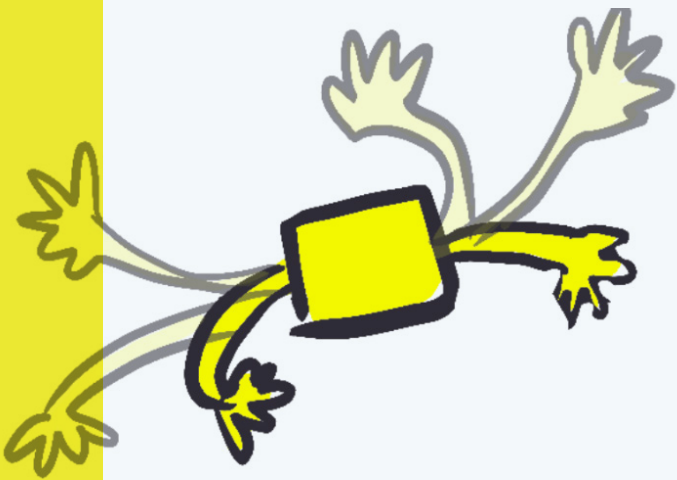


Figure 31 | Evaluation of three concepts with a Harris profile



Developing Huggow

Huggow can notify other loved ones that the person in a gloomy mood desires a hug, focussing on the desired effect rather than informing the reason. A hug is a natural desired reaction to show validation and is used in person as the initial response when seeing a gloomy person. External validation can be a push to enhance energy and effort to start effective gloomy mood regulation (Chapter 3).

There are four elements essential in the concept direction of Huggow (Figure 32). The base of these elements is found through context analysis and user research, and together form a solution for the design goal and the final design direction.

1. INVITING

Huggow stands for a direction that there should be a change in the way loved ones connect over a distance. Especially when not feeling their best. Buying Huggow, a tool to communicate with loved ones to keep building a connection and sharing a personal affect, is already a step in normalising this behaviour. Providing extra information about activities for gloomy mood regulation possible over a distance lets loved ones already feel more secure in others' capabilities. Huggow should invite a person in a gloomy mood to use it. Huggow will invite this person by having an open shape, mimicking the open arms of a loved one when they show their availability to give social support and validate their feeling (Chapter 3). Next to this, the material of the final concept should feel soft, squishy and warm, let it feel nice when hugging, and the material firm enough to feel the 'arms' around you.

2. PRESSURE TO RELAX

When hugging Huggow in a gloomy mood, it is crucial for someone who does not like to show their mood that their actions also have an effect. By hugging Huggow with no loved one on the other side, it is still important that they can make themselves feel somewhat relaxed. Chapter 3 also showed these insights where people in a gloomy mood like to pressure themselves when feeling gloomy. Next, it was considered important to feel two arms (or one arm) around the person in a gloomy mood during a hug between loved ones. When a person in a gloomy mood starts hugging

Huggow to receive a hug from a loved one, they must experience this feeling.

This relaxation should happen without technology. When hugging Huggow in a gloomy mood, it can be possible that there are no loved ones near their Huggow to embrace back - so no other interactions mimicking the closeness between loved ones can happen. Therefore the person in a gloomy mood needs to feel relaxed and get some energy from hugging Huggow even when the loved one is unavailable, or the technology fails. Thereby the experience of no loved one around or failing technology should not be too bad to stop a person in a gloomy mood from desiring to hug Huggow. Therefore the person in a gloomy mood should be able to put pressure on themselves with Huggow manually. In doing so, the person in a gloomy mood will hug themselves in a way, showing that it is okay to validate a gloomy mood by yourself as well.

3. FEELING CLOSE TO A LOVED ONE

Huggow will make loved ones feel closer towards each other when loved ones respond by hugging back. When the hugging is over, loved ones can initiate contact with the person in a gloomy mood—thinking of something themselves or using the extra information that could be given when buying Huggow.

4. NOTIFYING THE RIGHT WAY

Loved ones need to notice the need for a hug through Huggow. Therefore, Huggow needs to get their attention in the desired way. They are not intrusive or distracting from the hug itself. As explained before, it can be possible that a loved one is not near their Huggow. In this case, it will also be important that a loved one get notified and be able to respond to this notification in the desired way.

It is still unclear how to give pressure to relax, what technology to let loved ones feel close to, and how to notify them correctly. These three elements of Huggow will be developed and specified further in this chapter. The next chapter will combine all components into a final concept.

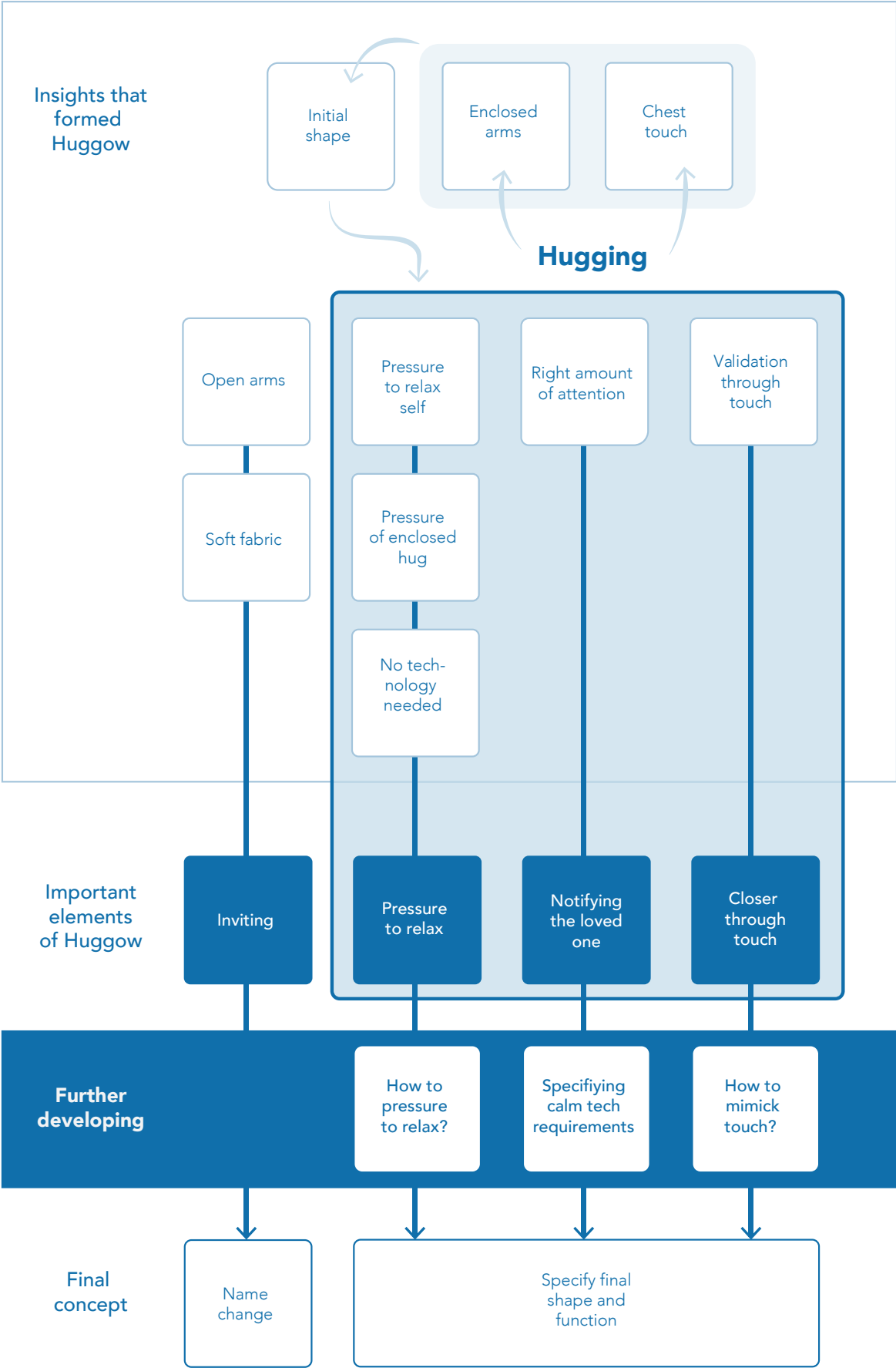


Figure 32 | Illustration of the insights that shaped Huggow, and the elements that need to be further developed

5.3 | Defining: Manual pressure to relax

As explained, relaxation is essential for a person in a gloomy mood. A person in a gloomy mood seeks direct comfort with their actions, and a person in a gloomy mood has the goal to feel relaxed after regulating their gloominess (Chapter 3). This section will focus on developing an ideal manual pressure mechanism to mimic the enclosed feeling of a hug that someone desires in a gloomy mood. Helping the person in a gloomy mood relax, feel safe and feel the literal pressure to start doing something.

The initial shape of Huggow is determined from the insights of a hug: feeling the chest touch and having two arms enclosed around the gloomy person. Different possibilities for manual mechanisms are ideated and developed to define this part of the final concept direction.

Four mechanisms

Four feasible manual mechanisms to apply pressure are ideated and conceptualised (Figure 33) (Appendix K). Manual mechanisms form the basis for the ideation to ensure the concept still functions when technology fails.

OPEN-UP

Opposite of a gloomy posture, when shoulders are hanging low, is a more open posture with the shoulders relaxed. Moving the bars to the side makes a person in a gloomy mood open their stance. They are faking it till they make it.

GRAVITY

The mechanism consists of a heavy material inside a soft outer shell. The person in a gloomy mood should place the concept on the neck. Their arms can be held and placed on the chest area. Gravity weights down on the user, making them feel more comfortable and relaxed.

ARMS

Users can hold the back bars of the concept. When placing the chest in the centre and bringing the bars closer, the arms on the side will enclose the user—mimicking an in-person hugging scenario.

FLOW

This concept’s mechanism works with the flow. The arms will enclose the user by pressing down with the chest and arms on the middle part of the concept. In the concept, Styrofoam particles are used to make the concept move on pressure. For a better experience of this air could be used.



Figure 33 | Illustration of the four mechanisms to manually pressure (Left to right: Open-up, Weighted, Arms, Flow)



Figure 34| Image showing the fabric sewed for Flow. A part of the prototyping process.

Duration

Lastly, for a hug to be pleasant, the duration of the hug is essential. Context analysis and user research did not result in a specific period of the desired hug. Only one person mentioned they gave a ‘long’ hug. To estimate the duration of an ideal hug in a gloomy mood is looked at hugs in literature. One-second hugs are less pleasant than 5-10 second hugs (Dueren et al., 2021). A regular hug takes 3 seconds, and a comforting hug will take longer. Interventions using deep pressure therapy to reduce stress and enhance a relaxed feeling often take 2-5 minutes a

day (Wilbarger & Wilbarger, 1991). Combining these insides concludes that a hug with Huggow should be comfortable for hugging between 5 seconds and approximately 2 minutes.

Choosing a mechanism

A small study is done to find what manual mechanism best fits the final concept. Four prototypes are made to be tested in this small study. These prototypes are shown in Figure 35.



Figure 35 | Images of the four prototypes to manually pressure (Left to right: Open-up, Weighted, Arms, Flow)

METHODOLOGY

I tested the products myself, as this was the fastest solution considering the time available. I ranked concepts on different criteria related to pressure and relaxation to keep the scoring fair. Criteria for relaxation were divided into the most relaxed feeling after a 2-minute hug, the highest heartbeat drop after 5 seconds and 2 minutes, and the most energised feeling after 5 seconds and 2 minutes. A fit-bit was used to measure the heartbeats per minute. Next to relaxation, pressure, effort and likeliness to use were also ranked. The person in a gloomy mood must feel the pressure. On the other hand, it should still be manageable and effortless for a person in a gloomy mood to apply this pressure and use the concept.

I tested the four different concepts two times. After each test, I wrote a small conclusion of my experience to ensure I remembered the hug when ranking the concepts. The first test consisted of a 5 seconds hug. At the start, I put on a Fitbit and read my heartbeat per minute in rest. After reading the heartbeat, I hugged the concept for 5 seconds and reread my bpm. I wrote these different numbers down together with the conclusion. After 10 sec rest, a second test with the same concept was done, only changing the duration of the hug to 2 minutes. I followed this procedure for all four concepts. After the testing, I ranked all the concepts following the found criteria. The not of this test can be found in Appendix K4.

Flow to relax

For this project, I will continue with the concept of Flow. Flow scored the highest in the ranking. Notably, the results (Figure 36) showed no increase in effort when hugging for 5 or 2 minutes with Flow. After 2 and 5 minutes of hugging, I felt relaxed and most inclined to use this concept to notify loved ones.

RELAXING HEAD SUPPORT

During testing, I found that I should add head support to make the hug comforting and relaxing. Simultaneously, a place for a person’s head to rest while hugging will provide more privacy. Let someone in a gloomy mood feel more safe and close to their loved one, mimicking the possibility of hiding a face in someone’s shoulder during a hug.

TOUCHING CHEST

When testing the concepts myself, I found that the concepts can be held different. During some positions, they do not always touch the chest. Of course, a person can use the design however they feel most comfortable, but this showed that cues need to be added to indicate where the concept should ideally touch the chest.

	BPM drop 5 seconds	BPM drop 2 minutes	Energized 5 seconds	Energized 2 minutes	Low effort 5 seconds	Low effort 2 minutes	Relaxed 2 minutes	Pressure intensity	Most likely to use	Total score
Gravity	4	4	1	3	2	4	2	4	3	27
Flow	3	3	3	4	4	3	3	2	4	29
Open-up	2	1	4	1	3	2	4	3	2	13
Arms	1	2	2	2	1	1	1	1	1	8

Figure 36 | Table showing the results of the weighted test with pressure mechanisms

5.4 | Defining: Feeling close to a loved one

By feeling the existence of a loved one close through touch, a loved one can show validation to a person in a gloomy mood. With this, a loved one can assure the person in a gloomy mood that their feeling is okay and that they have their full attention pointed to the gloomy person.

