DESIGN FOR YOUTH'S FLOURISHING

Intervention design strategies to enhance teenagers' mental resilience and well-being

Sofia Fonda
MSc Design for Interaction
Master thesis report

Delft University of Technology
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Our greatest glory is not in never falling,
but in rising every time we fall.

— Confucius

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ACKNOWLEDGEMENTS

As I am approaching my graduation, I would like to thank the people that accompanied and supported me throughout this journey.

First, I would like to thank my supervisory team, professors Paul Hekkert and Nazli Cila, for their availability, support and care demonstrated along the entire project. Thank you Paul for proposing this project to me, for pushing me to reflect on myself and on my role as a designer. Thank you Nazli for your encouragement even when I didn't believe so much in myself, for recognising my difficulties and efforts to improve. I am looking forward to meeting you in person for the very first time at my graduation ceremony. I would also like to thank my external advisor Levi van Dam. Thank you for your support and for all the material you provided regarding (adolescents') psychology, which was precious for my research.

I would like to acknowledge all the well-being experts that participated in my project, as interviewees or during the evaluation. Thank you to Diantha Voskuijl, Evelien Dietvorst, Timothy Houtman, Alisa Balabanova, professors Arne Popma, Philippe Delespaul and Marc Noom. I would also like to acknowledge all the professional designers and design academics that spend some of their time in helping me with my project, by participating in my research or evaluation phases. Thank you Bianca Caragüe, Ji-Youn Jung, Eva Legemaate, Nina Schouten, Nienke van der Straten, professors Valentijn Visch and Froukje Sleeswijk Visser. Thank you as well to all the people who expressed their preference of remaining anonymous.

Thank you to all the adolescents that disclosed their personal lives for my research.

Thank you Yeun, Andrea, Francesco and Ane for participating in my creative session and/or evaluation rounds. Thank you Michael for helping me when I was lost, for our fruitful discussions on design and for your suggestions. Thank you to my friends Paula, Mikel and Gabriele for participating in various activities, including and most importantly emotional support. Thank you Emanuel for always being there for me.

Finally, thank you to my family, without whom I would have not been able to start this journey in the first place.

ABSTRACT

The urge to promote mental health and well-being is gaining increasing importance and attention in recent years. Adolescents, who are among the most vulnerable under this aspect, are experiencing an increase in mental health complaints and need of youth care in the Netherlands. In addition, they perceive current means of care as inappropriate to their needs. Generally, mental healthcare remains hard to access due to its elevated costs and lack of resources. Alternative ways to promote mental well-being appear necessary. These could be provided by implementing design to mediate and promote positive activities through human-product interactions. Teenagers make heavy use of smartphones with continuous internet connection; this creates the possibility to take advantage of digital phenotyping, the practice of gaining information on users' (mental) state by collecting and interpreting data from smartphones' sensors and interactions. This system would allow to detect when teenagers experience risk states and provide proper (design) interventions.

This project aimed at providing designers with strategies to create interventions promoting teenagers' mental resilience and well-being through product-mediated activities. The research entailed literature review, interviews with experts and adolescents, examination of tools, prototyping and user evaluation. The Vision in Product design and Contextmapping methods were employed. Academic stress and depressed mood were identified as the two most relevant detectable risk markers for teenagers. The goals of *making adolescents embrace resilience as a collaborative learning process by identifying purpose and stick to congruent behaviour* (for academic stress) and *by reframing negative emotions, translating them into learning opportunities* (for depressed mood) led to the development of 14 intervention design strategies. These are presented in a card deck, whose evaluation stressed the importance of implementation, detailing and user testing to reach intended impact, and the necessity to evaluate and prevent potential counteractive effects.

This work contributes to the field of Design for Well-being and specifically to the Smart-CUEing MEntal health research project, whose aim is to promote adolescents' well-being by implementing digital phenotyping and design interventions.

CONTENTS

0. INTRODUCTION

In this chapter, the project is introduced by presenting its problem definition and problem statement in section 0.1.

In section 0.2, the methodology is discussed, listing the main methods implemented during the research and their integration.

The process is briefly described and illustrated in section 0.3, while section 0.4 proposes a reading guide for this report.

0.1 PROBLEM DEFINITION

Adolescence is one of the most vulnerable part of a human being life, with more than 75% of all mental disorders rising from the age of 12 to 25 (Kesler, et al. 2007). In recent years, a Dutch epidemiological research indicated a growth in school-related pressure, a decrease in school appreciation and an increase in divorces (Stevens et al., 2017). We are also witnessing an increase in stress-related complaints (Kleinjan et al., 2020) and in the percentage of youth receiving youth care in the Netherlands, reaching 1 out of 8 in 2018 (NJI, 2019), while the Netherlands Youth Institute indicated the current Dutch youth care system as 'not suitable to supply the high demands' (NJI, 2019). Moreover, adolescents have a negative perception of current assistance, e.g. therapeutic counselling, perceived as not appropriate to their needs (Leijsdorf et al., 2020). A research for alternative solutions appears necessary.

Young people aged 12 to 25 make heavy use of smartphones with continuous internet access: 98,9% (CBA, 2018). It is common practice, especially for young people, to keep the smart-phone close, checking it many times per day (Andrews et al. 2015, Eadicicco 2015).

Smart-phones are ubiquitous and allow to collect a large variety of data. These could be grouped under:
(1) Passively collected data, which is characterized by unobtrusive use of sensors and (almost) no engagement by the user. This can be collected through smart-phone's sensors (e.g. GPS location, screen on and off time) or by detecting interactions with its software (e.g. use of applications, keyboard interaction).
(2) Actively collected data, which needs to be actively provided by the user (e.g. through self-report).
Together, this data offers the opportunity of deducting, measuring and tracking human behaviour in real time and in the context of use; i.e., the practice described as "digital phenotyping" (Insel, 2018). While research in the field of digital phenotyping is still at a nascent stage, it appears promising in identifying behaviours related to mental health, consequently revolutionizing mental healthcare (Mohr et al, 2017). This kind of continuous, contextual monitoring would create the possibility to provide meaningful just-in-time adaptive interventions, "aiming to provide the right type/amount of support, at the right time, by adapting to an individual's changing internal and contextual state" (Nahum-Shani et al., 2017). Still, serious consideration must be given to ethical and feasibility issues rising from this practice (Mohr et al, 2017).

Smart-CUEing MEntal health is a Dutch multidisciplinary research project involving experts in design, mathematics and clinical psychology, currently being initiated. The term derives from "bio-cueing", which refers

PROBLEM STATEMENT

to the practice of cueing users when physiological values detected by wearable sensors indicate a risk for health (Paradiso et al., 2011; Riley et al., 2015). The goal of Smart-CUEing MEntal health is to create a mobile heath tool, an alternative source of care provided through a smart-phone application. This app would be capable of collecting data from passive and active smart-phone interactions, and, through its self-learning algorithm, evaluating the mental state of adolescents in order to provide appropriate interventions to boost mental resilience. This algorithm would be able to (a) identify patterns of behaviours indicating mental states, (b) provide just-in-time adaptive interventions to improve the mental resilience of the user, and (c) continuously learn about both individual users and general behaviours, improving and enriching the correlation between data, behaviours and mental states.

Digital phenotyping has the potential to provide game-changing benefits in the field of mental health care by (a) transforming the way care is delivered, (b) early identification of mental health problems and (c) prompting a new generation of mHealth (mobile health) tools (Mohr et al, 2017). The Smart-CUEing MEntal health research project aims at creating one of these tools, integrating different disciplines in the creation of a smartphone application.

There are some serious feasibility issues in the development of this tool, which need to be addressed. Positive design could offer a meaningful and fruitful approach to answer the question "how can interactive behavioural design based on smart-phone data, support youngsters in improving their emotional well-being?". Considering the importance of individuals' mental and physical activities in sustaining well-being, highlighted by positive psychology, it is possible to consider product-mediated activities as meaningful interventions to improve resilience (Wiese, Pohlmeyer, & Hekkert, 2019).

Figure 1 presents a visual summary of the components of the Smart-CUEing MEntal health project. It starts from the mental state of the adolescent, which determines some aspects of his behaviour. The smartphone application attempts to recognise this mental state employing passive and active data collected ecologically and in real-time. All this data is analysed by an AI, which interprets it identifying behavioural markers. These are indications of specific mental states and/or behaviours (e.g. stress, social avoidance, fatigue) that are used to determine what just-in-time adaptive intervention(s) to provide to the adolescent, if necessary. User's interaction with the intervention would promote positive activities, which provide a mental resilience boost.

This graduation project focuses on the last part of this infrastructure, after the AI's interpretation of data. The aim would be to find appropriate intervention design strategies targeting some of the most relevant detectable behavioural risk markers.

The goal of this project is to explore and identify strategies for developing effective and relevant design interventions for a mobile health tool, targeting two of the most relevant detectable behavioural risk markers, in order to improve adolescents' mental resilience though product-mediated activities.

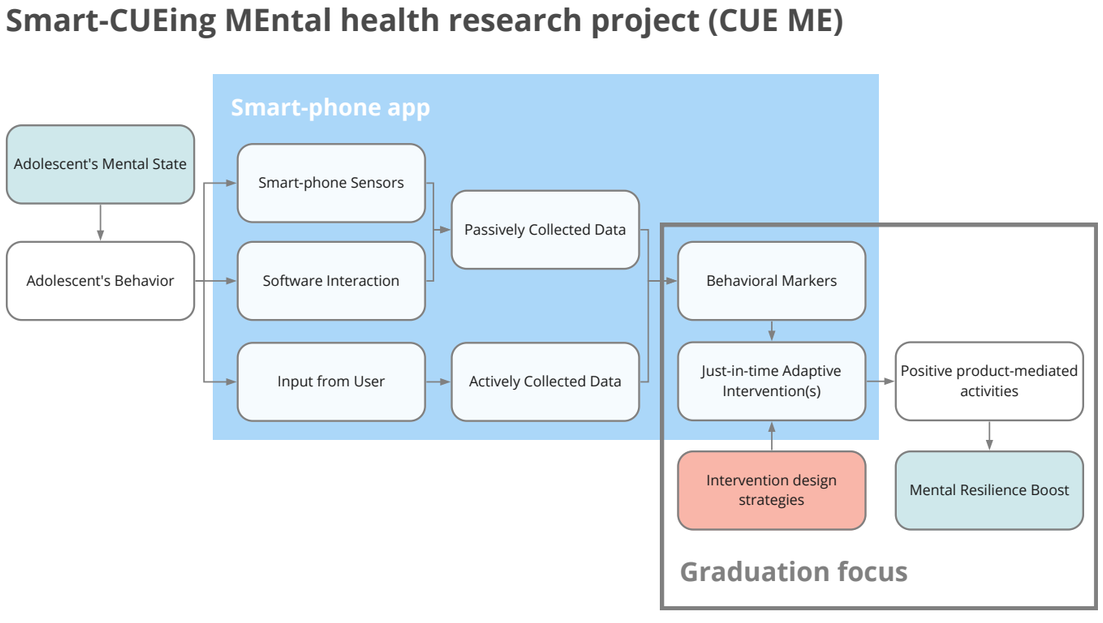

Figure 1. Schematic representation of the graduation focus related to the Smart-CUEing MEntal health research project.

0.2 METHODOLOGY

A number of research methods were implemented throughout the duration of the project. These are presented in this chapter.

LITERATURE

The examined papers covered a variety of topics, in particular:

a. Digital phenotyping, Just-in-time Adaptive Interventions (JITAIs), eHealth and mHealth tools

- state of the art
- opportunities and risks
- ethical issues
- (lack of) engagement issues
- behavioural markers that it is possible to sense with smartphone-based digital phenotyping

This research lead to the creation of the Glossary of terms related to digital phenotyping, JITAIs, eHealth and mHealth tools, reported in Appendix A, and a list of behavioural markers that were later discussed with experts; see section 2.1 Risk markers. New opportunities in this field are enlisted in section 1.2 eHealth tools for mental well-being.

b. Resilience development

- (positive) psychology theories and practices
- cognitive-behavioural therapy practices and interventions
- mindfulness techniques

This is reported in section 1.1 Theories on resilience development, and contributed to the collection of factors on the domain of "Resilience", used to build the worldview, presented in section 1.3 Resilience future context.

c. Design methods on how to research and design for resilience and well-being

- design for societal issues
- behavioural design
- persuasive techniques and game design

This provided a general understanding of the design research and practice in this field. A reflection on these topics is presented in section 3.2 Reflection on design.

EXAMINATION OF EHEALTH TOOLS

Part of the research consisted in the Examination of a number currently available web- and mobile-based tools to boost mental resilience. The intent was to familiarize with current digital trends in providing interventions to boost mental resilience, while getting inspired by these practical applications for later ideation. Results are discussed in section 1.2 and the list of examined tools can be found in Appendix B.

PARTICIPATION IN MENTAL FITNESS WORKSHOPS

Throughout the project, the participation in a number of workshops was useful to get a grasp of positive psychology and mindfulness practices currently proposed to workers and university students to increase their well-being. In particular, the series of workshops on mental fitness by MINDtreat founder and coach Suzan Grootscholten were inspirational in the exploration and identification of strategies.

INTERVIEWS WITH EXPERTS

Well-being experts (e.g. psychologists and psychiatrists) involved in Smart-CUEing MEntal health and similar projects were interviewed and asked to give their opinion on:

- which behavioural markers, from a list of markers found possible to be sensed with smartphone-based digital phenotyping, are the most important and relevant for adolescents
- current interventions for mental resilience regarding these markers
- current practice in motivating adolescents to enduring intervention adherence

The experts agreed on the two most important and relevant markers from the list and their correlation to others and each other; see section 2.1 Risk markers. These were later confirmed and illustrated by the results of contextmapping with adolescents and used to identify the design directions.

TIER LIST

Some of the interviews with the well-being experts were facilitated by the use of a specifically designed tier list template. This tool comes from the world of videogames and allows to easily move pictures, usually representing playable characters, on different levels of a board, subjectively ranking them according to their viability in competition. In this case the pictures represented the behavioural markers found in literature. It provided a clear overview while discussing markers' relevance with experts, while moving them on the board according to their feedback. The tier list format was first proposed to the experts, giving them the choice to engage in this or a more classical interview format. It was then clarified that the board was just a facilitation for the conversation and not a strict ranking of the markers.

The tier list, displayed in figure 3, was found to be useful in keeping a common understanding during the conversations, especially within strict time limitations.

Designers involved in the same projects were also interviewed to gain an understanding of their approach to interventions for resilience and their role and practice as designers.

CONTEXTMAPPING WITH ADOLESCENTS

Eight adolescents aged 15 to 18 years old where involved in contextmapping research in order to:

- empathise with end-users
- know their context and daily practices for well-being
- illustrate and confirm the relevance of the two selected behavioural markers
- confirm and illustrate the identified attitude/behavioural combinations
- inspire mechanisms for the design directions

The results confirmed and illustrated previous findings, and can be found in section 2.2. They inspired the selection of mechanisms in the design statements and guided the conceptualization phase.

A questionnaire was designed to be sent to all other volunteers that, due to time limitations, could not be involved in the whole sensitizing and interview process. The answers to this questionnaire were taken in consideration, however they were found to be not deep enough to heavily impact the research outcomes; see Appendix D. Contextmapping with adolescents.

VISION IN PRODUCT DESIGN (VIP)

Vision in Product Design is a method that allows designers to organize and create an overview of information collected during research. It encourages to consciously make a choice, defining a design direction and illustrating it with a statement, and to take responsibility for it. The ViP method was applied to integrate the results from the other methods, as illustrated in figure 2.

Initially, the factors coming mainly from literature research were collected and clustered. They can be found in Appendix C. ViP factors and references. These clusters contributed to the creation of a two-dimensional worldview, whose four quadrants illustrated different attitude/behavioural combinations; that is to say the attitudes people might have towards resilience and their related behaviours. These are illustrated in section 1.3 Resilience future context. After this, a decision was made regarding the design goal, which, integrated with mechanisms inspired by context-mapping, and referring to the behavioural markers, constituted the design direction presented in section 3.1 Design statements and analogies.

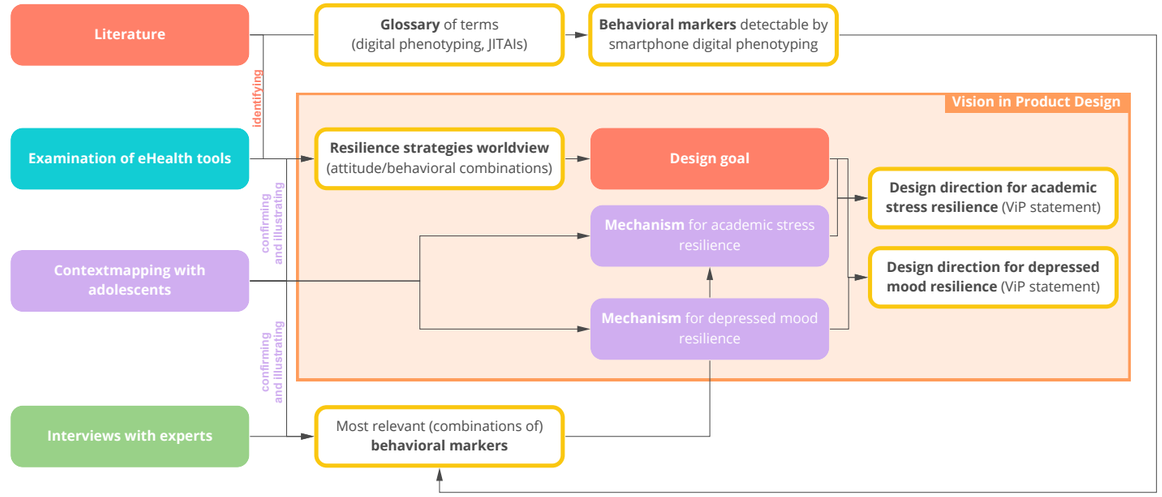

Figure 2. Integration of research methods scheme.

Figure 3. The tier list used as a conversation facilitator with experts. All the markers collected from literature were presented on the bottom. It was possible to move them in the different rows, indicating their importance and relevance to the project.

0.3 PROCESS

The initial part of the project was dedicated to researching topics related to the SmartCUEing MEntal health project: mental resilience and how to develop it; digital phenotyping and adaptive interventions; adolescents' daily lives and practices. Multiple methods, such as literature research, examination of e-health applications, interviews with experts, contextmapping with adolescents and Vision in Product design, were implemented and integrated in order to answer the research question and identify a direction to guide the subsequent design phase.

The ideation phase involved the ideation of three concepts, which were prototyped and evaluated with adolescents. The user evaluation's insights and the following iteration provoked a reflection on the role of design in behaviour change. The resulting considerations guided the creation of the design strategies, whose iteration was based on evaluation results with design students, design professionals and clinical experts. The final output is a card deck containing 14 intervention design strategies for boosting adolescents' mental resilience.

0.4 READING GUIDE

In this report, content is provided in order to guide readers through the insights and choices that led to the final outcome.

Chapter 1 offers an overview of the research made regarding resilience practices and theories, with a focus on eHealth tools, concluding with the envisioned resilience future context that guided the development of the project.

Chapter 2 focuses on adolescents' mental well-being, from the risk markers indicating a risk for their well-being possible to be sensed with smartphone digital phenotyping, to the findings of the research on adolescent's current practices.

Chapter 3 presents the design direction that was defined after a phase of conceptualisation that lead to a reflection on the role that design should take in this and similar projects.

Chapter 4 is dedicated to the intervention design strategies and the final card deck.

To conclude, final reflections, ethical considerations and conclusions are discussed in chapter 5.

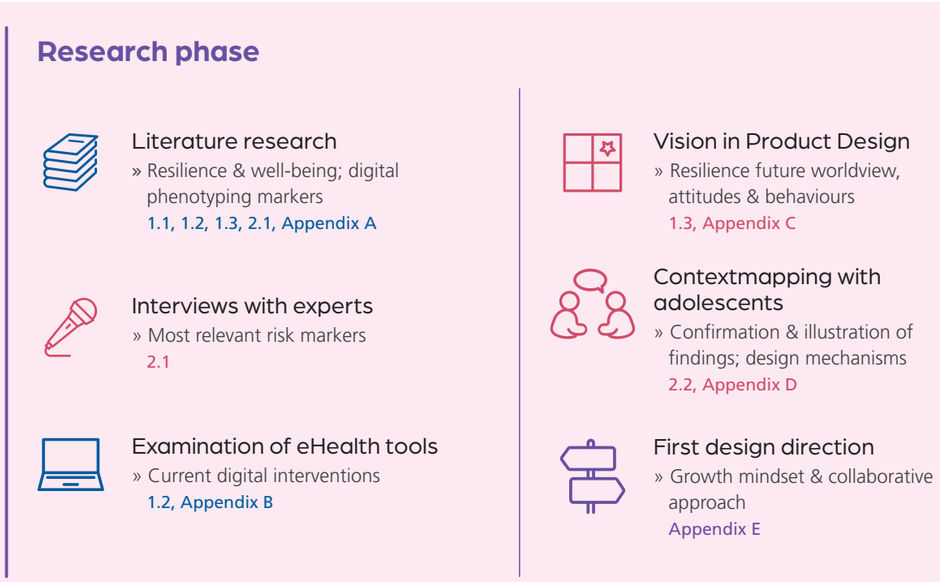

Figure 4. Process and activities in chronological order, indicating their main outcomes and the correspondent report sections and/or appendixes. Red colour indicates activities involving well-being experts or envisioned target users.

1. RESILIENCE PRACTICES

This chapter focuses on the results of the research on current practices to enhance mental resilience and well-being, aiming at human flourishing.

In section 1.1 it is possible to find an overview of the main theories on resilience and its development.

In section 1.2, currently available web- and mobile-based eHealth tools are discussed. New possibilities and challenges emerging thanks to novel technological progress in collecting and interpreting health data with digital phenotyping and providing just-in-time interventions to improve well-being are also presented.

Section 1.3 is dedicated to resilience future context, represented by a four-quadrants worldview built following the Vision in Product design method and integrating findings from the research on resilience practices, with a focus on adolescents. The worldview will be later confirmed and illustrated by adolescents' practices in chapter 2. The selection of one quadrant, together with the insights on adolescents' practices for well-being, informed the design direction presented in chapter 3.

1.1 THEORIES ON RESILIENCE DEVELOPMENT

Resilience is commonly defined as the ability to overcome difficulties and develop personal growth (Resilience Research Centre, 2021). Specifically, adolescent resilience is described as a process of recovery and sustainability, in which the adolescent is able to regain equilibrium after a stressful event and sustain this recovery pattern in order to achieve personal growth even in difficult situations. It was proven to moderate the relation between stress and consequent anxiety and depressive symptoms (Anyan & Hjemdal, 2016) and to predict psychological well-being (Pidgeon & Keye, 2014).

Cognitive Behavioural Therapy (CBT) is probably the most popular "problem-focused" approach whose final goal is to boost resilience. The premises of CBT are that cognitive activity affects behaviour and that, by monitoring and altering this activity, it is possible to lead to a desired behavioural change (Sutton, 2021). The aim is then to provide people with new strategies to recognise, control and change negative or maladaptive (pattern of) thoughts, consequently regulating their emotions and positively influencing their behaviour (Cherry, 2020).

Some of the most common "thinking errors" leading to emotional problems targeted by CBT are overgeneralising, minimising perception of own strengths while maximising perception of weaknesses, judging situations according to own feelings and only focusing on negative aspects while ignoring positive ones (Sutton, 2021). CBT includes a variety of techniques to change these

Resilience
The ability to overcome difficulties and develop personal growth (Resilience Research Centre, 2021).

Psychological well-being
The ability of an individual to balance many different thoughts, emotions, situations, to problem solve and respond to stress in a healthy manner (Bradshaw et al., 2007)

Positive Psychology
"The scientific study of the factors that enable individuals and communities to flourish" (Penn Positive Psychology Center, 2021).

Mindfulness
Basic human ability to be fully present, aware of where we are and what we're doing, and not overly reactive or overwhelmed by what's going on around us (Mindful.org, 2021)

patterns that can be translated in different types of interventions, from psychotherapy to self-help materials; some the most common interventions include cognitive reframing, with therapist's questions or through exercises, (thoughts) journalling, and relaxation techniques (Pietrangelo, 2019).

Another approach to developing resilience is provided by Positive Psychology. While CBT's focus is on problems (i.e. negative patterns of thoughts), Positive Psychology focuses on prevention of issues by identifying opportunities to develop well-being, human and societal flourishing.¬ Five building blocks contributing to well-being were identified as Positive emotion, Engagement, Relationships, Meaning and Accomplishment (Penn Positive Psychology Center, 2021).

Studies in this field found that individuals' intentional mental and physical activities account for their happiness by approximately 40% (Lyubomirsky et al., 2005). This creates the opportunity to influence people's behaviour in order to increase their resilience and overall well-being. The Penn Resiliency Program is an example on how to build resilience, well-being and optimism in a workshop format (Penn Positive Psychology Center, 2021), while in the design field this can be realised through product-mediated activities (Wiese et al., 2019). Some Positive Psychology interventions to promote well-being are: identification of own strengths and values, self compassion and expression of gratitude (Meyers et al., 2011).

Another renowned technique to improve mental resilience and well-being in general is mindfulness. The goal of mindfulness is to be aware and comprehend the functioning of our own mental, emotional, and physical processes by practicing meditation: the act of paying attention to the present moment without judgement (Mindful.org, 2021). Mindfulness was found to mediate the relation between stress and depressive symptoms (Anyan & Hjemdal, 2016), it is proven to provide physical and mental benefits and to contribute to psychological well-being (Pidgeon & Keye, 2014).

1.2 EHEALTH TOOLS FOR MENTAL WELL-BEING

In the last years, the need of psychological support is becoming increasingly prominent in western population, even more due to the influence of the COVID-19 pandemic consequences. As the market is booming, there is a growing tendency to design digital psychological care tools (Hall, 2021). The necessity to create alternative digital care becomes apparent taking into account the high, exclusive cost of traditional therapy (Hall, 2021) and, more specifically to youth, the perception of current means of assistance (e.g. therapy, counselling) as inappropriate to adolescents' needs (Leijsdorf et al., 2020).

A number of web- and mobile-based eHealth interventions targeting adults and/or adolescents were examined in order to gain an understanding of the characteristics of current products available on the market and their approach to well-being. Most of these products were based on CBT and Positive Psychology, integrating elements of mindfulness. A list of the examined tools can be found in Appendix B.

A common characteristic of these products was found in the format: the majority of them proposed either one-time or day-by-day interventions that somehow resembled academic lectures: a textual and/or (audio)visual informative section, in which theory was explained, accompanied by an exercise to put the novel knowledge into practice, most of the time in the format of an empty textbox to fill or an audio-guided meditation or relaxation session.

In some cases, a questionnaire on mood or resilience level was proposed to the user. Yet, most of the time the only outcome was mood tracking or a calculation of the level of risk for mental health. Only few times the results led to a suggestion on what "lectures" to embrace first.

eHealth
"Health services and information delivered and enhanced through the internet and related to technologies"
(Eysenbach, 2001)

mHealth
Health practices supported by mobile devices
(WHO, 2011).
In this report it refers in particular to practises for mental health supported by smartphones' applications

3 EXAMPLES:

Schleiderlab.org
one-time self-administered interventions of 30 min ca. explaining the theory and prompting self-reflection by filling text boxes were found to provide significant benefits to adolescents (Lab for Scalable Mental Health, 2021)

Mindshine
daily explanations and exercises of 15 min maximum to learn CBT, Positive Psychology and mindfulness practices

Headgear
daily explanations and exercises of 10 min maximum based on CBT, Positive Psychology and mindfulness, targeting employees in male-dominated industries, implementing a terminology and an approach adapted to target users

All the interventions were self-administered and based on knowledge coming from scientific literature, with no customisation or adaptation to users, except from adopting a specific communication style when the tool targeted a specific demographic. After a session, it was the user's responsibility to keep practicing, sometimes having the possibility to set a reminder. In a couple of cases, social network groups related to the eHealth tool were proposed to the user, or the outcome of the exercises could be shared within the tool with other users that could leave comments or "likes".

DECONSTRUCTION

To analyse and deconstruct these eHealth interventions, the ViP method was applied, in a much reduced and simplified version, in order to compose a worldview that would represent the context the creators of the interventions presumably took in consideration when developing them. Observing the interventions, some small pieces of information were collected and put together in clusters that later composed the context worldview in figure 7. The four quadrants represent different attitude/ behavioural approaches that people might engage in. The interventions are deemed to be part of the Guided + Study & exercise quadrant, in which people wish to know more about how to be happier and are supported by a platform that teach and make them practice techniques proved to be universally effective. An interaction vision analogy was also identified.

Photo by Christina @ wocintechchat.com on Unsplash

Photo by Jessica Lewis on Unsplash

Figure 5a,b. Visual representation of the interaction vision deemed to represent the interaction with current eHealth tools.

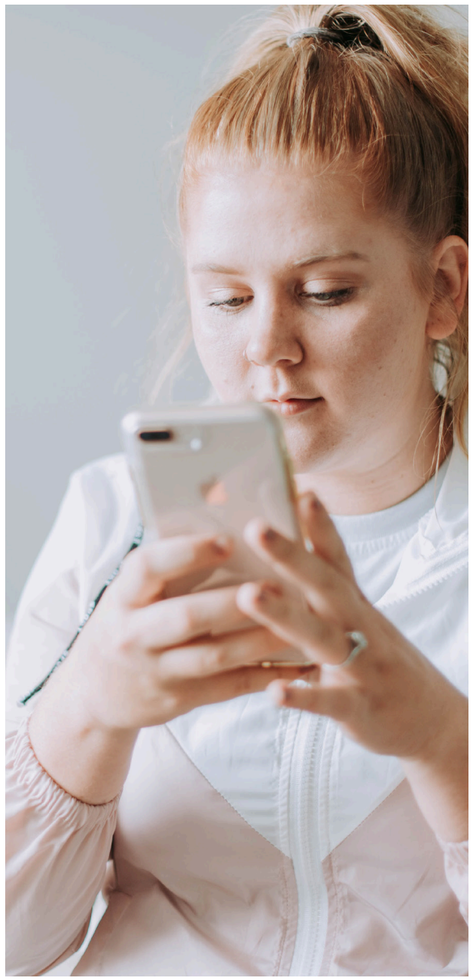

Photo by Samantha Gades on Unsplash

Figure 6. Visual representation of the context of use of current eHealth tools.

Old interaction vision
Having a private teacher, doing the exercises alone or with their guidance

Old context
- alone,
- decision to spend free time to learn something from a website or app (10 mins per day or 30 mins one-time ca.),
- quiet, peaceful settings for concentration,
- consistent trust, interest in and use of the content

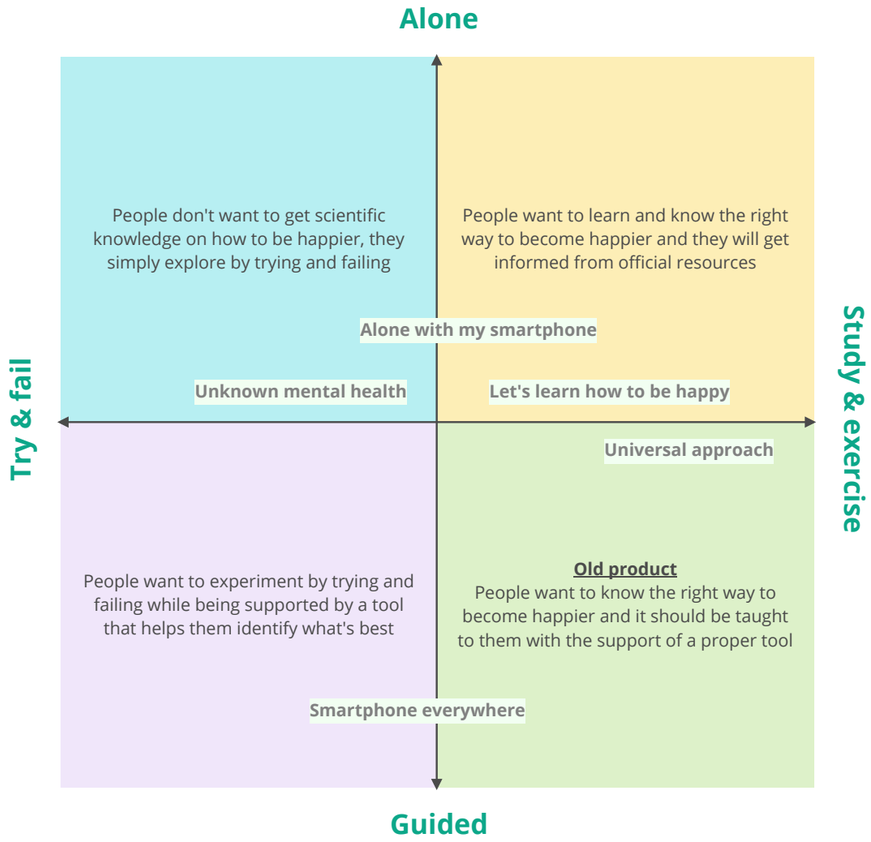

Figure 7. Worldview representing attitude/behavioural resilience approaches that were supposedly considered when designing the examined eHealth interventions. The corresponding design direction relies on the quadrant composed by guided + study & exercise.

MHEALTH TOOLS IN DEVELOPMENT

The functions of new mHealth tools for adolescents currently being developed were also examined through literature and conversations with well-being experts and designers involved in their development. These were the G-moji and the Grow it! smartphone applications. Both these apps are being designed to track (fluctuations of) emotions in order to contribute to the therapy practice, while Grow it! also applies gamification principles to motivate adolescents to participate in the acquisition of actively collected data. Strategies to intervene and boost adolescents' resilience could not be identified in these applications.

INTERVIEWED EXPERTS DEVELOPING NEW MHEALTH TOOLS

G-moji

- Psychologist
- UX designer
- Reiki therapist and psychologist-to-be

Grow it!

- Designer and associate professor at IDE faculty, TU Delft
- Design student in Design for Interaction

NEW DESIGN OPPORTUNITIES AND CHALLENGES

Digital phenotyping has the potential of sensing behavioural markers indicating risk for mental health of people by taking advantage of passive and active data collected though their smartphones (Nahum-Shani et al., 2017).

Likewise, it provides the opportunity to design and administer Just-In-Time Adaptive Interventions (JITAIs). These are interventions provided at the right time and in the right context, when the user needs them the most. Moreover, JITAIs can continuously adapt according to new dynamic information, in order to provide the right type and amount of support, personalized to each single user (Nahum-Shani et al., 2017). An example of adaptivity could be tracking the behaviour of a user in order to later propose activities that would be perceived as familiar, hence requiring lower effort and having a greater chance of being actualised (Aung et al., 2017). In other words, JITAIs applied to a mHealth smartphone application would give the opportunity to face rapid and unexpected emerging of behavioural markers ecologically, administering proper support and selecting the most appropriate moment to do so, maximising adherence and engagement. This would allow to gradually reinforce and improve desired behaviours and take advantage of situations in which the user is most receptive to learning new skills (Nahum-Shani et al., 2017).

Since JITAIs take advantage of short-term opportunities to aim at a long-term behavioural change, it is necessary to identify a final objective to be subdivided in proximal goals that would be addressed by, and ideally verifiable after, each intervention (Nahum-Shani et al., 2017).

This is also valid in regards to intervention engagement and intervention fatigue, that can be supervised by identifying, measuring and monitoring proper related proximal goals. Engagement needs to be maximised by, for example, making the user perceive the intervention as trustable and useful; while fatigue should be minimised, trying to avoid cognitive overload, habituation and negative emotions caused by the tool. One way to promote engagement and decrease fatigue altogether might be to fulfil core psychological needs, namely autonomy, curiosity, competence and relatedness (Nahum-Shani et al., 2017).

There are some challenges to face when designing and programming JITAIs. Firstly, circumstances evaluated by the system as optimal to provide support might occur repeatedly over a short period of time. This needs to be avoided in order not to submerge the individual with too frequent interventions. Also, delivering interventions in real-life settings could conflict with the daily activities of the user, resulting in intervention fatigue. Lastly, a tool designed in order to be used individually, with no extra support from, e.g., a therapist, might not pressure or motivate users enough to keep engaging with it (Nahum-Shani et al., 2017).

Additionally, digital phenotyping and JITAIs, especially when applied to a sensitive field such as mental health, rise a number of ethical concerns. One of them is the privacy of the user, which needs to be protected. This should be done by providing transparency on the use of data, clearly stating who has access to it and to what extent or in what way this data will be stored and handled. It is also important to give decisional control to the user on these aspects, always allowing withdrawal and cancellation of all data. Another concern is the lack of social relationships, non verbal communication, empathy and compassion that naturally comes from the interaction with a non-human entity. Special attention should be given to this issue, for a person sharing intimate information may need these qualities characterising an eventual response. Even so, this deficiency might as well come with opportunities: an individual might indeed feel less judged when referring to a virtual assistant rather than a real person, and may be even more prone to open up to it regarding personal issues (Vold et al., 2019).

Lastly, mHealth tools designed to provide support through the implementation of digital phenotyping and JITAIs should be designed with a human-centred approach, consciously avoiding the development of any form of digital dementia or problematic dependency with them, which would be counterproductive for the individual's well-being. It also needs to be inclusive, taking into consideration the needs of all kinds of people, with no discrimination of e.g. gender, race, social class (Vold et al., 2019).

Just-in-time adaptive intervention (JITAI)
"An intervention design aiming to provide the right type/amount of support, at the right time, by adapting to an individual's changing internal and contextual state, with the goal to deliver support at the moment and in the context that the person needs it most and is most likely to be receptive"
(Nahum-Shani et al., 2017)

Intervention fatigue
"A state of emotional or cognitive weariness associated with intervention engagement"
(Nahum-Shani et al., 2017)

Intervention engagement
A "state of motivational commitment or investment in the client role over the treatment process"
(King et al., 2014)

Digital dementia
cognitive and/or skill atrophy originating from excessive reliance on technology and the consequent reduction in the practice of tasks that would keep the individual's capacity abreast (Vold et al., 2019)

1.3 RESILIENCE FUTURE CONTEXT

In this section, the future context worldview created following the Vision in Product design method is illustrated, presenting the clusters that led to its development and the main factors composing each of them. The domain, resilience, was defined widely in order to include as much information as possible on mental resilience, with a focus on adolescents. Most of the factors that were collected and clustered came from literature review, while information coming from interviews with experts and examination of eHealth tools was also taken into consideration.

The result is a worldview consisting of four quadrants representing distinct attitude-behavioural combinations that adolescents might engage in, regarding resilience. The choice of one quadrant informed the design goal that, together with two mechanisms inspired by insights on adolescents' practices, led to the final design direction presented in chapter 3.

LEARNING TO BE HAPPY

People can learn to be happy by changing the activities they do everyday. Positive psychology can be taught to children in schools (but also to adults in workshops) in order to develop optimism, resilience and a more mindful attitude. Indeed, our internalized beliefs influence our resilience to stress and depression. People can also learn how to better use and manage their strengths, utilising them in activities to be more engaged, hence more mindful.

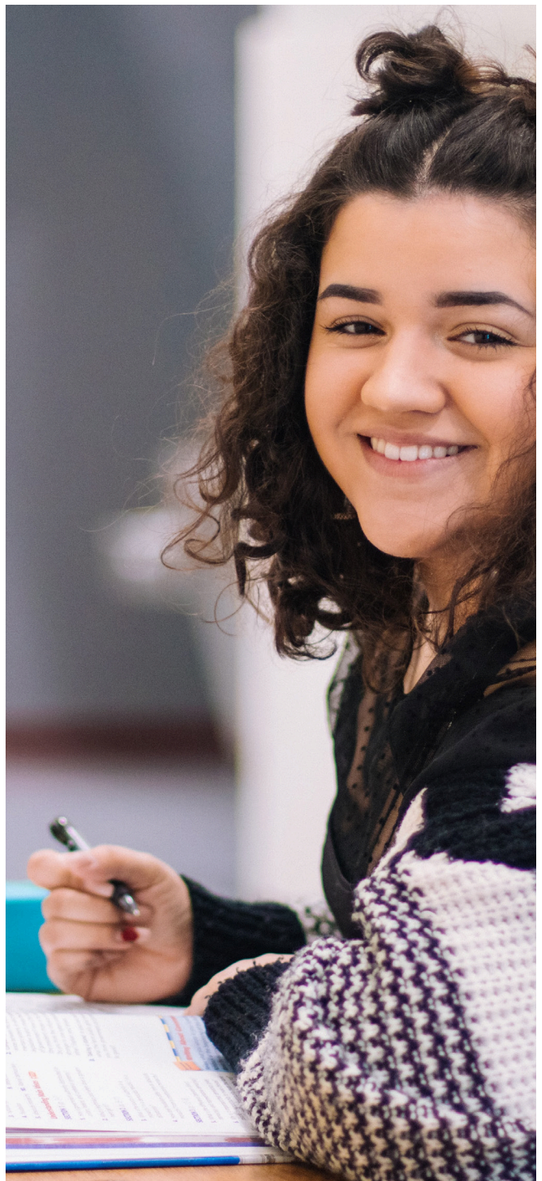

Photo by Jeswin Thomas on Unsplash

TOP FACTORS

40% of well-being depends on activities (principle/psyc+bio)
Since 40% of our well-being depends on intentional mental and physical actions, personal and voluntary effort can be one of the main factors for improving it. (Lyubomirsky et al., 2005)

Resilience should be thought in schools (development/cult)
Positive Psychology founder Martin Seligman supports the teaching of PERMA in schools, in order to provide more well-being and at the same time better performance results. (Seligman, 2016)

Strength development for more happiness (principle/psyc)
Positive psychology pushes for strengths assessment and intervention to allow patients to use their strengths to improve performance in various ways. However, it should not be only about identification and use but about development: understanding how and in which situation to use the strengths and what effects these strengths have on others. (Biswas-Diener et al., 2011)

Growth mindset = better performance (principle/psyc)
People having a growth mindset (concentrating on learning goals) were found to have better performance after receiving negative feedback compared to people with a fixed mindset (focus on performance), that would be too hard on themselves after criticism around a strength. (Biswas-Diener et al., 2011)

LIVING CONNECTED

Our daily lives are heavily influenced by the interconnected world we live in. Thanks to the advent of smartphones, the internet became ubiquitous, shaping our routines and consequently influencing our well-being. The positive side is that people now have the opportunity to create online communities with similar ones, sharing thoughts and problems in a more stigma-free environment. This made mental well-being a much more popular topic, contributing to removing the stigma, while creating the possibility to build new tools to support mental health. On the other hand, social media can be harmful, especially for adolescents, leading to self-comparison and consequent emotional instability.

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TOP FACTORS

Technology shapes our routine (state/tech)
Technology present in our lives has a strong influence on our activities and routines. For this reason it should be designed with a focus on well-being. (Klapperich et al., 2018)

More discussion around mental health (trend/cult)
People are focusing more on mental health and it is becoming increasingly important, especially after the Covid-19 pandemic. This contributes to remove the stigma, let people talk about it more openly and creates business opportunities. (Hall, 2021)

Interactive screen time bad for adolescents (principle/phys)
Active screen time is worse than passive screen time, especially in adolescents: "it causes dysregulation of the nervous system with hyper-arousal which can lead to emotional outbursts, meltdowns, irritability, and distractibility." (Binus, 2019)

Trendy virtual care (development/tech)
Behavioural care has been used more and more by companies and start-ups to create virtual digital care. (Hall, 2021)

SHARING AND CARING

The context in which people find themselves can allow for specific social practices to spark. One example is communities on the internet, where similar people get together to share similar issues, such as needing company to study, depressive thoughts, or support to quit smoking. The support of others and knowing you are not alone in something can be really helpful in overcoming difficulties.

Photo by Helena Lopes on Unsplash

TOP FACTORS

Gongbang: studying (not) alone (trend/soci)
It is a trend in live streaming platforms (e.g. Youtube, Twitch) to broadcast yourself while studying, giving the impression to your audience to be studying together. Gongbu bangsong is Korean for "study broadcast". (Campbell, Holroyd, 2021).

Peer support in behavioural change (principle/psyc)
In an app designed to support smoking cessation, social support was provided through a chat with peers. It helped sharing mainly information, concerns, strategies and emotional help among users. (Granado-Font et al., 2018)

People spontaneously create space of mental support online (trend/soci)
It can happen that (young) people start sharing their mental health problems online, spontaneously creating supportive communities. (Miller Hyndman, 2021)

Allies help (principle/psyc)
Having allies in app and sharing achievements with them motivates patients to keep trying achieving their goal (in reducing concussion symptoms among teenagers). (Worthen-Chaudhari et al., 2017)

TO EACH ITS OWN

If we consider well-being as a general concept, the risk is to take in consideration too general and abstract theories. In practice, well-being is strictly personal and related to each person. In fact, each one of us is different, with distinct values and, consequently, diverse strengths. However, people might not notice their uniqueness, as they tend to perceive others as similar to themselves. Moreover, since strengths are related to values, people might think that what they do and how they do it is simply "the right thing to do", rather than a unique approach to be valued and developed.

Photo by on Christophe Maertens Unsplash

TOP FACTORS

Well-being is individual (principle/psyc)
Describing well-being for a wide group of people becomes really theoretical and "obvious". This because well-being practically refers to different things per each individual. (Klapperich et al., 2018)

Therapy is getting personalized (trend/cult)
In therapy practice, psychologists used to diagnose and provide interventions based on the results. But now, therapy is getting personal, focusing on the person's goals and specific needs. (Popma, 2021)

False consensus: overestimating similarity of others (principle/psyc)
People tend to overestimate the similarity of others' thoughts, actions and behaviours to their own. This can lead them to believe what they do and their strengths are not unique, special and valuable. (Biswas-Diener et al., 2011)

Strength? I'm just doing the right thing. (principle/psyc)
As strengths are close to personal values, people tend to think what they are doing is just the right thing to do, not recognizing that it might be a strength of theirs, a unique and characterizing behavioural pattern. (Biswas-Diener et al., 2011)

THE VULNERABLE AGE

Adolescence is an age characterized by vulnerability, impulsivity, and more frequent reports of suicide ideation. Especially due to the covid pandemic, adolescents (and not only) are experiencing another kind of epidemic: not going to school and isolating themselves, they face increasingly growing mental health problems. This might get worse due to the stigma on mental health, which might stop them from exposing their issues and seeking help. Resilience can be a resource to improve the situation, since it allows adolescents to overcome difficult moments and have a positive growth attitude. Due to the characteristics of adolescents, resilience could be reinforced with the use of persuasive or gamification methods, while always giving importance to ethical issues.

Photo by Jesus Rodriguez on Unsplash

TOP FACTORS

Teenagers are highly vulnerable and impulsive (principle/psyc)
Teenagers "represent a vulnerable population with a high degree of impulsivity and frequent reports of suicidal ideation". (Cao et al., 2020)

The second epidemic (trend/psyc)
Together with Covid-19 epidemic, a mental health epidemic is also rising among adolescents. The risks of mental health issues are rising as they are forced to stay at home, not going to school. (Durano, 2021)

Stress for academic performance can lead to anxiety and depression (principle/psyc)
Stress in general leads to depression and viceversa. (Anyan & Hjemdal, 2016)

Adolescent resilience = recovery + sustainability (principle/psyc)
Adolescent resilience is a process made of recovery and sustainability. Recovery means that after a stressful events the adolescent is able to get back to an equilibrate state of health; sustainability is the ability to sustain this attitude and positively adapt to situations, even when facing serious adversity. (Anyan & Hjemdal, 2016)

FOUR ATTITUDE-BEHAVIOURAL COMBINATIONS

The above described clusters were arranged in order to create a two-dimensional, graphical representation of the future context of resilience: the worldview. This is defined by two axes, which, combined, delineate four quadrants representing attitude-behavioural combinations towards resilience that adolescents might engage in.

The vertical axes presents on its extremes growth and fixed mindset. Growth mindset is the belief that people can learn new skills in order to be more resilient. The goal is to learn, gain competence while overcoming setbacks in increasingly better ways, continuously acquiring new abilities. In other words, you never stop learning. In contrast, fixed mindset is the belief that people are as they are, characterised by fixed strengths. What they can do is identify them and use them in the best possible way. The goal in this case is to perform at best and get the highest achievements possible.

On the horizontal axes, two contrasting approaches can be found. The individual approach characterises the belief that individuals should deal with their own problems by themselves, while, on the other hand, the community approach defines the belief that people can and should help each other when dealing with difficulties.

The combination of these two axes outlines the four quadrants that will be described below. Each quadrant is represented by a quote expressing the attitude a person might have and a description of the relative performed behaviours. These were confirmed and illustrated by the findings on adolescents' practices for well-being, findable in chapter 2.

Growth mindset + Individual approach

"I can change and learn to overcome setbacks"
Getting informed, maybe online or using a smartphone application, learning new ways to deal with setbacks and difficulties of life, applying them to be more resilient.

Growth mindset + Community approach

"We can learn together and teach each other ways to overcome setbacks"
Including others in the process of learning how to be resilient, participating in group therapy and/or being part of (online) communities where people talk about their difficulties and learn how to overcome them, sharing approaches and tactics.

Fixed mindset + Individual approach

"I can and should overcome setbacks just the way I am"
Motivating yourself to identify and use your strengths as much as possible, overcoming difficulties in an intuitive way.

Fixed mindset + Community approach

"We are strong, we can overcome setbacks, together"
Motivating each other, being part of (online) mutual-coaching communities in which people push each other to do their best to overcome their difficulties.

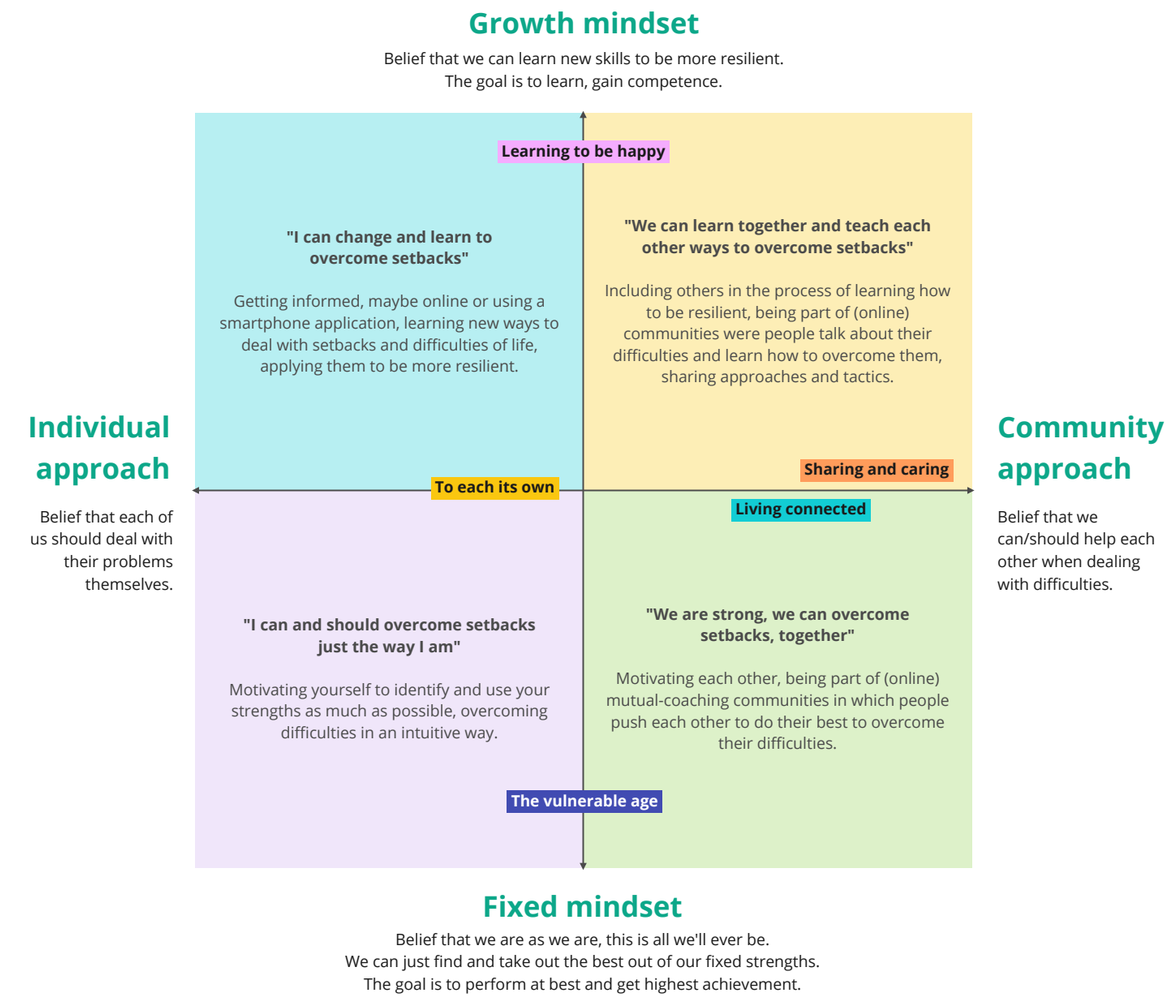


Figure 8. Worldview representing the future context of resilience and four attitude-behavioural combinations adolescents might engage in. The five clusters are positioned on the worldview as well.

2. ADOLESCENTS AND WELL-BEING

This chapter focuses on the findings from the research on adolescents and their mental well-being.

The first objective was to identify what markers indicating a risk for mental health are possible to be sensed by smartphone digital phenotyping, and which ones are the most relevant to consider regarding adolescents. The rationale for the selection of two markers, academic stress and depressed mood, is presented in section 2.1.

Secondly, adolescents' practices for well-being were investigated by directly involving eight teenagers in the research, implementing the Contextmapping method as thoroughly described in Appendix D. The insights are presented in section 2.2. They confirmed and illustrated the four attitude-behavioural combinations identified in section 1.3 and inspired the design direction defined in chapter 3.

2.1 RISK MARKERS

Smartphone-based digital phenotyping has been proven to allow the identification of behaviours related to mental health (Mohr et al., 2017). In particular, collecting and interpreting passively and actively collected data, it is possible to sense and recognise users' behaviours that may indicate a risk for their mental health with increasingly higher precision, creating the opportunity to provide interventions optimising the desired impact on the user's mental resilience (Huckvale et al., 2019). These indicators of (at-risk) behaviours are called behavioural markers (Spinazze et al., 2019).

Due to time limitation, this project focused on the selection of two behavioural markers to be considered when exploring intervention design strategies. The procedure was to first collect from literature those markers proven possible to be sensed with smartphone-based digital phenotyping. Secondly, this list of markers was presented to experts in the field of mental health in order to identify the two most important and relevant ones for adolescents. This also allowed to have a discussion with the experts on the current practice when providing interventions for these markers.

From literature, this list of behavioural markers was gathered:

- depressed mood most of the day;
- diminished interest or pleasure in all or most activities;
- fatigue or loss of energy;
- avoids activities, places, people.
- fatigue
- interest in activities
- social connectedness
- depressed mood

(Place et al., 2017)

- social anxiety severity

(Jacobson et al., 2020)

Digital phenotyping or Personal sensing
The process of deducting "individual behaviour from digital data generated through human interaction with electronic devices, including both physical hardware and software" (Spinazze et al., 2019)

Behavioural markers
association between data collected through digital phenotyping and its correspondence in terms of health indicators or risk factors (Spinazze et al., 2019)

- daily mood
- energy level

(DeMasi et al., 2017)

- hedonic activity
- psychomotor activity
- fatigue
- concentration/distractibility
- sleep disruption (duration, circadian rhythm)
- depressed mood
- stress
- social avoidance

(Mohr et al, 2017)

- alertness level

(Aung et al., 2017)

This list was simplified and presented to the experts in order to find the most important and relevant markers for adolescents. The result was the framework represented in figure 10. The conversations with the experts didn't simply lead to a selection of two markers but to a structure representing the relation of these two with other minor markers and each other.

The two selected risk markers were initially stress and depressed mood. However, some experts questioned the meaning of the word "stress", arguing that depressed mood is technically a type of stress as well. It was concluded that academic stress would be the most relevant form of stress to consider. This choice was further supported by literature (Thakkar, 2018; Anyan & Hjemdal, 2016) and by the following research on adolescents' well-being practices.

OPPORTUNITIES FROM DEEP LEARNING

The aim of this project was to provide a set of intervention design strategies to be integrated in the wider, interdisciplinary Smart-CUEing MEntal health project, whose final outcome is expected to be a smartphone application operating based on a deep learning algorithm. This kind of algorithm, thanks to its capacity to continuously learn from previous events, would be able to identify new patterns and relations among behavioural markers and between sensed data and behavioural markers (Aung et al., 2017). This would be possible starting from baseline information that would be continuously enriched by new data (Riley, 2015). We shall consider the framework in figure 10 as a small, embryonic part of this baseline information, on which it was possible to start working to identify proper intervention design strategies.

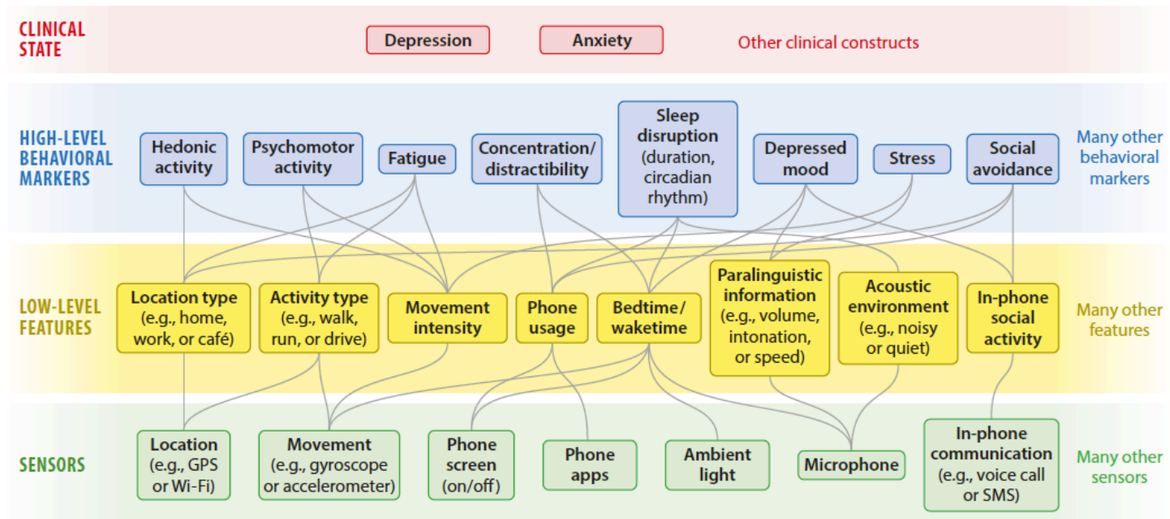


Figure 9. Example of a layered, hierarchical sensemaking framework to interpret data collected through digital phenotyping, from sensors to clinical state (Mohr et al, 2017). The focus of this project is on the "high-level behavioral markers".

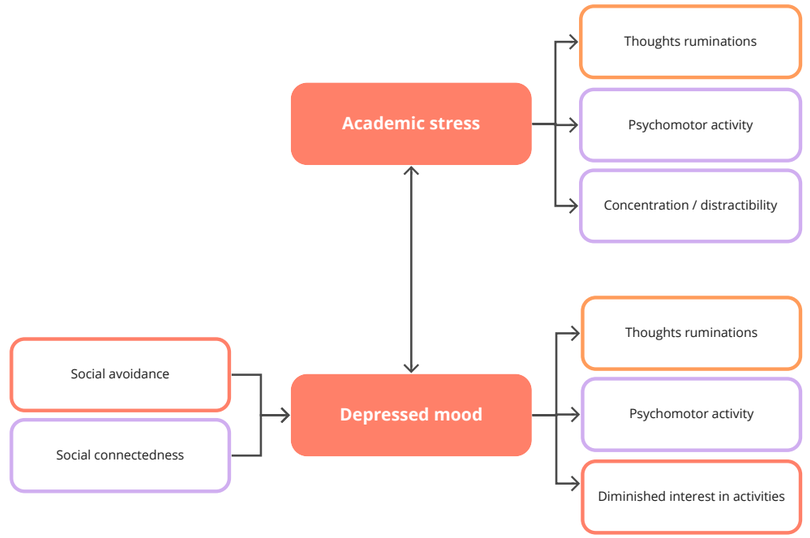


Figure 10. The two behavioural markers that were found to be the most important and relevant for adolescents: academic stress and depressed mood. In this framework, composed and confirmed by experts during interviews, the arrows represent the influence from and on other markers.

2.2 ADOLESCENTS' PRACTICES FOR WELL-BEING

The contextmapping approach was implemented in the qualitative research in order to empathise with the potential end users of the design interventions for resilience, the adolescents, to understand and familiarise with their context and daily practices for well-being. This was needed to find what approach would better fit the teenagers, in order to design strategies that would guide the ideation of effective and motivating design interventions. The research also aimed at confirming and illustrating the four attitude-behavioural approaches to resilience and the two selected behavioural markers.

The results inspired the selection of two distinct mechanisms related to each of the behavioural markers, academic stress and depressed mood. These mechanisms, combined with the selection of one quadrant from the worldview, constituted the design direction, presented in chapter 3.

PROCESS

Eight adolescents were recruited by opportunistic sampling. They went through a period of preparation of 5 days, in which they had to fill in sensitising material consisting of reflective exercises regarding their well-being, their daily practices, their wishes and the factors influencing it. After this, they were involved in individual interviews in which they were asked more specific questions, elaborating on what they already shared during the preparation days through the sensitising material.

FINDINGS

The main topics touched with the adolescents were their social circle and context, their sources of stress and depressed mood, their attitudes and behaviours to face them, factors positively and negatively influencing their well-being and their dream ally for well-being.

The analysis of the interviews and the filled sensitising material made it possible to confirm the validity of the quadrants and to illustrate them with real examples of attitudes and behaviours adolescents engage in when facing academic stress, figure 17a and 17b, and depressed mood, figure 18a and 18b. The two behavioural markers themselves were confirmed and illustrated, identifying the most prominent sources for each of them, see figure 14.

The insights are explained in more detail in the following pages.

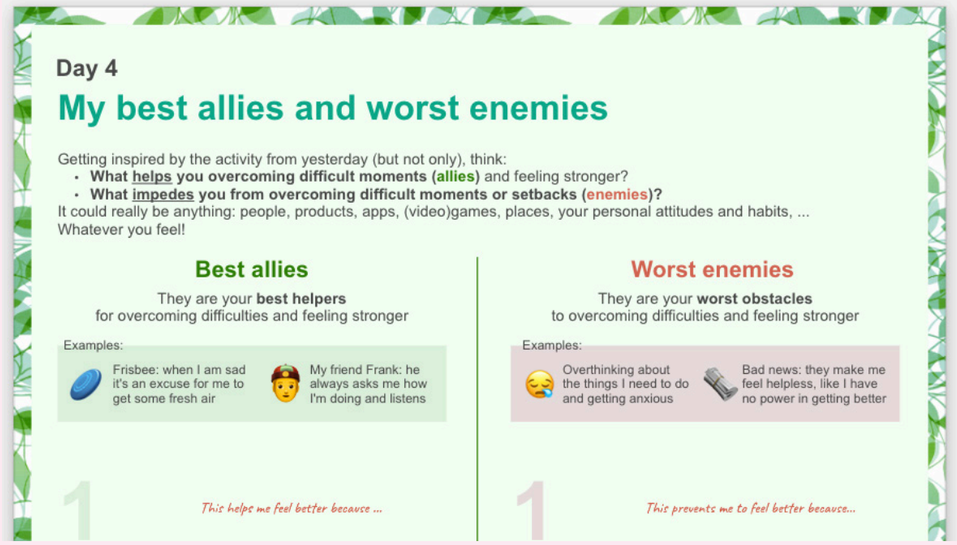


Figure 11. A portion of the filled sensitising board, asking adolescents to reflect on their main allies and enemies for their well-being. All the material used to involve adolescents in the research can be found in Appendix D.

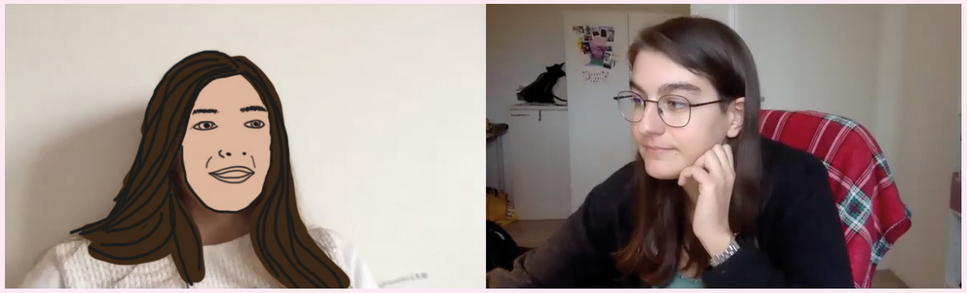


Figure 12. Anonymised screenshot from the interview with one adolescent, held on Zoom. Interviews were held after the sensitising period of 5 days, in which teenagers filled the sensitising exercises from the board.

ADOLESCENTS' CONTEXT

Siblings were indicated as part of the closer social circle of all of the 8 interviewed adolescents. 7 out of 8 located their parents in the same position. Friends unsurprisingly appeared to have a strong influence in the adolescents' lives as well: most of them named at least one (7/8) or multiple friends (4/8) as very closed to them.

Notably, the same adolescent indicating his parents as part of his social circle but not close to him, preferred to postpone the interview and make it happen outside of his home, in order not to let his parents hear his answers. This prompts reflection on how the lockdown situation was perceived by adolescents, who are still not independent and might not always find privacy in their own homes.

The COVID-19 situation was not an explicit topic in the interviews. Nevertheless online schooling was referred to as an issue, both in motivational terms and lack of socialisation. 3 out of 8 interviewees described professors as less empathic and engaging due to online school demotivation, which heavily impacts the students as well. Some (3/8) just admitted to dislike online school altogether, with one participant voicing her frustration towards the negative impact it had on her but even more on less lucky teenagers that may not have the proper tools to follow this kind of lectures. Another participant complained about a sort of cyber bullying on WhatsApp, coming from some classmates during online school.

Being creative, by playing an instrument, singing or drawing, was believed to be very relevant for well-being, together with hanging with friends. 6 out of 8 adolescents selected these activities and positioned them in their top 3. Other best activities were practicing a sport (6/8), being alone and reflect (4/8), listening to music (5/8), hang with family (5/8), have a walk (4/8), spend time with their pet (4/8) and reading or studying (3/8). All the reported activities for well-being can be consulted in figure 13.

SOURCES OF STRESS AND DEPRESSED MOOD

School related issues were indicated as the main source for stress. In particular, quantity of work and lack of motivation were issued by 7 out of 8 participants, some of them arguing they already wake up negatively in the morning because of school (3/8). As previously mentioned, other related issues were online schooling (3/8) and professors not being empathic and engaging (3/8). This confirmed academic stress as a relevant behavioural marker. Another source of stress, arguably somehow related to school work as well, was the perception of not being able to organise time effectively (3/8).

Apropos depressed mood, 5 out of 8 participants argued it is prompted by not feeling good enough at school or extracurricular activities. Half of the interviewed adolescents said they experience depressed mood due to knowing other people are suffering, while

1/8 DOESN'T USUALLY EXPERIENCE STRESS OR DEPRESSED MOOD

1/8 HAPPENS TO THINK ABOUT SELF-HARM AND SUICIDE

Adolescents' self-reported
Activities for well-being

Figure 13. Adolescents' daily activities for well-being.

"I DO VERY WELL AT SCHOOL AND SOCIALLY. [...] I'M NOT SUPPOSED TO BE SOMEONE WHO FEELS BAD, [...] AND YET I DO."

– One of the interviewed adolescents explaning the reason why he didn't feel like opening up with others about his recurring discomfort

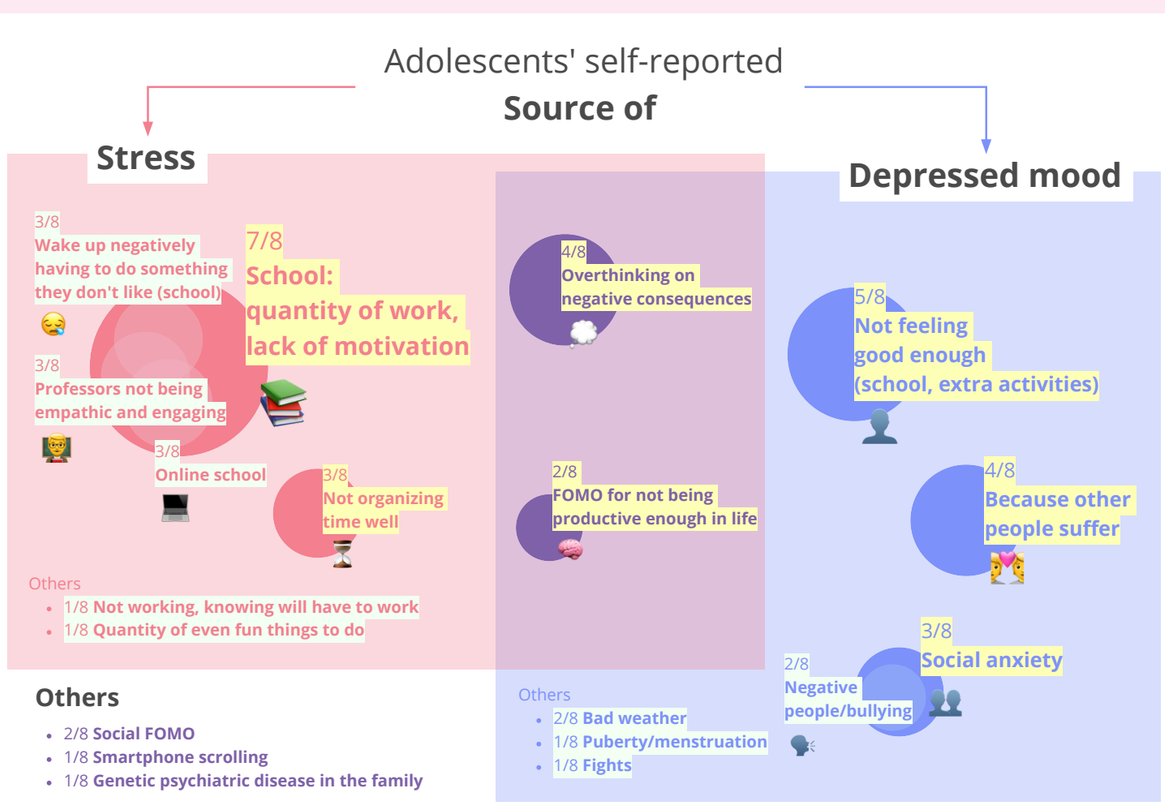


Figure 14. Adolescents' reported sources of stress, depressed mood and other issues.

3 out of 8 revealed social anxiety being a trigger, with two of them reporting bullies or negative people as one of the causes.

Other sources for both stress and depressed mood were over-thinking negative consequences (4/8) and Fear Of Missing Out regarding not being productive enough in their life (2/8). These and other emerged causes can be found in figure 14.

Notably, only 1 out of the 8 interviewed adolescents claimed not to usually experience either stress or depressed mood and to generally feel good about life. In contrast, one of the participants happened to experience some form of anxiety attacks, occasionally contemplating self-harm and suicide, not understanding the source of such discomfort. Not having a "real reason" to feel bad, the participant had kept his pain secret for some time, only recently starting to share it with some close friends. He also mentioned that talking about this in an interview was way easier, not knowing the person he was opening up to.

ATTITUDES AND BEHAVIOURS FOR RESILIENCE

When they were asked to propose a strategy to face academic stress to a friend, 6 out of 8 adolescents suggested to just start doing the work that needs to be done, while 4 out of 8 recommended to prioritise and organise it. Reframing the work in a positive way, accepting an potential failure was the second most common advice (5/8). Other suggestions were: thinking about or doing something else (4/8), asking for help from a friend (3/8) and going for a walk (2/8).

Regarding depressed mood, the most popular advice was to talk to someone about it (5/8). Activity-related recommendations were: doing something fun (4/8), hanging with someone (3/8), walking or doing something physical (3/8). The adolescents also proposed some reflective processes, such as investigating the reasons for this mood (2/8), recognising that you are not the only one feeling this way (2/8) and acknowledging that there will be another opportunity to do better (2/8).

These attitudes essentially matched the behaviours the adolescents reported, although 3 of them admitted not always being able to follow them.

Some performed behaviours considered valid to deal with stress were: prioritizing work or making a to-do list (3/8), asking suggestions from family members (3/8), taking breaks from work to be creative (i.e. to play the piano or sing; 2/8) or to do a breathing exercise (2/8). One participant explained a tactic to prompt motivation he learned from an informative video online: if a tasks takes less than 60 seconds to be performed, just do it immediately.

Among others, being creative (4/8), accepting imperfection as part of life (3/8), thinking about a positive future (3/8) and asking other people for their external point of view (3/8) where considered valid behaviours for both stress and depressed mood. Listening to music (4/8) was mentioned to be both a boost for positive mood and a way to confront themselves with the experience of someone else, in this case the singer-songwriter(s).

The most practiced behaviours for facing depressed mood were talking about it to (7/8) or having fun with (5/8) a friend. Reflecting on the issue and discussing it with a friend (3/8), getting distracted with some fun activities (3/8) and watching TV (4/8) were also considered effective. Interestingly, one adolescent pointed out that sadness can be a source of reflection and learning, in order to face future difficulties more effectively. All the behaviours considered valid can be found in figure 16.

When plotting behaviours, figure 17b and 18b, and especially when mapping out the single participants on the quadrants, figure 17d and 18d, it becomes apparent that in the case of stress there is a deficiency of behaviours on the community approach side, while for depressed mood most of them are positioned on the fixed mindset portion of the worldview. This suggests that most of the times adolescents perceive stress as something to deal with individually and depressed mood as something which you should somehow passively accept, waiting for it to go away. It is also interesting to notice that one teenager, even if presenting a tendency for certain quadrant(s), might engage in behaviours belonging to all four of them.

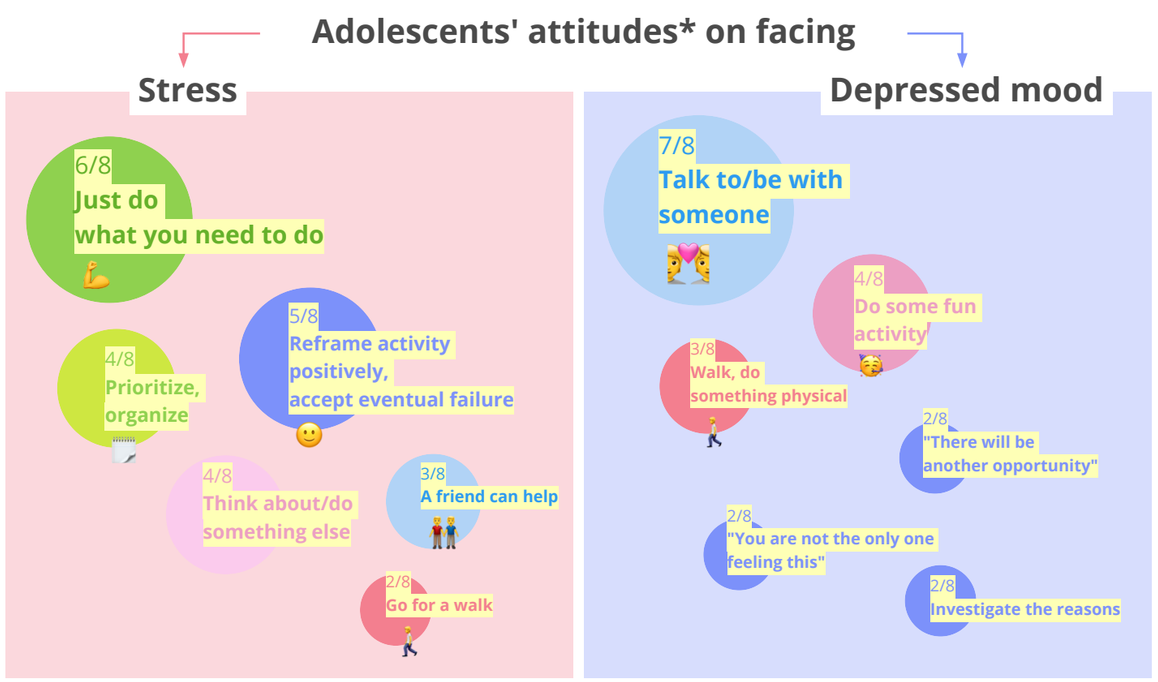


Figure 15. Adolescents' attitudes on facing stress and depressed mood.
*Participants were asked to give suggestions to a friend with a problem similar to their own.

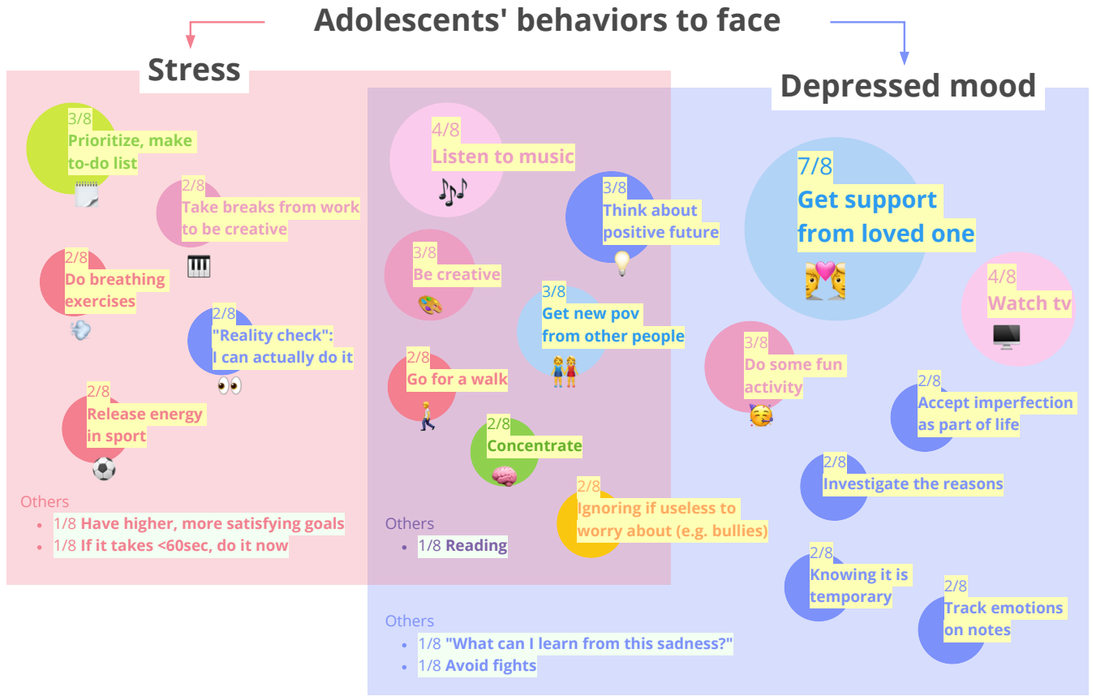


Figure 16. Adolescents' behaviours to face stress and depressed mood.