Closer through touch

As found during the user test, touch is an essential element to show validation to someone in a gloomy

mood. This importance of touch is supported by research as a gloomy person feels happier as touch releases oxytocin (Uvnäs-Moberg et al., 2015). Oxytocin is a hormone that is often called the cuddle hormone. Oxytocin plays a vital role in many human behaviours, including sexual arousal, recognition, trust, romantic attachment and mother-infant bonding (Hormones book). These insights show why touch can also make the loved one appear closer.

Mechanical breathing pattern



- + Mechanical movement does make it feel alive
- Not feel like a person is close: more a living object
- Mechanical movement is not in all positions comfortable to hold
- Mechanical movement can be more fragile to hold

Closeness with lights



- + Brightness intensity felt someone getting closer
- Only had an impact for the first seconds: did not keep the intensity
- Distance sensor is not manageable in a plush or pillow: hard to measure the person.
- Lights do not work in enhancing intensity as a person is likely to close their eyes when hugging

Touch through vibration



- + Vibration is most intensely felt
- + Can be used with eyes closed
- Vibration does not necessarily feel nice on the highest intensity
- Bit bland that it stays in one rhythm

Figure 37 | Overview of prototypes and test results used to define the feeling of closeness to a loved one

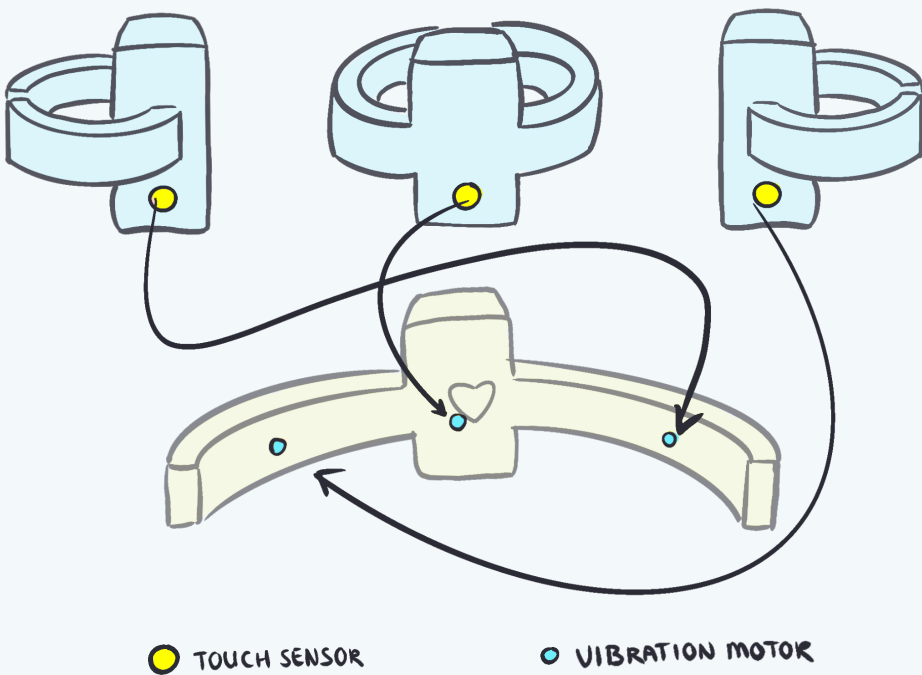


Figure 38 | Illustration of final idea of system with touch sensors and vibration motors

Ideation was done to define how the final concept should make a person feel closer through touch, ideating in different existing technologies and the desired effects received when touching a loved one during a hug. Appendix L shows a more elaborated overview of the entire ideation process of feeling the closeness of a loved one.

I compared these insights to current technologies or concepts already existing that can mimic this closeness between people, making sure the concept adds a new view on the topic of communication devices. These limitations resulted in the following possible options showed in Figure 37.

Small prototype testing with the main functions of the three chosen directions showed that touch through vibration had the most potential. Figure 32 shows an overview of the insights gathered in this research. This ideation resulted in another idea to make this idea of touch and vibration motors less bland (Figure 38) (Appendix L4).

The final concept will be mimicking the feeling of being close to a loved one, using different vibration motors connected to multiple touch sensors. This diverse connection will enable the person in a gloomy mood and their loved one to play and vary with the touch on how they would like this during a hug.

5.5 | Defining: Notifying the loved one

Notifying a loved one the right way is essential for the functioning of the concept. Therefore Uppie’s behaviour should fit a gloomy person’s and loved

one’s environment, using an Attention graph (Case, 2015) (Figure 39) to clarify this overall behaviour.

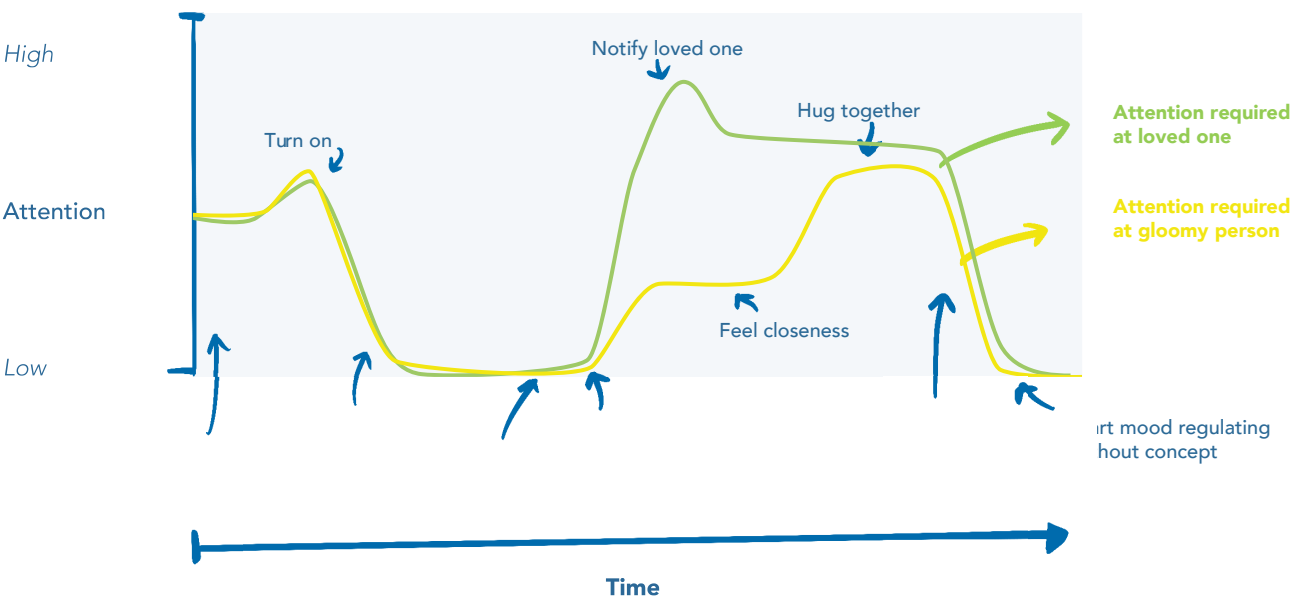


Figure 39 | Graph showing the required attention the final design should ask from the users (Green: Loved one, Yellow: Gloomy person)

There are two scenarios possible in notifying the loved one. In the first scenario, the loved one is near where they placed the concept. In the second scenario, the loved one is not near the concept.

The initial notifying will therefore take place through the concept. When there is no response after 2 minutes, an app could notify the loved one of the desired hug. In this app, there could be the possibility to send a digital hug to the physical concept of the person asking for a hug. On the

one hand, the loved one not being close to their concept could indicate them being busy and not having the full attention of the loved one. On the other hand, receiving a hug even when a loved one is not near their concept can validate the person as they at least recognise this. This decision can not be made clear with the current insights gathered from context analysis and user research. Therefore this decision will be discussed with participants during the final user test.

In notifying through the concept, the technology should require the slightest attention possible (Case, 2015). Three different attention models are made to achieve suitable attention and to show how the concept should act when notifying the loved one (Figure 40). An attention model is divided into primary, secondary, and tertiary attention. Primary attention is attention that needs the full focus. This attention is visual and direct. Secondary attention is attention that is more distant and does not directly need to be felt. This attention can consist of auditory signals or vibrations. Tertiary attention is peripheral attention, and this attention can consist of distant sound, environmental light, or environmental vibration (Case, 2015).

To notify the needed attention through the concept, a small LED is added behind the heart

of the concept, indicating the correct use and the state of the concept to assure the user is using the concept correctly. Furthermore, the already existing vibration motors will be used to notify the loved one.

The LED will show warm yellow light, and one vibration motor will turn on to notify a loved one that someone else desires a hug. When both the loved one and the person in a gloomy mood are hugging, the lights will dim, and only the touch and vibration motors should be working. While no other sensors function at that moment, they can focus on the touch they exchange.

To assure a person is in a gloomy mood, they will see a blue light when they hug correctly. Correctly meaning they are touching a sensor.

Gloomy person: Giving a hug

Primary	SecondaryT	ertiary
Yellow light	Pillow material and pressure	X

Loved one: Getting notified

Primary	SecondaryT	ertiary
XX		Environmental vibration Bright yellow light

Both: Giving a hug

Primary	SecondaryT	ertiary
Pillow material and use cues	Vibration and material softness on touch	X

Figure 40 | Attention models of; giving a hug, getting notified of the hug, and during a hug (Top to bottom)

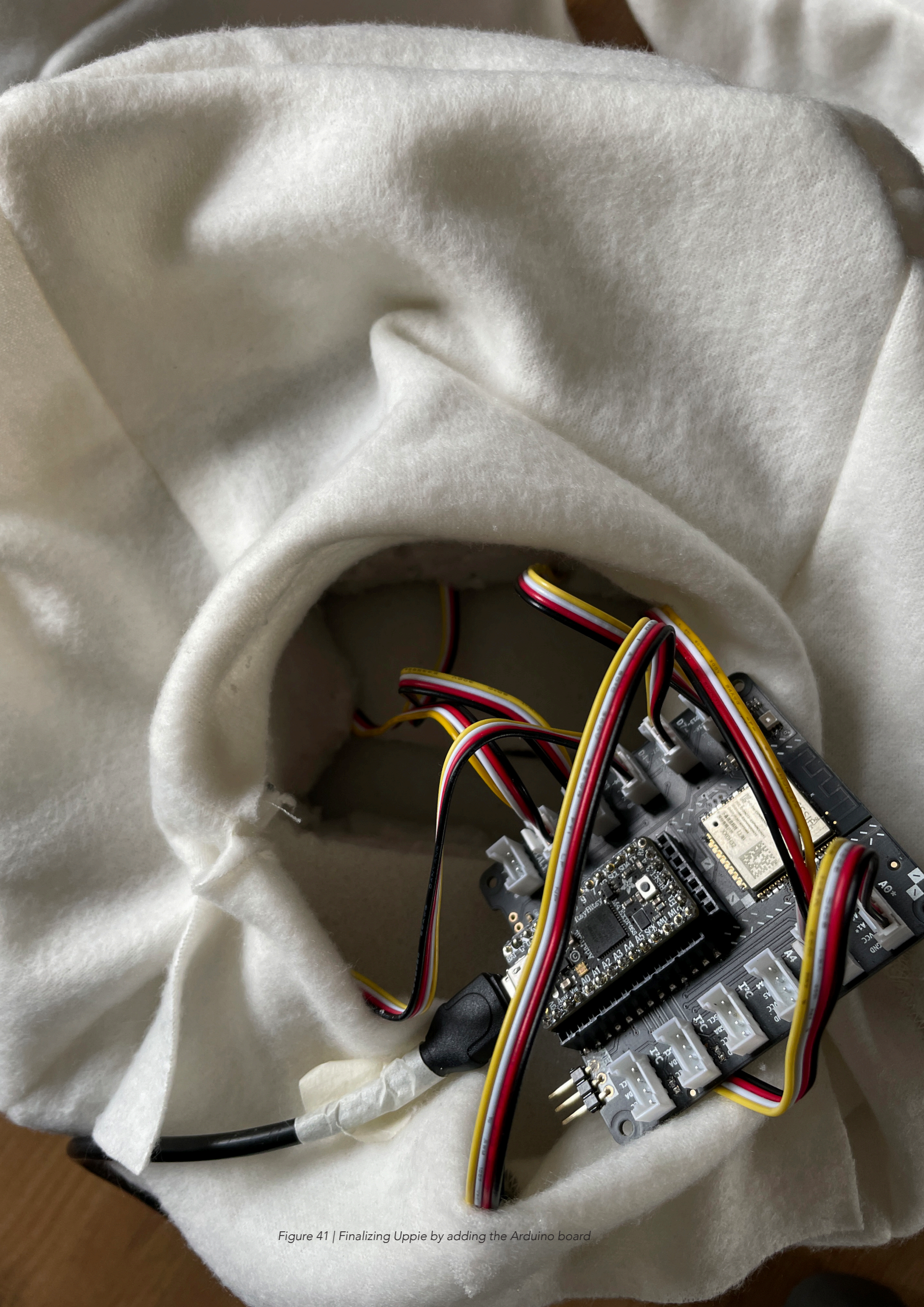


Figure 41 | Finalizing Uppie by adding the Arduino board

5.6 | Conclusion ideation and conceptualisation

Further how-to generation, morphologic mapping and the brainstorming session resulted in ideas in different concept directions. Favourable ideas were chosen and developed into Rad of fun, Blossom and Huggow. These concepts are evaluated with the design requirements in a Harris profile, concluding Huggow to be the most promising concept direction. Developing further on this concept's essential elements to finalise the design for this project's

scope, defining how to give pressure, choosing a concept to mimic touch, and specifying the way to get attention through the concept. Let a person in a gloomy mood feel more comfortable sharing their gloomy mood with their loved ones when being at a distance by receiving nonverbal cues of sympathy from their loved ones while sharing their need for social support in a gloomy mood.

6 | Final concept

I defined a final concept through ideation and conceptualisation to fit the design goal and direction. Let a gloomy person hiding their mood feel more comfortable sharing their gloomy mood with their loved ones over a distance by receiving non-verbal cues of sympathy from their loved ones while sharing their need for social support in a gloomy mood. Insights from the previous chapters are combined, forming the final design concept.

This chapter shows this final design concept, the important details that make this concept fit, and the main functions, ending this chapter with a user scenario.

6.1 Final concept: Uppie

6.2 Concept details

6.3 User scenario

“Sometimes a hug is all I need”

- Participant, User research (Chapter 2)



Samen met je
uppie



Uppie is uplifting, keeps loved ones close in their physical space, has contact and transfers energy when the effort is low. Keep building a relationship, even at a distance. Uppie works the same for the loved one and a person in a gloomy mood. Uppie

ideally lets people feel more comfortable sharing with their loved ones when they are gloomy, even when far from each other. The interaction of loved ones with Uppie is shown in Figure 42.

Figure 42 | Two loved ones hugging each other through Uppie

6.2 | Details of Uppie

Uppie is designed to make it more comfortable for a person in a gloomy mood to share this mood with their loved ones and start regulating their gloominess, even at a distance. Different details

of Uppie are important to create this comfort. This section shows an overview of the concept. The manual Uppie comes with when using Uppie and a more detailed explanation of all elements.



Figure 43 | Uppie

Important elements of Uppie

There are six elements essential in Uppie to make a person in a gloomy mood feel more comfortable

- Normalising gloominess
- Light indication
- Physically there
- Comforting
- Send and receive vibrations
- Loved ones can show initiative

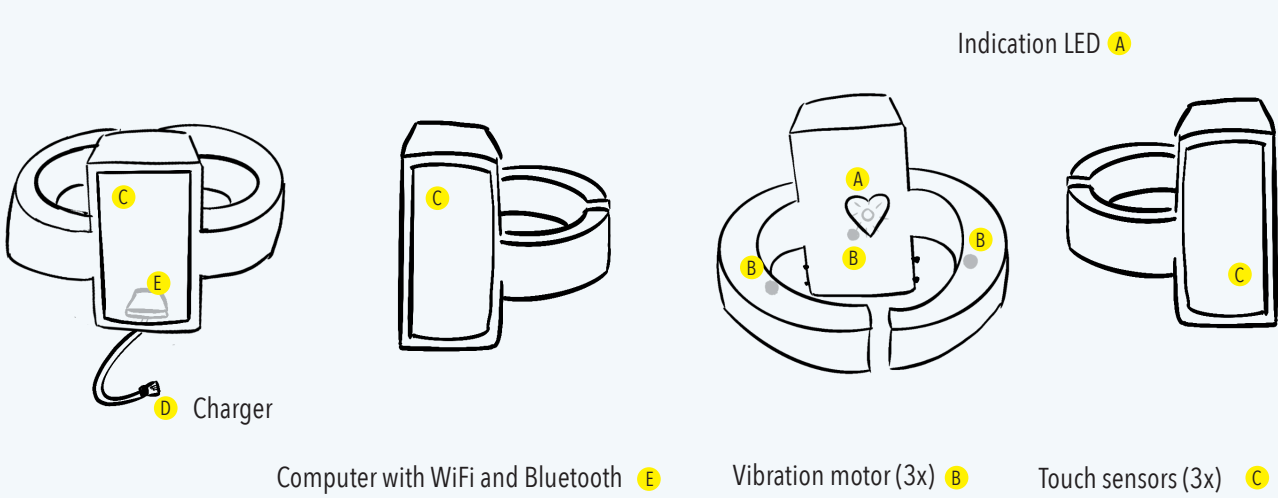


Figure 44 | Illustration of location of technical components inside Uppie

Manual

For complete assurance, Uppie comes provided with a user manual (Figure 45). This manual explains what elements Uppie consists of, how to install uppie, how to use Uppie with a loved one, what the light colours are, and the potential risks of using Uppie.



Figure 45 | User manual provided with Uppie



Figure 46 | Image showing how a person would see Uppie as a product

Normalising gloominess

Uppie is designed to share a gloomy feeling with loved ones. Creating a product that users can use daily is already normalising the sharing of

gloominess as there is now something to use. Normalising this mood is important for loved ones to start acting and make it easier to talk about the gloomy mood when they experience this.



Figure 47 | Embroidered heart of Uppie with a LED underneath

Light as indication

To assure both the loved one and the gloomy person that the concept is working, they need to know whether Uppie is receiving their signals and if Uppie is connected correctly to the internet.

The light is used as an indication for receiving the correct connection. Chapter 5.3, on defining the notifying part, already explained the importance of showing signals when using Uppie.

The same LED behind the heart will be used to notify the user before use and assure them that Uppie is correctly connected. A dark blue light indicates the concept is searching for a connection. Followed by a green light: showing it is connected, or a red light: Showing it failed to connect.

This light indication assures the user that they are using Uppie correctly and removes any doubt that could lead to using more effort when being gloomy.



Figure 48 | Uppie taking up physical space in a living area

Physically there

Uppie is a physical object designed to be located in someone's physical space. Making Uppie a physical object shows a person in a gloomy mood that there are real people for them. With this, I make sure

to divide the digital world from the physical one. Therefore, not being in the digital world is essential for the gloomy person to regulate their mood finally and not keep overthinking (Chapter 3).



Figure 49 | User using the neck support of Uppie to rest their head

Comforting

A person in a gloomy mood seeks to be comfortable. They do this by seeking minor distractions when being alone. An example is scrolling through social media on the phone or pressuring the head with a hand. Or a person in a gloomy mood can seek this comfort by using social support from loved ones (Chapter 3).

Uppie focuses on mimicking the comfort of hugging a loved one in person. This comfort is mimicked by giving pressure by enclosing arms. The arms can be opened, and during a hug, close around the person using it, imitating two arms of a loved one lightly pressuring around. The pressure is also indicated to be relaxing in previous research into manual pressure mechanisms (Chapter 5).



Figure 50 | Arms of Uppie enclosing around the user

Next to the arms, Uppie gives comfort by offering head support. The shoulder of Uppie makes a place for someone to rest their head in a gloomy mood. A person in a gloomy mood often tends to hang their head (Watson & Tellegen, 1985), and those in a gloomy mood like to support their head (Chapter 3). Thereby neck support showed to be necessary when testing out the concepts in Chapter 5.

All the above elements discussed make Uppie comforting to use. And by giving this comfort, a person in a gloomy mood can initiate their mood regulation a bit when technology is not yet possible.



Figure 51 | Indicating the touch areas on Uppie

Send and receive vibrations

When loved ones are using Uppie simultaneously, they are hugging together at a distance. This feeling is emphasised by vibration motors softly vibrating in both arms and the body of Uppie.

The vibration motors are linked to the touch sensors of the other uppie. If the right side of Uppie A is touched, the right arm of uppie B starts vibrating softly. If the left side of Uppie A is touched, the left arm of Uppie B starts vibrating softly. If the back of Uppie A is touched, the front of Uppie B will vibrate softly. These vibrations will happen the other way

around as well, from Uppie B to Uppie A. Thereby, multiple sensors can be active simultaneously. For example, when Uppie A is touched at the back and the left side, Uppie B will vibrate at the front and the left arm. At the same time, Uppie B is touched only at the back, causing Uppie A to vibrate softly at the front.

Deciding which areas to touch enables people to customise their hugs and communicate through vibration patterns. Mimicking the change in pressure and placement of hands during an in-person hug.



Figure 52 | Illustrating a loved one showing initiative in reaching out to the gloomy person

Loved ones can show initiative

When a person in a gloomy mood hugs Uppie and a loved one responds by hugging back, they share a brief hugging moment. In this hug, the loved one shows validation and availability through Uppie. This brief moment causes the loved one to be aware of the need for a hug from the person on the other side. When made aware of this need, the loved one can start acting to support the person on the other side even more. What it is people desire can depend a lot per person. Loved ones can fill in themselves what it is they do.

An example could be that after the hug, they could call the person who desired a hug to start playing an online game together or have a conversation while both are walking. Whatever it is they do, what works is that they then show initiative. Making it easier for the person in a gloomy mood to open up about their perceived mood, especially when they do not know why they feel that way.

6.3 | User scenario

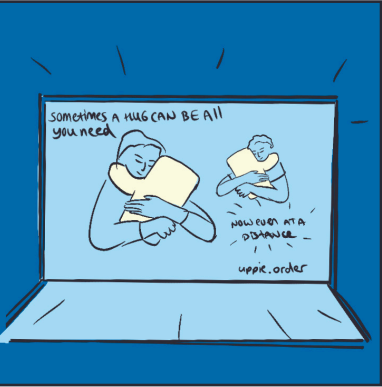
The concept details of Uppie provide an overview of all the different interactions that a person in a gloomy mood and their loved ones can have with Uppie. I made a user scenario to clearly show how Uppie works and how the elements of Uppie are connected.

Besides showing this connection, the user scenario is used to indicate the initialisation of Uppie. This scenario shows a first proposal on how Uppie could be marketed to the end-user, how they would buy the product, what they would receive when purchasing Uppie, and how they could connect Uppie to their network and their loved one's Uppie

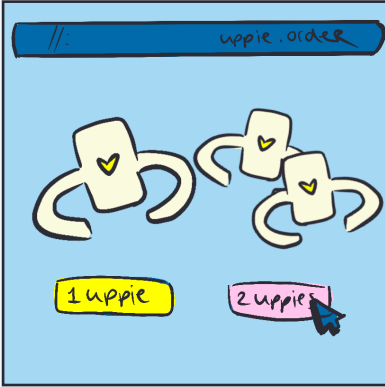
Therefore, the concept scenario is split into two parts: initialising Uppie and using Uppie when one is in a gloomy mood (or any mood when a hug from a loved one is desired).

The use scenario shows the story of Bobby and Alex, two family members who live in two different places in the world. They only see each other once or twice a year on family outings. The scenario starts with Bobby seeing an advertisement for Uppie and deciding to buy it for him and Alex. The user scenario is followed by showing how Bobby configures Uppie and how Bobby uses Uppie in a gloomy mood to seek social support from Alex.

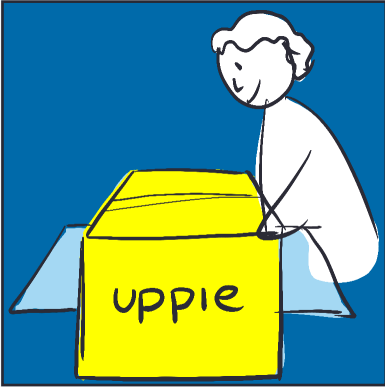
Initialisation of Uppie



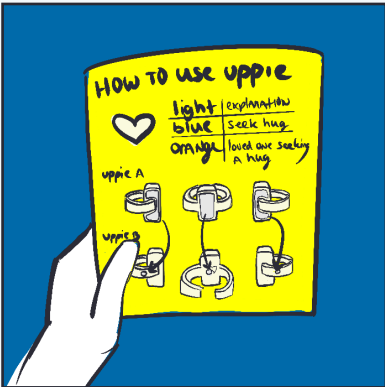
Bobby sees an advertisement for Uppie, focusing on the possibility of giving and receiving a hug from your distant loved ones.



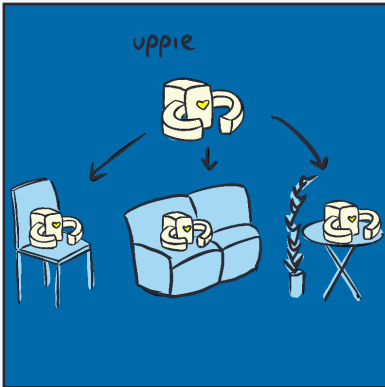
Bobby is persuaded to buy one for him and her brother Alex who lives further. He decides to buy one for himself as a surprise.



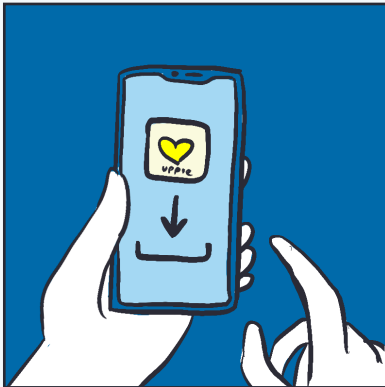
Bobby receives his Uppie through the mail.



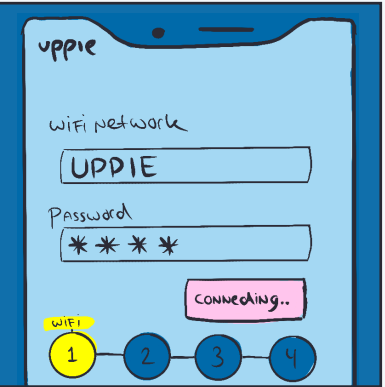
Bobby briefly studies the user manual before installing Uppie in her home.



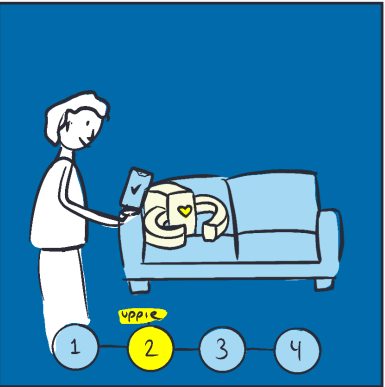
The user manual gives Bobby advice to place Uppie in a location she would typically have in-person contact with her loved one (Alex).



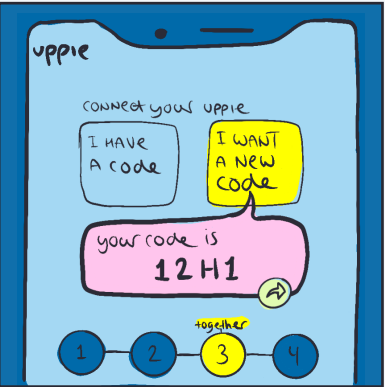
Bobby installs the Uppie app to connect her Uppie to the network and be able to connect with Alex's Uppie.