Adolescents'

Attitudes* on facing Academic Stress

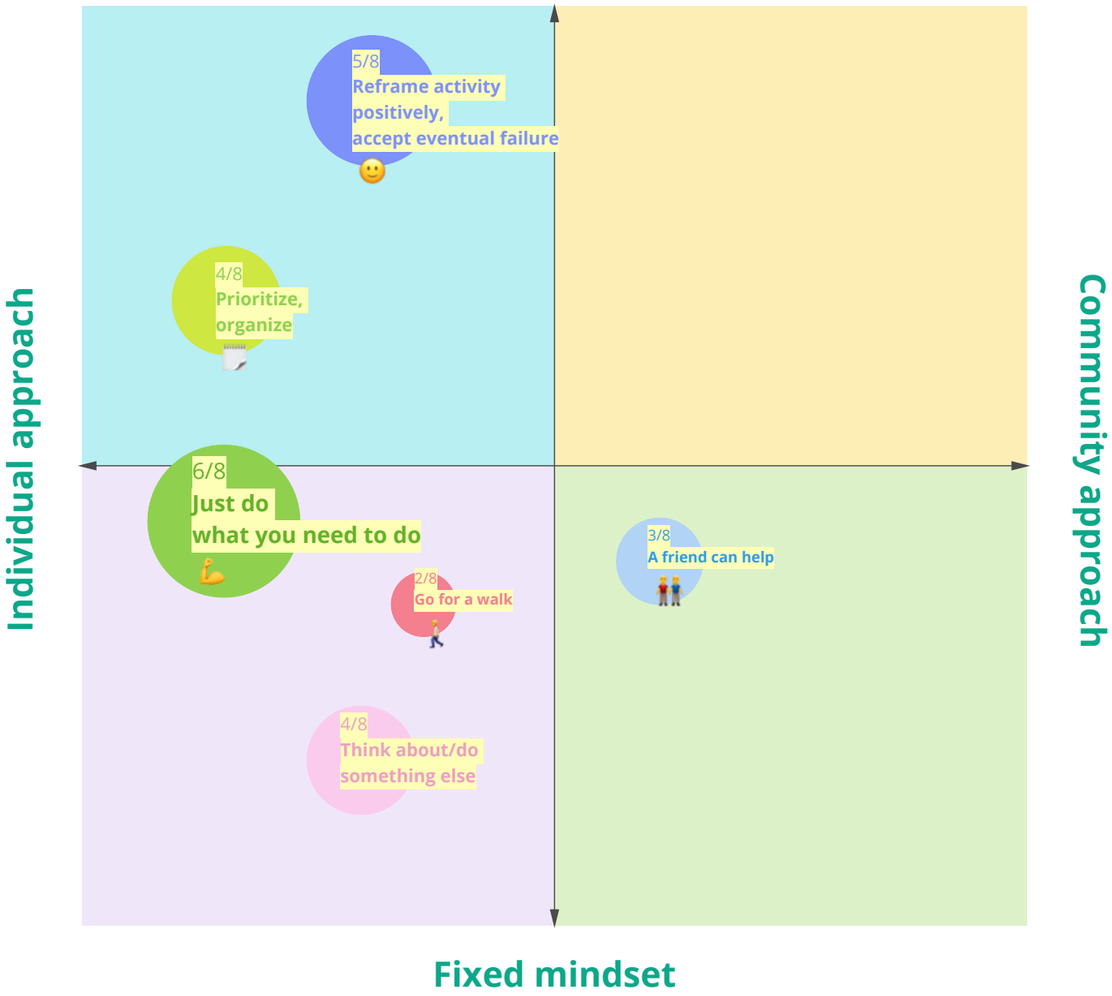


Figure 17a. Adolescents' attitudes on facing stress plotted on the worldview.
*Participants were asked to give suggestions to a friend with a problem similar to their own.

Adolescents' self-reported valid

Behaviors to face Academic Stress

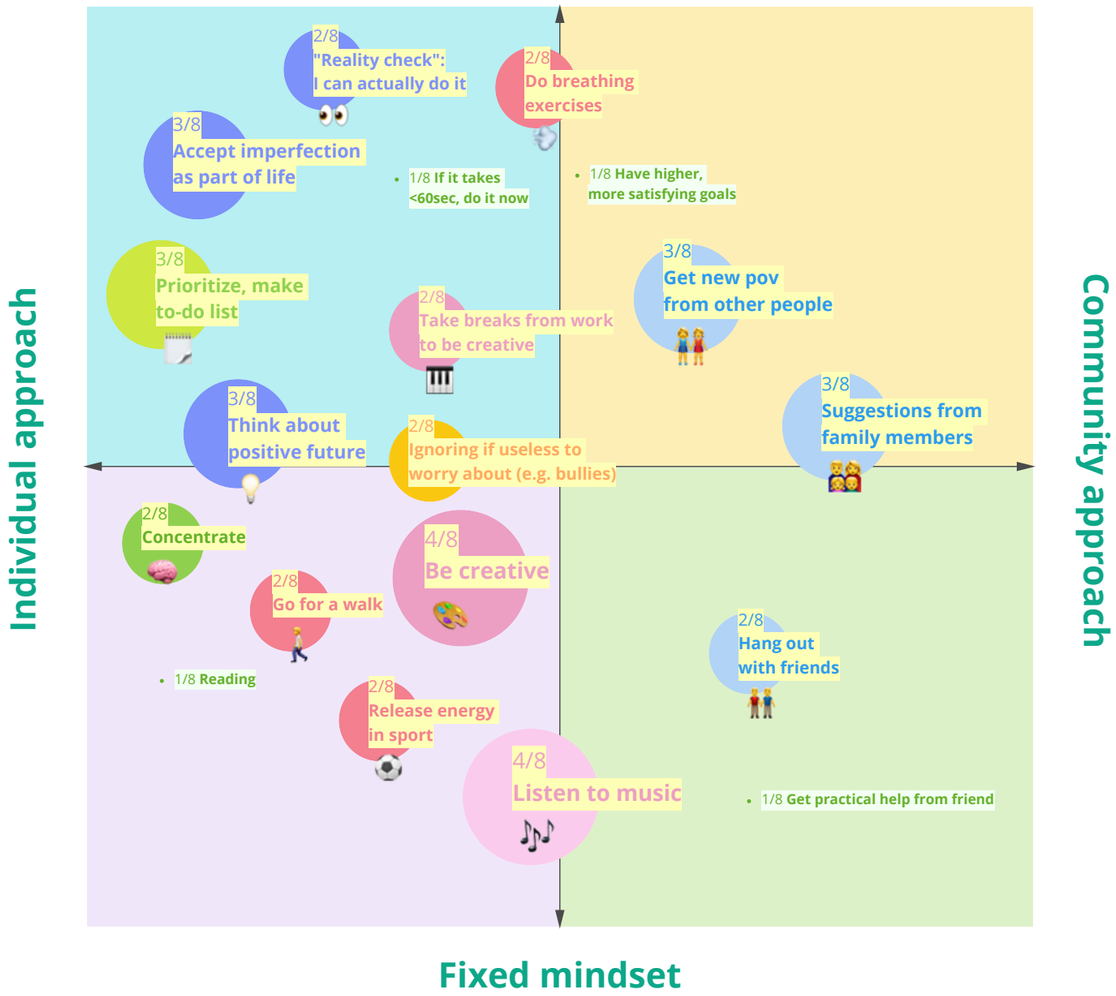


Figure 17b. Behaviours to face stress plotted on the worldview.

Adolescents'

Attitudes* on facing Depressed mood

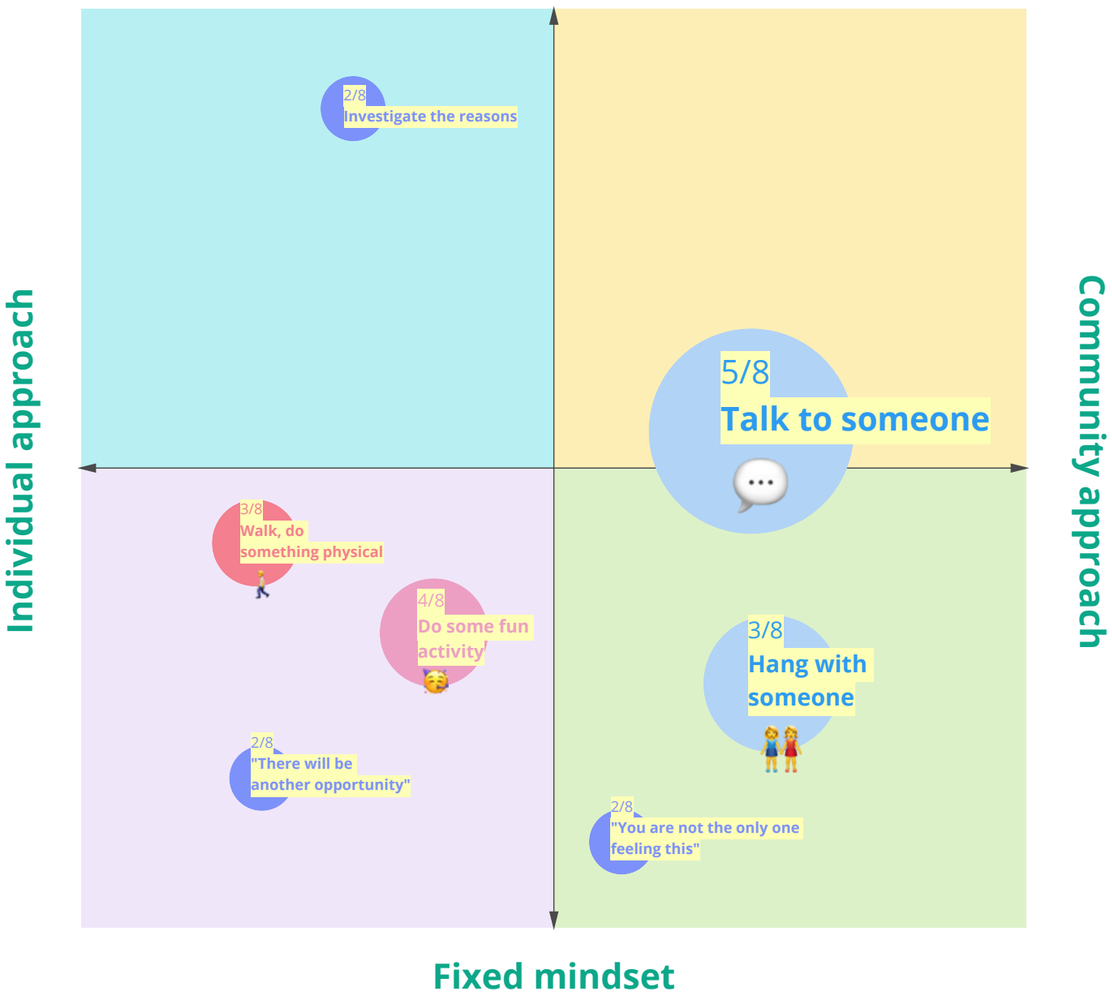


Figure 18a. Adolescents' attitudes on facing depressed mood plotted on the worldview.
*Participants were asked to give suggestions to a friend with a problem similar to their own.

Adolescents' self-reported valid

Behaviors to face Depressed mood

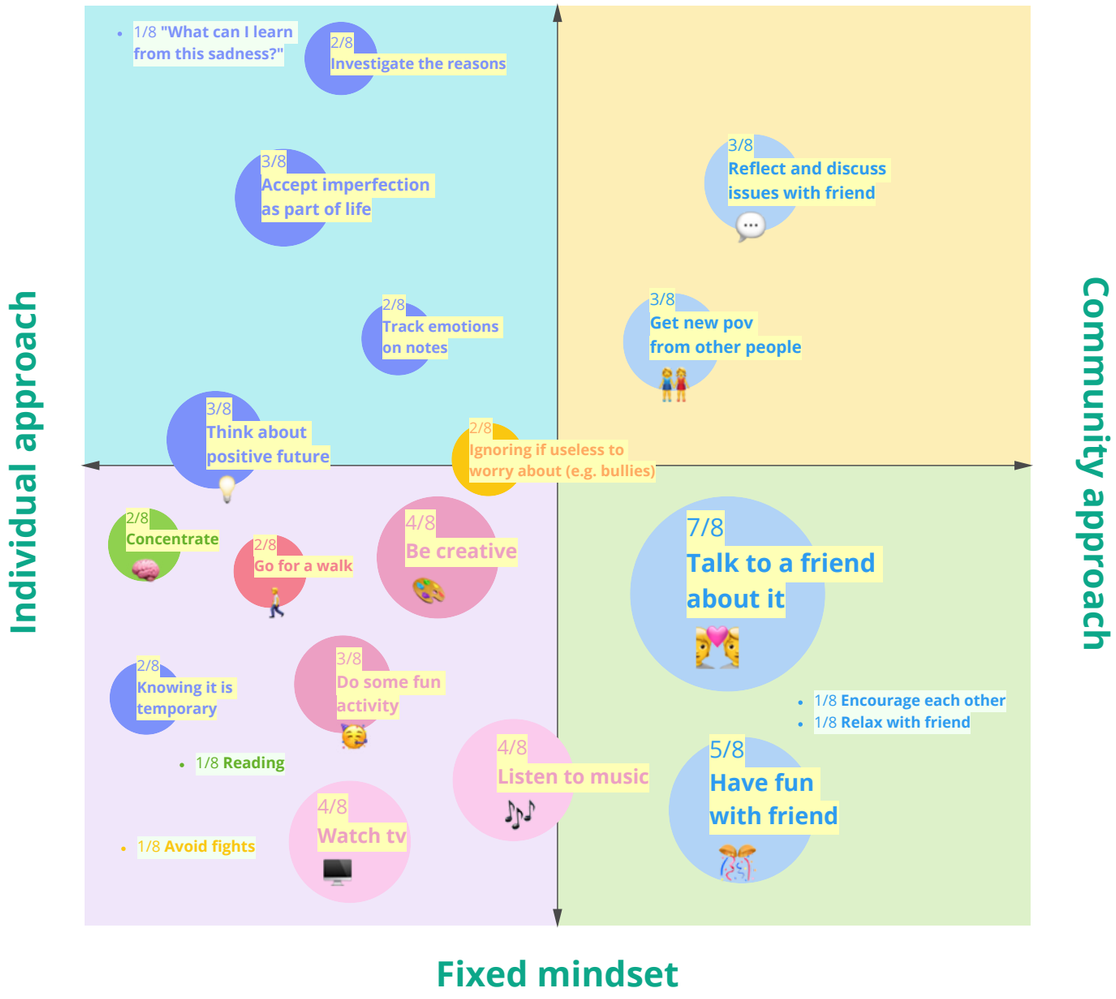


Figure 18b. Behaviours to face depressed mood plotted on the worldview.

Adolescents'

Attitudes* on facing Academic Stress

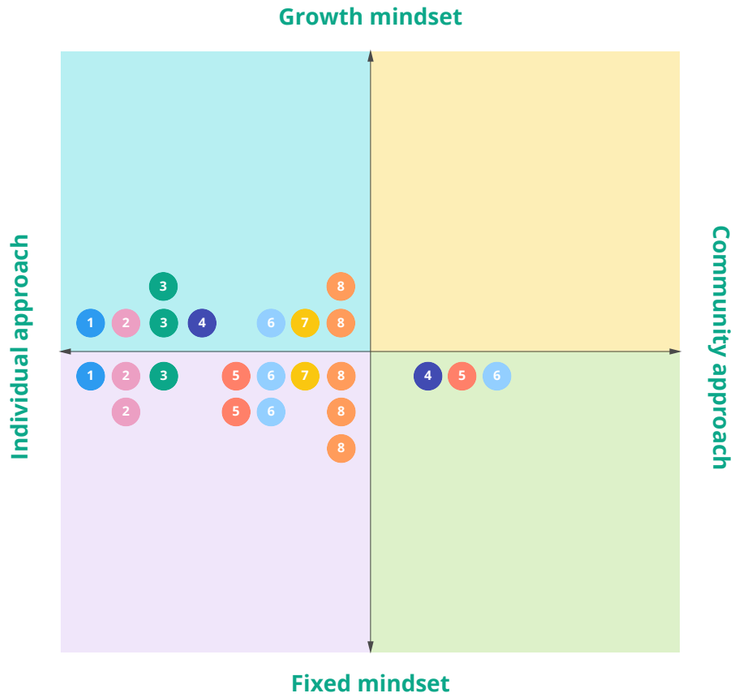


Figure 17c.
Participants plotted according to their attitudes to face stress.

*Participants were asked to give suggestions to a friend with a problem similar to their own.

Adolescents' self-reported valid

Behaviors to face Stress

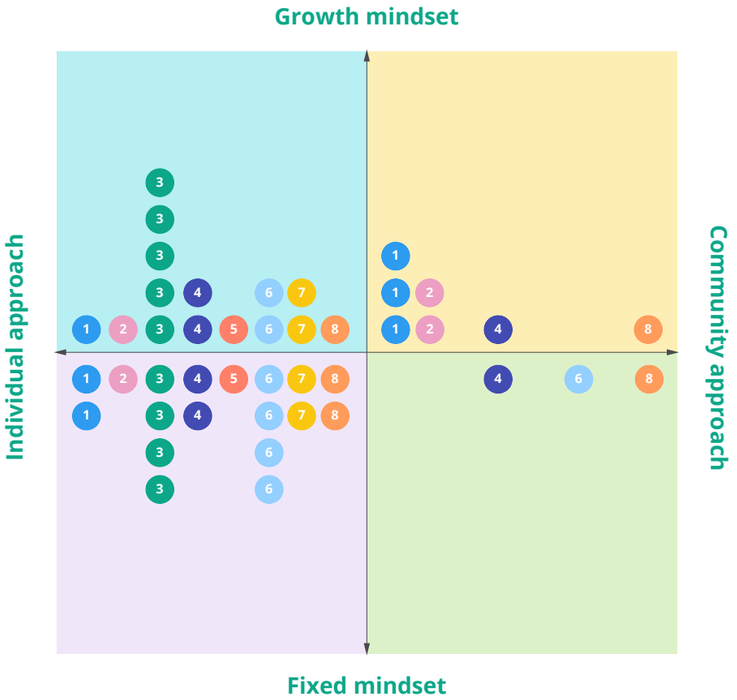


Figure 17d.
Participants plotted according to their behaviours to face stress.

Adolescents'

Attitudes* on facing Depressed mood

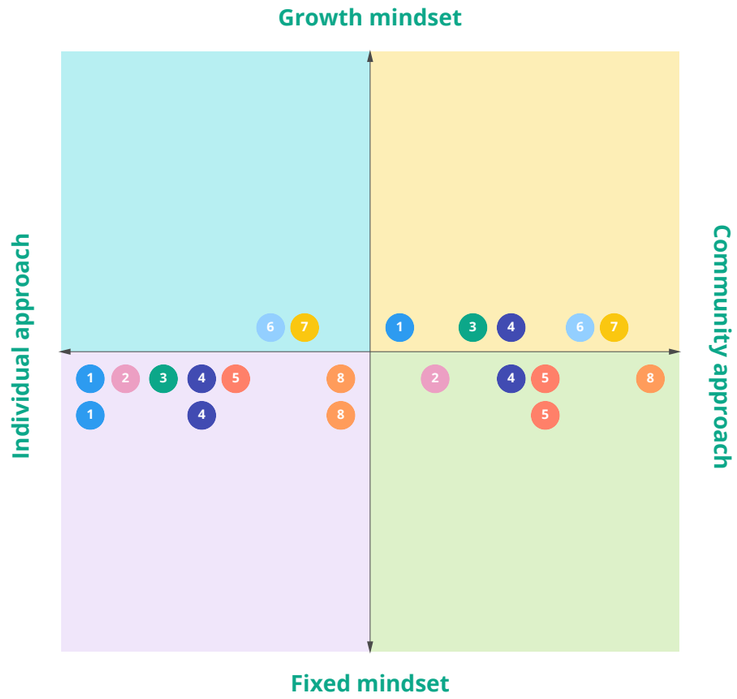


Figure 18c.
Participants plotted according to their attitudes to face depressed mood.

*Participants were asked to give suggestions to a friend with a problem similar to their own.

Adolescents' self-reported valid

Behaviors to face Depressed mood

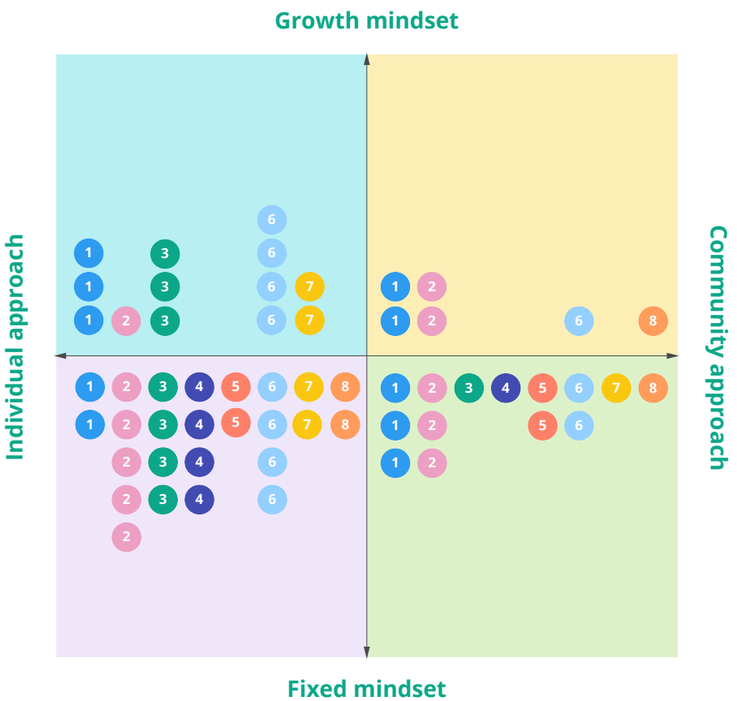


Figure 18d.
Participants plotted according to their behaviours to face depressed mood.

IDEAL ALLY

Most of the adolescents, when questioned, referred that the sensitising material made them reflect on and notice which activities are good for them and make them happier (5/8) and how important are certain friends in their lives (2/8). It might be discussed that even such kind of reflection would be useful for them to identify positive patterns and activities to flourish.

Remarkably, 7 out of 8 adolescents included one or more of their close friends in their three best allies for resilience. Also, when questioned about the characteristics of a future ideal ally, having the widest freedom to chose what it could be, most of them (6/8) indicated that a special, understanding person to count on, while the other 2 preferred a smartphone application.

The most chosen adjectives to describe this ally were motivational (7/8), understanding (6/8), playful and joyful (6/8) and kind and gentle (5/8). Half of the adolescents said they would expect this ally to come out with possible solutions when needed, while the other half would just wish for support and no solutions. Their ultimate goal when interacting with this ally would be to reflect on problems and get a different point of view (3/8), socialize better (2/8), know how to solve specific issues (2/8) and be stronger and more energetic (2/8).

"WHEN I TOOK THE TIME TO DO THE EXERCISES [...] I COULD REALLY REFLECT ON MYSELF"

– One of the interviewed adolescents about her participation in the research

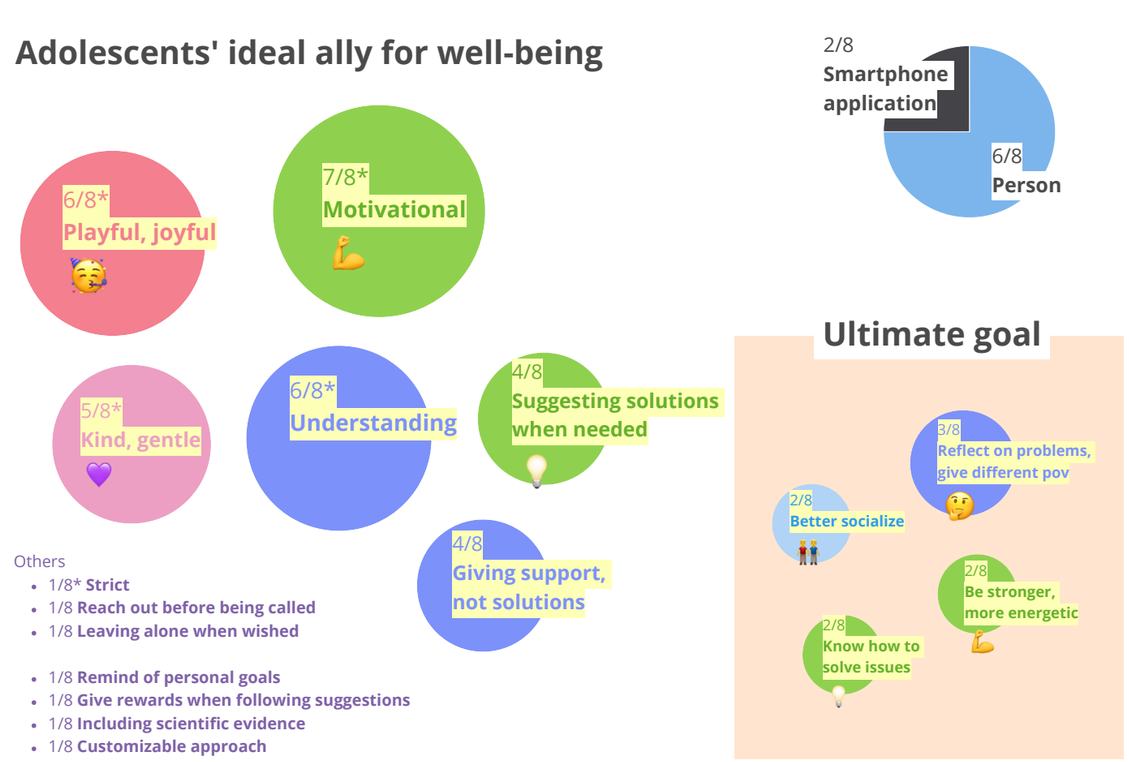


Figure 19. Characteristics of an ideal ally for well-being.
* Part of the characteristics proposed in the sensitizing material

REFLECTIONS AND LIMITATIONS

During the interviews, the adolescents were asked to describe their most valuable behaviours to face stress and depressed mood. However, these don't necessarily represent ideal approaches to face these markers. The whole contextmapping research was performed to understand the current situation in order to identify and evaluate practices with the support of literature findings. Teenagers' suggestions regarding their ideal ally, as all other results from this part of research were considered as inspirational for future ideation, not as strict guidelines for the design process.

Conducting the interviews was not always easy, having to deal with such a sensitive topic as mental health. Listening to tough stories as a design researcher, not being able to directly help the adolescents, was sometimes hard and stimulating the urge to suggest them strategies to feel better. A reflection was made on how to obtain information from adolescents without causing them harm, triggering discomfort or pain. It was concluded that teenagers participating in the research were volunteers already informed about the topic of discussion, hence willing to share personal information regarding it, and that, during the interviews and in the sensitising material, it would be reminded them of their right to avoid answering to any question or to skip any part of the interview or exercise(s). When encountering narrations of self-harm and suicide thoughts, support was requested to psychologist Levi van Dam, who suggested in these cases the best approach would be to advise the adolescents to see a counsellor or to consult specific websites such as 113.nl and ease.nl.

The wording of the recruiting, sensitising and interviewing material was designed in order not to trigger stigma while being understandable, making use of terms such as "well-being", "overcoming setbacks and difficulties" and "feeling stronger" instead of "mental health" and "resilience". Language was most probably a limitation in the research, since the 8 participants were living in different countries, namely the Netherlands (4), Italy (3) and Spain (1). Italian participants had the opportunity to use their native language during the whole process, while Dutch and Spanish adolescents needed to speak and write in English. Although all these participants demonstrated a high level of English proficiency, it may be assumed that language was sometimes an obstacle for free expression and understanding.

Some remarks need to be made regarding the recruitment of the adolescents as well. Most of them were recruited through opportunistic sampling, hence not truthfully representing the population and its different social classes. Also, these teenagers were presumably interested in the topic of well-being, since participation in the research was voluntary, with no reward other than the participation itself. Many of these adolescents later showed interest in the graduation project itself and curiosity on how the data would be used in a design process.

The 8 interviewed adolescents, 4 males and 4 females, were selected from a larger number of volunteers. 14 came from a high school in Italy were the recruitment video and form were officially distributed by the school director; 11 were recruited with "snowballing" opportunistic sampling, explicitly asking the participants to share the recruiting material with their friends and particularly with boys. From the total of 25 volunteers, only 6 of them were males. This prompts reflection on how much gender influences adolescents, and arguably people of other ages, in talking and opening up about their mental health and difficulties. The choice to involve females and males in equal parts was taken consciously and even more importantly for this reason.

3. DESIGN DIRECTION

In this chapter, the design statements that informed the intervention design strategies and their rationale are disclosed.

From the selection of one of the worldview's quadrants and the insights coming from teenagers' involvement, two design statements were defined: one for academic stress and one for depressed mood. These are presented together with the chosen interaction analogies in section 3.1.

After the research, the beginning of the design phase was dedicated to conceptualisation, evaluation and iteration of 3 concepts; process and results are reported in Appendix E. The resulting insights should have inspired the definition of the final output. However, a reflection on the role of design in behavioural change emerged from this process, and will be unfolded in section 3.2. This was essential in the identification of the intervention design strategies, which can be found in chapter 4.

3.1 DESIGN STATEMENTS AND ANALOGIES

The Vision in Product design method, implemented for the creation of the world-view of resilience future context, provides the designer to select of a portion of the established worldview, usually one or more quadrants, in order to develop a design goal that would promote those corresponding behaviours. This makes the influence and the responsibility of the designer clear, providing guidance for the ideation phase. ViP also prompts the formulation of a related statement, composed by a design goal and a mechanism (Hekkert & Van Dijk, 2011). In this project, two statements were built, one for each identified behavioural marker. These are differentiated by the two mechanisms, which were inspired by the results of the context-mapping research. Figure 2 represents the contribution of each design method in the creation of the final statements.

The worldview, described thoroughly in section 1.3, defined four different attitude-behavioural combinations for resilience that adolescents might engage in. The chosen quadrant was the one characterised by growth mindset and community approach. The choice of growth mindset was informed by literature. Indeed, having a growth mindset and considering learning, gaining competence as ones' own final purpose, was found to generate better performance after receiving a negative feedback, in contrast to having a fixed mindset, aiming for achievement, which was found to be related to harsh self-criticism (Biswas-Diener et al., 2011). In addition, interventions teaching growth mindset were qualified 'as "Well-Established" for reducing youth depression and "Probably Efficacious" for anxiety and general psychological distress' (Schleider et al., in press; Swarthmore, 2019). In the same fashion, the community approach was chosen due to the importance placed on relationships and relatedness, part of the PERMA theory of well-being and considered one of the three core psychological needs (Penn Positive Psychology Center, 2021; Nahum-Shani et al., 2017). Furthermore, when questioned about their three best allies for overcoming difficulties and feeling stronger, 7 out of 8 interviewed adolescents indicated one or more friends, and 6 out of 8 described their dream ally for well-being as a very special person to be close to them, signifying a strong need for relatedness.

The mechanisms were inspired by the adolescents' current practices for well-being. In particular, one teenager mentioned that having higher and more satisfying goals increased her motivation and helped her in dealing with stress, while two others expressed their fear for not being productive enough in their life, loosing time on meaningless activities. On the other hand, reframing sadness in order to learn how to face that difficulty better in the future was indicated as a valuable approach

when facing depressed mood by one adolescent. These strategies inspired the two mechanisms that, together with the design goal, composed the design directions.

The design is therefore envisioned to influence the process leading to resilience by affecting both attitudes and behaviours of the adolescents, as depicted in figure 21. This means it should prompt behaviours and reflections that will influence teenagers' perception and interpretation of negative emotions and their beliefs on how flourishing is achieved, while encouraging connection with others to support these practices.

I want adolescents to embrace resilience as a collaborative learning process

> by identifying their purpose and stick to a congruent behaviour.
Academic stress

> by reframing negative emotions, translating them into learning opportunities.
Depressed mood

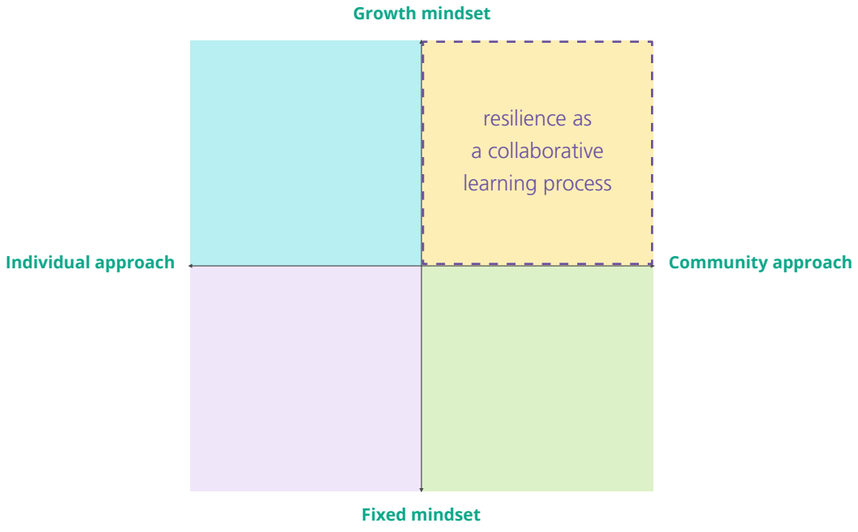


Figure 20: The design direction was initially defined by the selection of the quadrant defined by growth mindset and community approach. This led to the identification of the design goal, which, together with the two mechanisms, composed the two design statements.

"I ANALYSE THE PROBLEM. [...] IF IT MAKES SENSE TO FEEL SAD FOR THAT THING, THEN IT CAN BE A MOMENT TO LEARN"

– One of the interviewed adolescents about how he faces depressed mood

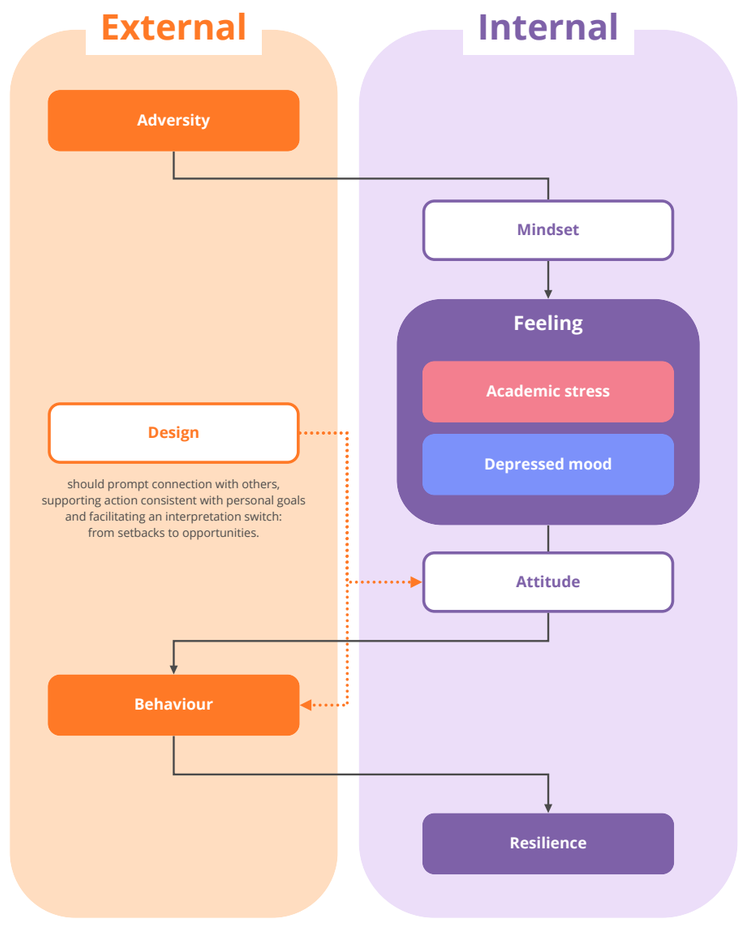


Figure 21: Design should influence attitudes and/or behaviours in order to support mental resilience.

ANALOGIES

The ViP method suggests the selection of analogies to inspire the design process (Hekkert & Van Dijk, 2011). These are metaphors intuitively representing the desired feeling that should be prompted by the user experience of the final design. They define some characteristics of the envisioned interaction and consequently determine mechanisms to be implemented in the design. In this case, they were used to inspire the final design strategies, presented in chapter 4.

DEPRESSED MOOD

Discovering a new view of your same boring hometown while touring it with a friend coming from abroad

- Attention
- Curiosity
- Sense of wonder, of something new
- "What else did I loose?"
- Stop and look
- Feeling small

When touring our boring hometown with a friend coming from another country, we might try to show him the best locations in town, maybe historically or architecturally important. We have lived in this town all our lives and we got used to them, we don't pay so much attention as we pass by them everyday. However, showing them to someone else forces us to stop and reflect on what we see and see it from a fresh, different perspective. This might make us discover some beautiful details we never noticed before, and ask ourselves: "what else did I miss in all this time?". We might feel small in front of the vastness of things we can still discover, even in such a known location, leaving us curious to discover more and pay more attention to the surroundings.

This means the design should make the users stop and reflect on their (negative) feelings, noticing their perception of reality is not the only one, reframing their interpretation of these feelings and trying to discover more and learn from them, with the support of a friend.

Figure 22.
Reframing negative emotions should feel like discovering a new view of your same boring hometown while touring it with a friend coming from abroad.

Photo by Josh Hild on Unsplash

ACADEMIC STRESS

Participating to a treasure hunt

- Collaboration
- Common goal
- Focus on process
- Challenges in real life
- Tracked step-by-step process

When participating to a treasure hunt, the main focus is on the collaborative process. The challenges are placed in real-life settings and each participant contributes with his best abilities while improving them. We might not win or be the firsts finding the treasure, but we will have fun with our teammates, while working towards a common goal. The purpose is hence not only the treasure itself, but the advancement in the game, which is tracked thanks to a map indicating the steps to take and on which it's possible to mark achievements. After each overcame challenge there is a small moment of celebration with the teammates, which gives motivation for the next one.