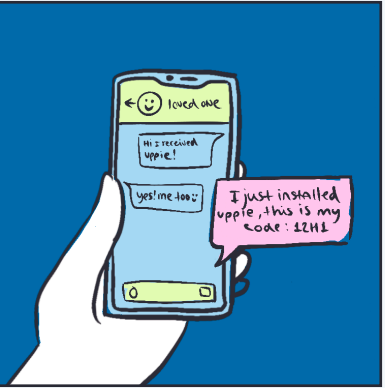
The app establishes a connection with Bobby's WiFi as Bobby fills in the network name and password.



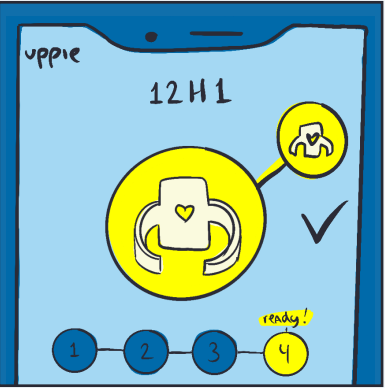
Bobby connects her Uppie with the app. This way, her Uppie can connect to WiFi.



A new Uppie-code is made for Bobby to share with Alex to connect their Uppie.



Bobby sends the Uppie-code to Alex.



The app shows Bobby that Alex did connect his Uppie with the code.

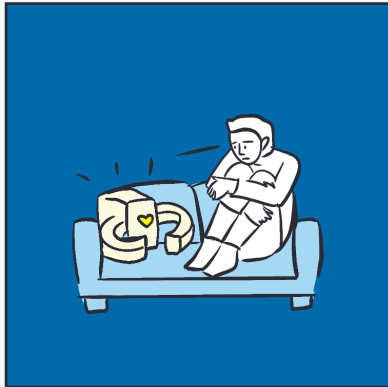


Bobby did successfully install Uppie. Now she can continue her day as usual.

Using uppie whilst being gloomy



Bobby is feeling gloomy and sits slumped on the couch.



Bobby notices Uppie sitting on the couch next to her.



As Uppie is in the physical space next to Bobby, Bobby is persuaded to pick up Uppie to receive a hug from Alex.



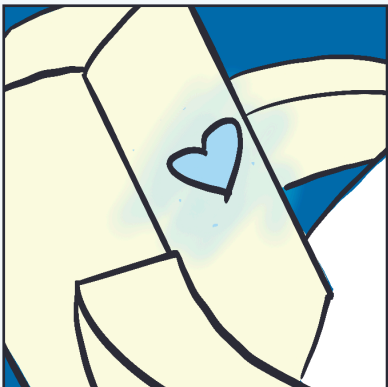
The hug continues. The encasement of Uppie, and the vibrations that mimic the touch of Alex, already make Bobby feel a bit more relaxed.



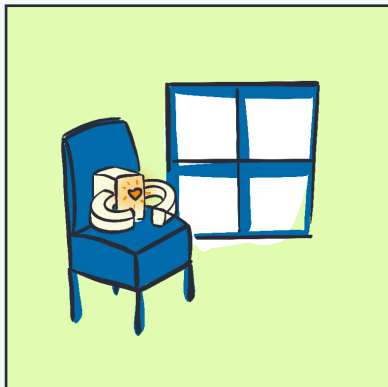
Bobby feels more relaxed and decides to stop the hug, placing Uppie back on the couch.



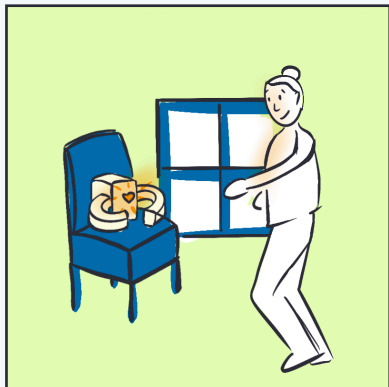
Alex notices no vibrations anymore and places Uppie back as well.



A blue light assures Bobby that she is signalling Alex through Uppie.



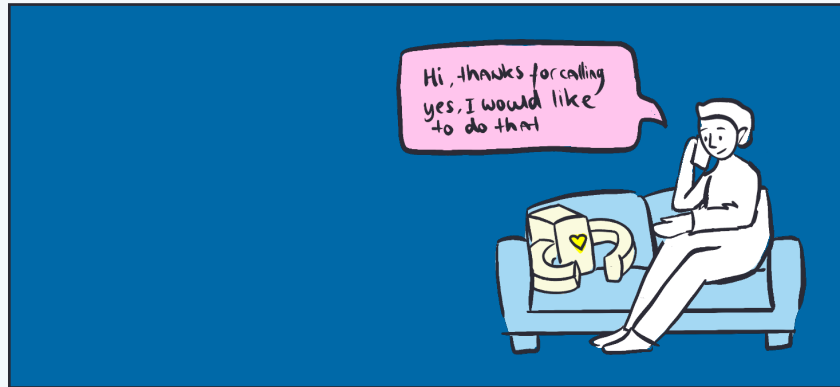
Alex's Uppie starts buzzing and shows a warm orange light at the moment Bobby starts hugging.



Alex notices the buzz and walks towards Uppie.



Uppie showed Alex that Bobby required a hug. Alex decides to give Bobby a call to see if she would like to do an activity.



Bobby enjoys the plan Alex proposed. In a gloomy mood, it can be hard to initiate contact. Uppie makes it more comfortable to share the gloomy mood.



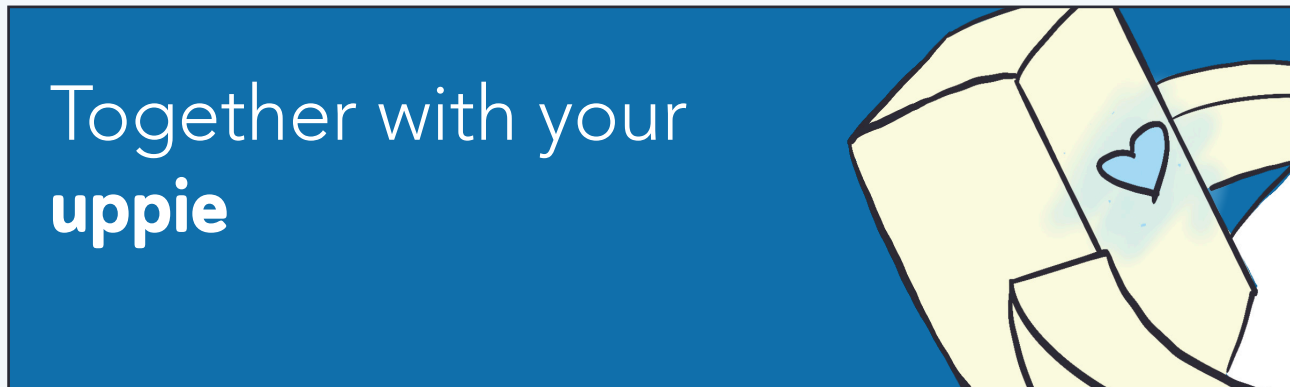
When Alex picks up his Uppie, the light dims, and the vibration motors become active. It shows Bobby and Alex they are hugging together.



When Alex touches the back and the side of his Uppie...



... Bobby notices her Uppie softly vibrating at the front and right arms.



7 | Design evaluation and recommendation

To validate the final concept an evaluation is done with participants who were sensitized to experiencing a gloomy mood. By validating the final concept, the concept is tested to find if it fit the design goal. Furthermore, recommendations can be formed for further implementation of the concept.

7.1 Test set-up

7.2 Results

7.3 Limitations

7.4 Evaluation

7.5 Recommendations

7.1 | Test setup

A final user test is done to evaluate the final design to see if it fits the design goal and direction and to find interesting possible iterations for further use.

The final design concept should meet the design goal and design direction defined in this project:

Let a gloomy person hiding their gloomy mood feel more comfortable sharing this with their loved ones over a distance by receiving nonverbal cues of sympathy from their loved ones while sharing their need for social support.

The following research questions validate the design goal and the chosen direction.

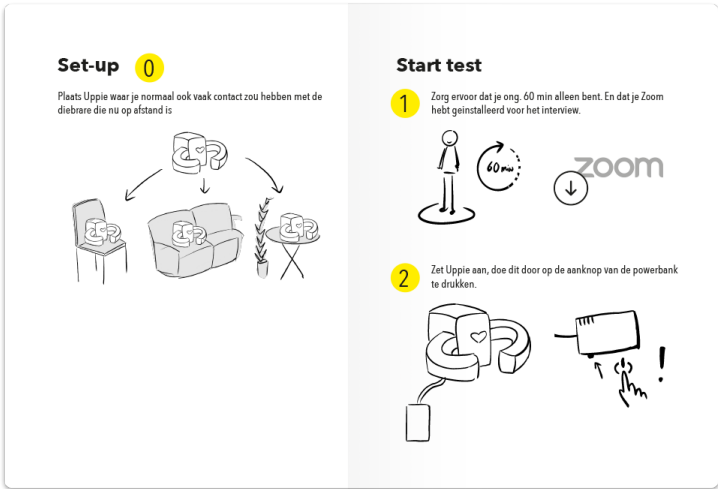
1. Do people feel comfortable sharing a gloomy mood when they receive sympathy from their loved ones through Uppie?
2. Do people feel comfortable sharing their mood when using Uppie if no loved one is available?
3. Do people feel more comfortable using Uppie to share a gloomy mood with a loved one over a distance compared to current communication media?

Diving more into what specific elements do or do not validate these questions could show possible design improvements to Uppie. Thereby there should be focussed on the mood experience, as Uppie should not make people feel worse than before.

Methodology

User tests and semi-structured interviews were conducted with three participants to gain insights to validate whether the final design fits the design goal and direction and insights into further design developments. The participants got induced into a gloomy mood and asked to use Uppie to notify a loved one. The three participants are Dutch and between the age of 23 and 60, living further away from their loved ones and comfortable with current technologies. For this test, the loved one was me, making sure there were no errors on the side of the loved ones that could influence the experience of the gloomy person. Having this control is essential as the gloomy person should have the main focus of this project. The participants had different relationships with their loved ones and knew little to nothing about the project. The interviews were conducted online after the participants tested with Uppie in their personal environment. The interviews took about 30 minutes each and were recorded through zoom and filmed with the consent of the participants. Before the user test, participants got a booklet (Figure 53). Appendix N1 shows the complete booklet.

- The user test consists of four parts
- Induce a gloomy mood
 - User test without loved one near Uppie
 - User test with loved one near Uppie
 - Final interview online



PART 1: INDUCING A GLOOMY MOOD.

To start, the participant ideally needs to be in a gloomy mood. A short fragment of Bambi is chosen as the emotion induction method to influence this mood. This method is retrieved from Maryam Fakhrhosseini et al. (2017). When watching, the participants are asked to try to experience their emotions when watching. To make it easy, they are allowed to watch it on their phone with sound. A short fragment was selected not to bore the participants and keep them concentrated.

As this method focuses on inducing emotion rather than a mood, this contradicts previous research shown in this project that there is a difference between mood and emotion. Rectify this research method using the following viewpoint on emotion and mood from Quigley et al. (2014).

“From our perspective, inducing emotion necessarily involves a change in affect (whereas changes in affect are not always transformed into emotions).” (Quigley et al., 2014)

PART 2: USER TEST WITHOUT A LOVED ONE NEAR UPPIE.

For the first part of the user test, the loved one will not hug back. The participant will not be aware of this. They will only know that they need to start the next hug after 10-15 minutes.

PART 3: USER TEST WITH A LOVED ONE USING THEIR UPPIE.

When they now hug the prototype, the loved one will hug back this time. The duration is still not decided. Except for a scheduled interview 10 - 15 minutes afterwards. Complete steps of user test are shown in Appendix N2.

PART 4: SEMI-STRUCTURED INTERVIEW.

Interviews with the participants will happen over Zoom. Recording the interviews to make sure there is enough time to listen at the moment and there is the possibility to listen back and quote participants. The interview will focus on their experience with Uppie, how they experienced the critical steps, if they feel comfortable, and if there are potential improvements based on their experience. Appendix N2 shows the interview guide.

The interviews were transcribed, and exciting insights into the functioning and validation of Uppie were gathered and analyzed in different clusters (Appendix P). I clustered the insights through Miro. Each collection showed the main insight into understanding the participant’s behaviour, experience with Uppie and motivations.