The design should hence be characterised by collaboration and inspiration between people having similar issues, with a focus on process and progress.

Figure 23, on the left page.
Acting according to a personal purpose should feel like participating to a treasure hunt.

3.2 REFLECTION ON DESIGN

Immediately after the end of the research phase, the mechanisms selected for the statements were different from the ones presented above. They were more concrete and guided the creation of 3 concepts that were prototyped and evaluated with couples of adolescent friends. These evaluations' findings were implemented in iteration, leading to the creation of a new concept. This part of the process should be considered as a research-through-design phase. It was supposed to allow collection of more insights on the adolescents and their interaction with a smartphone application dedicated to mental resilience designed according to the research findings. The insights coming from this phase were mainly reflections regarding the role of design in projects such as this one, in which psychological mechanisms and their implementation to prompt behavioural change are central for the design. In Appendix E, the whole process and findings are presented, while in this section the consequent reflections on design are discussed.

THE ROLE OF DESIGN IN BEHAVIOURAL CHANGE

What was pointed out in a meeting with the supervisory team was that all the prototyped and evaluated concepts seemed to be constituted in varying degrees by instructions or suggestions the adolescents had to follow in order to become more resilient. This was found to be a common practice in the examined eHealth tools mentioned in section 1.2 and might be explained by the fact that most contemporary psychology practices, heavily rely on instructional approaches, i.e. therapist questioning about or suggesting specific mental or physical activities (Mayo Clinic, 2016). This approach is to be considered of great value; however, it minimises the contribution of design, which becomes merely a way of presenting information as clearly as possible in an architecture to be easily navigated, and making the adolescents engage in certain behaviours by convincing them of their importance. What is, hence, the unique contribution design can bring to the table when considering behavioural change interventions for mental resilience?

People have conflicting concerns that underlie their behavioural decisions. One of these concerns needs to win over the other(s) in order to result in a fitting behaviour. For example, the need for comfort might make a person throw a cigarette bun to the floor,

while the need for a clean environment may prompt that same person to keep it and throw it in a rubbish bin. The stronger the concern, the more probably the behaviour will be performed (Tromp & Hekkert, 2018).

In the context of this project, the goal of design was to change teenagers' attitudes and behaviours to boost their mental resilience. To do so, adolescents should prioritise long-term concerns, i.e. feeling stronger and flourishing, over short-term concerns, e.g. being comfortable and lazy. One might reasonably argue that this kind of long-term concerns correspond as well to societal concerns for common well-being and societal flourishing.

In Design for Society, Tromp & Hekkert (2018) identify three roles design can take when implemented to improve society, hence to change behaviours of people in order to adhere to actions benefiting the wider community in which they live in, solving the conflict between personal and societal concerns. Design creates the possibility to transform, bypass, or resolve this kind of conflicts.

When design transforms a conflict, it translates long-term, societal consequences into short-term ones that are more easily perceivable and more strongly impacting the person's life. When design bypasses a conflict, it provides an artificial bonus for a desired behaviour. Finally, the strategy considered to be the best is resolve. When a design resolves a conflict, it addresses both personal and societal concerns by changing the behavioural context, the environment in which behaviour is performed, in order to make the desired behaviour follow naturally (Tromp & Hekkert, 2018). Designers should hence avoid instructional design and go for the resolve strategy whenever possible, in order to prompt behaviours in the most natural way.

In this project this is translated into acknowledging that simply informing, teaching, convincing and guiding people to act according to one specific concern is and can be already done by therapists or other kinds of professionals, while designers have the power to intervene differently, by resolving conflicting concerns. Nonetheless, this raises some ethical concerns, which are discussed in section 4.3.

DEDICATED AND ACTIVE DESIGN

As a result of this reflection on the role of design, another presumption was questioned. The project was initiated considering the desired final outcome of the Smart-CUEing MEntal health research project: a smartphone application dedicated to promoting mental resilience in adolescents. However, how can this type of design resolve conflict of concerns if the virtual environment, the smartphone app, is used by users specifically for its main goal of improving their resilience? Shouldn't design trigger wished behaviours by manipulating the "natural" context of the user?

Moreover, during the evaluation of the three prototyped concepts (see Appendix E), adolescents were questioned on whether they would use an improved version of the proposed concepts in their real lives. Out of six, four of them said they would not. Since they normally already shared their personal issues with their close friends, they did not see a strong enough added value in using a smartphone application to do so, even though they appreciated certain elements of the prototypes. This demonstrated it might be more difficult to reach adolescents through a smartphone application dedicated specifically to well-being, rather than intervening on their current interactions with their smartphones or in applications responding to different needs. This would presumably not only provide a stronger motivation to adolescents to engage in the interventions, but also reach those teenagers that do not consider improving well-being as one of their personal goals.

For these reasons, a turn in the design direction had to be taken. If until that point the final output of the project, the intervention design strategies, were assumed to be devoted to design products dedicated specifically to well-being, now the urge to implement positive interventions in other kind of designs, whose main aim is different from well-being, was felt. Hence, the decision was taken to consider both kind of designs, dedicated and active, as a reference in the development of the strategies, that are presented in the following chapter 4.

Dedicated design

"A technology or application […] built deliberately to foster a particular activity or intervention that increases well-being, e.g., an app that teaches people to be more mindful" (Wiese et al., 2020)

Active design

"Existing technologies or services whose main purpose is not to promote wellbeing […] enriched with wellbeing-enhancing features, e.g., a social networking platform that encourages their users to post respectful comments" (Wiese et al., 2020)

4. INTERVENTION DESIGN STRATEGIES

The intervention design strategies and their rationale are discussed in this chapter, in section 4.1. Their design was guided by the statements and the reflections presented in chapter 3, and inspired by all the insights gained throughout the research and design process.

The final outcome, the Design for Youth's Flourishing card deck, is presented in section 4.2. It presents all the strategies in separate cards, including examples of practical application of each of them. The card deck was iterated thanks to three rounds of evaluation with young designers, well-being experts and design professionals, in order to reach its final content and shape, and uncover its most appropriate use. The evaluation rounds are described in depth in Appendix F.

4.1 STRATEGIES' RATIONALE

The design statements and analogies coming from research guided the identification of 14 strategies to design interventions aiming at youth's flourishing by promoting mental resilience in case of academic stress and depressed mood. These are divided in categories, differentiated by their relation to the two statements, associated to the risk markers: 5 strategies are dedicated to face academic stress, 5 to deal with depressed mood and 4 more were found relevant for both markers. All the strategies are elucidated in this section, and are further displayed in their final card shape, with examples of design implementation, in section 4.2.

The focus of the strategies is to promote growth mindset and collaborative approach through smartphone digital applications, due to adolescents' heavy use of smartphone and the possibilities provided by digital phenotyping indicated in section 1.2. However, one might consider these strategies as valid for other contexts of design as well, and arguably other types of target users.

These strategies, in the hands of skilled designers, should support and inform the ideation of interventions that would boost mental resilience. However, it needs to be considered that these design interventions would not change adolescents' attitudes and behaviours from one day to the other; they would rather contribute in steering them gradually, by prompting activities and approaches that support resilience development. Moreover, the following this list of strategies should not be considered exhaustive for these markers and for well-being in general.

ACADEMIC STRESS

I want adolescents to embrace resilience as a collaborative learning process by identifying their purpose and stick to a congruent behaviour.

The design statement selected for academic stress guided the identification of 5 intervention design strategies. These focus on the discovery of a personal purpose and the fostering of congruent behaviours and actions. This would lead adolescents to a more meaningful and satisfying life, avoiding a feeling of wasting time in non-important matters.

Find a purpose. Having a sense of purpose in life contributes to optimal psychological functioning and it is mentioned as one of the most important factors contributing to resilience, providing guidance and motivation (Wiese et al., 2019; Rossouw, 2021). To find their own purpose(s), adolescents should start reflecting on what they find important in their lives and from this information extract patterns that hint to their deep values and purposes.

Step-by-step. Trying to achieve a goal can be overwhelming, especially if the goal is big and really important to us. However, results come from everyday efforts and habits, not by immediate success, so focus should be put on the long-term, effort-taking process rather than on the distance separating us from success. Seeing the journey towards a goal in this way and acknowledging that it is made of small steps that bring us closer to it everyday provides motivation and a feeling of self-determination (Fielding, 2019).

Supported adherence. It can be difficult for adolescents to stick to behaviours that bring them closer to their personal purpose without getting lost in meaningless activities. External support, especially if coming from loved ones, helps in maintaining adherence to relevant, worthwhile actions, hence more easily reaching a personal goal (Mohr et al., 2011).

Celebrate achievements. Adolescents might tend to neglect the celebration of successes, keep on focusing on the next challenge over and over again. In reality, it is important to acknowledge and celebrate (small) achievements, in order to increase motivation, positivity and confidence for facing future setbacks (Fielding, 2019).

Peer inspiration. Experiencing similar situations creates a common base for understanding and discussion among different people. Recognising the approach of peers when facing setbacks can help in inspiring people's strategies to face the same or similar issues in their own lives (Granado-Font et al., 2018).

DEPRESSED MOOD

I want adolescents to embrace resilience as a collaborative learning process by reframing negative emotions, translating them into learning opportunities.

The strategies dedicated to face depressed mood focus on the process of reframing negative emotions. These were found to be sometimes perceived by adolescents as something negative, to be avoided while waiting for them to disappear. However, approaching them as learning opportunities can provide advantages and help the adolescents to learn and grow, becoming more resilient. This motive led to the development of 5 dedicated intervention design strategies.

Examine feelings. The first step to reframe negative emotions is to perceive and accept them, since suppressing or ignoring them can lead to anxiety and to immobilism in the face of problems (Salters-Pedneault et al., 2004). Taking some time to perceive and examine feelings in their body and minds, the adolescents can learn to better recognise their emotions, without fearing or running from them, hence making a first steps towards understanding their root causes (Gleeson, 2020).

Unlock opportunities. Reframing negative emotions can be done by recognising that each adversity is also an opportunity to learn how to better face similar situations in the future, becoming stronger (Gleeson, 2020).

Uncovering bias. People tend to often engage in self-criticism and, especially when facing a challenge, to underestimate their capabilities (Biswas-Diener et al., 2011). Therefore, it is important for them to recognise that their interpretation of reality doesn't necessarily fit the actual situation. In this way they might uncover their tendency to negatively interpret situations, which was found to increase the probability to show symptoms of depression (Rossouw, 2021).

Serendipity bummer. The concept of serendipity entails that negative situations can create the settings for unexpected positive events (Beitman, 2016). Recognising this can help adolescents not to take bad situations in a hopeless way, putting attention on eventual happy consequences and promoting hopeful thinking.

Normalisation. It was found that adolescents might tend not to express and share their feelings with others because they might think they are not normal, or that they don't have the right or enough reasons to feel in that certain way. Showing them that others happen to go through similar experiences can help normalising these feelings and facilitate communication with others or asking for help (Miller Hyndman, 2021).

ACADEMIC STRESS AND DEPRESSED MOOD

The following strategies were found to fit both design statements for academic stress and depressed mood. They provide motivation to keep on working to reach a personal purpose while promoting the reframing of negative emotions.

Unique strengths. Strengths are related to personal values, hence people tend to underestimate or not recognise their strengths, believing their approach is just "the right thing to do", rather than a personal merit (Biswas-Diener et al., 2011). Recognising that they are somehow special in their abilities can provide adolescents with more confidence and self-trust.

Focus on action. People can either focus on issues that can be influenced by their own actions, namely their circle of influence, or on situations that are impossible for them to change, their circle of concern. It was found that focusing on the circle of influence and enlarging it by identifying possible contributing actions can promote optimism and self-efficacy (Covey, 1989).

Setbacks come and go. Realistic optimism was found to be one of the factors contributing to mental resilience. It includes having a positive approach to challenges, being hopeful and trusting our own abilities in allowing us to obtain positive outcomes, while, at the same time, recognising that the journey will be perturbed by difficulties (Rossouw, 2021). Knowing that it is normal to face difficulties and that these are possible to be overcome, can promote realistic optimism in teenagers.

Guidance / mentorship. Receiving suggestions on how to face a difficult situation from someone more skilled and experienced on that issue can help adolescents' adhering to effective strategies to overcome setbacks. On the other hand, people giving advice, sharing and narrating their experiences have the opportunity to reprocess and reflect on them, creating space for personal growth (Bland, 2019).

4.2 DESIGN FOR YOUTH'S FLOURISHING CARD DECK

The final outcome of the graduation project is a deck of 14 cards containing intervention design strategies to promote youth's flourishing. These were envisioned as a new tool for designers to conceptualise interventions for smartphone digital products, in order to boost the mental resilience of their users by promoting positive mental and/or physical activities.

Each card presents a strategy including its name, a short description and a simple illustration that should give a quick idea of its content. A longer explanation is also present on the front of each card, while the back side presents examples of practical applications of the strategy, to support and inspire designers with more concrete instances. The positioning of these elements is not casual: the title and short description are placed on the top of the front side to allow stacking of cards, see figure 24, in order to encourage ideation of interventions covering multiple strategies at the same time; the examples are arranged on the back, for designers not to be over-biased by their presence, being able to concentrate on the generic content on the card, while still being able to simply turn it and be inspired by specific applications. The application examples come from the author's individual brainstorming and from ideas sparked during the first two rounds of evaluation with young designers. All of them are labelled as dedicated or active designs, depending on their implementation in the context of an app whose main goal is promoting well-being (dedicated design) or whose main goal is different from well-being (active design). However, since the

Figure 24.
Cards stacked one on top of the other. The short description is always visible to the designer, who can consider all of them at the same time.

term was found confusing by a number of design students, the term "active" was substituted by "embedded", indicating the intervention would be integrated in a design not primarily dedicated to well-being.

The card deck is accompanied by a booklet containing suggestions on the use of the cards and a brief explanation of the research underlying the strategies, with a couple of key literature references and a link to this report. The result is a portable, physical set of cards possible to be used to inform, guide and inspire designers in the process of developing interventions aiming at youth's flourishing.

The graphic design makes use of colours to differentiate the cards according to risk markers. Blue represents depressed mood and red represents academic stress. Purple colour is often used to symbolise transformation and, being the natural result of mixing blue and red, characterises strategies covering both risk markers. The "Design for Youth's Flourishing" lettering takes advantage of this concept, with red and blue mixing in the extruding part of the lettering and their mix resulting in the prominent lettering colour: purple. A negative monogram logo was also developed. The three-dimensional letters extrusion represents the support to youth's growth and well-being.

The instruction booklet and all the cards, front and back, are displayed in the following pages and three application examples are illustrated with further details in the following pages.

Figure 25. Mock-up of the card deck.

14 Intervention design strategies to

ACT ACCORDING TO PERSONAL PURPOSE

ACADEMIC STRESS

REFRAME NEGATIVE EMOTIONS

DEPRESSED MOOD

Examples of application can be:

DEDICATED

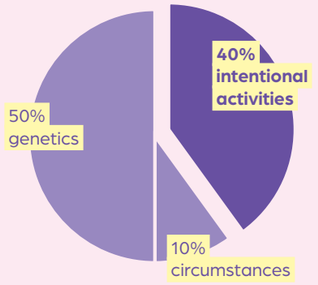
interventions for designs primarily dedicated to promoting well-being

EMBEDDED

interventions integrated in designs whose core function is different from promoting well-being (e.g. products for communication, entertainment, etc.)

DESIGN FOR YOUTH'S FLOURISHING

14 intervention design strategies to enhance teenagers' mental resilience and well-being



SUBJECTIVE WELL-BEING

DESIGN STRATEGIES

Research in positive psychology demonstrated that 40% of well-being depends on intentional bodily and mental activities. This creates the possibility of finding new ways of enhancing subjective well-being and human flourishing by promoting beneficial attitudes, beliefs and behaviours through design interventions.

Being adolescence the most vulnerable age for the onset of emotional and behavioural disorders, this card deck wants to support designers in the development of interventions promoting youth's flourishing by boosting their mental resilience.

Since approximately all adolescents own a smartphone, which now allows collection and interpretation of data regarding well-being, the strategies focus on digital interventions. However, they might be taken in consideration in different kinds of projects, and be inspirational for other target users as well.

BOOSTING WELL-BEING

Research was based on adolescents' contexts and practices and on scientific knowledge on resilience, well-being and human flourishing, in order to identify strategies fitting this specific demographic.

It was found that mental resilience and well-being are best developed by having a growth mindset, focusing on learning and progressing, and a community approach, involving others in the process of learning how to overcome adversities. Hence, the goal was to make adolescents embrace resilience as a collaborative learning process.

While other kinds of professionals work on informing and convincing adolescents to think and behave according to these principles, designers have the possibility to promote them by designing proper product-mediated activities that will lead to an increase of mental resilience in the users seamlessly.

EMBRACING RESILIENCE AS A COLLABORATIVE LEARNING PROCESS

DESIGN GOAL

IDENTIFYING PURPOSE AND STICK TO A CONGRUENT BEHAVIOUR.

ACADEMIC STRESS

REFRAMING NEGATIVE EMOTIONS, TRANSLATING THEM INTO LEARNING OPPORTUNITIES.

DEPRESSED MOOD

RISK MARKERS

From the research, it emerged that the two most relevant markers indicating a risk for adolescents' mental well-being were academic stress (stress related to school and performance pressure) and depressed mood. These two markers are intertwined and influence each other.

The 14 strategies are hence characterised by different colours depending on which of the two markers they are based on.

Red strategies, for facing academic stress, focus on supporting adolescents in identifying purpose and stick to a congruent behaviour.

Blue strategies, dedicated to depressed mood, help reframing negative emotions, translating them into learning opportunities.

Purple strategies support adolescents to face both makers.

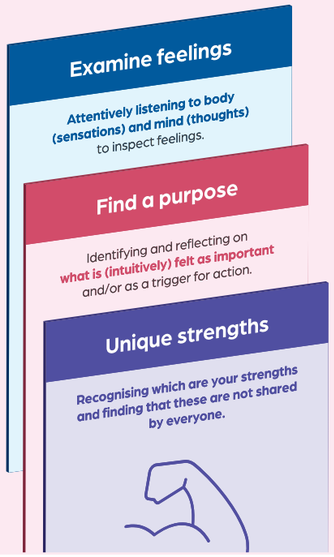
Figure 26. The instruction booklet accompanying the Design for Youth's Flourishing card deck.

USING THE CARDS

Designers are free to explore the cards, selecting the ones that are more suitable to their project by intuition or based on markers. They can support and inform designers along the whole research and design process. They were found especially useful in the analysis of (user) research results, decision making, categorisation and evaluation of concepts.

The back of the cards aims at offering specific examples of applications of the strategies, in order to further inspire ideation.
They are labelled as dedicated if they are supposed to be part of a design whose main goal is to support well-being, and embedded if they would be implemented in designs whose main goal is different from well-being. An example of an embedded design intervention could be implementing a new function in an instant messaging app, whose main goal is communicating with others (hence different from well-being).

THE CARDS CAN BE STACKED, PROMOTING IMPLEMENTATION OF MULTIPLE STRATEGIES AT ONCE.



Scan to obtain a digital version of the card deck and the thesis report.

This card deck is the result of Sofia Fonda's Design for Interaction master graduation project at the faculty of Industrial Design Engineering at Delft University of Technology.

Supervisory team: Paul Hekkert & Nazli Cila

MAIN REFERENCES

Lyubomirsky, S., Sheldon, K. M., & Schkade, D. (2005). Pursuing happiness: The architecture of sustainable change. Review of general psychology, 9(2), 111-131.

Wiese, L., Pohlmeyer, A. E., & Hekkert, P. (2020). Design for Sustained Wellbeing through Positive Activities—A Multi-Stage Framework. Multimodal Technologies and Interaction, 4(4), 71.

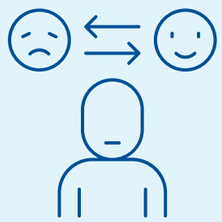
Swarthmore. (2019). Listen: Psychologist Jessica Schleider '12 on Youth Mental Health Interventions Retrieved on 05-07-2021 from https://www.swarthmore.edu/news-events/listen-psychologist-jessica-schleider-%E2%80%9912-youth-mental-health-interventions

Penn Positive Psichology Center. (2021). PERMA™ THEORY OF WELL-BEING AND PERMA™ WORKSHOPS. Retrieved on 04-02-2021 from https://ppc.sas.upenn.edu/learn-more/perma-theory-well-being-and-perma-workshops

Figure 27. The 14 cards part of the Design for Youth's Flourishing card deck, front and back.

Uncover biases

Recognising own biased interpretation of reality.



People might interpret situations in an overly negative way. Especially when facing a challenge, they tend to underestimate their capabilities. Recognising their interpretation of reality is not always correct can help to avoid over-thinking about negative consequences and self-criticism.

DEPRESSED MOOD

Uncover biases

Examples

When forwarding a received message to a friend, label it (e.g. 'scary') and let the friend confirm or contradict the interpretation.

EMBEDDED / DEDICATED

Having users (anonymously) draw a feared situation and let other users draw over it, to make it funny and less scary.

DEDICATED

Social app for suggesting movies to watch according to the people you are with. Users rate movies according to how, e.g., violent, romantic and scary they found them. Consulting others' reviews you can see how different interpretations can be.

EMBEDDED

Serendipity bummer

Recognising every situation can provide **unforeseen happy accidents.**

A failure can become a success, not only because it teaches how to perform better next time, but because it opens up new unexpected happy moments. From this perspective, anything can be a win somehow.

DEPRESSED MOOD

Serendipity bummer

Examples

Love accidents: stories of people who had an amazing love story due to an unlucky circumstance.

EMBEDDED / DEDICATED

Multiple choice interactive game in which you need to choose some (small) misfortunes to happen and these lead to happy accidents in the story.

EMBEDDED

Video-game in which if you die a large amount of times you unexpectedly unlock a new exclusive weapon.

EMBEDDED

Normalisation

Acknowledging others live similar experiences and thoughts, **normalising negative emotions.**

Being in an exploratory phase of their life, adolescents' run the risk of feeling alone with their feelings. Knowing someone else is experiencing their own similar difficulties can normalise emotions and facilitate asking for help.

DEPRESSED MOOD

Normalisation

Examples

Allow creation of public music playlists regarding specific adversities.

DEDICATED / EMBEDDED

Wall of thoughts: users see others' thoughts and can add their own or 'like' the ones they are experiencing as well.

DEDICATED

Celebrate achievements

Recognising the successful overcoming of difficulties and taking time to **enjoy and savouring achievements.**

Adolescents might forget to celebrate successes, tending to continuously focus on future challenges. Taking a moment to recognise (small) achievements can boost confidence and positivity, and give motivation to keep going.

ACADEMIC STRESS

Celebrate achievements

Examples

When friends believe you achieved something (in private or school life), they report your social network profile, which is set in celebration mode for some days.

DEDICATED / EMBEDDED

To-do list app that at the end of each week shows you what you have achieved, displaying the number and the difficulty of the tasks completed.

DEDICATED

Find a purpose

Identifying and reflecting on **what is (intuitively) felt as important** and/or as a trigger for action.

Personal values guide people in defining their lives' purposes. However, these might be difficult to identify for adolescents. Finding and reflecting on what is felt as important creates the possibility to identify patterns hinting to values and purposes, providing guidance and motivation.

ACADEMIC STRESS

Find a purpose

Examples

Allowing public thematic collection of social media posts or profiles that the user perceives as important.

EMBEDDED / DEDICATED

Quiz choices between "value-based" actions (e.g. would you enjoy more: inventing a new mean of communication OR transportation?)

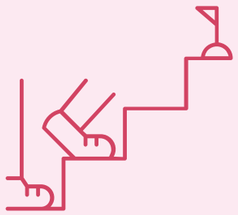
DEDICATED / EMBEDDED

"Art values": app displaying 3 different paintings every day. Choosing your favourite one, you gain access to a description of its meaning and the author's values. You can reflect on them, deciding if they fit you as well.

EMBEDDED

Step-by-step

Acknowledging the journey towards a goal is a **long, step-by-step, effort-taking process.**



Understanding goals are made of (micro) steps, makes them appear as something achievable, boosting motivation. Placing importance on efforts, habits and perseverance highlights personal contribution in the achieved progress, giving a feeling of self-determination.

ACADEMIC STRESS

Step-by-step

Examples

Weekly list of activities displayed only one portion of the day at the time.

EMBEDDED / DEDICATED

Visual representations of users' setbacks positioned in order, leading to their final goal, allowing to track action taken to overcome them.

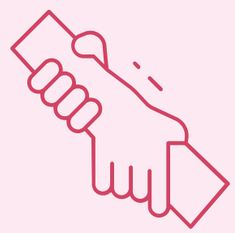
DEDICATED

Social media page posting steps for success of an inspirational figure in reverse: from success to beginning of career.

EMBEDDED

Supported adherence

Obtaining support for **engagement in activities consistent with personal purpose.**



Adolescents might behave counterproductively due to unhealthy coping mechanisms or other external pressures and seductions. Having external (human) support while working towards a personal goal increases the chances of success.

ACADEMIC STRESS

Supported adherence

Examples

Possibility to set automatic instant message replies to specific friend asking "Shouldn't you be studying right now?"

EMBEDDED

App proposing activities that are connected to the user's passions (e.g. if you are passionate about design you might try pottery)

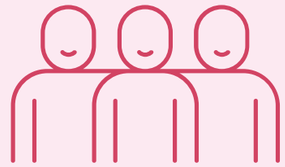
EMBEDDED / DEDICATED

When working in groups, allow removal of focus mode only if all of them require it.

DEDICATED

Peer inspiration

Observing behaviour of peers to obtain inspiration for own behaviour.



Acknowledging how peers behave provides inspiration on what to do when facing their same adversities. Encountering similar experiences creates a common base for understanding, while peers' diversity sparks discussion.

ACADEMIC STRESS

Peer inspiration

Examples

Allowing consultation of other users' progress tracking regarding a shared issue, allowing comments.

DEDICATED

AI analysing public social media stories containing specific hashtags and matching users posting similar pictures.

EMBEDDED

Matching app based on common interests and goals in life.

DEDICATED

Focus on action

Focusing on what is possible to do to improve the situation rather than what is not.

Focusing on the circle of influence (what is possible to influence with action) rather than on the circle of concern (what is not possible to change) brings more optimism and a feeling of self-efficacy.

DEPRESSED MOOD AND ACADEMIC STRESS

Focus on action

Examples

"Act or forget" matching app introducing users to groups of people working on the causes they swipe right to.

DEDICATED DESIGN

"Rainy days" app providing inspiration on things to do when it's raining.

DEDICATED / EMBEDDED DESIGN

Provide the possibility to talk with others and/or read daily news while in a video-conferencing waiting room.

EMBEDDED DESIGN

Setbacks come and go

Recognising it is normal to encounter obstacles and that it is possible to overcome them.

Realistic optimism consists of acknowledging that obstacles and failure are part of the journey, while knowing it is possible to surmount them and staying positive and hopeful about the future.

DEPRESSED MOOD AND ACADEMIC STRESS

Setbacks come and go

Examples

Re-propose pictures from the past that show a past achievement moment, e.g. celebration after an exam.

EMBEDDED

Allowing creation of cartoon animated stories (e.g. for celebrating graduation) requiring insertion of both difficult moments and success.

EMBEDDED / DEDICATED

Visually represent overcame issues as neutralised enemies in a game-resembling scenario.

DEDICATED

Unique strengths

Finding your strengths and recognising that these are not the same for everyone.

Being strengths related to personal values, they are often interpreted as simply "the right thing to do" rather than a merit. Recognising uniqueness can promote self-trust and confidence.

DEPRESSED MOOD AND ACADEMIC STRESS

Unique strengths

Examples

Quiz on how users would act in certain situations showing different answers of others.

DEDICATED / EMBEDDED

"2 friends indicated you as a good listener": allowing users to indicate which strengths their friends have that they don't.

DEDICATED / EMBEDDED

Notifications reminding you to self-compliment on a specific strength after a filling out an initial questionnaire about personal strengths, confirmed by a friend.

DEDICATED

Guidance / mentorship

Having people **exchanging suggestions** on how to best face an adversity.

People that already learned how to face a setback earlier in life are more knowledgeable and reliable, hence can give better advices. Also, giving suggestions to others prompts reflection, which is useful to learn from your own experience.

DEPRESSED MOOD AND ACADEMIC STRESS

Guidance / mentorship

Examples

Giving social network users who already faced and overcame a specific issue a badge to be recognised as "seniors".

DEDICATED / EMBEDDED

App listing productivity tools including reviews, with hashtags indicating what issue each user used them for.

DEDICATED

THREE EXAMPLES OF APPLICATION

STEP-BY-STEP

Visual representations of users' setbacks positioned in order, leading to their final goal, allowing to track action taken to overcome them.

This intervention was prototyped and evaluated with couples of adolescents, see Appendix E, before the formulation of the strategies. However, it was found relevant to illustrate an example of implementation of the step-by-step strategy.

In the prototype, the adolescent had to identify a reason for his discomfort. He was then questioned on what achievement this issue was preventing and to identify some more obstacles to reach it. The prototype then presented an interactive space in which the adolescent could, together with a close friend, engage in small activities that would help him in reaching his final goal by facing one obstacle at the time. The step-by-step strategy was here implemented by creating a visualisation of the single obstacles, positioning them in order and leading to the final achievement.

Adolescents appreciated this way of representing setbacks, demonstrating they are "only a small part of what you are, and that you can even destroy them". On the other hand, a fixed, videogame representation of personal issues was found confusing, which suggests that this intervention should be implemented while allowing users to choose the style of the issues' representation.

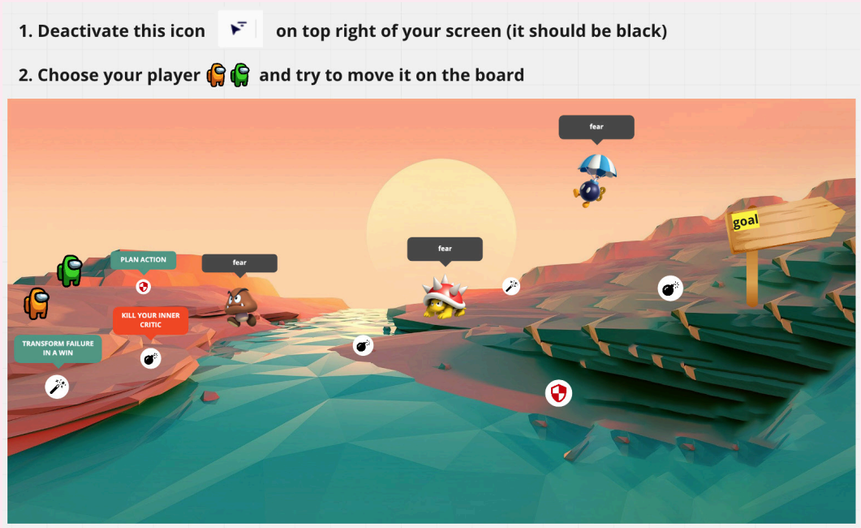


Figure 28. Metaphoriser prototype presented setbacks as video-game enemies, real obstacles to the teenager's final goal, to be faced one at the time.

Illustrations by Nintendo, Among us, Dave2D; No copyright infringement intended, use for research purposes only.
Icons by Yaroslav Samoilov, Deemak Daksina from Noun Project.

UNCOVER BIAS

Having users drawing a feared situation and let friends draw over it, to make it fun.

This intervention's prototype and evaluation can be found in Appendix E. As the previous one, it was ideated before the formulation of the final strategies and found relevant to represent an application of "uncover bias".

In the prototype, the adolescent had to draw a fear causing him distress. After this, a close friend was involved and asked to sketch over the initial drawing in order to ridicule it.

The adolescents' liked to represent their issues concretely and the drawing-over process allowed the friend not only make the fear look less scary, but also to present his view on the issue, highlighting some strengths the adolescent was undervaluing. It was found that some fears were less suitable to laugh at, revealing this kind of approach might not be fitting every kind of issue. This interventions might hence be implemented in larger applications, leaving teenagers freedom to choose it when they would find it relevant.

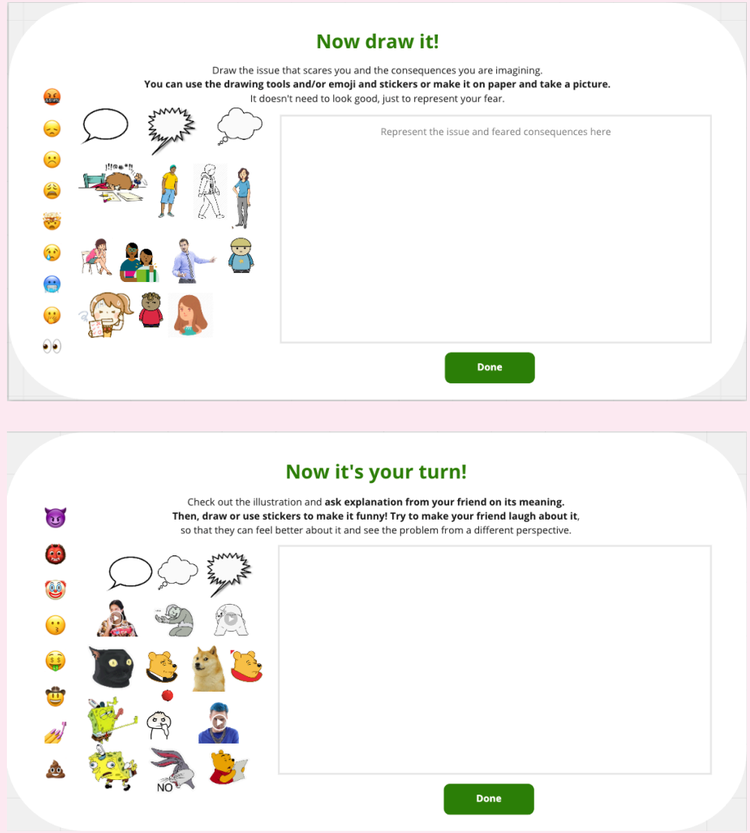


Figure 29. Laughable prototype screenshots: in the top one, the adolescent was required to draw his fear; in the bottom one, his close friend had to ridicule it by drawing over the previously drawn fear.

No copyright infringement intended, use of illustrations for research purposes only.

FOCUS ON ACTION

“Rainy days” app providing inspiration on things to do when it’s raining.

This is one of the ideas that emerged during the evaluation sessions with graduating design master students. It was found relevant, and implemented in the strategy’s card as an example.

In this concept, the adolescent would focus on what is possible to do to have a cheerful and productive day even if it is raining, hence circumstances are not favourable. In this way the focus is put on feasible action, not on the adverse weather, which would be impossible to modify anyway.

It might be noticed how this intervention also recalls the “unlock opportunities” strategy. Implementing multiple strategies at once is indeed encouraged.

EVALUATION

The cards and content of the strategies were evaluated with graduating or just graduated design master students, well-being experts and design professionals. Procedures, results and elaborated conclusions of the three evaluation rounds are extensively elucidated in Appendix F.

1ST AND 2ND ROUND

During the first two evaluations, young designers were prompted to give feedback and ideate concepts using the card deck, in order to probe if the cards were clear enough to spark ideation. The resulting concepts or intervention ideas were sometimes included in the cards themselves as examples of strategies application. Generally speaking, the cards were evaluated positively by these designers and their feedback was taken in consideration regarding content and shape of cards and instruction booklet. One example of iteration was the use of the word “embedded” in place of “active” design, since the denotation of the latter was not clear.

The two well-being experts involved in the first two rounds of evaluation appreciated the strategies, considered to reflect current knowledge on resilience and well-being. It was not clear to them how these cards should be practically implemented in a design, as they noticed that the examples presented engaging ways to implement them, while the cards themselves were more theoretical. However, the target users of the cards were always considered to be designers, who supposedly should know how to implement design interventions. The experts also gave notes that where included in the next iteration of the card deck.

FINAL TESTING

The final round of testing involved 3 professional designers, who were asked to conceptualise positive interventions using the card deck for their own projects targeting teenagers or for a fake brief, providing feedback on their use of the cards.

From this testing, it was concluded that the card deck would better target designers whose knowledge on well-being and resilience is limited. Moreover, the cards were indicated as useful not just for ideation, but also for analysis of research results, decision making, categorisation and evaluation of concepts. They were found more informational and educational than inspiring for ideation, revealing they would be better implemented along and since the beginning of the design process. This information was implemented to iterate on the content of the instruction booklet. The least positively evaluated aspect of the card deck was the attractiveness of the cards.

Four well-being experts were also involved in the final evaluation. They were provided descriptions of concepts ideated by designers, from this or previous rounds of evaluation, and concepts presented as examples in the cards. The goal was to evaluate whether the card deck could guide the conceptualisation of interventions that would be really meaningful for teenagers’ well-being and

PEOPLE INVOLVED IN EVALUATION

1st round:

- 2 graduating design master students

2nd round:

- 4 graduating design master students
- 1 psychologist

Quick round, inspiration for final:

- 1 design academic
- 1 post-doc in child and adolescent psychiatry

Final testing:

- 3 professional designers
- 4 well-being experts

resilience. The results were on average moderately positive, indicating that each intervention could have a slight impact on the well-being and resilience of teenagers, as wished. However, they hint to an amount of uncertainty regarding the validity of the interventions, with a couple of (strong) contrasts in experts opinions and some divergence from information found on literature (i.e. one expert claimed that reflecting on personal purposes or acting for external causes were not valuable strategies for well-being and resilience). This highlighted how different opinions coexist in the field of psychology, factor that was already discussed with the supervisory team and with a PhD candidate graduated in health psychology and behavioural sciences. Being the field of design for well-being quite novel, it would not be uncommon to encounter opposite opinions on the effectiveness of interventions provided through design.

The main expressed issues were the engagement of adolescents, which is indeed to be furthered, and the too indirect manner in which these interventions would promote well-being and resilience in teenagers. Since the role of design in this field would be to promote well-being indirectly, this aspect should be deepened, by involving end-users in evaluation of concepts. This was partially executed, as reported in Appendix E. The "Visualised setbacks" intervention, for example, was then found relevant in supporting the teenager in facing academic stress. One expert, on the other hand, had a different opinion on the impact of this intervention.

After having emerged during user evaluation (Appendix E), the importance of implementation and detailing of interventions to obtain intended effects was further stressed by an expert.

LIMITATIONS AND FUTURE RECOMMENDATIONS

A number of limitations influenced the results of the final testing. Designers received the card deck in a digital format rather than physically, which it can be assumed to have influenced their interaction with and use of the cards. The resulting concepts were used as evaluation material with experts. However, cards cannot guarantee that designers would ideate proper and original concepts. Their influence would be better evaluated with larger number of designers working on the same design brief, including a comparison of before and after use.

The subjectivity of this field is also a factor to be considered as a limitation for this test. Experts have their own opinions, that were even found to differentiate from literature or from users' feedback.

All things considered, a more rigorous testing, involving larger numbers of designers and experts, appears necessary to more precisely evaluate strategies and interventions. End-users should as well be involved, to assess short-term predictors of their probability of engaging in positive activities with and without interventions, as recommended by Wiese et al. (2020). This would also allow to explore the relationship between feedbacks provided by experts and real effects on teenagers. Specific attention should be given to implementation and detailing of interventions, since they were found to influence results, and to potential counteractive effects. Maximisation of intervention engagement and minimisation of intervention fatigue should as well be considered in future research and evaluation.

5. CONCLUSIONS

This final chapter presents (personal) reflections on the project, together with limitations and recommendations for future research, in section 5.1.

In section 5.2, ethical considerations that design projects such as this one require, due to their aim of changing the behaviour of users, will be outlined.

Finally, conclusions regarding the project are drawn in section 5.3.

5.1 REFLECTIONS, LIMITATIONS AND FUTURE RECOMMENDATIONS

At the outset of this project, the goal was to identify intervention design strategies that would promote adolescents' well-being by making them engage in positive activities mediated by a smartphone application, maximising intervention adherence and minimising fatigue. As the project initiated and unravelled, this goal was found to be too ambitious, considering the early development of what we could refer as the field of Design for Well-being. With time, the new aim became to identify design strategies to promote teenagers' resilience through design, loosing the focus on adherence and fatigue, which were considered secondary, even if still crucial for obtaining positive results. A first limitation of the project is thus the lack of information regarding the level of engagement positive interventions would generate in teenagers. The main consideration regarding this aspect was that, if teenagers already engage with one specific product, then a small intervention implemented within that same product would be used as well. For example, considering an intervention for Instagram or WhatsApp (the two most used smartphone applications by Dutch teenagers in 2021), even if just a small percentage of users would engage with it, it would already provide benefits to quite some people. This was mentioned in section 3.2; however, it was not researched or proved. To do so, future research should focus on adolescent's relationship with their smartphone and smartphone applications, their (level of) engagement with them and the reason for such engagement. In this way, more would be known on what is possible to do to maximise intervention adherence and minimise intervention fatigue.

Another note has to be done regarding the final evaluation of the design strategies. If it is true that the field of design for well-being is pretty novel, it is also true that psychologists and psychiatrist are, on average, not used to these kind of interventions. Notably, as it was found during the research, a large number of currently available eHealth tools for mental well-being are based on direct suggestions, recommendations and exercises, which are usual procedures of clinical experts. However, the novelty of this field lies in considering user-product interaction as just one of the steps facilitating, triggering, inspiring or motivating the engagement in such positive physical or mental activities leading to increased well-being and resilience (Wiese et al., 2020). It might be difficult for a clinical expert to recognise and evaluate such characteristics in a described intervention concept. Hence, the experts' evaluation was certainly considered valuable and reflection-triggering, even if its limitations became evident in a second moment. Further research should focus on how to test such intervention concepts in order to find if the designer's goal would be achieved. As Wiese et al. (2020) suggest, this kind of evaluation should be done involving

the final users, testing whether their interaction with the product would support their adherence to certain activities. This was only partially executed in this project during concepts evaluation, see Appendix E. In future research, increased emphasis should be put on this stage, involving adolescents in testing prototyped interventions and evaluating their inclination to engage in positive activities, before and after interacting with the prototype, in a more rigorous way.

PERSONAL REFLECTION

On a personal note, this project was a source of continuous personal reflection and learning. In particular, researching in this field made me reflect on my own attitudes and behaviours when facing adversities and on how I could improve in order to be more resilient and feel better. The strategies themselves became a reminder of how I should face setbacks and self-improvement, and I find this of extraordinary importance.

This project also made me reflect on my role as a designer and on the role of design in behavioural change in general. This is already mentioned in section 3.2, which portrays a crucial moment in the project, when I realised the added value, influence and power design can have on people's behaviour. It was also surprising to find how, since the very last weeks of the project, I continued to improve my understanding of the characteristics of this kind of design. Particularly, I believe it was important for me to realise more and more that I cannot provide a universal solution that would fit every user and that will solve most of the issues I target. It might sound silly to try resolving all problems with a design intervention; however, setting such a challenging design goal as the one of this project made me believe there should have been a way to actually solve the overall situation with one single, masterful design concept. In reality, especially in these kinds of projects aiming for a long-term behavioural and attitudinal change, the improvement shall be gradual, facilitated by positive interventions that in turn promote positive activities.

I believe my considerations can be exemplified and explained thanks to the results of my research itself. I have long been a person focused on performing, aiming for high results, to be achieved thanks to my own strengths. This gave me much anxiety and discomfort in my personal, academic and work life. I also encountered this in many people around me, in all kinds of contexts. I would position this kind of attitude in the "individual approach + fixed mindset" quadrant of the worldview, explained in section 1.3.

My supervisory team helped me in identifying this kind of attitude in me. I felt like my work should be perfect, or it would prove myself as unworthy. This led me to react negatively to feedbacks coming from my coaches, since I was unconsciously perceiving them as attacks to my own worth rather than fruitful moments from which to enrich myself. I was still treasuring the notes I was receiving, but rather painfully. The same happened when I found myself having no idea how to put together the design strategies, which were my goal since the beginning. More pain came from there, because instead of thinking that I could ask for help and learn how to do that, I felt lost and unable to properly perform.

More recently, I am trying to actively work on myself in order to follow the strategies I identified, in order to move to the preferred part of the worldview, characterised by growth mindset and collaborative approach. I believe this has already been partially achieved, since I am putting effort into focusing on progress and growth rather than performance, and on seeking collaboration rather than facing everything alone. It would be counterproductive, and part of a fixed mindset, to expect immediate, ideal results from my attitude and behavioural change. It will be a matter of time and personal effort to reach the goal of being more healthy and resilient, as the strategy "step-by-step" recommends.

For all these reasons, I greatly value having been through this journey full of adversities and "drama", since it enriched me not just professionally but personally, and I would much enjoy being part of subsequent research in this field. What matters is how much I grew and progressed in this time and it would be precious for me to keep doing so, whatever I will end up doing after the end of the master.

To other design students approaching their graduation I would recommend to work on design for well-being if they feel the passion for such a topic, as it requires much effort but it also provides satisfaction and tremendous growth. I would suggest them not to focus on delivering perfect outputs but to concentrate on what they are doing and learning along the project, trying to stick to attitudes and behaviours from the "right" side of the worldview.

I actually believe that the card deck itself contains strategies that could be used by any person in order to get informed and inspired to become more resilient, even if it would not happen through interaction with a design intervention. So, I would recommend anyone to give them a read, and reflect if they are applying those approaches in their own lives.

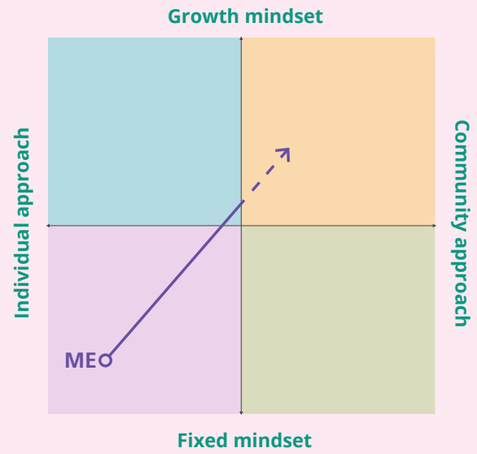


Figure 30. The project had an impact on my own attitudes and behaviours for resilience, pushing me towards the chosen quadrant of growth mindset and collaborative approach. Still, effort needs to be put in this change in order to maintain and improve it.

5.2 ETHICAL CONSIDERATIONS

The aim of this project's final outcome is to support designers in the ideation of design interventions that would boost mental resilience in adolescents by promoting intentional, positive, mental and/or physical activities. Even though the aim is noble, there are some considerations to make in such kind of project, that would ultimately push for a behavioural change in adolescents.

Design has the power to change people's behaviour seamlessly, sometimes without them noticing what is really happening, by changing their context of interaction. Let's consider the nudge theory, which is implemented, for example, in the supermarket shelves, designed in order to take advantage of the positioning of goods to promote the selling of some products over others by, for example, placing them at medium height in shelves, or close to the tills (iNudgeyou, 2016). Designers hence gain a certain influence over the users of their design, in this case the supermarket shells, by pushing them to act in one way over another, through deliberately shaping the physical context of interaction.

Figure 31. Increasing attention is called to the unforeseen (negative) effects of social media on people's health, lives and social fabric.

Photo by Christopher Ott on Unsplash.

It is proven that a number of designs led to a decrease in the well-being of their users: let's take into consideration, for example, social media, whose negative consequences are emerging and are getting increasing attention by both experts and population (e.g. thesocialdilemma.com; Orlowki, 2020). They are as well products of the work of designers, whose aim in this case was to keep users interested in the content of these platforms for as long as possible, to increase advertising profit at the expense of their health.

For these reasons it is essential to design products being conscious of the influence exerted over people and their well-being. In the context of this project, this is translated into a need of balance when implementing the strategies. For example, if it is true that envisioning a step-by-step process is beneficial when experiencing stress, it is also true that an extreme application of the "step-by-step" strategy could lead to a hyper-division of tasks. In the same fashion, the "celebrating achievements" strategy, brought to an extreme, would promote a continuous, minute-by-minute celebration of even the smallest daily achievements, loosing its benefits. This phenomenon of taking a positive intervention to the extreme, making it counterproductive for well-being, was also identified in one of the most popular interventions for mental resilience: expressing gratitude. Even if gratitude was found to be beneficial for well-being, applying it too much can entail negative consequences: being prompted to continuously focus on the positive side of their lives, people might forget to thrive to improve them, even feeling more depressed in occasions in which they cannot identify anything to be grateful for (Greenberg & Thomson, 2018). Focusing only on the positive, might also lead to toxic positivity, which entails ignoring difficult emotions and increasing isolation and communication issues (Villines, 2021). These might as well be consequences of over-application of the "serendipity bummer" strategy. In the same way, extreme cases of collaboration, generally deemed positive for subjective well-being, could entail negative influences or even the creation of cults. The amount of risk of such over-application of the final strategies would depend on their implementation by designers, who should be conscious of their influence on people's behaviour and of possible side effects, in this such as in any design project.

Other ethical concerns related specifically to developing eHealth tools for mental well-being are discussed by Vold et al. (2019), and reported in section 1.2 of this report.

5.3 CONCLUSIONS

This project was meant to explore and identify strategies for developing effective design interventions targeting behavioural markers indicating risk for teenagers' mental health, in order to boost their mental resilience. Smartphone applications interventions were the major focus, due to teenagers' heavy use of these tools and new opportunities coming from the practice of digital phenotyping.

Literature research was performed in order to gain knowledge on current practices to promote resilience and well-being coming from, in particular, Cognitive-Behavioural therapy, Positive Psychology and Mindfulness. Examining eHealth tools currently on the market also gave an overview of previous design work targeting promotion of resilience and well-being through digital interventions.

Literature on the novel practice of digital phenotyping and its opportunities allowed the acquisition of a list of behavioural markers that could reasonably be detected through smartphones. Interviews with well-being experts were performed to obtain a selection of the two most relevant risk markers to be taken in consideration when designing for teenagers. These were found to be academic stress and depressed mood, which are two intertwined and related markers.

Information was collected and synthesised in the form of a worldview, following the procedure recommended by the Vision in Product design method. This worldview represents the future context of resilience and highlights four different attitude-behavioural combinations adolescents might engage in. According to literature, the chosen quadrant to be promoted by the final output was the one characterised by growth mindset (focus on learning and progress) and collaborative approach (belief that we can and should help each other when facing difficulties).

The contextmapping method was implemented to include teenagers (15-18 yo.) in the research, identifying their practices for well-being, confirming and illustrating the relevance of the risk markers. It also uncovered their attitudes and behaviours in the face of academic stress and depressed mood.

The design goal was defined as "making adolescents embrace resilience as a collaborative learning process" and two mechanisms were identified, inspired by valuable attitudes and behaviours reported by teenagers: "by identifying purpose and stick to a congruent behaviour" for academic stress and "by reframing negative emotions, translating them into learning opportunities" for depressed mood. This goals and a reflection on the role of design in behavioural change led to the creation of 14 intervention design strategies.

The strategies are presented in the Design for Youth's Flourishing card deck, to be implemented by designers during their design process, informing, promoting and inspiring conceptualisation of design interventions supporting positive mental and physical activities, ultimately boosting teenagers' resilience and well-being. The cards are characterised by different colours according to their related risk marker(s) and provide examples of their application on their back.

The card deck was found to support designers in multiple phases of the design process. The evaluation with well-being experts highlighted the existence of contrasting opinions in the field of psychology and well-being interventions, and the need to test strategies and resulting concepts with end-users more rigorously, with particular attention to implementation and detailing of concepts, and potential counteractive effects. Future research should also cover how to promote teenagers' engagement and adherence to these interventions.

This project contributes to the field of design for well-being and to the research project Smart-CUEing MEntal health, aiming at implementing digital phenotyping and design interventions in a smartphone application.

Figure 32.
The final outcome of the project: the Design for Youth's Flourishing card deck, containing 14 intervention design strategies.

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APPENDIXES

APPENDIX A. GLOSSARY OF TERMS

The terms taken in consideration during the project are reported in this appendix, including an explanation of their meaning and their relevance to the project.

Term	Description	Examples	Relevance in graduation project
Digital phenotyping or personal sensing	"The process of deducting individual behaviour from digital data generated through human interaction with electronic devices, including both physical hardware and software." (Spinazze et al., 2019)	Smart-watch deducting type of physical activity the user is engaging in (e.g. swimming, tennins) from accelerometer data	From literature: general, superficial understanding
Passively collected data	Rough data coming from smartphone sensors or software interaction.	GPS location, voice pitch, number and duration of phone calls	From literature: general, superficial understanding
Sensor data	"Output of a digital device that detects and responds to interactions with the physical environment." (Spinazze et al., 2019)	accelerometers detect changes in gravitational acceleration of a device to determine • acceleration, • tilt and • vibration	**Note:** This description and the one below come from literature, while the previous was written by me**...Continues**
Electronic activity	"All individual activity recorded through hardware and software use" (Spinazze et al., 2019)	• device usage data, • social media activity, • browser history, • cookies and • online shopping	**Continues...** Together, they refer to passively collected data differentiating the source between sensors and software interaction.
Actively collected data	Data collected through self-report, thus actively provided by the user.	Answers from a questionnaire	From literature: general, superficial understanding
Feature or variable	"Quantifiable measure of some aspect of human behaviour potentially correlated with a symptom or health condition" (Spinazze et al., 2019)	Percentage of time a person spends at home relative to other locations	From literature: general, superficial understanding
Behavioral markers	User's status and/or behavior that can be identified from a combination of both actively and passively collected data.	• Stress • concentration/distractability • social connectedness • depressed mood	From literature: identification of the markers possible to be sensed with digital phenotyping From experts and contextmapping: selection of 2/3 most relevant ones to be considered in the project
Digital marker	"(Sustainable and interpretable) statistical association between features and health outcomes or rather, digital risk factor" (Spinazze et al., 2019)	• increased home stay may indicate loss of interest in activities • decreased activity is associated with depression	**Note:** This description comes from literature, while the previous was written by me. They both refer to the same thing though.

Term	Description	Examples	Relevance in graduation project
Interventions	Intervention meant to improve the mental resilience of adolescents.	Suggesting to write down 5 things to be grateful for, reminder to accept the eventuality of failure, reminder to drink some water	From literature and experts: identification of current practice From participatory design: identification of adolescents' activities and habits, characteristics of well-being activities, facilitators and barriers
JITAIs	Just-in-time adaptive interventions. Interventions based on digital phenotyping, provided in the context, in real time, when and where they are most needed. _ "an intervention design aiming to provide • the right type/amount of support, • at the right time, by adapting to an individual's changing • internal and • contextual state" (Nahum-Shani et al., 2017)	Smartphone notification reminder to breathe	From literature and experts: current and best practices, ways to improve motivation and adherence to the interventions From participatory design: ways to facilitate activities, increasing engagement, adherence and motivation
eHealth tool	"Health services and information delivered and enhanced through the internet and related to technologies" (Eysenbach, 2001)	Website providing one-time intervention to improve well-being	Examination and experiencing of existing tools
mHealth tool	Health practices supported by mobile devices (WHO, 2011). In this report it refers in particular to practises for mental health supported by smartphones' applications	Smartphone application assessing and promoting subjective wellbeing	Examination and experiencing of existing tools

APPENDIX B.
LIST OF EXAMINED EHEALTH TOOLS

In this appendix, the eHealth tools examined during the project are listed.

eHealth tools	myCompass	Project Y.E.S.	Bite Back	iBobbly
Intervention	Interactive activities composed by up to 3 sessions of 10-15 mins	3 sessions, peer insights from the sessions	Thank tank (gratitude), peer gratitude posts, Learn sections	Mood diary, Create action plan, manage thoughts and feelings
Reward	None	None	(Not really meaningful) badge	
Prompt	None		User sets email reminders for gratitude	
Target	Adults / young adults / seniors	Teens 11-17 y/o	Teens	15+ aboriginal teens
Use for	7 weeks	30 mins per session	6 weeks challenge	6 weeks
Input data	Self assessment tests	During session, to self-reflect	Self-assessment tests	Self-assessment
Nationality	Australian		Australian	

mHealth tools	SuperBetter	Intellect	HeadGear	Waking up	Sanvello	Mindshine
Intervention	Heroic narration of activities	Learning paths, guided journals, rescue sessions, behavioral exercises (experiments)	1 exercise per day of meditation, reflection, selection of goal and stweps towards it	Meditation + lectures on the topic	Journeys to get better with e.g. anxiety, space for journaling, hope board, subdivision of a goal in steps…	Everyday exercise to learn
Reward	Gaining points	(Hidden) badges	Advancing on board			
Prompt	None	Notifications	Notifications (+ customized notifications)	Daily notification for the "moment", helping implementing meditation in daily life	Notification for the same check up every day	Notification with short text + bringing to app
Target			Adult men in male dominant workplaces		Young adults/adolescents	Young adults/ adolescents
Input data		During session, to self reflect	Some text		Evaluation of resilience output (numbers on non-specified scale, telling if you have low resilience, no suggestion on action)	Reflection and textual exercises

APPENDIX C.
VIP FACTORS AND REFERENCES

In this appendix, all the factors employed in the ViP process, divided by cluster, and their references are reported.

LEARNING TO BE HAPPY

Usual practice = suggestions and teaching (state/cult)
The current usual practice when try to make people engage in well- being boosting activities is just suggesting and teaching them what is beast to do in order to reach that goal. (Nahum- Shani et al., 2017)

40% of well-being depends on activities (principle/psyc+bio)
Since 40% of our well-being depends on intentional mental and physical actions, personal and voluntary effort can be one of the main factors for improving it. (Lyubomirsky et al., 2005)

Resilience should be thought in schools (development/cult)
Positive Psychology founder Martin Seligman supports the teaching of PERMA in schools, in order to provide more well- being and at the same time better performance results. (Seligman, 2016)

Using strengths = more passion in the activity (principle/psych)
Using our strengths makes us work with more passion. (Biswas- Diener et al., 2011)

Gamification: elements of games for serious behaviour change intervention (state/tech)
Gamification is designing a design intervention including elements of game such as rewards, goals, storytelling. It has been used in multiple design projects in order to change users' behaviour in an ethical way. (Visch et al., 2013)

Important barrier to effectiveness of eHealth tools is lack of engagement (state/tech)
Many eHealth tool see intervention engagement dropping after a few weeks or months. This is a major barrier to effectiveness of these tools. (Garnett et al., 2018)

Growth mindset = better performance (principle/psyc)
People having a growth mindset (concentrating on learning goals) were found to have better performance after receiving negative feedback compared to people with a fixed mindset (focus on performance), that would be too hard on themselves after criticism around a strength. (Biswas- Diener et al., 2011)

Strength development for more happiness (principle/psyc)
Positive psychology pushes for strengths assessment and intervention to allow patients to use their strengths to improve performance in various ways. However, it should not be only about identification and use but about development: understanding how and in which situation to use the strengths and what effects these strengths have on others. (Biswas- Diener et al., 2011)

PERMA can be taught (principle/psyc)
PERMA can be taught to people in workshops or at school. (Penn Positive Psychology Center, 2021)

Resilience skill set (principle/psyc)
Resilience skills include self- awareness (recognising thoughts/emotions/...), self- regulation (changing own thoughts/emotions/...), mental agility (looking at situation from multiple points of view), strength of character (using strengths properly), connection (building relationships) and optimism (expect the positive, focus on what you can control) . (Penn Positive Psychology Center, 2021)

Biofeedback: making patients aware (state/tech)
Biofeedback provides feedback making patients aware of physiological processes they are usually not aware of. The aim is to let them learn how to adjust mental and physiological processes themselves. (Paradiso, 2011)

Flourishing based on activities (principle/psyc)
"Wellbeing and flourishing can be understood as the consequence of arranging daily routines and activities in a manner, we find especially meaningful and enjoyable." (Klapperich et al., 2018)

Cognitive vulnerability - stress paradigm (principle/psyc)
"Psychosocial and environmental stressors interact with cognitive factors to increase the risk for psychopathology." So the risk of psychopathology derives from the combination of stressors and cognitive factors. (Anyan & Hjemdal, 2016)

Mindfulness moderates relation between stress and depression (principle/psyc)
Mindfulness is the practice of being present in the moment. It decreases the changes of having depression in case of stress. (Anyan & Hjemdal, 2016)

Ego resilience moderates relation between stress and anxiety (principle/psyc)
Ego resilience is the "ability to overcome obstacles and engage the world in a positive way with openness to experience". It decreases the changes of having anxiety in case of stress. (Anyan & Hjemdal, 2016)

Gamification similar to principles of health behaviour change (principle/tech)
Gamification's principles are similar to the ones proved to have positive effect in health behavior change technology. Also, it is easier

to apply to interventions that are shaped similarly to coaching. (Cugelman, 2013)

Engagement = involvement, experience, duration of use (principle/tech)
Engagement indicates users' (type of) interaction with technology, how their experience it and the duration of their involvement. It also qualitatively include the state of involvement with technology (e.g. being absorbed in the experience). User can be engaged with small technology interactions and/or with the overall goal of the technology. (Milward et al., 2018)

Apps for augmented therapy (trend/tech)
The most common concept of app design for mental health is associated with therapy support. The app would collect data to improve therapy and make it more concise. (Hall, 2021)

LIVING CONNECTED

Combination of game world and real world (principle/psyc)
When a person plays a game she finds herself in the "game world". However, she will still also perceive part of the real world, as game and real world are extremes of a continuum and different games are positioned in different points on it. (Visch et al., 2013)

There are not enough resources for mental health (development/orga+econ)
Dutch system cannot supply the increasingly high demands for youth care (NJI, 2019)

Technology shapes our routine (state/tech)
Technology present in our lives has a strong influence on our activities and routines. For this reason it should be designed with a focus on well- being. (Klapperich et al., 2018)

Limiting interactions (principle/tech)
A technology mediating communication between its users can moderate their interaction, by censoring them or by simply not technically permitting them to happen. (sky game example source?)

Interactive screen time bad for adolescents (principle/phys)
Active screen time is worse than passive screen time, especially in adolescents: "it causes dysregulation of the nervous system with hyper- arousal which can lead to emotional outbursts, meltdowns, irritability, and distractibility." (Binus, 2019)

Trendy virtual care (development/tech)
Behavioural care has been used more and more by companies and start- ups to create virtual digital care. (Hall, 2021)

More discussion around mental health (trend/cult)
People are focusing more on mental health and it is becoming increasingly important, especially after the Covid-19 pandemic. This contributes to remove the stigma, let people talk about it more openly and creates business opportunities. (Hall, 2021)

The market is ready (development/econ)
The U.S. fundings on mental health are (more or less) tripled in 2020 compared to the previous 4 years. The market is booming with this new trend and people are investing. (Hall, 2021)

SHARING AND CARING

eHealth with my psychologist (state/tech)
Many eHeath interventions for mental health are being studied to be implemented and uses together with a practitioner, or including the practitioner as a user. (Hall, 2021)

Social practices composition (principle/soci)
Meaning (symbolic, goal), competences (skills, techniques) and materials (tools, context) compose social practices. New practices come from different combinations of these 3 elements (Klapperich et al., 2018)

Design for meaningful social practices (principle/soci)
Considering the 3 elements of social practices, we can (1) identify the elements that lead to positive practices and (2) design to facilitate these and new positive practices. (Klapperich et al., 2018)

Peer support in behavioural change (principle/psyc)
In an app designed to support smoking cessation, social support was provided through a chat with peers. It helped sharing mainly information, concerns, strategies and emotional help among users. (Granado-Font et al., 2018)

People spontaneously create space of mental support online (trend/soci)
It can happen that (young) people start sharing their mental health problems online, spontaneously creating supportive communities. (Miller Hyndman, 2021)

Online communities are leading to destigmatisation of mental health (trend/cult)
Talking about mental health problems so openly online can destigmatize them and allow people to share more about their issues even in real life. (Miller Hyndman, 2021)

Allies help (principle/psyc)
Having allies in app and sharing achievements with them motivates patients to keep trying achieving their goal (in reducing concussion symptoms among teenagers). (Worthen-Chaudhari et al., 2017)

Gongbang: studying (not) alone (trend/soci)
It is a trend in live streaming platforms (e.g. Youtube, Twitch) to broadcast yourself while studying, giving the impression to your audience to be studying together. Gongbu bangsong is Korean for "study broadcast". (Campbell, Holroyd, 2021).

Young males are reaching out more (development/cult)
In 2020 the number of young males looking for mental health information and resources increased. (Wheeler, 2020)

TO EACH ITS OWN

Resilience = overcoming difficulties (principle/psyc)
Resilience is commonly indicated as the capacity to overcome difficulties and keep developing personal growth. More precise definition includes navigating into psychological, social, cultural, and physical resources sustaining well- being and 'individually and collectively negotiating for these resources to be provided in culturally meaningful ways'. (Resilience Research Centre, 2021)

People might not identify their own strengths (principle/psyc)
For a variety of reasons it might be difficult to a person to recognize her own strengths and consequently use them for her advantage. (Biswas- Diener et al., 2011)

Maximum engagement is flow (principle/psyc)
The maximum form of engagement happens when a person looses the perception of time during an activity that is really immersive for her. The level of challenge of the activity needs to be balanced with the skills of the user, there must be a clear goal and immediate feedback. (Penn Positive Psychology Center, 2021)

Strengths are related to values (principle/psyc)
Our psychological strengths are related to our personal values, interests and passions. (Biswas- Diener et al., 2011)

Users engage in eHealth tools differently (state/tech)
Users can engage in and take advantage of eHealth tools in different ways. For example, some might just use it to track their health (factors), others might try to change them using the tool, and others might just stop engaging after very few uses. (Milward et al., 2018)

Other people value similar strengths to what they have (principle/psyc)
Since strengths are close to values, people tend to value strengths in others that are similar to their own, as they do with values. (Biswas- Diener et al., 2011)

False consensus: overestimating similarity of others (principle/psyc)
People tend to overestimate the similarity of others' thoughts, actions and behaviours to their own. This can lead them to believe what they do and their strengths are not unique, special and valuable. (Biswas- Diener et al., 2011)

Strength? I'm just doing the right thing. (principle/psyc)
As strengths are close to personal values, people tend to think what they are doing is just the right thing to do, not recognizing that it might be a strength of theirs, a unique and characterizing behavioural pattern. (Biswas- Diener et al., 2011)

Current mental health support doesn't fit adolescents (development/soci)
Adolescents report experiencing current mental health assistance as not fitting their needs. (Leijsdorf et al., 2020)

PERMA for more resilience (principle/psyc)
Positive emotion, Engagement, Relationships, Meaning and Accomplishment lead to a less depression and anxiety, less burnout and reduce the risk of dropping out of school. (Penn Positive Psychology Center, 2021)

(Intensively) adaptive interventions: from baseline to individual adaptation (state/tech)
With continuous monitoring, intensively adaptive interventions based on deep learning algorithms start with a baseline rule for intervention and continuously adapt, labelling more and more (combinations of) data and providing relevant interventions. (Riley, 2015)

Personal concerns and social dilemmas (principle/psyc)
People perceive more easily the personal, short- term effects of their actions rather than long- term effects affecting the collectivity. Designing for short- term personal concerns can facilitate people act for the long- term, collective good. (Tromp & Hekkert, 2014)

Well-being is individual (principle/psyc)
Describing well- being for a wide group of people become really theoretical and "obvious". This because well- being practically refers to different things per each individual. (Klapperich et al., 2018)

Interventions should fit into users' context (state/ethi)
Interventions should be able to fit into users' (social) context. E.g. it should show path to seek more help if needed, give possibility to share data or keep it private and it should not add to the workload of user but fit into his life. (Vold et al., 2019)

Tailored = more attention and long- lasting effects (principle/tech)
People process information better if the message they receive is "personally relevant or tailored to them". (Milward et al., 2018)

Choice of words is important (state/cult)
Due to the stigma on mental health, it is important to select wording carefully when designing a tool for it, as some might be more stigmatizing than others (e.g. fitness & well- being rather than mental health). (Deady et al., 2017)

Different user, different context, different intervention (state/cult)
The kind of intervention should be designed around the end- users of the app and their context. (Deady et al., 2017)

Adaptive education (development/educ)
It was the fifth most researched word on Google in 2020 in the Netherlands: Snappet is a teaching method for primary education that adapts to students to get the most out of them. Adaptive tools started being implemented in schools in the Netherlands during Covid-19. (Séveno, 2020)

Therapy is getting personalized (trend/cult)
In therapy practice, psychologists used to diagnose and provide interventions based on the results. But now, therapy is getting personal, focusing on the person's goals and specific needs. (Popma, 2021)

THE VULNERABLE AGE

Strengths are contextual (principle/psych)
Strengths should be considered as contextual, since "contextual factors determine the appropriateness of strength use" and the amount of strength that should be implemented. (Biswas- Diener et al., 2011)

I can do it alone (development/psyc+tech)
It has been proven that single- time self- administered web- based interventions lasting 30 minutes can improve the mental well- being of adolescents. (Lab for Scalable Mental Health, 2021)

Games are engaging (principle/tech)
(Video) games immersive and engaging and can simulate real life situations or represent them in a different form. (Visch et al., 2013)

Adolescent resilience = recovery + sustainability (principle/psyc)
Adolescent resilience is a process made of recovery and sustainability. Recovery means that after a stressful events the adolescent is able to get back to an equilibrate state of health; sustainability is the ability to sustain this attitude and positively adapt to situations, even when facing serious adversity. (Anyan & Hjemdal, 2016)

Egocentric bias: overestimating own contribution (principle/psyc)
In a group or relationship, one person tends to overestimate her own contribution. (Biswas- Diener et al., 2011)

Comparison biases: underestimating own prowess (principle/psyc)
People underestimate their skills, especially when facing a difficult task. (Biswas- Diener et al., 2011)

Science of persuasion (principle/psyc)
There are a number of way to make people do what you wish. The main principles are reciprocity (need to give in return), scarcity (the less there is the more you want), authority (more serious the person the more you follow), consistency (want to be consistent to previous commitment we took), liking (follow more people similar to us) and consensus (if others are doing it, I'll do it). (Cialdini, 2012)

Increase in youth mental stress (development/demo)
Adolescents are experiencing an increase in stress related issues (Kleinjan et al., 2020)

Stigma on mental health issues (state/cult)
Stigma on mental health issues is still strong and people might be worried about others seeing they are using a tool for it. (Deady et al., 2017)

Interventions should support autonomy (state/ethi)
A mental well- being intervention should always support autonomy of the patient and his rights to decide for himself. It should not be addictive and it should be transparent in its goals and data treatment. (Vold et al., 2019)

Teenagers are highly vulnerable and impulsive (principle/psyc)
Teenagers "represent a vulnerable population with a high degree of impulsivity and frequent reports of suicidal ideation". (Cao et al., 2020)

Stress for academic performance can lead to anxiety and depression (principle/psyc)
Stress in general leads to depression and vice versa. (Anyan & Hjemdal, 2016)

Resilience moderate effects of parental problem drinking on adolescents (principle/psyc)
Resilience moderates effects on both externalizing and internalizing behavior of adolescents. (Anyan & Hjemdal, 2016)

Augmenting resilience and minimizing stress (principle/psyc)
Augmenting resilience and minimizing stress is expected to be the best way to impact adolescents mental wellbeing. (Anyan & Hjemdal, 2016)

Epic win = epic feedback (principle/psyc)
Shifting the narrative to a heroic one, giving positive "gamified" feedback in app motivates patients to keep trying achieving their goal (in reducing concussion symptoms among teenagers). (Worthen- Chaudhari et al., 2017)

Privacy is essential (state/cult)
Especially due to the stigma, privacy around data regarding mental health is extremely sensitive and it should be treated properly, giving freedom of choice to the user. (Deady et al., 2017)

The second epidemic (trend/psyc)
Together with Covid-19 epidemic, a mental health epidemic is also rising among adolescents. The risks of mental health issues are rising as they are forced to stay at home, not going to school. (Durano, 2021)

Young males more at risk of suicide (state/cult)
Males suicide 3 times more than women and have less access to therapy. (Wheeler, 2020)

Imitating can be dangerous (state/soci)
Young people tend to follow trends done by others. On TikTok, multiple trends are born, some of which can be extremely dangerous. (Glaze, 2020)

High peer pressure (state/psyc)
Adolescents tend to follow the behaviour of their peers much more than adults. (Psychology Encyclopedia, 2021)

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APPENDIX D. CONTEXTMAPPING WITH ADOLESCENTS

In this Appendix, the process of the contextmapping research with the adolescents is elucidated. The results are presented in chapter 2 of the main text.

RECRUITMENT FORM AND VIDEO

The participants were recruited by "snow-balling sampling". Adolescents already participating in the research were encouraged to share with friends and acquaintances a recruitment form together with a video of the researcher briefly presenting herself and the project. This made the recruitment process effortless, while adding a friendly personal touch by showing the face of the person with whom the adolescents would have had to share their sensitive information with, in case of participation.

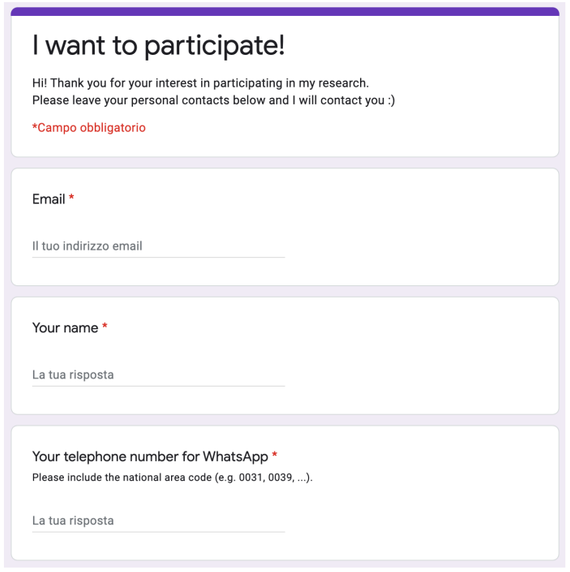


Figure 33. The recruitment form required the sharing of a personal email address and a telephone number.

Figure 34. A screenshot from the recruitment video.

SENSITIZING MATERIAL AND INTERVIEW

During short introductory videocalls with the researcher, the 8 participants filled the informed consent form and were provided with the sensitizing material on a online digital board (miro.com) containing 5 short exercises to be executed once per day for 5 days. The material was previously piloted to grant feasibility. This training, part of the contextmapping methodology, prepared them for the interview, prompting reflection on their experiences and practices regarding well-being. After this sensitizing period, the participants were involved in a one-hour interview based on the results of the sensitising exercises, in which they were asked for deeper and more research-focused information.