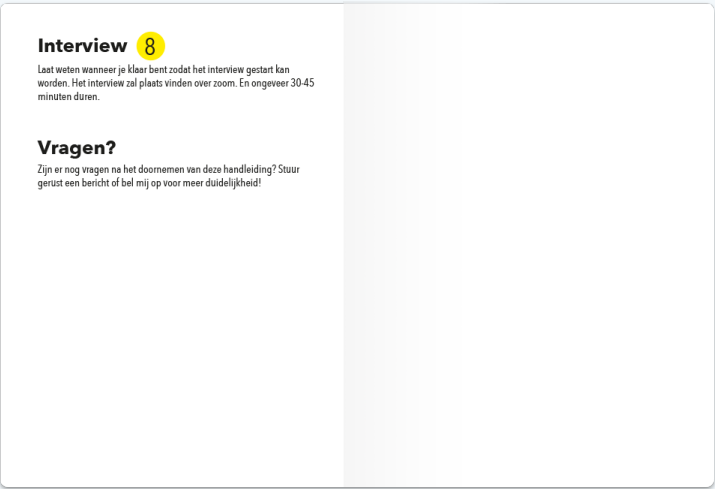
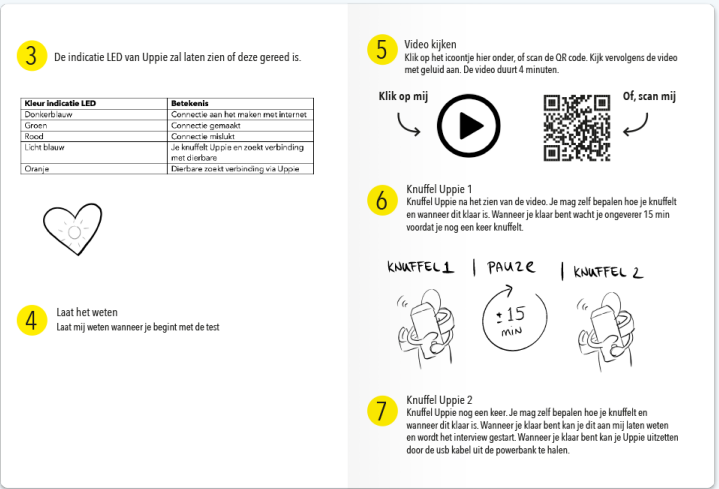


Figure 53 | Three pages of information booklet for participants, explaining the steps to perform the user test

Prototype

For the user tests with Uppie, a prototype was made that participants could use. This prototype differs from the final design in having smaller touch sensors. The concept uses small touch sensors on the back and the sides instead of larger touch areas. Secondly, Uppie can not enclose its arms during a hug. However, it is made from foam to mimic the pressure of a hug. Lastly, the participants can not connect their prototype to the WiFi network; this needs to be done by me when delivering the Uppie to the participant. Appendix M shows the design process of the prototype.

Sensors and actuators of SEED are used in combination with Arduino To make the behaviour of Uppie happen. The code for Uppie is written in C++ with Arduino. Figure 54 gives an overview of the basic functioning of Uppie. Important to notice is that this is only a diagram to get a basic understanding. It does not resemble the complete functioning of Uppie. The entire code can be found in Appendix O.

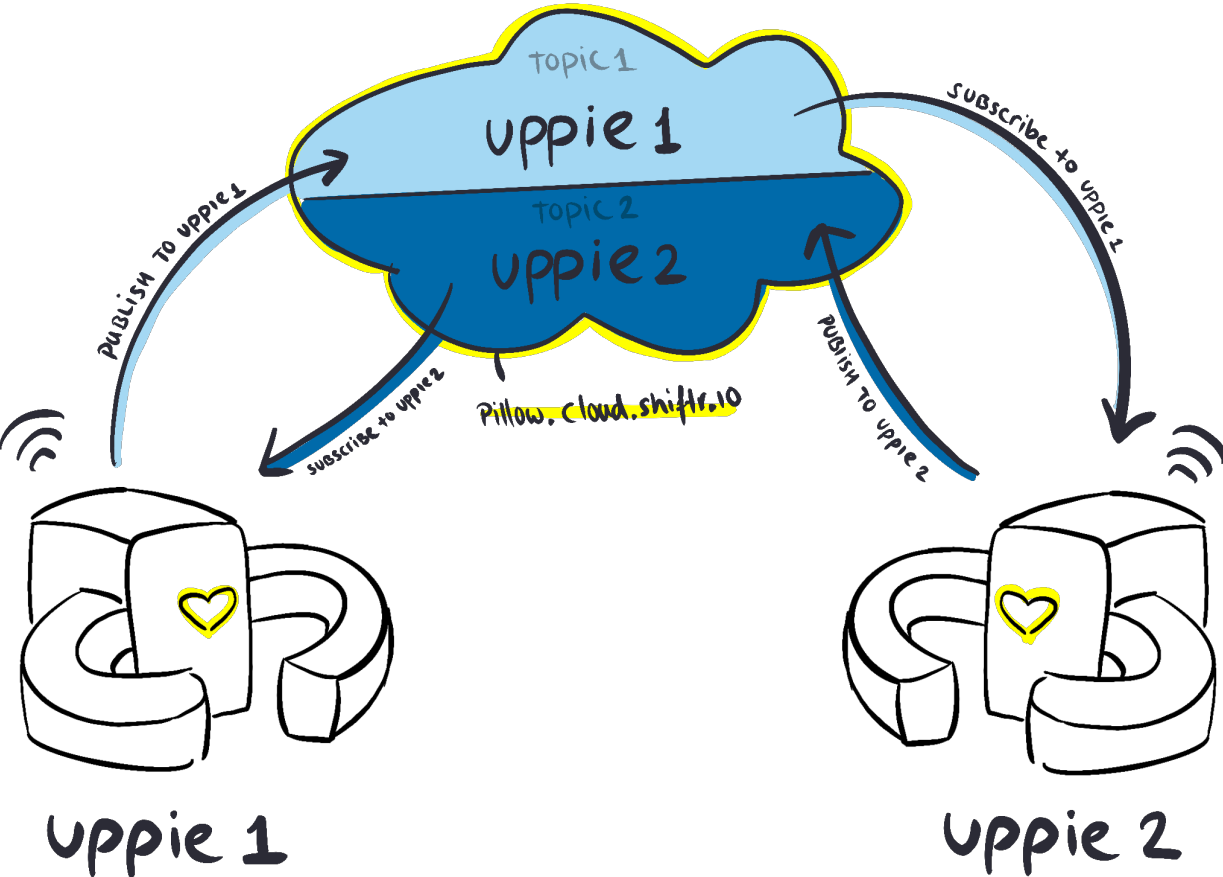


Figure 54 | Overview of how Uppies are connecting together during prototype test

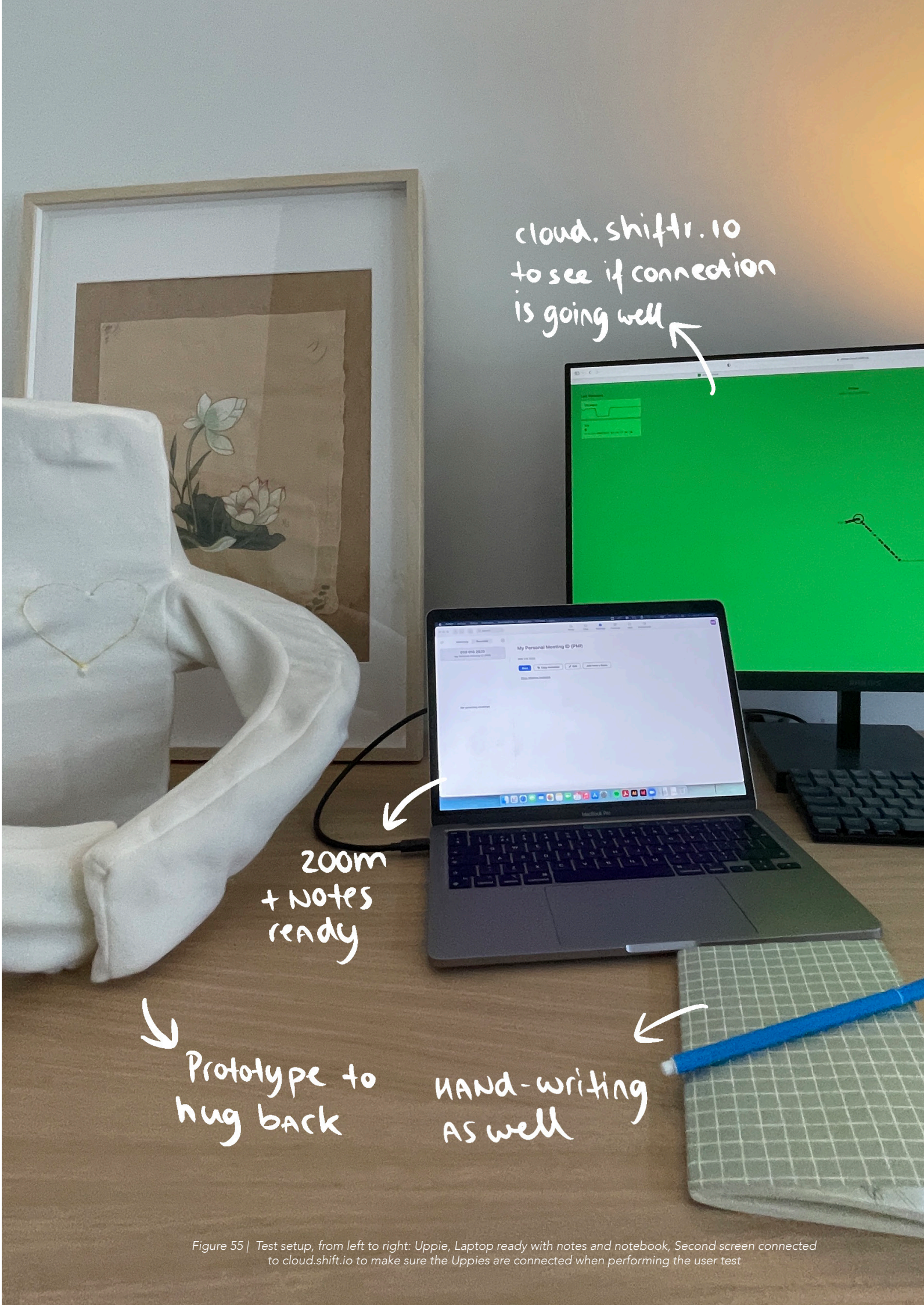


Figure 55 | Test setup, from left to right: Uppie, Laptop ready with notes and notebook, Second screen connected to cloud.shifttr.io to make sure the Uppies are connected when performing the user test

7.2 | User test results

This section describes the results from the three different user tests and interviews, and another additional interview. Participants could use Uppie for some days after the interview. One participant did use Uppie when feeling gloomy after the user tests. This participant was interviewed again after this use to find out why they used Uppie and if it helped them.

Overall goal of Uppie

1. UPPIE MAKES IT EASIER TO SEEK OUT CONTACT WHEN BEING IN A GLOOMY MOOD

During the interview, most participants found that Uppie made it easier to show a loved one their desire for a hug. They indicated that they like to not talk in doing so. One participant even used Uppie to deal with a gloomy mood after the interview. Uppie was not turned on and therefore did not connect with the network. However, did this not stop the participant from receiving a hug and sharing their gloomy mood. An interview afterwards showed that this participant did need a hug or just wanted to see someone. When staring into the space, the participant saw Uppie sitting in the living room. The participant liked the idea of not having to talk about the reasoning for their gloomy mood. Talking would have made it too complicated to get in touch with someone over a distance. And sending a message would become too emotional.

“You do not want to explain to someone why you have this feeling. This makes it too complicated. It evokes too much emotion when you have to tell this through a message.”

The results were formed by transcribing the interviews in Miro and clustering the insight of the four interviews (Appendix P). The insights can be divided into six different topics. The following pages do describe the insights in more depth.

Secondly, when asked about their experience and using Uppie in a gloomy mood. All participants responded that they could see Uppie working as it lowered their threshold to share their moods. Besides this, the participant that hugged Uppie during an actual gloomy mood said that sending a message or calling someone in that situation was not even an option. Another participant supported this argument.

“When being at a distance, you are more likely to keep up the appearance. Uppie lowers this threshold to let someone know that you need a hug or that you miss them”

On the other hand, one participant mentioned that there could still be the possibility of not wanting to share your need for a hug with loved ones. However, this participant said that Uppie would, in this case, still be helping them by secretly hugging them.

“.. That Uppie hugs back automatically when you do not want anyone to know.”

Inviting to use uppie

2. UPPIE TAKING UP PHYSICAL SPACE IS A REMINDER OF LOVED ONES BEING AVAILABLE.

Participants did feel comfort in hugging Uppie in a private room. They liked to be able to feel comfort in being able to hold Uppie tightly. When asking the participant that used Uppie in an actual gloomy mood about their motivation, this participant mentioned that it helped to see Uppie. It was not the case that this participant did think of the possibility of hugging Uppie before searching for Uppie.

“I was sitting there, lost in my own thought, and then I saw Uppie standing there, with its hands reached forwards. I decided to hug Uppie, opened up the arms and went sitting like that for a moment.”

The arms reaching did invite this participant to use Uppie and were the first step for them to get out of their thought. Next to the arms, the participant mentioned the small heart being inviting to hug Uppie.

3. UPPIE IS COMFORTABLE BUT CAN BE MORE ORGANIC.

When asked how participants hold Uppie and why they held Uppie this way, participants showed that they find Uppie comfortable to use to support their gloomy mood. Participants liked the soft outside material and the more sturdy but soft inside material to hold onto Uppie tightly. And the arms that surrounded them. The arms were an essential factor as they provided security.

“Arms do enhance the sense of security normally, I would grab a pillow, but now there was something around you as well.”

However, there is room for improvement. One participant mentioned that enhancing the shape of the arms could improve the secure feeling. All participants liked to use Uppie to support and make them feel secure. Uppie was not held as intended. All participants placed Uppie on their lap instead of lifting it higher to their chest.

When asked about this, participants mentioned that Uppie was too square to hold as intended, and an organic shape would be more desired when holding Uppie.

“Would be nice if it was more like a Teddy bear or had different sizes. This would make it somewhat holdable.”

As participants did not hold Uppie as intended, they were unaware of the neck support. When notifying participants about the neck support, participants mentioned that it made them feel more comfortable resting their heads and that this support enhanced their secure feeling. But again, the shape of Uppie felt too square. Besides the shape and material being comforting, the heart that lit up also enhanced participants’ comfort.

“I like that you get a response from Uppie through the light.”

4. NOT LIKELY YET TO PLACE UPPIE ON THE COUCH LIKE THIS

When asked to use Uppie in daily life, there were hesitations about Uppie being a physical object.

Participants are not likely to put Uppie on their couch in its current shape. Mentioning it would be nice to be able to customise some parts of Uppie to make it fit your style.

On the other hand, one participant mentioned that it should not become too blended into the environment to avoid accidental connections.