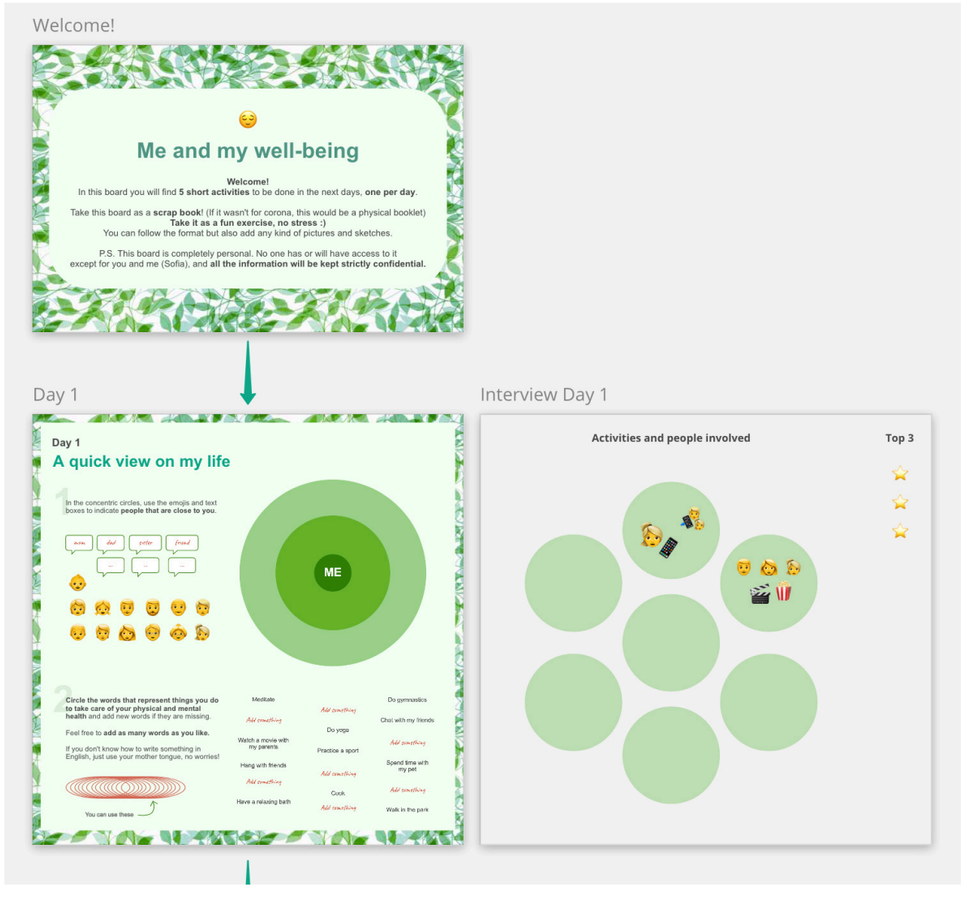
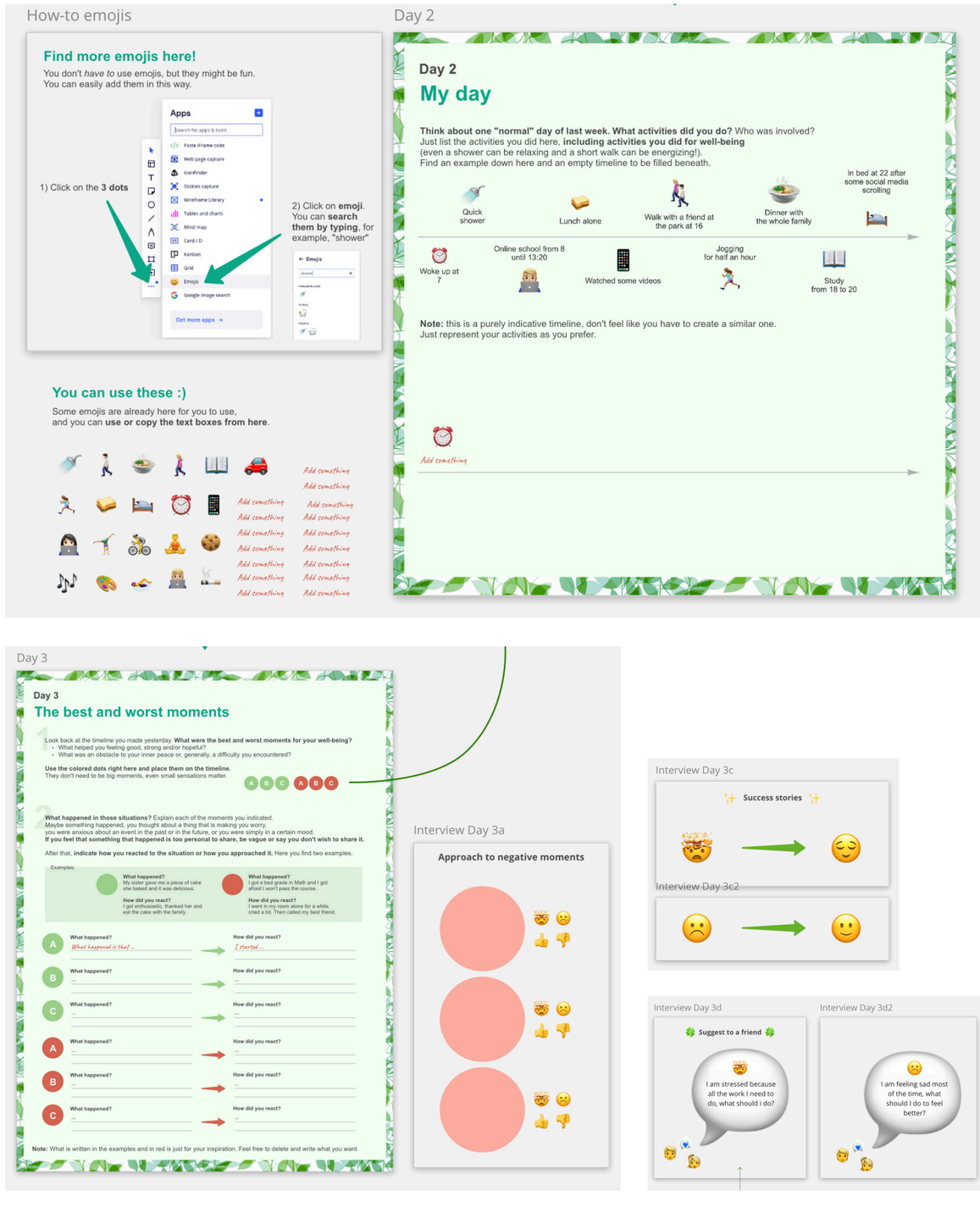
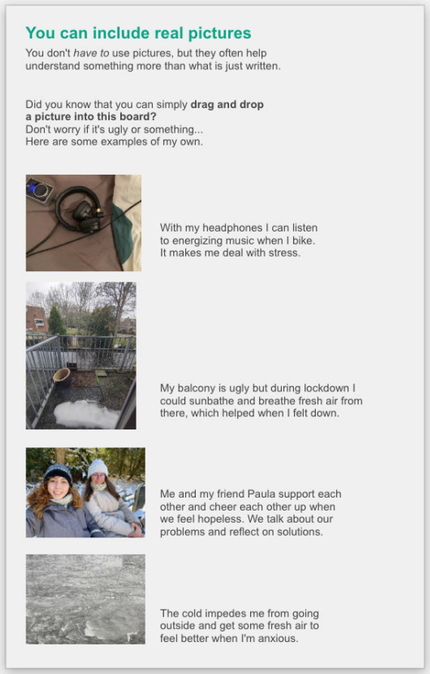


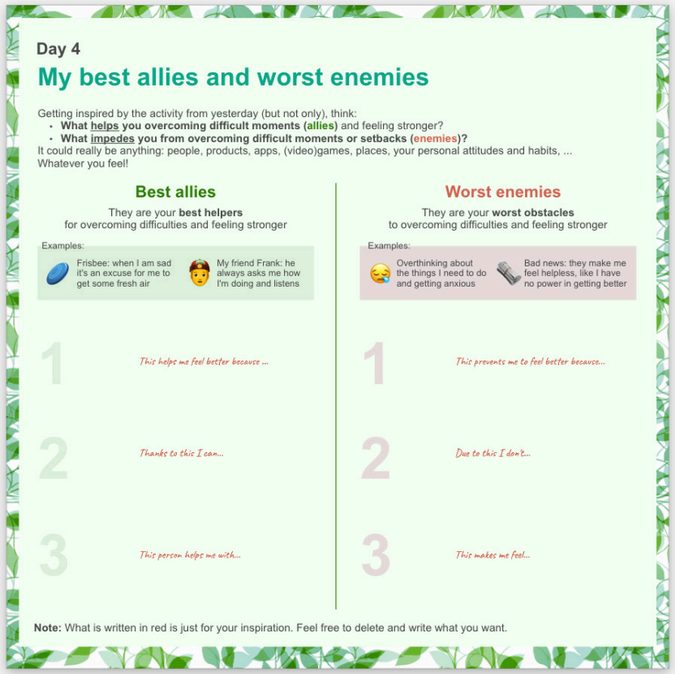
Figure 35. The sensitising material to be filled by the adolescent participants. The undecorated, grey frames named "Interview Day ..." were added right before the interviews to guide the discourse and allow collection of deeper information.



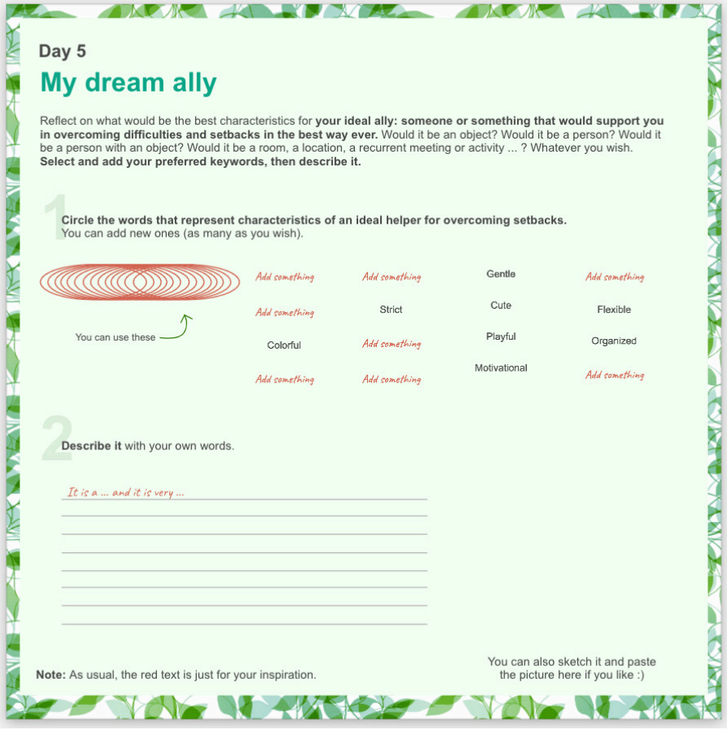
How-to pictures



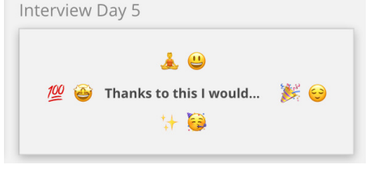
Day 4



Day 5



Interview Day 5



Study information and informed consent

Now a bit of boring stuff... But it is in your own interest.
Please read the study information below.

Study information

24/02/2021

This study is aimed to get insights about adolescents' context, habits and preferences about well-being and well-being activities.
The results of this study will be used to design interventions to improve adolescents' mental well-being.

The study will include a sensitizing period of one week, with short daily activities, and a one-to-one interview of one hour.
Eventually, participants will be asked to participate in a follow up co-design session, alone or in small groups, after giving further consent.

Taking part in this research is entirely voluntary and refusal or withdrawal at any time will involve no penalty or loss, now or in the future.

Audio- and videotaping will be used to record the interviews and the eventual following sessions.
All recorded data will be used exclusively by the researcher (Sofia) for the purposes of the project and will be anonymized if used in project-related communication (e.g. presentations, reports).
These tapes will be destroyed or anonymized at the end of the academic year (1st of September 2021) or at the end of the project.

The participant can obtain a copy of the data and/or the project results, by addressing the contact person below.

Sofia Fonda

1. Email *

2. Your name *

3. Taking part in the study *

- I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.
- I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.
- I understand that taking part in the study involves having my image and audio recorded during interviews and/or sessions and information will be collected taking notes in the process and from this material.

4. Use of the information in the study *

- I understand that information I provide will be used for reports, presentations and eventually informative videos. In all these cases the material will be anonymized.
- I understand that personal information collected about me that can identify me, such as my name, contacts or where I live, will not be shared with anyone beyond the researcher (Sofia).
- I agree that my information can be quoted in research outputs after being anonymized.

5. Further use and reuse of the information *

- I give permission for my video recordings and photographs to be archived in the researcher's personal computers so it can be used for future research and learning.

If you have questions or need further information, you know where to find me!

Please contact:

Sofia Fonda

Figure 36. The informed consent filled by the adolescent participants.

FOCUS AND SCOPE

The focus and scope of the contextmapping research are represented in figure 37. The context of the participants was addressed, asking them to depict their daily activities, their activities for well-being and people being part of their social circle. Afterwards, participants had to select some positive and negative moments from their daily activities' timeline and explain how they felt about and how they reacted to each situation. They also described a successful situation in which they faced stress and depress mood in an optimal way. This information was utilised to confirm and illustrate the chosen behavioural markers of academic stress and depressed mood and to identify the behaviours adolescents engage in when facing adversity. Participants were also interviewed on their attitudes and beliefs on resilience by inviting them to fictionally suggest a friend on what they considered successful strategies to face stress and depressed mood. Facilitators and barriers for resilience where identified by asking the adolescents to describe three best allies that support them in overcoming difficulties and three worst enemies that represent obstacles for surmounting setbacks. Finally, participants expressed their wishes regarding an ideal ally for their well-being, explaining its function and characteristics.

As envisioned by the contextmapping approach, the sensitising material contained activities regarding the whole scope of the research, starting from general present context, moving to past experiences, prompting reflection on those, and finally addressing the future situation. On the other hand, the interviews focused on obtaining deeper information starting from the sensitising results.

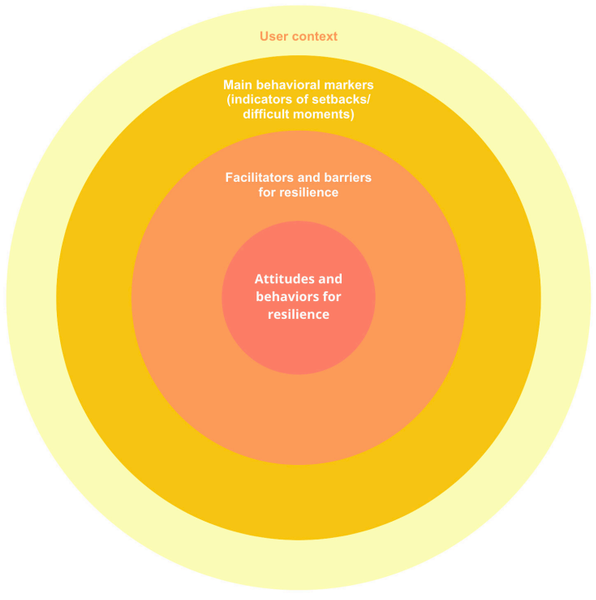


Figure 37.
Scope and focus of the contextmapping research. The sensitising material covered the entire scope, while the interviews focused on the core of the research, asking more in depth question on the previously completed exercises.

INTERVIEW SCRIPT

The semi-structured interviews followed a flexible script. This means that questions were posed according to the script, however some parts of the script were adapted or skipped according to the development of the interviews themselves or depending on the content of the sensitising material.

	Foundation points			RQ - Research questions
A	Behavioral markers	1	Setbacks / moments of difficulty	What are the main setbacks/moments in which they don't feel well and they would need help (behav.mark.)?
B	Improving resilience	2	Behaviors for res.	What are their behaviors to overcome setbacks (res.)?
		3	Attitudes for res.	What are their attitudes to overcome setbacks (res.)?
		4	Match?	Do attitude and behaviors match? Why not?
		5	Best behaviors/attitudes	Which are the most fruitful?
C	Motivation and engagement	6	How change of attidute/behavior	Did they change behavior/attitude in the past already? How? What happened?
	MECHANISM	7	Res. Facilitators	What are facilitators for overcoming setbacks (res.)? What are their characteristics?
	MECHANISM	7b	Facilitation to facilitators	What motivates the adolescent in engaging with facilitators? How to boost facilitators (indirectly improving res.)?
		8	Res. Barriers	What are barriers to overcoming setbacks (res.)? What are their characteristics?
	MECHANISM	8b	Barriers to barriers	How to diminish barriers (indirectly improving res.)?
D	Adapting interventions	9	Goal / need	What would be the goal(s) for each adolescent in using the smartphone application?

Figure 38. The research questions were categorised and characterised by a colour.

RQ	Time	Opening		
	7	INTRODUCTION		**RECORD** How did you like to do the activities? What did they make you reflect on in particular? Did it make you realize something that you didn't think about before? This interview is going to be more of a conversation between me and you. There is no right or wrong, it is about you. Feel free to say and add anything you wish while we talk. And remember you can always avoid to answer if you don't feel like. Just say "I don't wish to aswer to this" If something comes to your mind while I ask you questions, just tell me, and if you have any doubt just ask. We will use the sensitizing board to guide us through the questions: **please open the board**
		Day 1		
B 5 B 2 C 7, 7b C 6	7	1 ACTIVITIES THEY DO ALREADY		Here are the activities you circled in day 1.
			1	Which ones are the most important for you (choose 3 using the stars)?
			2	*(For the non clear activities)* How do these activities help?
			3	Who is usually involved in them from your social circle? Drag the relative emoji in the circle of the activity and explain a little.
			4	*(For relevant activities)* How did you start practicing/doing this? *e.g. someone proposed to you, you read about it somewhere, ...*
		Day 3		**ASK ABOUT POSITIVE MOMENTS IF INTERESTING**
A 1 B 2 B 5	5	3a REACTIONS TO WORST MOMENTS		Let's take in consideration these **negative moments** you highlighted, one at a time.
			1	*(If unclear from description)* How did you feel in that moment? What were you thinking? Where you stressed or sad?
			2	What do you do or think about to try to feel better in a situation like this?
			3	Does it work? Do you actually feel better?
A 1 B 5 ; C 7 C 7b	10	3c BEST BEHAVIOR		Let's think of a success story: one time in which you were **stressed**, you did something and then felt better and you were proud of how you managed it.
			4	What happened?
			5	How did you manage to overcome the difficult situation? What did you do or think?
			6	What helped you in reacting in that (amazing) way? *e.g. did someone suggest to do something*
				Did something similar happen one time when you were **sad**? *Repeat questions 4-6*
B 3 B 3 B 4 C 8	5	3d ATTITUDE		Now imagine for a moment that you are talking to one of your dear friends. Did you imagine a friend? Ok, imagine (s)he is telling you...
			7	I am stressed because of school and the amount of work to do, what should I do to feel better and overcome this difficulty? What do you suggest?
			8	And if your friend telld you (s)he feels sad? What would suggest to feel better?
			9	Are you following these suggestions in your daily life?
			10	*(If no)* What do you think it's stopping you from following them?
		Day 4		
		FACILITATORS AND BARRIERS		
C 7 C 7	7	4a ALLIES		Let's consider the **allies** you indicated here
			1	*(If unclear from description)* What happens when you interact with this? What do you appreciate of it?
			2	What kind of difficulties does it help you overcome? **Stress or sadness**? Related to what? How does it help? *e.g. overcoming stress, forget about a problem, feel relaxed, take problems more rationally, ...*
C 7b C 7b C 7			3	In what situation do you "meet" this ally? What helps you being in contact with it?
			4	*(If applicable)* In what way could it help your friend in the suggestion you gave earlier?
			5	Did you think about **other allies** while we were talking?
C 8 C 8 C 8b B 4, C 8b	7	4b ENEMIES		Now let's consider the **enemies**
			6	*(If unclear from description)* What happens here? What in particular upsets you of this?
			7	*(If applicable)* How does this stop you to do something that would make you feel better?
			8	How do you try to avoid this enemy? Do you have any tactic (a thought or an action or activity you do) to avoid it?
			9	Now imagine for a moment that you are talking to one of you dear friends again: how would you suggest him/her to avoid this?
		Day 5		
C 7, 7b D 9 D 9	3	DREAM FACILITATOR		Here you described your best ally and you said it would be... FROM SENSITIZING
				(If unclear from description) Could you explain to me what you meant here better?
				In your dream world, how would you feel when interacting with it? What would you use it for? What would be the best result ever from using it? *e.g. relax more, take problems more rationally, avoid anxiety, ...*
		Closing		
	2	FOLLOW-UP		Would you be up for testing around the end of April or May? *(If yes)* Also with other people or would you prefer to be alone?
TOTAL	53			

Figure 39. The interview script. The questions were divided according to the sensitising exercise, in order to obtain deeper insights. In the first column, there were references to the research questions. Each group of question had an estimated timing and a title. The single questions were coloured differently to intuitively identify the most important questions from, e.g., the optional ones.

QUESTIONNAIRE

A questionnaire was designed in order to obtain information from all the adolescent volunteers. It resembled the structure of the sensitising material and interview script, adapted and selected in order to fit the questionnaire format. From a total of 10 respondents, all of them happened to be female. The answers were collected and analysed, but they were found rather poor in content compared to the much deeper information collected in sensitising materials and during interviews. It was assumed that talking about such a personal topic on a questionnaire didn't help the expression of the participants, and the lack of follow-up questions led to a lack of reasoning, which was essential in the overall research. Still, the way adolescents answered to the questionnaire inspired part of the design project: e.g. the use of metaphors in some questionnaire answers inspired the conceptualisation of the metaphoriser concept.

Questionnaire on well-being

Thank you so much for your availability to participate in my research on adolescents' well-being.
All information you will provide will be considered strictly confidential and will be elaborated anonymously.

In this questionnaire I will ask you to answer to some question about your well-being: activities you do to keep it high and tactics you use to overcome difficulties and setbacks. You will find 10 research questions divided in 4 sections.

Feel free to avoid sharing any information you consider too private.

1. You are... *
   - ◯ male
   - ◯ female
   - ◯ I prefer not to answer
   - ◯ Altro: _____

2. How old are you? *
   - ◯ 14
   - ◯ 15
   - ◯ 16
   - ◯ 17
   - ◯ 18
   - ◯ Altro: _____

Activities for my well-being

Reflect on the activities you do for your well-being and answer to the following questions.

3. What activities do you do for your well-being? *

In "other" feel free to write all the activities that are not present in this list.

- ☐ Practice a specific sport
- ☐ Do gymnastic
- ☐ Play a musical instrument
- ☐ Do yoga
- ☐ Walk in nature/in a park
- ☐ Listen to music
- ☐ Watch a movie or tv series
- ☐ Spend time with pets/animals
- ☐ Cook
- ☐ Eating healthy
- ☐ Have a relaxing bath

Altro: ☐ _____

Figure 40. The structure of the questionnaire on mental well-being.

4. (A) Consider an activity you started doing recently: how does it help you? How did you start practicing it? *

   Try to explain, including (if there are) the people that contributed to make you start doing it. E.g. a friend suggested me to start doing yoga because he was doing it already; I read on the internet about this activity and I decided to try together with my sister; ...

5. (B) Choose another activity from the previous list: how does it help you? How did you start practicing it?

   Try to explain, including (if there are) the people that contributed to make you start doing it.

6. (C) Choose a last activity: how does it help you? How did you start practicing it?

   Try to explain, including (if there are) the people that contributed to make you start doing it.

7. Would you like to add anything?

   For example: is there a characteristic of an activity you find especially important? how do you think it helps in daily life? ...

Success stories

Think about moments of difficulty that you overcame in a particularly successful way in the past.

8. (a) One day I was feeling really stressed. But I managed to overcome that moment in the best way by doing/thinking/going/... *

   What happened? How did you manage to overcome that setback at best? What helped you in overcoming it (e.g. a person, an object, a product, a service, a (video)game, a particular place, ...)?

9. (b) One time I was feeling sad and hopeless. But I managed to overcome that moment in the best way by doing/thinking/going/... *

   What happened? How did you manage to overcome that setback at best? What helped you in overcoming it (e.g. a person, an object, a product, a service, a (video)game, a particular place, ...)?

My best allies in overcoming difficulties

Identify some allies that you meet in your daily life, that help you overcoming difficulties at best. They can be anything you can think of: activities, thoughts, reasoning, people, (video)games, places, ...

10. (1) An ally to overcome difficulties *

    In what situations does it help? How does it help? How do you get in contact with it?

X3

My ideal ally

Imagine your dream ally: something or someone that would support you in overcoming difficulties in the best way ever. Again, it could be anything: an activities, thought, reasoning, person, (video)game, specific place or location, ...

13. Who is your dream ally? *

    What/who is it? How would it help? What are its characteristics? How would you interact with it?

14. Want to add something? Write here!

    This is the end of the questionnaire. If you have anything to add, write it here :)

ANALYSIS AND RESULTS

The eight interviews were recorded and later re-watched to analyse their content. Post-its with information were collected on a digital board and rearranged according to research questions. Patterns were identified and represented in infographics, plotted on the worldview when relevant. In this way it was possible to confirm the validity of the quadrants and to illustrate them with real examples of attitudes and behaviours adolescents engage in when facing academic stress, figure 17a and 17b, and depressed mood, figure 18a and 18b. The two behavioural markers themselves were confirmed and illustrated, identifying the most prominent sources for each of them, see figure 14.

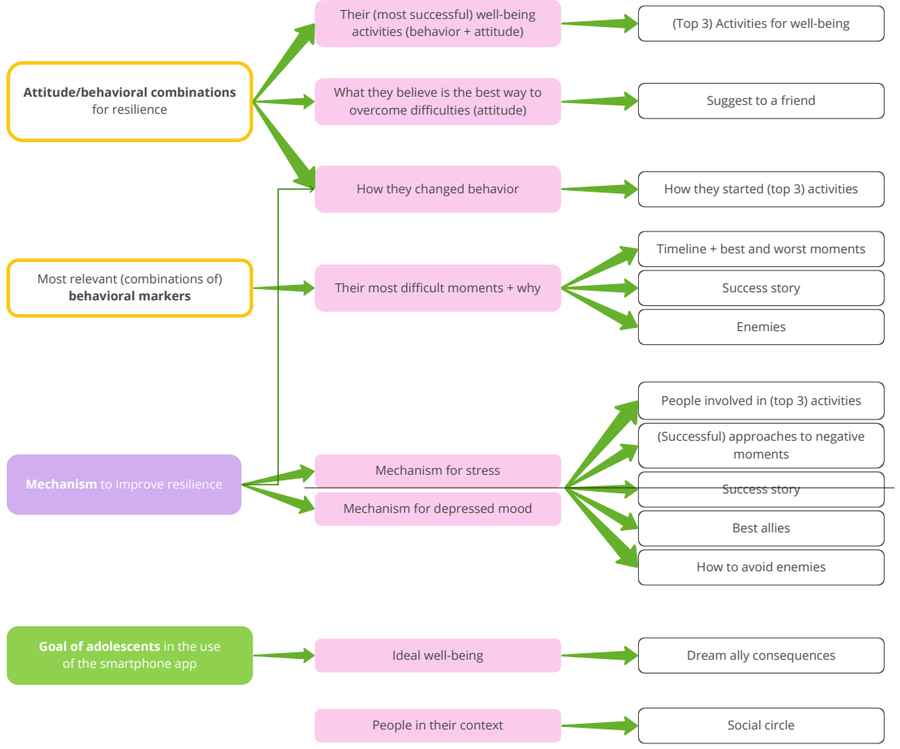


Figure 41. The research questions used to cluster post-its containing information coming from sensitising material and interviews.

APPENDIX E. CONCEPTS' IDEATION, EVALUATION AND ITERATION

The quantity of information and knowledge collected during the research phase created a detail-focus mindset which was identified as an obstacle to creative ideation. To re-gain a holistic picture of the design problem and boost creativity, one graduated designer and three graduating master students in Design for Interaction at TU Delft were involved in a creative session. The outcomes were deemed as a starting point for later individual re-elaboration, which led to the development of three design concepts and the creation of three raw prototypes. These served to explore different possibilities to provide interventions for well-being.

In this appendix, the three concepts will be presented, each accompanied by the analogy that inspired its development, a rationale and a description of the prototype. The user evaluation, its insights and the following iteration provoked a reflection on the role of design in behaviour change, which is discussed in chapter 3.2. The resulting considerations guided the design of the final output.

CREATIVE SESSION

The session was designed in order to gain fresh and new ideas. It started with the "flower association" exercise, in which participants could reflect and brainstorm on the words "collaborative" and "learning process". After that, the design problem was disclosed: "How to collaboratively embrace mental resilience as a learning process?", in order to inform the brainstorming session. The produced ideas were clustered in order to name the assumptions the designers had when approaching the design problem during the brainstorming. In the "hidden presumptions" exercise, the participants were encouraged to find new ideas excluding or taking inspiration from those assumptions. Finally, there was a voting session to identify the best ideas, which were force-fitted into raw smartphone application concepts.

These concepts and all the material from the creative session were used to inspire individual conceptualisation and prototype creation, in which all the knowledge from the research phase was integrated.

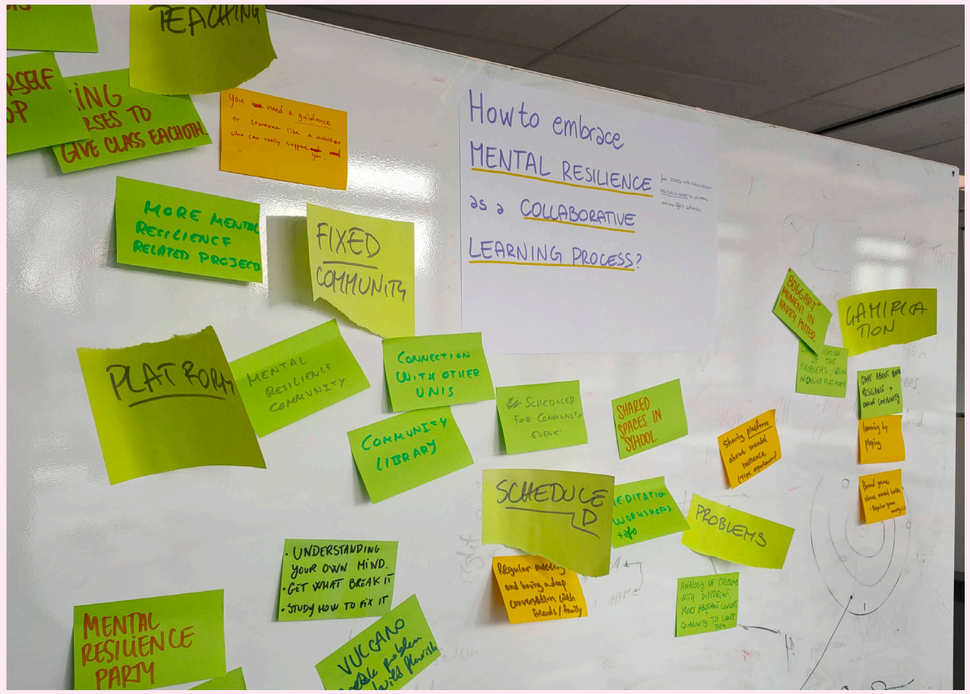


Figure 42a, top of the page. Board with design question and clusters of ideas for "hidden presumptions" exercise.
Figure 42b, bottom of the page: Graduated designer and design students during the creative session.

THREE CONCEPTS AND PROTOTYPES

The ideas from the creative session inspired the development of three concepts based on the design statements defined at the end of the research phase. The goal of ideating and evaluating these concepts was to explore various ways to provide interventions to boost mental resilience.

The generation of the concepts was guided and inspired by the six domains of resilience identified by Rossouw. These are vision, composure, reasoning, tenacity, collaboration and health (Rossouw et al., 2017).

- Vision includes having a personal purpose and being congruent to it with actions.
- Composure means being able to regulate and interpret emotions correctly.
- Reasoning includes being resourceful, having problem-solving abilities, being able to foresee and prevent setbacks, while expecting new opportunities from change.
- Tenacity concerns being persistent in the face of problems, learning from mistakes and having realistic optimism.
- Collaboration is about finding support in others and perceiving this available support. It also includes realising that the context should change the mode of interaction with people.
- Finally, Health is considered "the fundamental domain", an enabler for all other domains. It is a combination of healthy nutrition, quality sleep and regular exercise (Rossouw et al., 2017).

Together with collaboration, which was already part of the design statement, the concept of realistic optimism was central during conceptualisation. Realistic optimism means being hopeful regarding the future and your capabilities to succeed, while acknowledging that there will be difficulties to face (Rossouw, 2021). This was found congruent with the notions of growth mindset and embracing resilience as a learning process. Collaboration was integrated by considering the pal as a close friend with whom the adolescent already shares his/her personal problems. This decision was taken because a friend knows personal characteristics and strengths of the other person much better than a stranger, hence being more helpful in showing a different perspective and pushing for more fitting solutions to issues.

All concepts were then envisioned as smartphone applications supporting development of adolescents' resilience as a learning process to be embraced together with a close friend, from now on referred to as "pal", and were built according to the following structure:

1. Identification: individual reflection on and identification of issue
2. Reframing: facilitating communication with pal; collaborative discussion and reframing of the negative thoughts
3. Goal, planning: collaborative selection of a goal and tool(s) to face the issue
4. Tool use: prompting action and reflection on action
5. Tool adaptation: tracking of progress in order to prompt reflection and integration of tools in daily life

The way reframing was actualised was the main differentiation between the three concepts. The first one, named Questionapp, guided the reframing process by addressing reflective questions to both the adolescent and the pal simultaneously. The second, Metaphoriser, implemented a metaphoric visualisation representing the issue in a novel visual way, to create common knowledge and a base for discussion between the two friends. Laughable, the last concept, relied on the pal ridiculing the adolescent's fears in order to make them look less scary and to spark discussion.

#1 Questionapp
...reflective questions

#2 Metaphoriser
...metaphoric visualisation

#3 Laughable
...ridiculing of fear

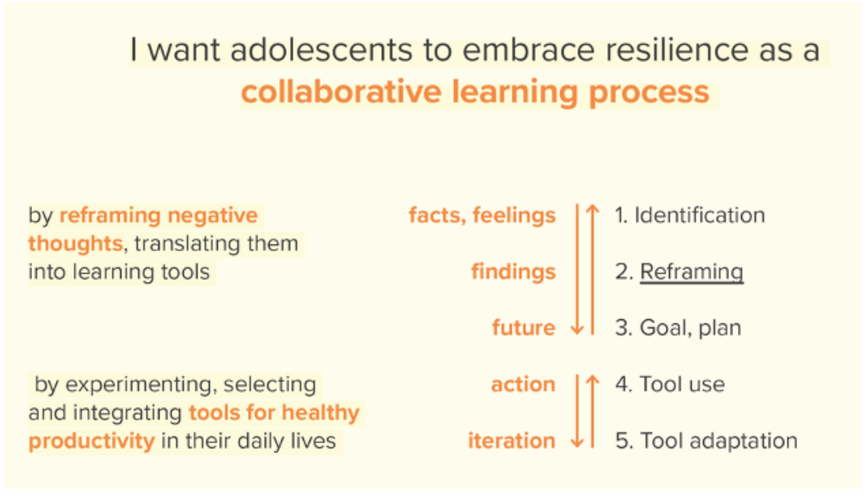


Figure 43. The conceptual structure for the three concepts was based on the design statements and their two mechanisms, results of the research phase. The 4Fs of active reviewing (facts, feelings, findings and future) were also considered in the creation of this structure.

PROTOTYPING

The three concepts were prototyped using Framer (framer.com), an online prototyping tool, and Miro (miro.com), an online platform allowing the creation of collaborative digital whiteboards. Framer allows to input text in forms and interact with buttons, ratings and check-lists in a smartphone app resembling prototype, while Miro permits to input text, move elements and sketch on the whiteboard.

During the user evaluations, the Wizard of Oz prototyping method was implemented to move participants among frames inside the static Miro whiteboards, simulating interaction with the smartphone app. Also, information provided by participants during evaluation was collected in real time and input in pre-arranged files, in order to simulate the app's creation of visuals, that were shared with participants via WhatsApp at the proper timing.

The three concepts and prototypes are presented and described below.

#1 QUESTIONAPP

A smartphone application asking questions that make adolescents analyse their negative emotions together with a friend.

ANALOGY

Embracing resilience as a collaborative learning process should feel like working on a detective case as a duo.

The most relevant characteristics of such interaction were:

- Working as a team
- Having a common enemy
- Inspiring each other, having different points of view and strategies
- Using tools in order to deal with the enemy
- Collecting data in reports for communication and synthesis purposes
- Not ignoring or running away from problems but stop and analyse them in order to solve the bigger case

RATIONALE

Having a common enemy enhances collaboration in teams and communities, making people more motivated and efficient in facing it (Savar, 2019). Adolescents often suffer from similar issues, most prominently academic stress and depressed mood, but they may find it difficult to ask for help to their loved ones. It was also found that sincerely opening up regarding personal issues to a non-human entity such a chat-bot or an AI might feel easier than when talking with

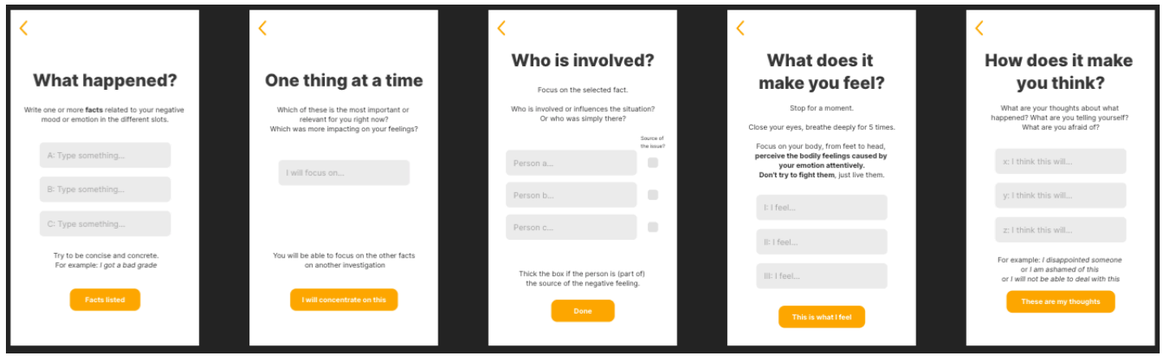
a known person, due to lack of perceived judgement (Borzykowski, 2016).

In this case, setbacks and adversities were considered as the common enemy that adolescent friends could join forces to fight against. During the initial reflection and identification of the issue the adolescent is alone, answering to questions coming from the app. This individual reflection translates into a report facilitating involvement of and discussion with a pal, who provides a fresh perspective on the issue.

Ideally, after analysing an emotion together with a pal, a progress tracking page is created to keep track of the collaborative reflection's results and future progress. This functionality should support persistence on the issue while allowing potential sharing of the tracking page for further collaboration and/or inspiration of peers on the process.

PROTOTYPE

The prototype resembled an app proposing written exercises and was entirely developed in Framer. An initial written reflection guided the user to identify and select one of the unsettling facts that made him/her feel bad, in order to work on it. Subsequent questions regarded people involved in these facts, bodily feelings and thoughts that were prompted. Part of this information was then returned to the adolescent in the form of a report to be shared with a pal. After reading the report alone, the pal could join the adolescent, pretending to be in app and connected via audio, to reflect together on the thoughts the adolescent reported and the opportunities rising from the situation. They could then decide on a goal and a tool to try to face the situation at best. The progress tracking page was mentioned at the end of the prototype, in order to trigger the participants to envision it and express their wishes towards it.



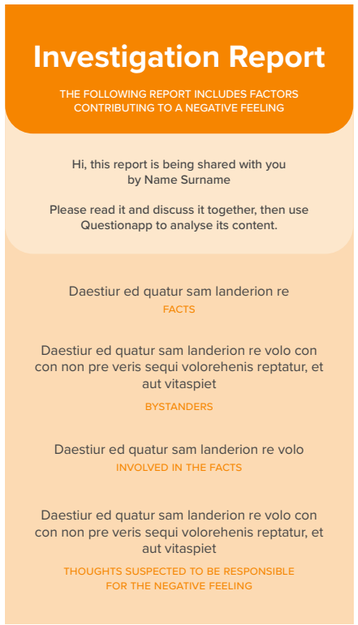
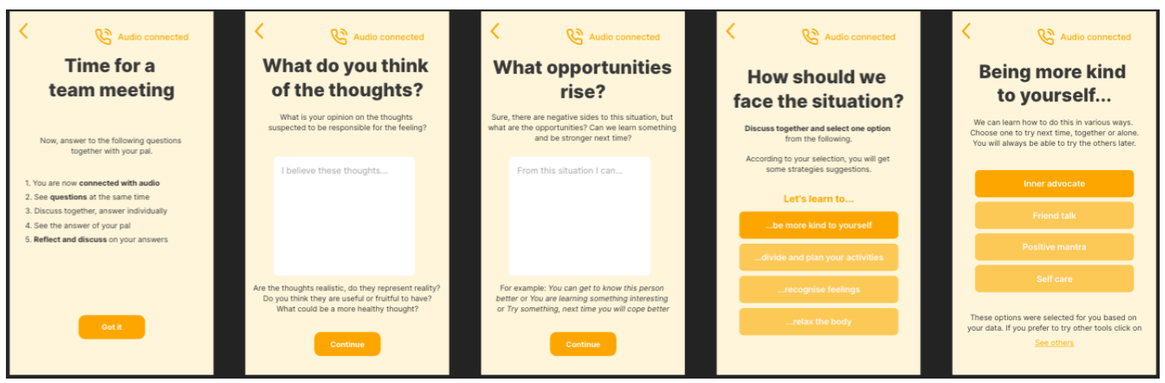


Figure 44a, top of the page.
The adolescent went through a number of screens asking to reflect on what happened, to identify the components of the issue, both practically and emotionally.

Figure 44b, on the left.
The template of the Investigation Report. This report briefly contained the information previously provided by the user, who could share it with a close friend, in order to include him/her in the investigation.

Figure 44c, bottom of the page.
After sharing the report, both the user and their friend went through another series of questions in order to discuss the content of the report and plan a strategy to face the situation together.



#2 METAPHORISER

A smartphone application transforming the source of adolescents' negative emotions in an interactive environment to be explored with a friend.

ANALOGY

Embracing resilience as a collaborative learning process should feel like being part of nature.

Nature includes all existing natural elements, its essence is holistic. Every problem or setback for one of its components means an opportunity for another. A volcano eruption destroys parts of a land but fertilises soil for vegetation. The killing of an antelope is continuation of life for a lion. In the same way, in our lives, problems can be recognised as well as opportunities if we consider the bigger picture.