“There still needs to be some difference. You should not accidentally touch Uppie when relaxing on the couch, for example.”

When hugging with a loved one

5. TOUCH AND VIBRATION DO SHOW SYMPATHY, BUT THERE IS A DESIRE FOR SOME MORE INTENSITY AND VARIATION.

When focussing on the experience of a loved one hugging back, participants mentioned that they felt the loved one was there for them.

Participants did feel that this vibration was an addition to the contact. The vibration on the skin was explicitly essential to mimic the touch of one participant.

“The second time I noticed a difference, it did something with my skin, my feelings. It touches your skin.”

Besides, extra contact was noted by all participants because of the dynamic movement.

“I felt this extra contact of the loved one as I felt the dynamic movement, sometimes it was one side, and then it was the other side.”

Even though all participants felt the closeness because the touch was dynamic as they could vary

Thereby Uppie still looked vulnerable to the participants. They were not likely to place the object where they could not supervise what was happening to it.

“Downstairs is not safe, except for the kitchen. I do not want the children to break Uppie accidentally.”

Next, participants mentioned that Uppie might take up too much space and that they had to move it when other people would visit. On the other hand, the participant noted it could be interesting to see what others would do with it.

the touch and vibrations, some participants still desired to see or feel more of the intensity of the hug. They mentioned that you sometimes do give someone a light hug, or sometimes an intense hug.

“[Explaining how a warm colour would be an intense hug] I can imagine when you see a warm colour, you would think, ah, that’s nice.”

Next to the intensity, participants mentioned that it would be nice to be able to signal more to the other person by having more interactions on the back. Letting the other know you are just holding tight, or if you are petting them or giving some pats on the back. As in the current prototype, they had to hold their hand at a sensor to send the signal.

Important in this all is that participants did mention that potential further design should not get too complicated.

“Many things are already happening; it should not get too complicated. Otherwise, you might receive too many stimuli.”

6. TOUCH CAN TICKLE AND MAKE PEOPLE FEEL HAPPY.

Two of the three participants held Uppie slightly wrong; the vibration motors in the arms of Uppie ended up just below their armpits. Hugging Uppie for the first time made them feel tickled instead of hugged. At first, this gave an undesired effect to one of them, but later they found that this made them laugh and feel happy and relaxed after using Uppie. It was giving them some energy by making them giggle.

“It actually makes you laugh because the person on the other side sort of tickles you.”

“I was laughing really hard. It was hilarious. Suddenly I was tickled by the right arm of Uppie, and it started buzzing buzz bzz. It was funny; it made me feel happy.”

However, this tickling effect made it harder to notice that there was a loved one hugging at the other side.

“If you realise that there is someone on the other side hugging their Uppie, it makes it a nice thought when you feel the vibration.”

7. TOUCH AND VIBRATION INTERACTION BETWEEN TWO UPPIES IS NOT ALWAYS CLEAR

Being able to send and receive vibrations was not completely clear for all participants.

“[Explaining I received the signals as well] Ohh, so you were feeling the vibrations, haha, that is funny.”

8. TOUCH, VIBRATION AND THE SURROUNDING SHAPE OF UPPIE SHOW FULL ATTENTION

When the loved one was hugging back, the participants mentioned afterwards that they felt their loved one was giving them their full attention.

“[Talking about the vibrations] But this became a reassurance as I thought someone is now giving me this full attention back.”

Another participant compared it to using a phone when someone is in a gloomy mood.

“With this, someone does not only have to press a button, but it shows they are actually into it as well.”

Notifying loved ones

9. INSECURE IN FIRST USE (WHEN NO ONE IS AVAILABLE)

In general, participants mentioned that they did understand the behaviour of Uppie because of the lights it showed them and the user manual that came with it.

However, participants showed to be insecure in first use when there was no loved one responding. One participant was hesitant about Uppie working, as the touch sensors gave a small red light. As this was partly visible through the fabric of Uppie, the participant initially thought that these small lights indicated that it might not work.

During the first hug, it was unclear what would happen with Uppie. Participants were unsure when to stop the hug and what would happen. Even though they understood the user manual, they were waiting for some form of response.

"I saw a blue light and was wondering what would happen. I started feeling a bit inconvenient and was thinking, how long do I need to keep sitting like this? What will happen next."

One participant even became self-aware during this first use.

"I was thinking if people see me sitting like this, what would they even think."

Another participant mentioned that they did not understand why no one was responding. It was unclear to this participant whether there was contact or not. It made them feel alone.

Therefore, the second experience, when someone hugged back, was essential to be able to use Uppie again.

"If I could have the second experience again, I would do it again."

10. DESIRE TO NOTIFY THE LOVED ONE WHEN THEY ARE NOT RESPONDING TO THE HUG

Participants felt discomfort in hugging without a loved one being there to hug back. When asked whether they would like to notify a loved one in another way, participants said they would like to receive at least some response showing them that someone is unavailable right now.

"Some sort of reaction would be something people desire in this case"

One participant even mentioned receiving anonymous contact from people worldwide owning an Uppie, saying that this will increase the possibility of receiving a hug back. However, this participant noted that it could depend on the reason behind a hug if anonymous contact is desired.

"Sometimes you just need a hug, but on other occasions, you desire a specific connection with a loved one."

When asking participants to be able to let Uppie mention a loved one by sending them a message, they all liked that idea, as it reassured them that the loved one at least knew. And that their loved one could show more initiative in this case.

"When they receive a short message, they could let you know that they are not home but that they are able for a call."

However, participants highlighted that a potential app should not be an obligation for their loved ones to respond to this message Uppie. It should stay simple for them. Next to seeing this from the gloomy person's side, participants found the app could work for a loved one to make sure they do not miss someone hugging them and they can respond to them.

"It will allow you to see who hugged you; this way, you can send maybe a small code, or call and send a message and ask how this person is doing."

11. MULTIPLE PEOPLE CONNECTED TO YOUR UPPIE WOULD BE LIKEABLE, BUT IT DEPENDS ON THE SITUATION.

For now, Uppie can connect two loved ones. Participants initially responded that they would like to join multiple loved ones when asked about the possibility of connecting numerous people. They liked that multiple connections would increase their chances of getting a hug back and not be missed. When thinking longer about it, participants varied more in their responses. It was difficult for them to figure out what they would like when being in a gloomy mood, as participants mentioned that the interaction with Uppie in a gloomy mood should not become too complicated.

"Looking back, I would not use an app in this case. You have to turn it on, and activate it, maybe you are crying your eyes out, and then you need to think of whom you want to connect to. It becomes too much effort, but I would still like to choose. Maybe it would be possible on Uppie itself"

When interviewing the participant who used Uppie during a gloomy mood, this participant mentioned that it was essential to hug someone close—in this case, not specifying a specific person.

"At that moment, I thought of the people close to me. I was thinking about my family."

At first, this participant mentioned that they wanted to hug a family member who understood this emotion but came back to that as they mainly figured they desired not to have to explain the feeling but to receive a hug.

For the side of the loved ones, participants did find it easier to see how to connect with different loved ones. And in this case, it was also desired to see which loved one was reaching out to get a hug. As they mentioned that they wanted to know who was hugging them so they could reach out to these people later if necessary.

Ending the hug

12. A GLOOMY PERSON FEELS IN CONTROL WHEN ENDING A HUG, BUT A LOVED ONE COULD USE MORE FEEDBACK.

During questioning participants about the end of the hug with a person, they seemed to feel in control. Stating that it was a natural response, it was clear to them that the hug did end.

"It was clear that the hug had ended. I put it next to me on the couch."

During the test, participants figured this experience was the same for the loved one, and they would know the hug had ended in the same natural way

as them. However, when thinking about this further, participants could see how it might be unclear for the loved one to notice the end of the hug. One participant mentioned it would be interesting to agree with each other in advance on specific signals that could, for example, communicate the ending of a hug. Another participant mentioned that the end of a hug could be more straightforward for the loved one to be able to help the gloomy person.

"As a loved one, you want some feedback; you would like to estimate if the hug is enough. You would want to know if you should continue or if it might become too much for this person."

Critical before daily use

13. FEEL THE NEED TO GET AWARE OF THE BENEFITS OF UPPIE

Before answering if participants would like to use this concept in their daily life, they showed that they first had to understand what Uppie could mean to them during a gloomy mood. As they now tested Uppie with an induced mood.

“Maybe I am too down to earth for a concept like this; I would first use it some time with a real emotion to see what it does with me.”

Next to this, some participants stated they were unaware of the benefits of Uppie as it was a new experience and first had to get over the fun effect of the vibration sensors.

When asked the participant that used Uppie after the interview, they showed surprise by themselves that they desired to use Uppie.

“It was already fun for me to realise I wanted to hug Uppie.”

7.3 | Limitations

Limitations of the user test and the method used are listed below.

• Induced mood of participants
Participants did not test with their natural mood but with an induced mood. I asked participants to hug Uppie instead of letting them behave for themselves. In asking participants to hug, the results do not mean that when the participants hug Uppie now, they do it because they are in a gloomy mood or do not have the effort available to send a message or call about their mood. Therefore the comfort of using Uppie in signalling a loved one about their gloomy mood is mainly researched by their interpretation and their experience of hugging Uppie. I tried to limit this effect by distancing myself when doing the user test by giving participants a booklet so I did not have personal contact with them right before the user test.

• Prototype
The prototype is not yet a finished model and could still have some flaws in functioning. For example, participants need to watch me change the program of Uppie to fill in their WiFi and password. A small thing like this could influence participants to behave with Uppie differently and be more hesitant in use.

• Square
Initially, the filling of Uppie would be polystyrene granules. However, using technical components should be surrounded by another shell to protect

them. Therefore I used 50mm thick foam to fill up Uppie and cover the technical elements. The foam made it easier to touch the touch sensors used in this prototype. The downside was that the round shape in the corners was too complicated to prototype. However, as this shape was not essential to test the main goals of Uppie, I went with a slightly more squared Uppie to test. Besides, user research is first needed to show whether neck support is required.

• Small touch sensors
The prototype differed from the initial final design in having smaller touch sensors instead of a surface that can be touched. These smaller sensors make participants need to be more focused to touch the smaller area.

• Personal connection
Participants are all loved ones of mine. Indicating that it could be possible that they might find it difficult to tell me certain things during the interview.

• No response from loved one
I did not test the response of a loved one after hugging back after noticing their loved one desiring a hug during this user test. As I was the loved one in all cases and knew what the goal was after hugging back: Calling or sending the loved one a message to do something. Therefore this test did not find if seeing a loved one hug Uppie would stimulate to call or message the gloomy person and they would say to them.

7.4 | Evaluation

The evaluation validates the final concept to the design goal and direction by answering the research questions proposed during the test setup to validate the design.

Do people feel comfortable sharing a gloomy mood when they receive sympathy from their loved ones through Uppie?

COMFORT IN LIGHT

The heart of Uppie that lit up felt assuring to participants as it showed the state of Uppie, which helped the participants see if they were touching the sensors correctly and were asking for a hug.

COMFORT IN FEELING CLOSE AND RECEIVING FULL ATTENTION

Using the three different vibration motors connected with the various touch sensors let participants feel the closeness of their loved ones by touching their skin. It mimicked the dynamic interactions of a hug. However, on first use, some participants regard this as tickling. This tickling feeling made it harder to realise the loved one on the other side giving their full attention. However, when participants realised this, they found it comforting to share their gloomy mood with Uppie. The idea of someone giving their full attention in hugging Uppie and therefore having their full attention on them made it comforting.

COMFORT IN NON-VERBAL SIGNALS

All participants liked that they did not have to talk to a loved one using Uppie and could ask for a hug by hugging Uppie. One participant even validated this by using after the test to retrieve a hug from Uppie by themselves.

STILL LACKING SOME COMFORT IN SHARING

On the other hand, one participant still enjoyed the sympathy but could imagine a situation in which Uppie would give them this sympathy without notifying the loved ones—indicating that some comfort is still missing in sharing a gloomy mood through Uppie. Or this shows how more interventions need to be done to change people’s full beliefs about sharing or not sharing a mood. It is, of course, acceptable to not share. However, I do not want to design for a world where people can

get human-like validation utterly autonomous from a robot. In this scenario, I believe that people will become more distant.

Do people feel comfortable sharing their mood when using Uppie if no loved one is available?

UNCERTAIN IN RESPONSE WHEN NO LOVED ONE IS THERE

When using Uppie for the first time, participants showed discomfort in using Uppie without the loved one responding to their desire for a hug. Feeling uncertain in their behaviour mainly occurred because the participants did not know if there would be a response and how long they were expected or needed to wait for a hug. Currently, there was no notification here to keep the user’s attention on the task of hugging. However, participants seem to miss some reassurance when no loved one is available. One participant mentioned feeling anticipated and unsure, indicating they were leaving their comfort zone (Brown, 2008). When Uppie could send a signal about the availability of the loved one, the gloomy person would be more assured and therefore feel more comfortable as they know which scenario to expect. This signal should be sent through Uppie to keep the attention focussed on the hug and not another device. Hugging with Uppie on its own can already be beneficial to feel less gloomy. A loved one should be able to indicate they are unavailable to notify the person in a gloomy mood about their availability. A loved one can already show their availability by hugging back when they see their Uppie light up. In doing this, the gloomy person does receive a signal through the vibration motors when this happens.

SECURE SHAPE GIVES COMFORT

On the other hand, the overall shape of the arms and softness of Uppie gave participants a feeling of security and comfort. One participant even used Uppie after the interview without it being connected to another Uppie. It still helped them in a way to feel more comfortable during their gloomy experience. It shows that Uppie is already comforting and helping during a gloomy mood without needing a hug back from the loved one.

DOESN'T MATTER WHO RESPONDS

One participant mentioning involving all users with an Uppie as a possibility to send a signal back, enhancing the probability of receiving a signal back. This could show that they were not necessarily contacting their loved ones or that the desire for a sign was high enough to make it not matter which person was responding. At the moment, this participant said this would depend on the situation and could not indicate which of the following was faithful to them.