RATIONALE

Reasoning was identified as one of the six domains of resilience. It includes being resourceful, possessing creative, innovative problem-solving capabilities and being able to anticipate and plan at best how to face difficult situations (Rossouw et al., 2019). Another of the domains is Tenacity, which involves not giving up in the face of adversities, keep being persistent when encountering problems. (Rossouw et al., 2017).

These insights guided the conceptualisation of Metaphoriser. In this concept, problem-solving and persistence are supported by visually representing setbacks as "enemies" in an interactive environment. This kind of visualisation of setbacks should cause the adolescent to perceive them in a metaphorical way, seeing them with different eyes, and eventually finding creative solutions.

Figure 45. Metaphoriser was inspired by the holistic essence of nature: where there is death or destruction there is also new life opportunity.
Photo by Ahmed Galal on Unsplash

This mechanism was inspired by Synectics, a design method that induces the designer to find analogies in order to spark new problem-solving ideas (Van Boeijen et al., 2020). In addition, during the research phase some adolescents made use of metaphors when trying to explain their feelings, which made it possible to consider metaphors as a valid communication tool.

Embodying setbacks into concrete graphic representations and maintaining them in app also stimulates the adolescent to be persistent in solving them, without trying to forget or suppress them. To support persistence, the interactive environment provides resources: tools, in the form of small exercises, that can be used to face the aforementioned adversities. In this way, both the problems and the opportunities are emphasised.

Lastly, enemies are presented in order, one after the other, on the way to a specific personal goal of the adolescent. This should stimulate anticipation and planning regarding reaching that personal goal, which the setbacks are preventing. Ideally, the more a setback would be fought, the smaller it would become, still being present in the environment as a reminder of the adolescent's effort, eliciting a feeling of self-efficacy.

PROTOTYPE

The initial part of the prototype was developed in Framer. In this section, the adolescent alone was firstly asked to describe an issue provoking negative feelings and to identify what kind of ideal situation this issue was impeding. Secondly, reflection was prompted on what other issues represented obstacles to that same wished condition. After this initial reflection, the pal was involved in a Miro board whose settings resembled a video-game in which the obstacles were visualised as enemies to be neutralised to reach the wished situation. Scattered around, it was possible to find a number of tools to try. The adolescent and the pal could select one of them and go through a rather quick exercise together, which would help them in facing the obstacle and slowly get closer to the final goal.

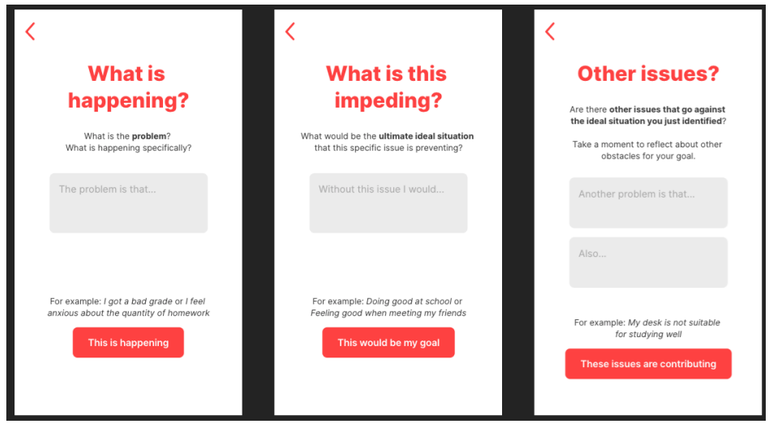
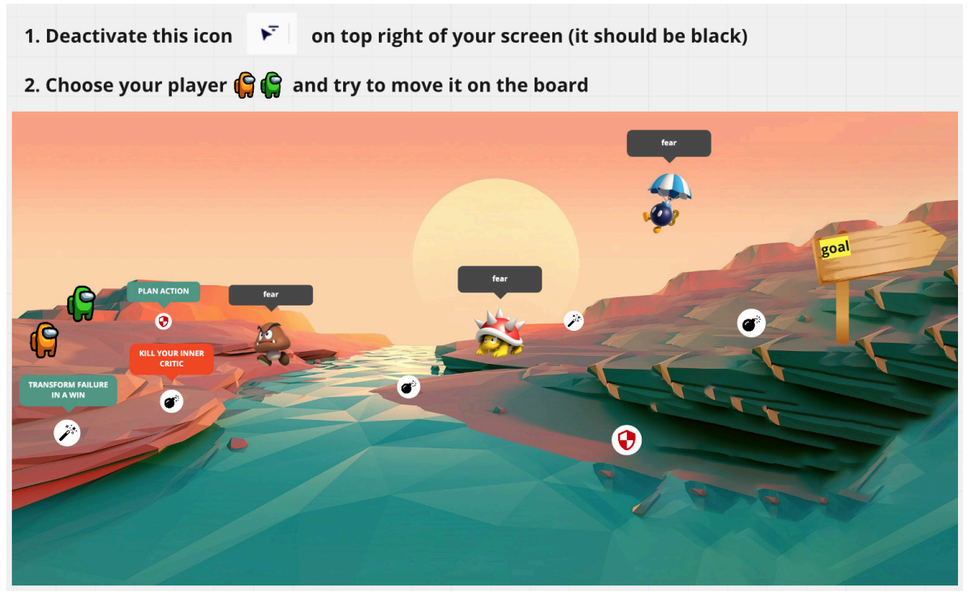


Figure 46a.
The teenager went through some questions alone, to identify the issue (s)he was experiencing, the aimed situation (goal) and other issues impeding the wished situation to happen. These were later visualised as video-game style enemies (see Fig. 48b).



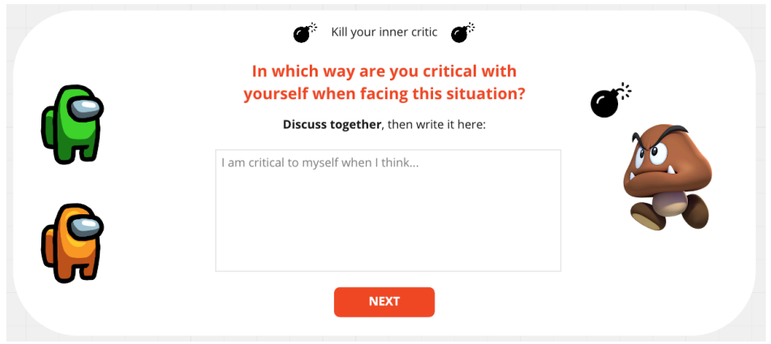


Figure 46b.
The prototyped interactive environment, in which both the adolescent and the pal could move their character, see the setbacks on the way to the goal and choose a tool to fight them.

Illustrations by Nintendo, Among us, Dave2D; No copyright infringement intended, use for research purposes only. Icons by Yaroslav Samoilov, Deemak Daksina from Noun Project.

Figure 46c. The selected tool was presented as a fill-in exercise to be performed in collaboration with the pal.

Illustrations by Nintendo, Among us, Dave2D; No copyright infringement intended, use for research purposes only.

#3 LAUGHABLE

A smartphone application making adolescents laugh and change perspective on their fears by drawing them and having them ridiculed by a friend.

ANALOGY

Embracing mental resilience as a collaborative learning process should feel like being a wizard facing a Boggart (magic creatures from the Harry Potter series, taking the form of the worst fears of the wizards who, thanks to a magic spell, make them ridiculous).

The most relevant characteristics of such interaction were:

- The fear is faced in a protected environment, with support of others
- Something makes the object of that fear look ridiculous
- After this experience, you might have a different approach to the fear and be less scared of it

RATIONALE

During the research phase, half of the interviewed adolescents (4/8) indicated overthinking negative consequences as a source of stress and depressed mood. On the other hand, laughing was proven to make fears look less scary and to reduce stress (Chang, 2013). For these reasons, the idea of Laugable is to make the adolescent laugh on his/her fears while seeing them from the perspective of the pal. By drawing the fear, the adolescent expresses it and makes it concrete, facilitating reflection and discussion with the pal. In the same manner, the pal embodies his/her feedback as a sketch over that fear, trying to make it funny. In this way, the adolescent obtains a fresh perspective on the fear and might recognise his/her own biased interpretation of reality.

It was found that focusing on the circle of influence, as in what is possible to change with actions, rather than the circle of concern, things that cannot be changed, contributes to having a proactive approach and being a more effective person (Covey, 1989). For this reason, Laughable includes a collaborative reflection on what is and was is not possible to do to avoid making the fear come true. The reflection should facilitate adolescent and pal in the definition and writing of an action plan. The drawing is then used to send personalised notifications, inviting the user to stick to the plan.

The drawing with the over-sketched feedback would ideally remain in the app and be paired with tools implemented by the adolescent to face that setback. This would remind the user of the issue, pushing for persistence, while recalling efforts made to overcome it.

PROTOTYPE

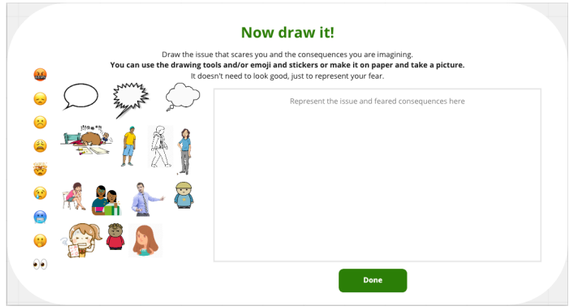
The first part of the prototype was developed in Miro, in order to allow sketching. Initially, a couple of questions were posed to the adolescent in order to identify a fear. Then the adolescent was asked to draw it by sketching it and/or using preset emojis and illustrations. At this point the pal was involved, having to sketch over the previous drawing and making it funny. Then the prototype continued on Framer, were adolescent and pal would go through a short series of reflective questions together, regarding the source of the fear and what would be possible to do to face it. These terminated with the collaborative definition of an action plan. After this, the prototype would ask the adolescent to imagine some days had passed. At that moment, a reminder would be sent to him/her, including the agreed written action plan and a screenshot of the fear's ridiculed sketch. Finally a small reflection on successful and unsuccessful application of the plan was prompted.Three user evaluation sessions were performed with couples of adolescents, friends in real life, via video conferencing on Zoom (zoom.us). An informed consent form was sent to all participants prior to the sessions, which were recorded for later analysis.

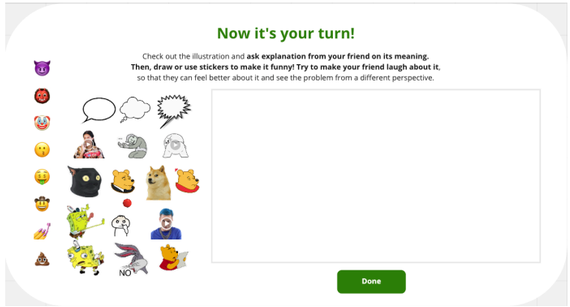
USER EVALUATION

The sessions followed a common script and the prototypes were personalised with the names of the participants before each meeting. During the first session all three prototypes were evaluated, while the following ones focused on two of them, testing different prototypes in different order each time.

The two participants had different roles in the evaluation. From now on, they will be referred to as "main participant" and "pal". The session would start with an introduction and a presentation explaining how the session would unfold. The pal was then moved to a break-out room, hence disconnected from the primary session. The main participant, now alone, was asked to recall a difficult moment experienced recently and the context in which this happened. Also, (s)he was invited to imagine being alone after this event and receiving a notification on his/her smartphone. The link to the (initial part) of the first prototype was then shared with the participant, who was able to interact with it. At the proper timing, the pal was taken back from the breakout room and involved in the interaction with the prototype and the main participant.

At the end of each prototype exploration, some specific questions regarding the single prototype were posed to both participants. At the end of the entire session, a short interview was performed with the two adolescents, to compare and contrast the prototypes. The aim was having the participants expressing their opinions openly. This was also encouraged since the beginning of the session, stating that criticism and sincerity were going to be helpful for the evaluation.





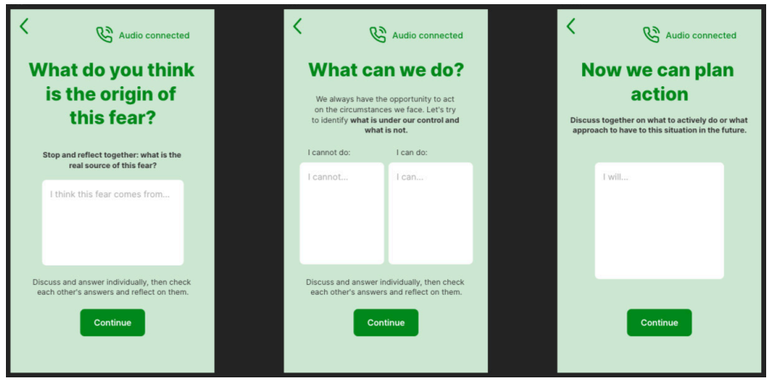


Figure 47a, top.
The main participant of the evaluation had to draw his fear, while his close friend should ridicule it by sketching over it.
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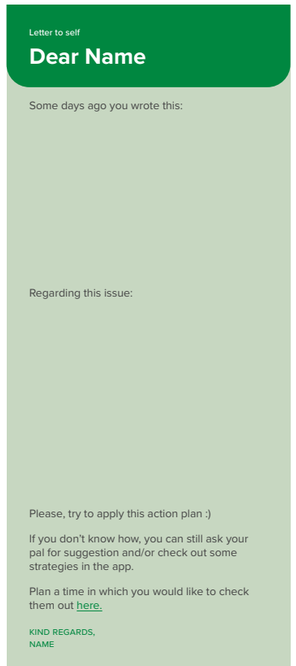
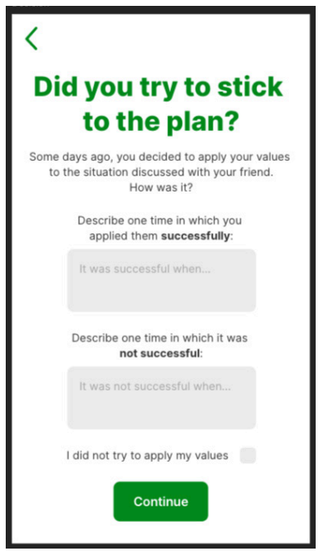
Figure 47b, on the left.
After drawing, the two adolescents could discuss and plan how to face the situation at best, reflecting on what it was possible and not possible to do.





Figures 47c & 47d.
The decision taken together with the friend was reminded to the adolescent, pretending a couple of days had passed, through a "letter to self" containing the action plan and the drawing of the ridiculed fear. After this, pretending some other days passed, the adolescent was asked to reflect on the successful or unsuccessful application of the action plan.

Evaluation script	time		
WELCOME AND RECORD	10 min	Ask if you can **RECORD THE SESSION**	PAL
		Verbal **informed consent** and accepting (?)	PAL
INTRODUCTION		Initial presentation and explanation (think out loud)	PAL
		The prototypes are **really rough and not complete**	PAL
		Pal in breakout room	MP
		Continue presentation only for MP	MP
#1 QUESTIONAPP	15 min	Pal in breakout room	MP
		Share **Framer** prototype link in Zoom chat	MP
		Ask to share the screen	MP
		Let the MP explore the prototype (think out loud)	MP
		Fill report with info	me
		Send report to MP	me
		Pal back in main room	PAL
		Share **Framer** prototype link in Zoom chat	PAL
		Let them discuss the report and finish explore the prototype	PAL
		What did you **think** of this prototype?	
		How was the **individual reflection**?	
		How was the **collaboration phase? Did the report help?**	
		How would you **expect the Case Tracking Page** to be?	
		SWITCH OF EMOTION???	
#2 METAPHORISER	15 min	Pal in breakout room	MP
		Share **Framer** prototype link in Zoom chat	MP
		Ask to share the screen	MP
		Let the MP explore the prototype (think out loud)	MP
		Fill Miro names of enemies and goal with info	me
		Pal back in main room	PAL
		Share **Miro** prototype link in Zoom chat	PAL
		Share Miro prototype password in Zoom chat	PAL
		Follow the participants and move them in the prototype	PAL
		How did you find this prototype?	
		Did you like the **gamification approach**?	
		Do you think it helped to **visualise your issues and goal** like this?	
		How did you like the **collaboration** between you two?	
		What about the **exercise (inner critic)**?	
		What did you think of the **push to personalise** the exercise?	
#3 LAUGHABLE	15 min	Pal in breakout room	MP
		Share **Miro** prototype link in Zoom chat	MP
		Share Miro prototype password in Zoom chat	MP
		Let the MP explore the prototype (think out loud)	MP
		Pal back in main room	
		Share **Miro** prototype link in Zoom chat	PAL
		Share Miro prototype password in Zoom chat	PAL
		Let them discuss and work on prototype	PAL
		Share **Framer** prototype link in Zoom chat	PAL
		Ask to share the screen	PAL
		Let them explore the prototype	PAL
		Fill letter to self with **goal and drawing**	me
		Send letter to self to MP	me
		Pal in breakout room	MP
		Let MP finish to explore the prototype	MP
		What do you think about this prototype?	
		How did you like its **approach to the issue?**	
		How was the **collaboration** between you two?	
		How did you feel about the **exercise can/can't do**?	
		What did you think about the **"letter to self"** way of reminding the strat	
		How did you feel about the **reflection after applying the strategy** (successful/unsuccessful)?	
EVALUATION	10 min	Time for questions!	
		What do you think of the prototypes?	
		Which **one** did you **like the better**?	
		What did you **like** in particular?	
		What did you **dislike** in particular?	
		What would be your **ideal combination of elements** from these prototy	
		Do you think an app like this would be nice to use for you? Why?	
		Would you feel like using it again?	
		What would you think of having a **vocal (audio) explanation** in the app	

Figure 48. The script made use of colours to highlight its most essential parts.

What should you both do?

- **Use your imagination**
  - immerse in the situation
  - pretend the prototype is a product
- **Think out loud**
- At the end, **answer questions on the experience**
- **Be sincere**
  - I will not get offended
  - **Criticism helps me!**
- I am testing the prototype, **not your skills. There is no right or wrong behaviour.**

Try to remember the situation that made you feel like this:

- where were you?
- who was there or were you alone?
- what happened?

Figure 49a,b. The initial presentation used to open the testing with the adolescents.
No copyright infringement intended, use of photos for research purposes only.

FINDINGS

The evaluation sessions were analysed qualitatively. The results highlighted some questions, summarised below.

The three concepts were designed to boost the mental resilience of one adolescent by including a pal to support a friend in the reframing and decisional process regarding a setback. However, when interacting with the prototypes, some adolescents presented an issue shared by both the main participant and the pal. It also happened that while discussing the problem of the main participant, the pal would start talking about his own similar issues. This highlighted the wrong presumption embedded in the concepts that communication regarding adversities had to be hierarchical, from problem owner (main participant) to supporter (pal). Another issue that came clear in this phase was that one single reframing approach would not fit all kinds of issues. For example, it might not seem appropriate to ridicule certain fears.

Characteristics appreciated in the prototypes were the proposal of a variety of tools to face issues, the possibility to track one's progress and the visualisation of steps leading to a final goal. The visual embodiment of setbacks, i.e. as enemies in a video-game in Metaphoriser, was also appreciated but it was pointed out that there should be the possibility to personalise the graphic representation according to the represented adversity.

Participants also highlighted the importance of graphic design in the app: the use of a soft colour and a curated design, including illustrations and nice graphics, would encourage to express and share personal issues. What was also found important was the presence of entertainment elements in the concepts, that would motivate the adolescents to engage with the app more.

Two out of three couples of participants stated that they would not use similar or improved versions of the concepts, since they already shared their problems with their friends. One participant said she would maybe use a similar concept in case she had a problem with her group of friends, seeking for support from outside her social circle.

LIMITATIONS

Something that was not taken into consideration before the evaluation was the eventuality in which the main participant would choose to discuss an adversity that (s)he already discussed with the pal previously. During two of the three sessions, it was clear (and later confirmed) that the two adolescents had talked about the issue in question before. This presumably influenced the results of the sessions, leading to less discussion and less questions coming from the pal regarding the issue, since it was immediately recognised and understood.

Participants were required to bring a close friend with them to the session, and adolescents that could not provide this were automatically excluded from the evaluation. Most participants claimed they would not

use similar smartphone applications in their daily lives, while one adolescent mentioned she could use it with strangers online. This could be a sign that a similar application might be more suitable for adolescents that don't usually open up with friends regarding their personal issues. This was however not further investigated.

One last note has to be done regarding the language barriers encountered. While in the first evaluation session the two participants could use their native language, Italian, in the two following sessions the participants were respectively Spanish and Dutch. The language barrier was present in both cases, and especially during the third session, in which during the final interview the pal started translating the main participant's opinions due to his impossibility to properly communicate them in English. Moreover, during the sessions, the participants had to talk about their personal issues among friends and it can be assumed that having to speak a different language influenced their approach even more heavily than it would normally be in an evaluation session.

Figure 50. Discussion moment after evaluation of prototypes. The evaluation was performed with couples of adolescent friends sharing their screen on Zoom.

#1 Questionapp

pal #1 : "[...] I think it can help to better know yourself, especially in the adolescent age, in which you don't know yourself enough"

Evaluation insights

+

- usable in different situations
- reflection and discussion
- exercises they would not do otherwise
- choice of tools

-

- less engaging (that others)
- tools content not clear

★ Problems of individual but also friends' common problem

★ Case tracking page: tracking of progress and previous reflections

#2 Metaphoriser

mp1 "Seeing my problems like this makes you see they are only a small part of what you are, and that you can even destroy them"

mp2 "You already see the situation represented as in a video game. It was a bit strange."

Evaluation insights

+

- visualisation of steps and goal

-

- fixed representation of issues

★ Show steps and goals, integrate with other concepts

#3 Laughable

pal1 "It was the best one [...] drawing a situation I can express my opinion on the situation my friend is afraid about"

mp3 "You already laugh with friends on this stuff at our age"

Evaluation insights

+

- expression: concrete representation of issue
- collaborative reflection
- new perspective

-

- not suitable for grave topics
- difficult to draw certain topics

★ Make drawing an option, integrate with other concepts

★ Pal highlights positive sides that teen might not consider

Figure 51a,b,c. Results of the user testing of each prototype.

ITERATION

The evaluation of the three concepts led to an iteration based on its findings. This new concept took advantage of the best characteristics of the previous concepts and was used to inspire the strategies, also prompting reflection on the role of design in behavioural change, presented in section 3.2.

TOOL.LAND

A smartphone app providing the opportunity to collaboratively explore tools for resilience according to the kind of adversity faced.

ANALOGY

Embracing resilience as a collaborative learning process should feel like participating in a treasure hunt (See section 3.1 for a detailed explanation).

RATIONALE

This concept was guided by the findings of the previous user evaluation. In particular, the focus that was previously put on one single adolescent was here switched to adolescents as peers, interacting in the same environment. This was envisioned as a map in which each island is unlocked once the adolescent feels stressed or depressed due to a specific issue, grouping people with similar problems in the same areas. The tools that were appreciated during evaluation were here proposed in challenges the users could participate in together with other adolescents. The tools would be introduced to each participants in different ways, for example suggesting to make a to-do list on paper or using a smartphone app. In this way, at the end of the time-based challenge, adolescents using the tool differently would be put in contact with a chat, having the possibility to share what they learned about the tool and giving suggestions to each other. Having experienced a similar experience and used the same tool they would have a common ground for discussion, while the different shape of the tool would promote comparison and inspiration for the future. In the end they would get a reward for the completed challenge in the app in a tracking page.

This concept was not prototyped and evaluated as initially envisioned, but prompted reflection on the role of design in behavioural change, which is presented in section 3.2 Reflection on design.

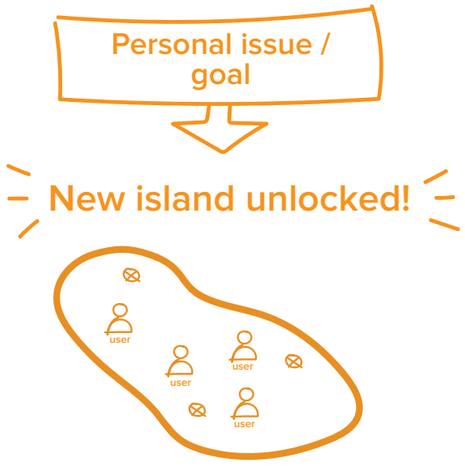


Figure 52a. Adversity unlocks new area with proper tools (Reframing negative emotions into learning tools)

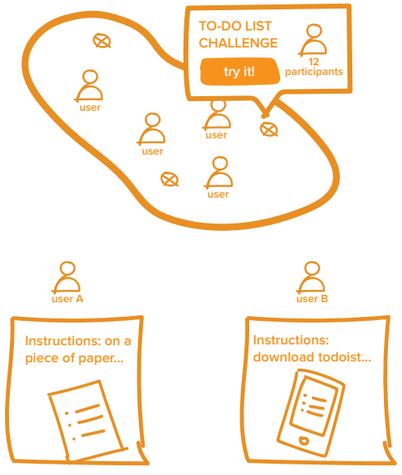


Figure 52b. Group "challenges": same tool in different format for each participant (Experimentation of tools)

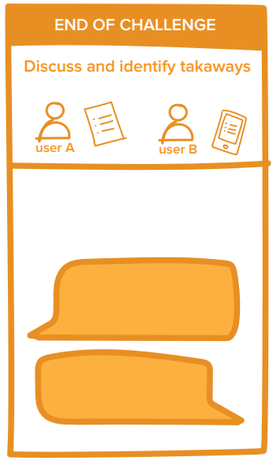


Figure 52c. Peer-review: discussion and reflection on experience with tool (Selection of tools)

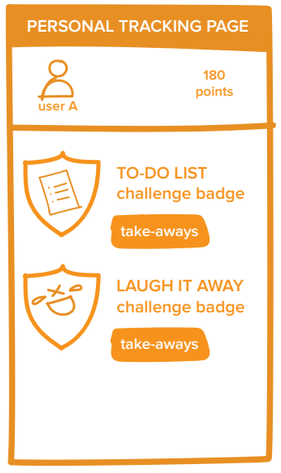


Figure 52d. Reward with main insights in personal tracking page (Integration of tool in daily life)

APPENDIX F. STRATEGIES' EVALUATIONS AND ITERATIONS

The strategies and card deck went through 3 main evaluations and iterations: the fist two with design master students, the last one with expert professional designers and clinical experts such as psychologists and psychiatrist working in the field of adolescent's well-being.

FIRST EVALUATION

The first evaluation was performed with two master design students that were already informed about the topic of the project, using a very initial version of the cards. The students were asked to interact with the cards as they would feel more natural and they were questioned on what they thought the cards would be useful for and if they were understandable. Their interaction with the cards and their comments were taken in consideration to find what format would be ideal to present the cards. To check if the strategies were inspirational, they were asked to make an attempt to brainstorm and apply them in one of their projects or to just ideate on a concept guided by them. The most relevant concepts coming from these quick ideation sessions were collected and implemented as examples in the cards in the following iteration.

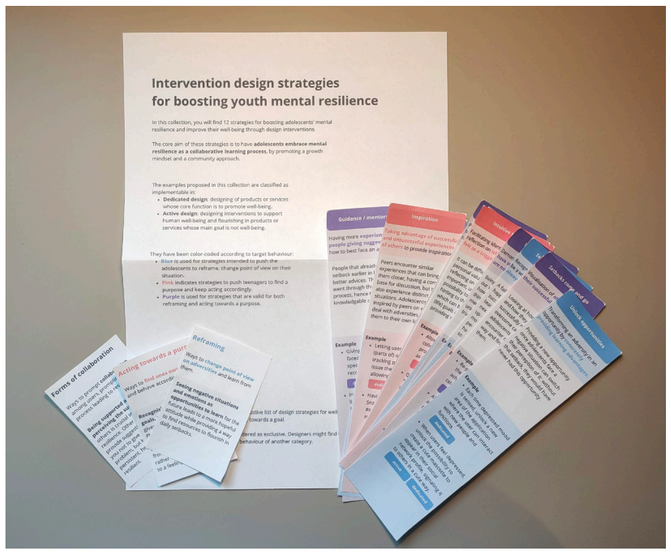


Figure 53. The very first version of the cards was presenting the strategy's title, explanation and examples one after the other in a vertical, narrow format. They were accompanied by a paper sheet explaining their content and some labels categorising them.

Why evaluation with designers

To check...

- If cards are understandable
- If cards are perceived as useful information
- If cards inspire nice ideas
- How cards would be used by the designer
- What format would be best

Evaluation with designers script

1. Give the designer the strategies [with the (shorter) explanation paper (?)]
2. Present the strategies as a product (e.g. design for emotion cards)
3. Ask them to interact with them as they would use some other cards (they don't necessarily have to read the instructions)
4. Ask them to pretend to consult these strategies for (one of) their project
    a. [e.g. for inspiration in their project, or
    b. during a brainstorming session.]
5. Ask them to think out loud
6. Look at their approach to them and observe if they understand them

Questions during consultation

1. Please think out loud.
2. Is everything clear? What do you think the card says?
3. What do you think of the
    a. explanation?
    b. examples?
    c. title?
4. Is the card triggering you any initial design idea? Try to think of one (or more).

Questions at the end

1. What did you think of the cards?
2. What did you think the cards are made for?
3. How would you use the cards?
4. In which phase of the design process would you consult the cards?
5. What do you think of the format of the cards?
6. Do you think the cards should include some other elements or information?

Figure 54. The research questions and script for the 1st and 2nd round of evaluation of the strategies.

After this evaluation round, the cards' layout was made. The title and short explanation were placed on the top of the front card to let designers stack the cards together, as it was noticed to happen during the evaluation sessions. This was found interesting and important for later use of the cards, to promote the implementation of multiple strategies altogether. The examples were placed on the back of the card in order not to bias designers too much during brainstorming or ideation, another phenomenon that was observed during evaluation.

SECOND EVALUATION

The second evaluation and iteration round was shaped very similarly to the first one. The format was open, giving space to four new design students to comment on the cards and brainstorm with their support. The content of the cards was continuously iterated according to the feedback of the students. Psychologist Levi van Dam was also involved in a brief evaluation of the strategies. The cards were sent to him and he was free to give his opinion on them. During the evaluation meeting he expressed positive opinions on the strategies, while providing some relevant feedback for certain cards. This feedback was immediately implemented and enriched the quality of the strategies, including more research-based insights.

After this round of evaluation the cards were iterated again, changing some of their content to make it more clear and creating a visual identity. For example, most students found the term "active" confusing, hence the word was changed into "embedded", to indicate

Figure 55. Second iteration of strategies' cards implemented in the second evaluation round.

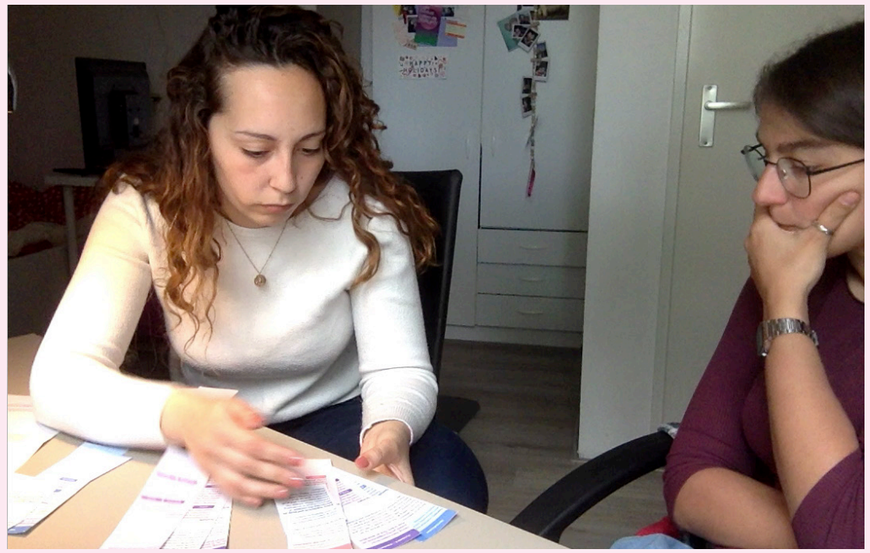


Figure 56a. Design master student participating in the 1st round of evaluation, next to the author.

Figure 56b. Design master student participating in the 2nd round of evaluation.

the same concepts in a more direct way. Also, an instruction booklet was made to cover what students indicated as important during the evaluations. They wished to trust the cards more, receiving more information on the project and the backbone of the strategies, including some literature references. They would also expect to receive some guidance on how to use them in the design process.

Before starting the final evaluation, a design academic and a post-doc researcher in Child and Adolescent Psychiatry were involved in a quick round of evaluation as well. They also gave suggestions on how to structure and approach the testing.

THIRD AND FINAL EVALUATION

These newly iterated cards and instruction booklet were implemented in the third and final evaluation. This time the approach was more rigorous, implementing online forms with ratings in order to properly evaluate the cards. Three professional designers and four experts in adolescents' mental well-being were involved. The experts were: a post-doc researcher in Child and Adolescent Psychiatry and Psychology, a developmental psychologist and academic, a research assistant graduated in psychology and previously involved in the Gmoji project, and a design PhD candidate graduated in health psychology and behavioural sciences. The designers were: a UX designer involved in the Gmoji project, a medior social designer and a junior designer working at Redesigning Psychiatry.

The structure of the evaluation is presented in figure 58. The cards were evaluated first with their envisioned end-users: professional designers. It was considered important to know if the cards were first understandable, useful and inspirational for designers along the design process.

To evaluate this, designers were required to use the card deck to ideate new interventions for well-being to be implemented in projects they were working on, targeting teenagers. One of the designers was not working on such a project, hence she was provided with a fictional brief for which to ideate interventions. One week after receiving the cards, they were asked to provide feedback regarding the cards and their use throught a form, in which they also provided descriptions of the concepts they ideated.

Experts in teenagers' well-being were involved after this phase, in order to evaluate the interventions coming from the use of the cards. They were provided an online form in which concepts were described and their goal regarding well-being was explained. These were concepts generated by the designers, coming from previous evaluation rounds, or concepts implemented as examples in the cards. According to this information, they were asked to rate the meaningfulness and appropriateness of each intervention regarding promoting adolescents' well-being. Two forms were created, containing respectively 5 and 4 concepts. Two experts were assigned to each form, in order to obtain two different opinions for each intervention.

Involving teenagers in the evaluation of the final card deck was considered valuable, but not feasible due to time constrains. Moreover, some interventions had already been tested with adolescents in the phase described in Appendix E, in which teenager participants were involved in evaluation of prototypes.

Figure 57. Third iteration of strategies' cards and the instruction booklet used for the third evaluation round, containing what design students wished to obtain during the first two evaluation rounds.

DYF card deck testing plan – description

Testing with:
1. Professional designers working on projects targeting adolescents
2. Experts in adolescents' mental resilience and well-being

Testing to find if the strategies…
1. Designers: Are understandable
2. Designers: Fit the design process and are inspirational
3. Experts: Lead to the creation of meaningful concepts…
    a. having proper approach
    b. in the proper context
    c. fitting the goal the designer had (inspired by strategy)
    d. based on proper goal

   …for promoting adolescents' well-being

To maintain a certain neutrality most interactions in the testing will happen through **online forms, often using rating scales and open questions or comments.**

A. Testing with designers

2 forms, conceptualisation with use of cards, (maybe) interview

1. **Form A**
    a. What project regarding adolescents are they working on
    b. What was their approach to research in this field
        i. Did they consider well-being
        ii. Is well-being the main focus of the project
    c. Did they use any tools
    d. Generally speaking: what are the current interventions for well-being they conceptualised (if there are)
2. **Provide the card deck**
    a. Ask them to ideate for their own project with the support of the card deck
3. **Form B**
    a. How did they use the cards
    b. In more detail: what interventions did they ideate with the cards
        i. With the use of which card(s)
    c. Future: would they use the cards in future projects and (if yes) how
4. **Interview** (with a couple of them, if timing allows to) for deeper insights

B. Preparation for experts

Preparing concepts for evaluation

1. **Collect concepts descriptions from designers**
    a. Make them homogeneous and understandable for experts
        i. Explain the goal behind (e.g. "this concept aims at promoting resilience by making adolescents celebrate achievements")
2. **Divide concepts per experts available to test** (to avoid overload)

C. Testing with experts

Form to evaluate concepts with rating scales and open comments

1. **Explain context of project clearly**
2. **Present and evaluate concepts one at the time**
    a. Are they meaningful
    b. Do they have a proper approach
    c. Would it be a proper context
    d. Do they fit the goal the designer had (inspired by strategy)
    e. Are they based on proper goal

   …for supporting adolescents' well-being

Figure 58. Research questions and script of the 3rd and final evaluation.

DYF card deck testing (A)

Thank you so much for your availability to participate in this testing procedure.

In this first form you will first give your informed consent for the participation in the study, then you will be asked to give some details on the design project you are working on at the moment. If you are working on multiple projects, choose the one that would fit the best, knowing the card deck you will be testing is designed with a focus on adolescents and smartphone digital products.

After completion, you will receive the Design for Youth's Flourishing card deck to inform the design process and guide the ideation of new (small or big) interventions to be implemented in your project. A second form to provide feedback on the cards and to collect the intervention concepts coming from this ideation will be sent to you as well.

*Campo obbligatorio

1. Email *
2. Your name *
3. Your professional role and seniority *

Study information

02/07/2021

This study is aimed to evaluate the Design for Youth's Flourishing card deck, containing strategies designed to inform the design process and guide ideation of interventions supporting adolescents' well-being to be integrated in new or existing designs, with a focus on digital products.

Taking part in this research is entirely voluntary and refusal or withdrawal at any time will involve no penalty or loss, now or in the future.

The participation will consist of (1) filling a form regarding your project, (2) receiving the card deck and use it to guide your conceptualization of new interventions that could be integrated in your design, and (3) filling a subsequent feedback form, including description of the concepts coming from the use of the cards.
A couple of participants might be asked to participate in a subsequent interview with the researcher, on a voluntary base. In that case, interviews will be audio- and video-recorded and the footage will be destroyed or anonymized at the end of the project.

All recorded data will be used exclusively by the researcher (Sofia) for the purposes of the project and will be anonymized if used in project-related communication (e.g. presentations, reports).

The participant can ask for any clarification, obtain a copy of the data and/or the project results, by addressing the contact person below.

Sofia Fonda

Figure 59. Form A, for designers to give their informed consent and information on their projects targeting teenagers.

5. Use of the information in the study *

Contrassegna solo un ovale per riga.

	YES	NO
I understand that information I provide will be used for reports, presentations and eventually informative videos. In all these cases the material will be anonymized if this is my preferred choice.	◯	◯
I understand that personal information collected about me that can identify me, such as my name, contacts or where I live, will not be shared with anyone beyond the researcher (Sofia) without my explicit permission.	◯	◯
I agree that my information can be quoted in research outputs and that these will be anonymized or not according to my choice.	◯	◯

6. Your privacy choice *

This choice regards mentioning you as a testing participant in the report. You will have the possibility to further decide if your name should be associated with each of the concepts you will ideate in the final form, which you will receive together with the card deck.

Contrassegna solo un ovale.