Do people feel more comfortable using Uppie to share a gloomy mood with a loved one over a distance compared to current communication media?

LOWERED THRESHOLD

Participants liked that Uppie made it possible to share the need for a hug without talking. It lowered the threshold they would typically experience in their daily life. With Uppie, it is possible to receive the desired social support by indirectly sharing a gloomy mood with loved ones. One participant even mentioned that it was not even an option to share this mood over their phone and that with Uppie, it felt easier. Thereby, it helped that Uppie showed a physical resemblance to a loved one. It was making the participant aware that they could use Uppie. This participant did not first think about using Uppie to share this gloomy mood they were experiencing, but this participant decided to use Uppie as they saw Uppie during this gloomy mood. The reaching arms and the heart showing invited the participant to hug Uppie. When comparing this with a phone, the phone does probably not

immediately remind a person that they could use this to validate their gloomy feeling by reaching out to a loved one. A smartphone is used for multiple things, from ordering food to reading the news, answering work emails and keeping in contact with all friends, family, and co-workers.

EASY TO UNDERSTAND

Furthermore, Uppie was not considered too complicated. One of the other main problems was that it was difficult to touch the suitable sensors. However, this is a flaw in the prototype and will not be taken into account. On the other hand, some changes could make it even easier and more understandable to use Uppie so people would be more comfortable using Uppie over a distance compared to current communication media.

NOT YET LIKELY TO USE IN DAILY LIFE

Changes should be made to the final design of Uppie to enhance its comfort of Uppie, and services to connect multiple loved ones should be added to make it easier to communicate in bigger groups. When no changes are made in further developing Uppie, it could result in people stuck with their phones. Even though it feels more comfortable when using Uppie over using a smartphone to communicate a gloomy mood. It is still essential to normalise the idea of using something like Uppie to make people feel comfortable using this over not having an Uppie. During the final evaluation of Uppie, besides validating the design, the user test gave insights into areas for improvement to enhance the experience.

7.5 | Design recommendations

Besides validating the design, the user test gave insights into areas for improvement to enhance the experience of a person in a gloomy mood. Important to know is that these are still ideas and not final concept changes that are validated to work to enhance the experience of Uppie. Some recommendations are already discussed during validation.

PERSONALISING APPEARANCE

Uppie could improve to fit better into a person's living area by letting them choose their preferred colours (Figure 56). Thereby the size of Uppie should be changed to make it blend in a bit more into someones living space and make them more likely to keep it there. However, it is crucial to notice that Uppie should not blend in too much. There should be no accidental touch happen.

CHANGE SHAPE, KEEP THE ARMS

Currently, Uppie was often held by being placed on the participant's lap with the arms of Uppie hugging around their middle. With Uppie like this, participants do not fit Uppie as designed: at their chest. Iterations on the design could be done to improve the square shape to a more organic form. Especially the head support can be made more round to make it more comfortable and show that the head can rest there. If the head rested, people would probably be more likely to keep Uppie higher. Besides making Uppie more organic, it could help people lift Uppie higher when making Uppie a bit smaller and more accessible to hold higher. Thereby, more emphasis could be made on the heart that it should touch the heart of the person holding it. This usecue can be shown on the box or manual when hugging Uppie. However, it should be tested if the misplacement was because they wanted to see the light. The current design of Uppie makes it impossible to hold it correctly during the hug and see the light simultaneously. Further research could test these functions out of the context of a gloomy mood.

TEST WITH PARTICIPANTS IN A GLOOMY MOOD

During the current test, participants did not voluntary use Uppie when they experienced a gloomy mood. Participants were induced with a gloomy mood and were asked to hug Uppie afterwards as part of the user test. As this gave already some valuable insights into their experience with hugging Uppie, it is hard

to say what the value will be in the longer term for users. It was already promising that one participant used Uppie by themselves. Therefore it would be interesting to test how people respond to having Uppie for a longer time. Before testing this, other design recommendations could be considered that are found during this user test.

TEST WITH LOVED ONES

For now, Uppie was mainly tested with the person in a gloomy mood as this person is the primary user of Uppie. However, more user tests should be done with the loved one as the primary focus to determine if the loved one experience any usability issues. Next, it is essential to test what the loved one would do after they hugged back their loved one. Will they even send a message and call the person desiring a hug. This test should determine what kind of message would be most helpful for a person in a gloomy mood. As the actions after a hug vary significantly between people, further research should test this with multiple people. It would be possible for the desired message to be tested before testing with the loved one's behaviour. This way, the design could be more specific in sending the right message to the person in a gloomy mood.

NOTIFYING AVAILABILITY

One main current flaw of Uppie is that a person in a gloomy mood does not get notified when the loved one is unavailable, making participants feel insecure during this moment of insecurity. Further design should provide the notification of this availability. . However, there are different possible solutions for this and when this notification is desired. Therefore it must be tested first how long participants still feel comfortable without receiving any message from the availability of the loved one. An example is shown in Figure 58. After testing the desired waiting time, there could be many possibilities: Loved ones could get notified on their phone, after which they could make aware of their unavailability. Or Uppie could use a sensor to measure if there are any phones nearby. On the other hand, when a gloomy person feels okay with a more extended time, Uppie could give them a signal after a certain amount of time has passed. Thereby loved ones should not feel obligated to respond, and the person in a gloomy mood should not feel like they are asking too much from their loved one.

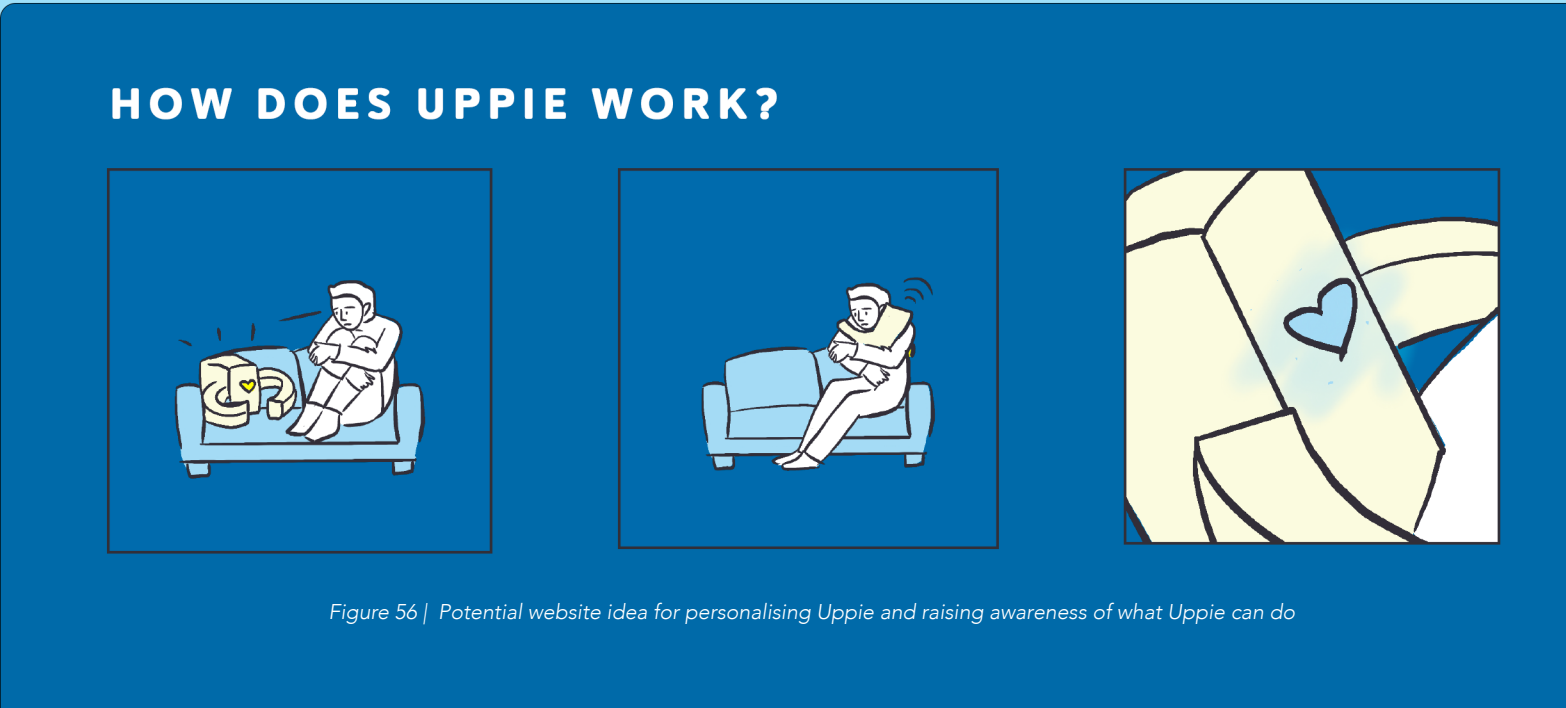


Figure 56 | Potential website idea for personalising Uppie and raising awareness of what Uppie can do

ENHANCE COMMUNICATION DURING A HUG

In giving a hug, people can change their touch by touching the sensors on the back, left, and right sides. For further design, another test should be done with a touch area instead of a touch sensor to determine how people experience the final design. Nonetheless, participants desired to communicate more about the intensity of the hug they intended to give. It would be interesting to look at splitting the back area so people can mimic the petting on the back, someone participants tend to do in hugging. A change in shape could enable a vibration motor to be at someone's back instead of the front. Next, a touch area on the top of Uppie could be considered to enhance the feeling of tapping someone on their head.

With the different touch areas available (Figure 57), it would be interesting to look at how people would use these areas to signal each other with different codes. Loved ones could use signals to exchange extra information. For example, this signal could comfort the loved one to receive additional information to see if the hug is enough or if the person in a gloomy mood would be in a gloomy mood like to continue hugging.

Besides, an iteration could add lights and sound to Uppie to enhance communication by letting loved ones use all senses. Adding lights could help make it easier to notice what is happening during a hug. However, Uppie should not become too complicated and become something you would need to use for a more extended time. The main goal would still be the hug to notify the loved one about their gloominess, to which the loved one can respond.

DIGITAL INITIALISATION

The initialisation of Uppie and the user manual could be made digital to enhance the clarity of hugging Uppie. Having a digital setup will allow for a slow introduction to the use of Uppie. For example, users could see with the app how their vibrations are sent to the other Uppie when they are touching different sensors. Thereby it could be possible to receive signals simultaneously as seeing the visual on the app. Besides, this enhanced understanding could help users have the initial correct experience of the loved one hugging back to make them desire to use Uppie again when no one is responding.

CONNECTING MULTIPLE LOVED ONES

The current design of Uppie only made it possible to connect two loved ones. The user test showed that a person in a gloomy mood would like the idea of connecting multiple people with an Uppie. However, this should be firstly designed and tested. It is crucial to notice that connecting Uppie with multiple users might involve more actions from the user in a gloomy mood before they can hug the desired loved one. Extra steps in a possible digital service or on Uppie itself could enhance the effort. However, to design for a gloomy mood, it is essential to have the effort required before use as low as possible and the steps before using as little as possible. Thereby, connecting multiple loved ones should still indicate a loved one who needs a hug for them to be able to communicate with this loved one afterwards.

HUGGING DIGITALLY

Participants mentioned that it might be quite a burden to ask people to buy an Uppie. Looking at the current functions, I would estimate it to be about 100 euros for an Uppie, so it would not be something all people could buy easily. It could be possible to look at developing an App that could be used to send digital hugs to a physical Uppie as well. Having this app could relieve the burden of asking loved ones to use and buy Uppie and simultaneously make the step smaller for people to start using a physical Uppie.

What this digital hug should look like should be tested further. Researching is essential as using an app or messaging service to connect with loved ones could decrease the feeling of loved ones having their full attention when hugging Uppie. Showing this attention through using the physical Uppie is one of the main ideas I validated to make Uppie work to make it more comfortable for a person in a gloomy mood to share this with loved ones.

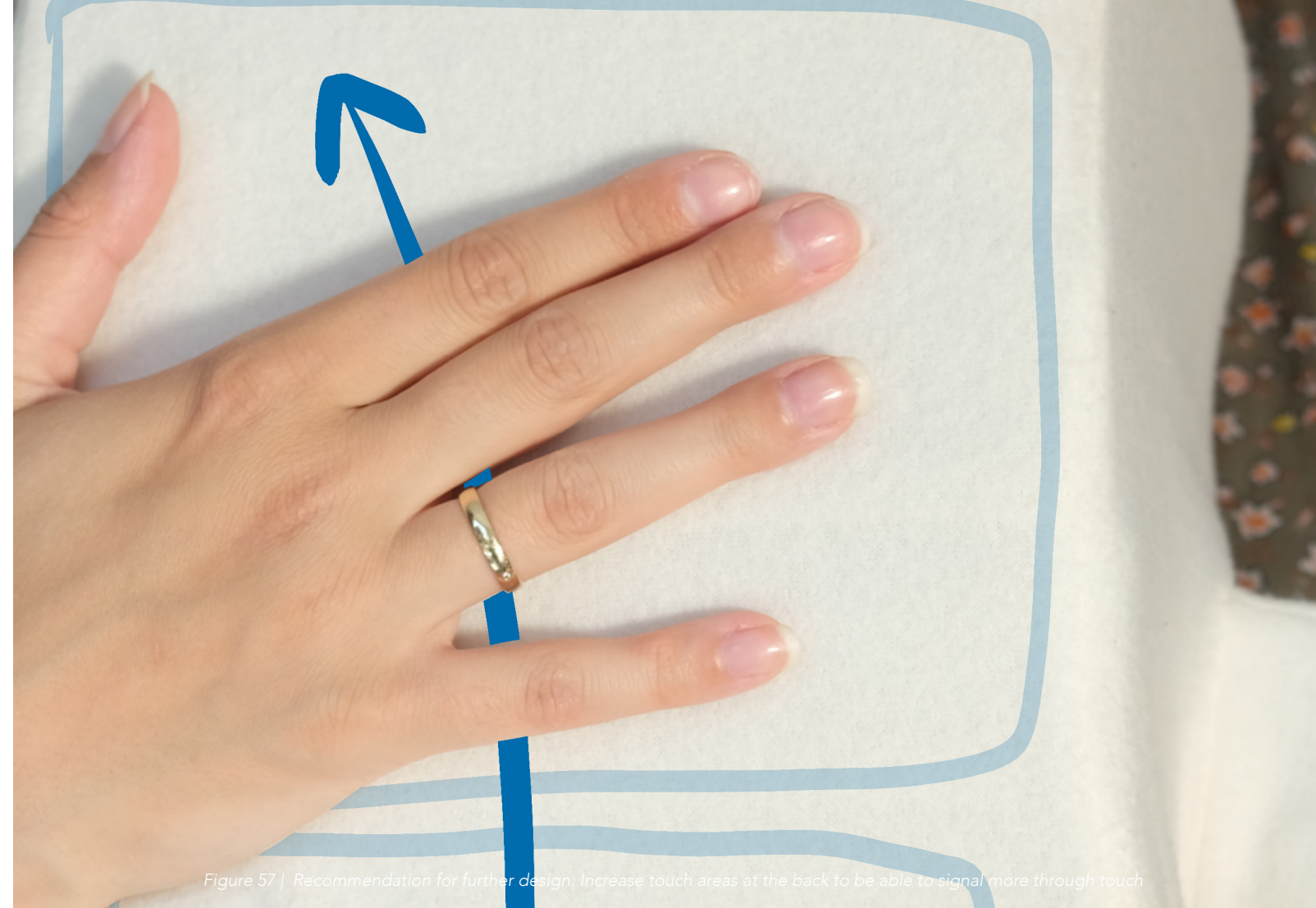


Figure 57 | Recommendation for further design: Increase touch areas at the back to be able to signal more through touch

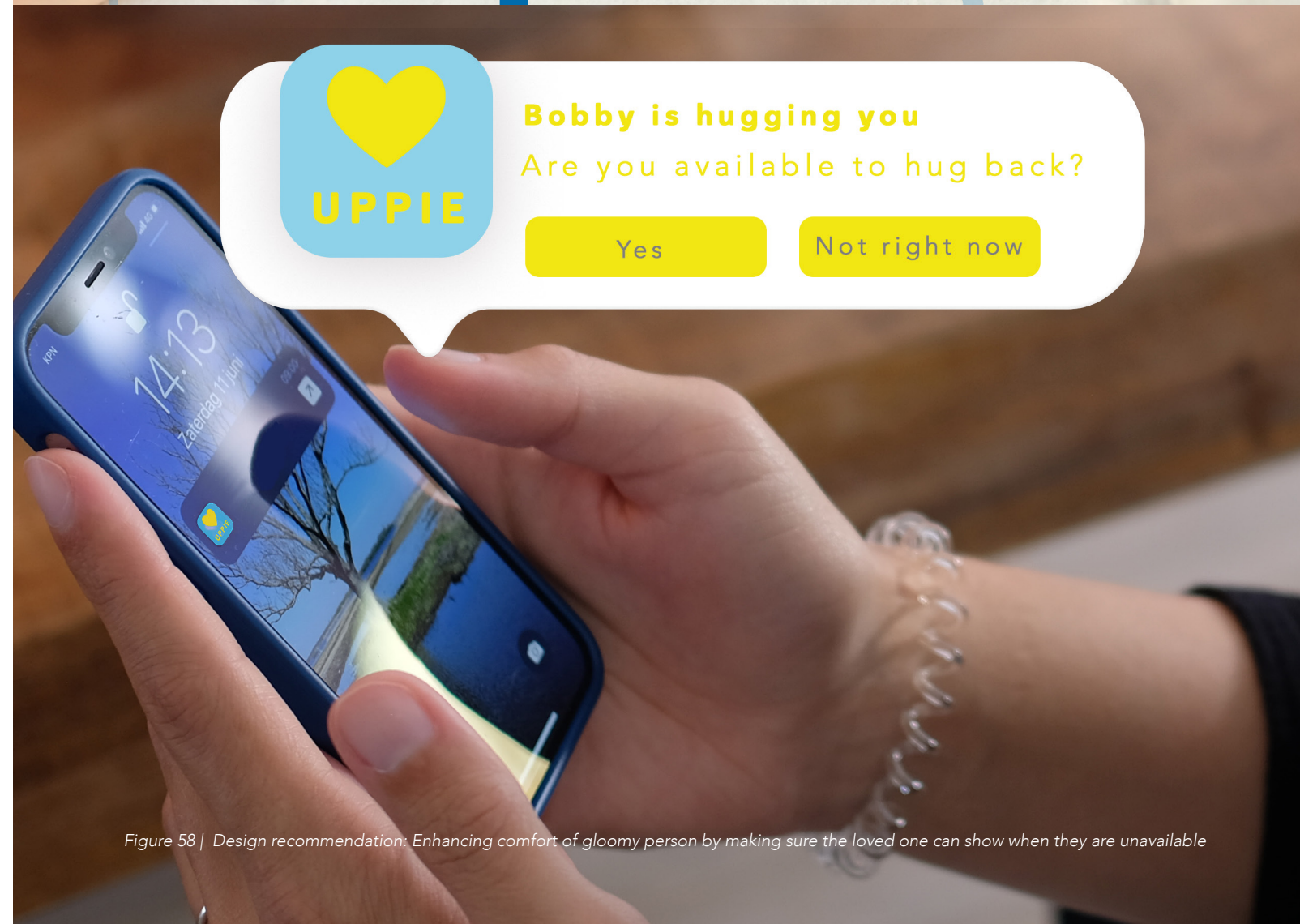


Figure 58 | Design recommendation: Enhancing comfort of gloomy person by making sure the loved one can show when they are unavailable

8 | Concluding the project

This last chapter presents the conclusion of this project. I discuss how this project answered the design goal stated in the introduction, the final result, a reflection of the research methods used, recommendations for further studies, and ending with a reflection on the desirability, feasibility and viability of Uppie and how it fits in this project.

8.1 Answering the main research question

8.2 Reflection

8.3 Recommendations

8.4 Conclusion

8.1 | Answering the main research question

This research aimed to find how loved ones can support their loved ones over a distance in regulating their gloomy mood. Literature research and qualitative user research showed it is crucial for a person in a gloomy mood to feel more comfortable sharing their gloomy mood over a distance. Current communication media do not bring this comfort. A gloomy person could find this comfort by being able to share this mood through non-verbal signals and receiving the sympathy of the loved one in doing so.

Design research indicated how a gloomy person could receive this comfort and sympathy by using a concept focused on enabling mood sharing through the non-verbal communication of a hug. A final user test evaluated this design. The results indicate that a person in a gloomy mood can feel more comfortable sharing their gloomy mood and receive social support through hugging Uppie. In doing so, the person can start relieving their gloomy mood through the help of loved ones, making it possible to begin reducing their mood and not keep stuck in overthinking.

8.2 | Reflection

This research illustrates how loved ones can support their loved ones in a gloomy mood, starting by questioning this by looking at existing literature research available on this topic. As I am no expert on social studies, it could be possible that interesting literature is missed as I might have used different terminology. However, the literature analysis during this research sketched a promising base for further user research.

I did multiple questionnaires at the start of the user research as it was difficult for a person in a gloomy mood to talk about the details of the experience to find out what non-verbal cues they use. This context was challenging to reach due to gloominess being a private experience. Qualitative research methods or observations could have led to more elaborated results in the beginning. Which, in return, could have reduced the time spent on the user analysis. However, sketching an idea of the different behaviours possible during a gloomy mood was best seemed through questionnaires. And this approach gave a good and broad understanding of the context. In the end, I accepted the extra time it took to do different user tests.

After the questionnaires, I did qualitative user research to learn more about the experiences in a gloomy mood in person and how social support played an essential role in this. I can argue that this study would have been enough for this project. However, it was helpful to have more explicit knowledge about the context before starting the interviews done during this research and having this clearer view helped collect exciting insights. Besides, the insights from the questionnaires did help in designing a desirable concept when focussing on non-verbal communication during external validation.

Looking back at the design research that followed, evaluating with a Harris profile could be changed to user testing the initial concept ideas I spontaneously formed after user research. However, using a Harris profile to decide direction gave a clear overview of how the concepts fit the design goal and direction. In establishing this profile, the focus lies on the recommendations and adding value to the requirements. Developing this design further by testing things out myself led to interesting insights, but it could have been interesting to see more opinions of a gloomy person in this. And doing it

this way made it possible to manage it somewhat in time.

The final user test consisted of a prototype test followed by a qualitative semi-structured interview. This prototype test was done at the participants' homes and not filmed or observed, as I learned during the user test that a gloomy mood is usually a private experience. So even though it would have been nice to see people interact with the concept, this was the most natural way for people to interact and find the most value. It was good to have the participant be able to test Uppie in their private atmosphere. As they already had to induce a gloomy mood. Before this user test, I sometimes let others try out concepts without documenting this; it would have also been interesting to have recorded and evaluated these results more in detail. Testing the usability of Uppie outside of the context would have made sense before the final user test. Currently, I did this without official recordings.

The user test was evaluated by partly subscribing to the test in Miro and making clusters. No other people were involved in reviewing these clusters. Involving other people in this process could lead to more results as other people might have different viewpoints. However, as I did this project myself and did not involve another company, it was best to do it this way, highlighting how I could find insights into this project. Ideally, I would have taken more time to review this and work out more details for the project, but this was not available.

Overall I find that the research done led to interesting opportunities. Looking back, I might have taken a different focus instead of mood. I struggled initially to find an opening for this project; for example, the focus would have been on not being able to give the desired support to loved ones over a distance. I could have used other research methods that might have made it easier for me to start. Thereby, I realised that I find mood interesting and essential in a way, but that it might not work for me to begin with during research. Next to this, I ideally would have done more prototype tests with users in a gloomy mood; however, the context was challenging to understand and test as it was hard to mimic this situation. I have to realise that you can not always test as desired.

8.3 | Recommendations

Further research is needed to determine the final shape of Uppie that would fit the best people in current society—continuing with the recommendations for design highlighted in the previous chapter. Most important in this is that the user test should be executed in the actual context of loved ones experiencing a gloomy mood at a distance. Focus with these user tests on the gloomy person and their loved one. Thereby, it would be interesting to do generative sessions with multiple stakeholders, including professionals in this field.

When focussing on loved ones, the focus should be on their usability issues, whether they miss anything, whether they act as intended, and whether they send a message afterwards. For the message, it should as well first be tested with a person in a gloomy mood what this message exactly should look like. And then if this desired message should be communicated through the loved one. When this is designed, this user test with a loved one can also take place. Before this, user tests with loved ones on the usability of Uppie could take place.

Next to the recommendations for Uppie itself, there can be looked at using Uppie for other purposes. The final user test showed potential in using Uppie to enhance the goodbye of a phone conversation or using the tickling effect of the vibration motors to uplift someone’s mood over a distance.

When looking at the project in general, some further studies could be interesting to do with the other research directions provided in this research. To enhance the understanding of how loved ones can support their loved ones in a gloomy mood over a distance and not keep the focus on Uppie. The research showed multiple exciting design opportunities besides Uppie to enhance the gloomy mood through social support over a distance.

Lastly, this study focussed mainly on the non-verbal cues in a gloomy mood. However, further research could focus on different scenarios to enhance communication over a distance with non-verbal cues. Context analysis showed how current communication media is limited in communicating various non-verbal signals. Further studies could continue to strengthen everyday non-verbal communication with these technologies.

8.4 | Conclusion

Current communication media do not support social support over a distance for a person in a gloomy mood to relieve their gloominess through the support of loved ones living further apart. However, user research showed that social support, especially external validation of loved ones, can help boost the available energy to start regulating this gloomy mood. Loved ones often initiate this process as they see the person’s non-verbal signals in a gloomy mood. Receiving this external validation is essential for a person in a gloomy mood when they can not find the energy, causing them to overthink and stay inside their head. Current communication media could even stimulate this overthinking, as it keeps them in the loop of a short burst of dopamine and distractions.

With Uppie, a person can indirectly share their gloomy mood with loved ones by asking for a hug and receiving their loved one’s full attention. Loved ones can, in return, hug back in the same way. Final evaluation with users showed that sharing this touch makes the gloomy person feel comforted, comfortable and validated by their loved one. With Uppie, loved ones can help the gloomy person start regulating this gloomy mood and make them not feel alone in experiencing it, enabling a person in a gloomy mood to share their needs when it is too difficult to express their needs verbally.

Through prototypes, I showed that it is possible to realise this design of Uppie. However, that I can make a prototype of Uppie does not necessarily mean it is possible to produce Uppie easily. There will be a lot of time and effort needed to do more user tests, set up a marketing campaign, write the code, find out the optimal way to get the Uppie produced, and finally find a company willing to make this. However, the current design of Uppie forms a great start to this and will be a new experience in communication between loved ones over a distance.

Lastly, before introducing Uppie, it must survive in the longer term. As discussed before, it is important that in redesigning Uppie, more tests should show the value Uppie can bring when a real gloomy mood is experienced. Showing this value is especially important to potential users of Uppie, to let them know about other people’s experiences with Uppie and why it works for them. People might be hesitant at first to use Uppie, as research showed how normal it is to not mention a gloomy mood, especially at a distance. Thereby some people do not consider themselves a hugger. Therefore it is essential to keep the threshold in using Uppie and buying Uppie as low as possible. Making it a product everyone can test out easily and letting them experience the benefits Uppie could bring to them personally and for their relationships at a distance. Making it possible to receive social support in a comfortable way and bring this communication with loved ones at a distance from the digital to the physical world.

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Hey, up for a walk?

11:30