- ◯ I want to remain completely anonymous
- ◯ I would like my name to be mentioned in the thesis report
- ◯ Altro: _____

Your project's target users

In these sections you give details on the project you are working on, for which you will use the strategies.

7. I am working on a project... *

Contrassegna solo un ovale.

- ◯ targeting teenagers specifically (15-18 yo)
- ◯ targeting young people
- ◯ whose target includes also teenagers
- ◯ whose target is different from teenagers

8. What is the specific target of your project? *

The focus of your project

In these sections you give details on the project you are working on, for which you will use the strategies.

9. The main goal of my project is... *

Please indicate the main aim of your project (e.g. communication, transportation, entertainment, ...)

Contrassegna solo un ovale.

- ◯ supporting users' well-being *Passa alla domanda 11.*
- ◯ Altro: _____

10. Provide a description of your project *

Please provide a clear description of your project, including objectives and main focus.

Your research and design process

In these sections you give details on the project you are working on, for which you will use the strategies.

11. Did you perform research on well-being yourself? *

Contrassegna solo un ovale.

- ◯ Yes
- ◯ No
- ◯ Altro: _____

12. How did you approach and perform research or how did you obtain information on well-being? *

13. Did you use any specific design tool(s) to support your research and design process? *

Contrassegna solo un ovale.

- ◯ Yes
- ◯ No
- ◯ Altro: _____

14. If yes, which tool(s)?

Passa alla domanda 19.

Your research and design process

In these sections you give details on the project you are working on, for which you will use the strategies.

15. Did you consider implementing interventions to support well-being in your project? *

These include any kind of functions designed to support well-being or including characteristics that should promote it.

- ◯ Yes *Passa alla domanda 19.*
- ◯ No
- ◯ Altro: _____

16. If yes, how did you approach and perform research or how did you obtain information on well-being?

17. Did you use any specific design tool(s) to support your research and design process? *

- ◯ Yes
- ◯ No
- ◯ Altro: _____

19. What interventions to promote well-being did you implement in your design (briefly)? *

Please describe these interventions briefly but as clearly as possible. These include any kind of functions designed to support well-being or including characteristics that should promote it.

20. If you like, you can share sketches or more information on these interventions.

THANK YOU AGAIN FOR PARTICIPATING!

You just received the card deck with the instruction booklet.

Now, use the card deck in your preferred way, to try and conceptualise small or big interventions for your design project. You could improve your previous concepts, add functions or ideate brand new ones.

The intervention concepts

Your concepts don't need to be already implemented in your design but...

- they should be feasible, possible to be implemented in your design in a second moment
- they should be realistic and respect the requirements and limitations of your project
- you should consider them proper and worthy of consideration in your project

In less words: the interventions should resemble concepts you would consider for your project in a real, normal setting.

After this, you will be asked to fill the final form describing your use of the cards, giving feedback on them, and describing the design interventions you conceptualised using the cards.

HAVE FUN AND HAPPY IDEATI

THANK YOU AGAIN FOR PARTICIPATING!

You just received the card deck with the instruction booklet.

Now, use the card deck in your preferred way, to try and conceptualise small or big interventions to promote teenagers' mental resilience and well-being, according to the following brief.

–

The brief

Facebook Inc. want to implement some design interventions to promote teenagers mental well-being in their smartphone applications, particularly in WhatsApp and Instagram, Dutch teenagers' most used apps in 2021.

Ideate on interventions to be integrated in one or more of these apps in order to promote teenagers' well-being and mental resilience with the use of the DYF card deck.

The interventions you will ideate could be small or big, and they should resemble concepts you would consider feasible, proper and worthy for such a project in a real, normal setting.

–

After this, you will be asked to fill the final form describing your use of the cards, giving feedback on them, and describing the design interventions you conceptualised using the cards.

HAVE FUN AND HAPPY IDEATION!

FIgure 60a, on the left.
The instructions provided to designers in order to ideate interventions for teenagers' well-being for their own projects.

Figure 60b, on the bottom.
The instructions provided to designers in order to ideate interventions for teenagers' well-being using a fictional brief.

DYF card deck testing (B)

Welcome to the final form for the Design for Youth's Flourishing card deck testing. Thank you for getting this far!

Before starting to fill this questionnaire, you should have received the card deck and already used it to conceptualise some interventions that could realistically and reasonably be implemented in your current design project. If this is not the case, please do that first.

In this form you will be asked to explain how you used the cards and to describe the concepts you came out with using the card deck Design for Youth's Flourishing. You will also provide feedback on the cards and their use.

*Campo obbligatorio

1. Email *
2. Your name *
3. What did you use the cards for and how? *

   Please read all options, select all the correct ones and/or add a new one.

   Seleziona tutte le voci applicabili.

   - [ ] I consulted the cards digitally
   - [ ] I printed the cards and used them physically
   - [ ] To obtain information on how to promote well-being
   - [ ] Before brainstorming
   - [ ] During brainstorming
   - [ ] After brainstorming
   - [ ] To categorise concepts/interventions
   - [ ] To evaluate previously ideated concepts/interventions
   - [ ] To change / elaborate on existing concepts/interventions
   - [ ] To create brand new concepts/interventions
   - [ ] I used the cards alone
   - [ ] I used the cards together with colleagues
   - [ ] I used the cards with potential users
   - [ ] Altro: _____

4. Please elaborate on how you implemented the card deck in your design process. *

   How did you use the cards, more precisely? Was someone else involved in the use?

FIgure 61. Form B, for designers to provide feedback on their use of the cards and descriptions of the interventions ideated using the card deck. Note that it was possible to upload up to 6 interventions and 3 different sections were used to give feedback on the 3 groups of cards, distinguished by colour.

5. How did you approach the information contained in the card deck? *

   Please read all options, select all the correct ones and/or add a new one.

   Seleziona tutte le voci applicabili.

   - [ ] I read all the cards thoroughly
   - [ ] I quickly selected the cards I found were fitting my project and read only those thoroughly
   - [ ] I gave a quick look to the cards I found most interesting / fitting my project
   - [ ] I gave a quick look to all the cards
   - [ ] I didn't read any card thoroughly
   - [ ] I read the instruction booklet thoroughly
   - [ ] I only read the highlighted parts of the instruction booklet
   - [ ] I didn't read the instruction booklet
   - [ ] Altro: _____

6. Any other comment?

Intervention 1

In these sections you will have to describe the concepts you ideated with the use of the cards.

7. Intervention 1: give it a name *
8. Please thoroughly and clearly describe Intervention 1 *
9. If you like, upload a sketch or other material to better illustrate Intervention 1
10. Select the card(s) that contributed to the ideation of Intervention 1 *

    Seleziona tutte le voci applicabili.

    - [ ] Examine feelings
    - [ ] Unlock opportunities
    - [ ] Uncover bias
    - [ ] Serendipity bummer
    - [ ] Normalisation
    - [ ] Celebrate achievements
    - [ ] Find a purpose
    - [ ] Step-by-step
    - [ ] Supported adherence
    - [ ] Peer inspiration
    - [ ] Focus on action
    - [ ] Setbacks come and go
    - [ ] Unique strengths
    - [ ] Guidance / mentorship
    - [ ] Altro: _____

11. This concept is... *

Contrassegna solo un ovale.

- ◯ a new concept
- ◯ an iteration of a previous concept
- ◯ Altro: _____

12. What contribution did the cards give to the concept? *

13. Any other comment?

14. Your choice of use of Intervention 1 in the project *

Contrassegna solo un ovale per riga.

	YES	NO
I want to remain anonymous	◯	◯
I would like my name to be mentioned as the author of this concept in the thesis report	◯	◯
I give permission to include a brief description of this concept as an example to be used in a future iteration of the cards	◯	◯

15. I ideated other concepts *

Contrassegna solo un ovale.

- ◯ Yes, I have other concepts
- ◯ No, this was all *Passa alla domanda 61.*

Future use

In this section, you will express your opinion on if and how the cards could benefit the design process.

61. Do you believe you would use the cards again in the future (in this or other projects)? *

	1	2	3	4	5	6	7	
I don't believe so	◯	◯	◯	◯	◯	◯	◯	Definitely yes

62. Would you use the cards again in the future for this or other projects? If yes, how? *

Please read all the options, select the ones representing your opinion and/or add a new one.

- ☐ No, because I already got the information I needed by consulting them once
- ☐ No, because I don't find them that useful
- ☐ No, because I find them pretty obvious / I have better ways to get this kind information
- ☐ No, because I prefer not to use any tool
- ☐ No, because they were not handy
- ☐ Yes, to obtain and recall information on how to promote well-being
- ☐ Yes, before brainstorming
- ☐ Yes, during brainstorming
- ☐ Yes, after brainstorming
- ☐ Yes, to categorise concepts
- ☐ Yes, to evaluate previously ideated concepts
- ☐ Yes, to change / elaborate on existing concepts
- ☐ Yes, to ideate brand new interventions
- Altro: ☐ _____

63. What was something you liked about the card deck? *

64. What was something you didn't like about the card deck? *

65. Is there one or more cards that you found especially interesting or useful? *

- ☐ Not really
- ☐ I can't choose, they are all equally interesting and useful
- ☐ Examine feelings
- ☐ Unlock opportunities
- ☐ Uncover bias
- ☐ Serendipity bummer
- ☐ Normalisation
- ☐ Celebrate achievements
- ☐ Find a purpose
- ☐ Step-by-step
- ☐ Supported adherence
- ☐ Peer inspiration
- ☐ Focus on action
- ☐ Setbacks come and go
- ☐ Unique strengths
- ☐ Guidance / mentorship
- Altro: ☐ _____

66. If yes, why did you find it/them especially interesting or useful? *

67. Is there one or more cards that you found unclear, confusing or you had some problems with? *

Seleziona tutte le voci applicabili.

- [ ] Not really
- [ ] I can't choose, all of them made me doubt
- [ ] Examine feelings
- [ ] Unlock opportunities
- [ ] Uncover bias
- [ ] Serendipity bummer
- [ ] Normalisation
- [ ] Celebrate achievements
- [ ] Find a purpose
- [ ] Step-by-step
- [ ] Supported adherence
- [ ] Peer inspiration
- [ ] Focus on action
- [ ] Setbacks come and go
- [ ] Unique strengths
- [ ] Guidance / mentorship

Altro: [ ] _____

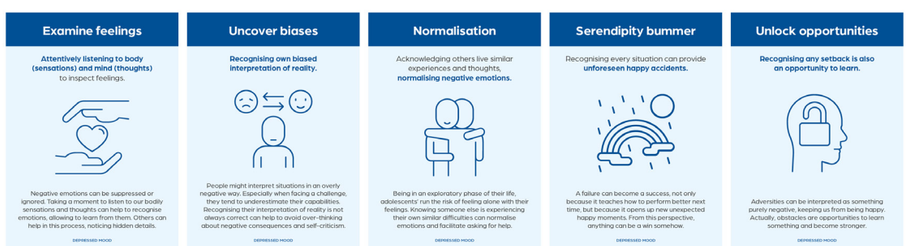
68. If yes, why did you find it/them difficult to understand or to use? *

69. Any other comment?

Feedback BLUE CARDS

In this last sections, rate the following statements according to your perception of the card deck.
Consider now the blue cards, targeting depressed mood.

Blue cards targeting depressed mood



70. How did you use these cards? *

Please read all options, select all the correct ones and/or add a new one.

- [ ] I read them thoroughly
- [ ] I read them quickly
- [ ] I used them to conceptualise brand new concepts/interventions
- [ ] Intervention(s) I described in this form come from the use of these cards
- [ ] I used them to evaluate previous concepts/interventions
- [ ] I used them to enrich previous concepts/interventions
- [ ] I used them to categorise concepts/interventions
- [ ] I didn't read them
- [ ] I didn't ideate any concepts/interventions from these cards

Altro: [ ] _____

71. The cards were generally clear and understandable *

72. The cards were informative, educational *

73. The cards were interesting, attractive *

74. The cards were inspirational in the ideation of concepts/interventions *

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

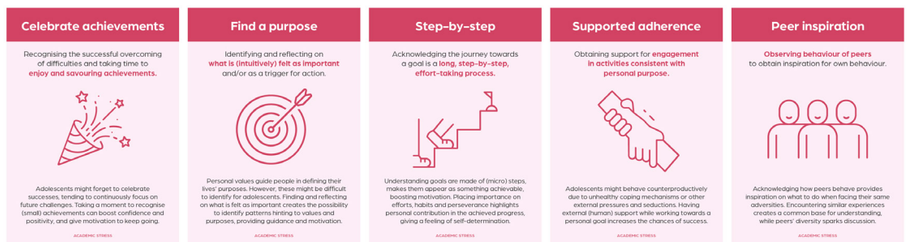
75. Please give an explanation of your choices. *

76. Do you have any other notes on one or more of the blue cards? *

Feedback RED CARDS

Consider now the red cards, targeting academic stress.

Red cards targeting academic stress



*The same questions (70-76) were asked regarding the red cards.

Feedback PURPLE CARDS

Consider now the purple cards, targeting academic stress and depressed mood.

Purple cards targeting depressed mood and academic stress

*The same questions (70-76) were asked regarding the purple cards.

Feedback INSTRUCTION BOOKLET

Consider now the instruction booklet.

91. The instruction booklet was clear and understandable *
92. The instruction booklet was useful *
93. The instruction booklet was interesting, attractive *
94. The instruction booklet inspired trust in the cards content *

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

95. Please give a brief explanation of your choices. *
96. Do you have any other notes on the instruction booklet? *

Concepts evaluation

Thank you so much for your availability to participate in this testing procedure.

In this form you will first give your informed consent for the participation in the study, then you will be introduced to the project and you will be asked to evaluate some design interventions designed to promote adolescents' resilience and well-being through product-mediated activities.

*Campo obbligatorio

1. Email *
2. Your name *
3. Your professional role and seniority *

Study information

02/07/2021

This study is aimed to evaluate the Design for Youth's Flourishing card deck, containing strategies designed to inform the design process and guide ideation of interventions supporting adolescents' well-being to be integrated in new or existing designs, with a focus on digital products.

Taking part in this research is entirely voluntary and refusal or withdrawal at any time will involve no penalty or loss, now or in the future.

The participation will consist of filling this form, giving feedback on design interventions that have been conceptualised by designers with the support of the DYF card deck.
A couple of participants might be asked to participate in a subsequent interview with the researcher, on a voluntary base. In that case, interviews will be audio- and video-recorded and the footage will be destroyed or anonymized at the end of the project.

All recorded data will be used exclusively by the researcher (Sofia) for the purposes of the project and will be anonymized if used in project-related communication (e.g. presentations, reports).

The participant can ask for any clarification, obtain a copy of the data and/or the project results, by addressing the contact person below.

Sofia Fonda

Figure 62. Form C, for experts to provide their feedback on the design interventions. All the evaluated interventions are presented and they were all evaluated with the same set of rating questions, with recurrent space to explain the rating's reason.

4. Taking part in the study *

	YES	NO
I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	◯	◯
I consent voluntarily to be a participant in this study and understand that I can withdraw from the study at any time, without having to give a reason.	◯	◯
I understand and agree that, if I will take part in an interview, this would involve having my image and audio recorded and that this material will be stored in the researcher's personal computer.	◯	◯

5. Use of the information in the study *

	YES	NO
I understand that information I provide will be used for reports, presentations and eventually informative videos. In all these cases the material will be anonymized if this is your preferred choice.	◯	◯
I understand that personal information collected about me that can identify me, such as my name, contacts or where I live, will not be shared with anyone beyond the researcher (Sofia) without my explicit permission.	◯	◯
I agree that my information can be quoted in research outputs and that these will be anonymized or not according to my choice.	◯	◯

6. Your privacy choice *

- ◯ I want to remain completely anonymous
- ◯ I would like my name to be mentioned in the thesis report
- ◯ Altro: _____

Information on the project

Please read carefully this section as it contains explanation regarding the context of the project and its aims.

Design for Youth's Flourishing

Design for Youth's Flourishing is a card deck resulting from Sofia Fonda's Design for Interaction graduation master project. The cards have been designed to support designers in the conceptualisation of interventions to be implemented in products in order to support and boost adolescents' (15-18 yo) resilience and well-being.

In the following sections, you will be presented with some design interventions and you will be asked to evaluate them according to your knowledge regarding how to improve teenagers mental well-being. Every intervention will come with a description and an explanation of the mechanism the designer wished to trigger in order to boost resilience.

Please consider that these interventions are supposed to be a support to teenagers to prevent mental issues and the necessity of therapy. They are not supposed to support or substitute therapy in any way. Every intervention is also not supposed to be exhaustive to support mental health, but should promote engagement in one or more positive (mental of physical) activities, which were found to be influencing 40% of subjective well-being (Lyubomirsky, 2005).

Please notice that, with design, these activities can be facilitated in different ways than suggesting or recommending them (i.e. designing a product that allows an activity to happen naturally). Interventions promoting these activities could be implemented in a variety of different products, from products dedicated to boost well-being to other kinds of products that can promote well-being indirectly.

If you have any questions regarding this matter, please contact:
Sofia Fonda

Intervention A: Personal movie rating

Please read the description and explanation of the intervention thoroughly, then rate the following statements and provide your feedback.

Personal movie rating

A social application for smartphone suggesting movies to watch according to the people you are with.

Like a social network in which you rate movies you have seen according not only to how I liked them but also how, e.g., violent, romantic and scary you found them.
Once you are with some friends and want to watch a movie, you can select their profiles and the app will propose you a movie that according to our ratings could be fitting all people watching.

The main goal of the product would be to help users select what movie to watch when they are with friends, but it would also allow to consult ratings coming from others on a movie you just watched, and see how different interpretations of the same film can be.

Well-being goal of the intervention

This intervention is supposed to let users acknowledge that their interpretation of reality can be biased and not always correct.

In this case, seeing that other people (and friends) rated the same movie in a pretty different way could (1) show teenagers that others perceive things differently; (2) spark discussion with their friends regarding their different interpretations; and finally (3) help them to apply this thinking in their daily lives: e.g. "my interpretation of reality is not always correct, hence it might be I see things too negatively sometimes", or "I criticise myself too much".

This should lead to a more critical thinking towards their interpretations of situations and improve their mental resilience regarding depressed mood on the long term.

7. The goal of the intervention is proper to improve teenagers' well-being *

9. The design intervention fits the target well-being goal *

11. The approach of the intervention is proper for teenagers *

13. The context of the intervention is proper for promoting teenagers' resilience and well-being in the described way *

15. The intervention is meaningful and proper *

17. The intervention promotes well-being and resilience *

19. The intervention could (indirectly) support teenagers to be resilient when facing depressed mood as described *

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

8. Why?

21. Please give a general comment to the intervention *

Emotion mascot

New function on Instagram allowing teenagers to create a personalised mascot to appear in their social network profile, to signal they are experiencing depressed mood to others in a cute way.

When depressed mood is sensed by the teenager's smartphone sensors and/or with the support of a self-report survey (thanks to the new technological practice of digital phenotyping), Instagram unlocks the possibility to create a cute personalised mascot as a temporary addition to their profile.

This mascot would not only be a nice extra in the social network profile: it would also allow other users to see something is going on with that particular person, and it would promote interactions among them and the profile owner, providing access to a network of support.

Well-being goal of the intervention

This intervention is supposed to let users acknowledge that negative situations do not only lead to only negative results, but can bring opportunities to learn.

In this case, teenagers would be provided (1) a new way to get in contact with others through the social network, to obtain support and help from them; (2) the opportunity to acknowledge and have a realistic perception of their support network; and ultimately (3) recognise that obstacles don't just bring negative consequences but also opportunities to learn and to become stronger. In this case, depressed mood would provide this opportunity to be in contact with others and the potential to learn new ways to be resilient thanks to their suggestions or by simply being in contact with them.

Art values

Smartphone application displaying 3 different paintings every day. Choosing your favourite one, you gain access to a description of its meaning and the author's values. You can reflect on them, deciding if they fit you as well.

Seeing three different paintings everyday, with no extra information, would push teenagers to choose for the one they like the most or feel most attracted to. The decision could be taken more or less consciously regarding the reasons why of this choice.

Receiving an explanation of the painting and a description of the artist's values regarding the painting or his/her personal life can be interesting from an artistic and historical point of view. However, being this explanation related to a personal choice the teenager made, it could also push the adolescent to reflect on the values described,

Well-being goal of the intervention

This intervention is supposed to support teenagers in recognising their own purpose(s). Since values are related to and define our lives' purposes, identifying them would consequently facilitating teenagers' identification of purpose(s).

In this intervention, teenagers would (1) be presented with some values that may be related to their owns, thanks to a personal, intuitive choice between paintings made at the beginning; (2) reflect on them and consider if these values could eventually be part of their own values as well; and ultimately (3) identify own values, facilitating a proper selection of (life) purposes.

On the long term, this should promote reflection on things that are intuitively found important in life, and extraction of personal values from them in order to facilitate identification of meaningful purposes to target. This would provide teenagers with increased guidance and motivation in everyday life, promoting resilience when facing (academic) stress.

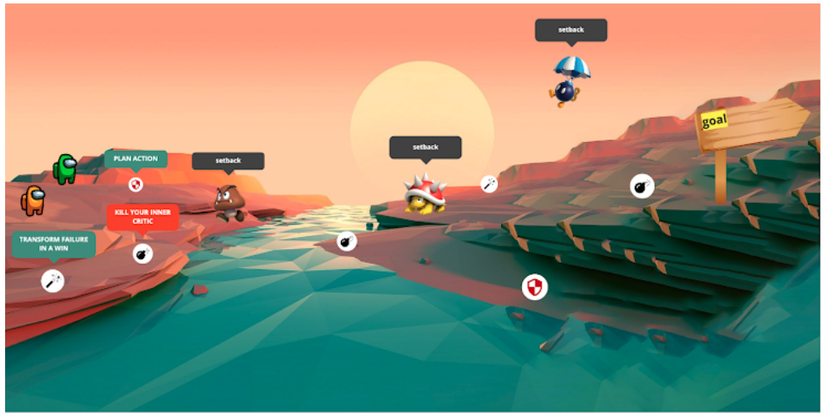
Visualised setbacks

Smartphone application visually representing users' setbacks positioned in order, leading to a final goal, allowing to track action taken to overcome them.

Teenagers are asked to report a problem they are facing and an explanation of what would be the ideal situation if this problem didn't exist. After this, they can indicate more setbacks interfering with the same ideal situation, which can be considered as their final goal. The application allows teenagers to create a personalised visualisation of each setback (e.g. by creating a videogame-style enemy) and it displays all of them ordered in a digital environment, leading to the final goal. Finally, this visualisation becomes a space to plan and track the actions taken in order to face each of these specific problems, potentially providing tools to fight the "enemies".

In this way teenagers have the possibility to see their problems in a concrete way, and recognise that issues need to be addressed one at the time, involving personal effort, to reach the ideal situation they picture.

Example of application



Illustrations by Nintendo, Among us, Dave2D; No copyright infringement intended, use for research purposes only.
Icons by Yaroslav Samoilov, Deemak Daksina from Noun Project.

Well-being goal of the intervention

This intervention is supposed to make teenagers realise that the journey towards a goal is a long, step-by-step, effort-taking process. Emphasising their personal contribution in the overcoming of issues in this way should lead to an enhanced feeling of self-determination.

In this intervention, teenagers would (1) identify what setbacks are preventing their final goal; (2) recognise that these setbacks need to be tackled one at the time, step-by-step, and not all together, in order to reach a better situation; and (3) acknowledge that they need to expend efforts in order to overcome these difficulties.

On the long term, his intervention should support teenagers in facing (academic) stress, by promoting a new perception of issues and the proper way to face them: a long step-by-step journey requiring dedication.

Act or forget

A matching application introducing users to groups of people working on the causes they swipe right to.

Similar to Tinder, this app proposes you some causes, e.g. regarding environment, artistic preservation, etc. You have the possibility to swipe left or right to the, according to your interest. If you swipe left, you are not willing to do something to improve the situation regarding that specific cause; if you swipe right it means you you decided to take action regarding that issue and you will be able to choose among some concrete actions to improve the situation, e.g. signing a petition, joining a group of activists, etc.

In this way, users can concretely act on issues they care the most about, and virtually ignore and forget the others.

Well-being goal of the intervention

This intervention is supposed to make teenagers focus on what is possible to do to improve the situation rather than what is not, focusing on the circle of influence rather than their circle of concern.

Specifically, the app would make users (1) take concrete decisions regarding what to actively "fight" for; (2) practically leave out some choices and categorise them as something they should "forget" about, since they are not acting for them; and (3) concretely take action to improve situations they care about.

On the long term, teenagers should take their personal issues in this way as well: focusing on what they can do, without getting stuck in thinking about what is going wrong but they can do nothing about. This should help building resilience when facing (academic) stress and depressed mood, focusing on the actions to be taken to overcome setbacks, such an exam, and avoiding overthinking on issues on which the adolescent has no influence on.

Your algorithm analysis

An added function on social media where you can view your algorithm report. It shows users their activity and how the algorithm adjusts itself to show them the information they get.

The goal of the intervention would be to make users reflect on what intuitively they find meaningful or interesting.

Well-being goal of the intervention

This intervention is supposed to let users acknowledge and reflect on what they find intuitively important, in order to identify patterns that lead to .

Engaging with this intervention would make users (1) observe their own behaviour on social media; (2) recognise what they spend more time on; and (3) eventually recognise patterns hinting to deeper interests, that could guide the identification of (life) purposes.

On the long term, this should promote reflection on things that are intuitively found important in life, identification of patterns and extraction of personal values from them in order to facilitate identification of meaningful purposes to target. This would promote teenagers' resilience when facing (academic) stress, providing them with increased guidance and motivation in everyday life.

I feel ya

New button to respond to someone else's post on social media, indicating that you also share the same experience, struggle or situation of the post's author.

Well-being goal of the intervention

This intervention is supposed to let users acknowledge they are not the only ones experiencing certain negative emotions or situations, normalising them.

In this case, teenagers would (1) receive external feedback and recognition of their own feelings (or recognising similar feelings to their owns, expressed by others in a post); (2) understand they are not the only ones feeling like that, knowing what they experience is ok; and ultimately (3) normalise these emotions, facilitating the request for external help or support.

Since adolescents risk of feeling alone with their emotions, believe no one else would understand them or that they don't have the right to feel in that way, it is important to normalise these feelings. Knowing someone else is experiencing their own similar difficulties should normalise emotions and facilitate asking for help, promoting resilience when facing depressed mood.

Fuck-up festival

An online festival where people share and celebrate their fails.

Well-being goal of the intervention

This intervention is supposed to make teenagers recognise it is normal to encounter difficulties and to fail.

In this intervention, teenagers would (1) see that a festival is organised on purpose to celebrate what they might consider purely negative situations; (2) share and listen to failure stories with others, alleviating the stigma on failure; and (3) acknowledge that everyone fails, it is normal, and it is possible to overcome failure.

On the long term, this should promote realistic optimism: the acknowledgement that obstacles and failure are part of the journey, while acknowledging that it is possible to surmount them, staying positive and hopeful about the future. Teenagers would then be more resilient in the face of (academic) stress and depressed mood.

Skillshare

A platform for youngsters in Youth services to help each other with skills and challenges like finances, hygiene, putting an Ikea closet together, etc. These youngsters often lack those skills and do not have the social network to fix it.

This platform would build adolescents' confidence and elaborate their social network, making them more self-reliant and positive for the future.

Well-being goal of the intervention

This intervention is supposed to make adolescents discover that adversities can be opportunities to learn something new. Also, it would push them to focus on what is possible for them to do, and to act to improve the situation.

In this intervention, adolescents would (1) have the possibility to get in contact with a network of peers whenever they encounter a practical difficulty; (2) take action to improve their own situation; and (3) learn and achieve something new.

On the long term, his intervention should support teenagers in facing stress and depressed mood, (a) by switching their perception of adversities: from merely negative situations to opportunities to learn something new; (b) by making them focus on what is possible to actually do to improve the situation (circle of influence) rather than on what is not under their control (circle of concern); and (c) by recognising their achievements.
This should boost their confidence and feeling of self-efficacy, leading to increased optimism.

DESIGNERS' TEST RESULTS

Two out of three designers came out with concepts fitting their project or the fictional brief provided, while the other designer expressed some ideas to be later transformed in concrete interventions. The cards were used to ideate brand new concepts, to iterate and elaborate previous ones or to categorise them. One designer indicated how the cards helped her in stimulating creativity and made her take grounded choices regarding her concept. The strategies matched and helped to put together information provided by target users during her previous research.

Two designers rated 6/7 their wish to use the cards again in the same or other projects, while one rated it 3/7, claiming most of the information in the cards sounded already familiar to her. Still, she recognised the deck as a nice overview of well-being interventions and as a tool to be used to communicate with people not familiar with the topic. The same designer found the blue cards as the most inspiring, and the red cards the least novel to her. This was however not reflected in her use of the cards to ideate concepts, which were inspired by 2 red cards and 1 blue card.

What was generally most appreciated in the cards was their clarity and understandability, which was rated 6/7 in average; in particular, one designer appreciated their short and clear copy. The cards were rated 5,6/7 informative and educational; 4,5/7 interesting and attractive; and 5,2/7 inspirational for intervention concepts. The instruction booklet was found 5,6/7 clear and understandable, 5/7 useful, 5,6/7 interesting and attractive and 5,3/7 inspiring trust in the use of the cards.

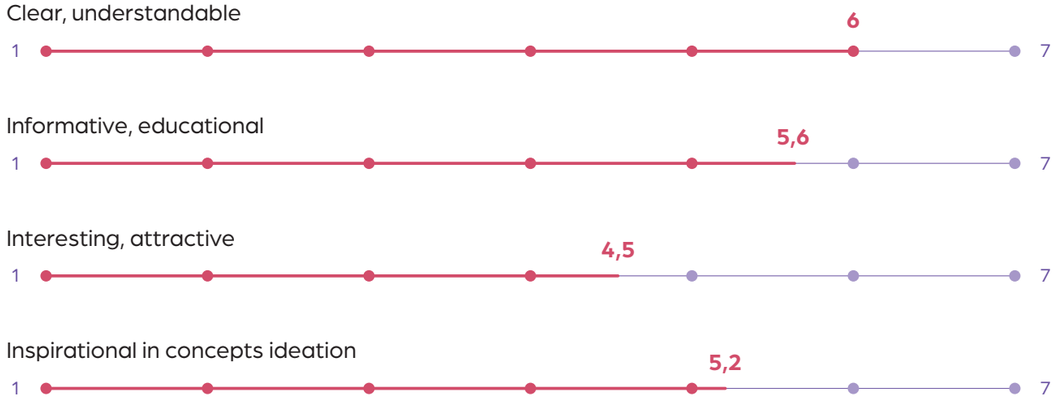


Figure 63. Results from professional designers' evaluation of the cards.

DESIGNERS' TEST CONCLUSIONS

The initial assumption was that the cards would be helping designers during ideation or brainstorming of new design interventions. However, they were found also useful for categorising already ideated concepts, assisting designers in decision making and in making sense of research results, also coming from involvement of users. The cards were more highly rated as informational and educational than inspirational for ideation, and they were found not so novel by the designer most informed on well-being practices, who still indicated them as valuable to communicate with people novel to resilience and well-being knowledge.

For these reasons, the card deck could target designers not familiar with these practices and be of guidance along the entire design process, rather than exclusively of inspiration during the ideation phase:

- at the beginning of a design project, they could be a way to obtain quick condensed information, with the possibility to research deeper on each topic;
- during research, they could help in putting findings in order and make sense of them; and
- after ideation they could be used to categorise concepts and support in providing a rationale for them.

The attractiveness of the cards received the lowest score. This might be caused by the choice of simple icons to illustrate the cards, representing abstract concepts rather than people or interactions. The fact that the cards were sent out in a digital format could also have contributed to this score: it can be assumed that high quality material cards are more attractive than digital or home-printed ones. In further iterations, special attention should be given to the attractiveness of the cards, eventually implementing new illustrations and more deeply questioning designers on their preferences.

EXPERTS' TEST RESULTS

Generally speaking, the evaluation ratings coming from well-being experts were quite critical, as can be deducted from the average ratings reported in figure 64. Many times, the reason for a low rating was a lack of directness in the intervention, e.g. "A much too indirect intervention to try to achieve such a concrete goal." (Art values), "the goal of the intervention is too distant from the teenager's individual and personal goals" (Act or forget), "the best way to reduce their academic stress would be to let them think about strategies to do their work" (Art values). Sometimes a lack of universality of the intervention was reported, e.g. "there is this group of people that does not like movies, and does not go to the cinema" (Personal movie rating). The experts also worried about counterproductive reactions from external people regarding interventions in which teenagers should open up about their feelings, e.g. "it would require teenagers to share negative emotions that [...] could be taken advantage from" (I feel ya); or if the intervention was enough for reaching the intended effect, e.g. "I wonder if the mascot is enough" (Emotion mascot), "I can imagine many factors having a greater impact" (Personal movie rating). Often, issues regarding engagement were raised, e.g. "have teenagers engage with the platforms may be the biggest challenge" (Skillshare), "it would be important to reach those that need [this intervention] the most. Those individuals may be less likely to join an event like this out of their own motivation" (Fuck-up festival).

In other cases, comments were positive, confirming the validity of the interventions and their goals, e.g. "An interesting approach, addressed at enabling the communication on a person's feelings" (Emotion mascot), "the intervention has a good potential to promote resilience in teenagers by informing them about their use of social media. It can be engaging for them and important to understand how their online behaviours influence

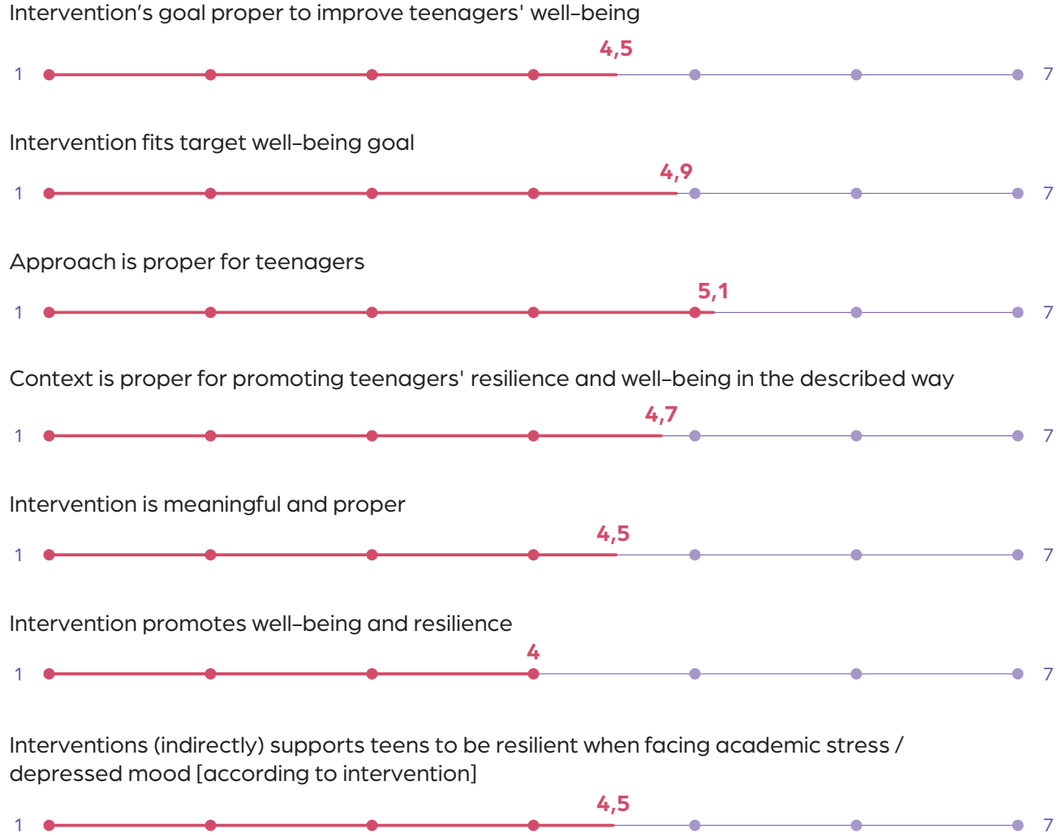


Figure 64. Results from well-being experts' evaluation of the design concepts coming from the use of the card deck. The averages include all evaluated interventions' ratings.

their emotional well-being in the present time." (Your algorithm analysis).

In two circumstances, experts had quite drastically opposite opinions regarding a specific intervention. Two experts even provided evaluations of 5 points difference for the Art values concept. One claimed that the goal of reflecting on own life's purposes was not proper for promoting well-being, rating it 1/7: "Reflecting about your goals in life could even make you sad, if your goals are very high, and you see no way to achieve them". The other one considered it proper (6/7) and expressed enthusiasm for this particular intervention: "Great idea, best idea that I have read so far. Easy, not so time consuming and it is novel".

One of the experts highlighted that "implementation and execution [of the intervention] would be important for the intended effect" (I feel ya).

EXPERTS' TEST CONCLUSIONS

The first noticeable aspect of the results coming from testing with experts was the occasional vast difference in evaluation of different participants regarding the same intervention concepts. This hints at the existence of a variety of (more or less) subjective opinions that can be found in the field of psychology. This aspect had already been pointed out during coach meetings with the supervisory team and by a PhD candidate when discussing the card deck's evaluation plan, who expressed concerns on the validity of experts evaluation due to this phenomenon.

The average rating results hint to an amount uncertainty on whether the interventions ideated using the DYF card deck would promote well-being and resilience in teenagers or not. A number of times, ratings balanced themselves in the neutral-high rating scale due to contrasting opinions. Most of the times, the problem was the "too indirect" approach to personal issues of the teenagers.

It was surprising to find one expert asserting that giving the possibility to contribute to external causes not directly related to the individual, personal issues of teenagers (Act or forget) would not be of help regarding their subjective well-being; while during this project's research, half of the involved adolescents claimed that the source of part of their discomfort was to attribute to the fact someone else was experiencing troubles (e.g. less fortunate students not being able to properly participate in online-schooling). The same happened with the Art values concept: the expert said that reflecting on ones' purposes in life would not contribute to well-being or resilience, or at least not as significantly as other kinds of interventions; while other sources presented it as a meaningful factor for well-being and resilience (e.g., Wiese et al., 2019; Rossouw, 2021).

Engagement of adolescents in the interventions was something often mentioned by experts in evaluating the concepts. A number of time, it was indicated that not all teenagers would have liked to engage with such intervention due to lack of interest in the interventions' topics, e.g. cinema (Personal movie rating), art (Art values). Engagement is indeed a factor that was partially excluded form the research focus, and that needs to be further analysed. However, it might be assumed that experts, being used to rather universal interventions, were expecting concepts possible to be applied to the entire demographic of teenagers, rather than to just people interested in the product in which they may be integrated, who would consequently be positively influenced by its characteristics.

An aspect pointed out by one participant was considered significant: interventions' (well-being) outcomes are heavily influenced by their implementation and detailing. This is a factor that already emerged during user evaluation of prototypes (see Appendix E), in which one teenager participant mentioned how the graphics and visuals of the prototype had an influence on his willingness to open up with such smartphone application. Indeed, these characteristics have a strong influence on user interaction and user experience and could arguably provoke opposite results in influencing of users' mindset and behaviours.

All things considered, this calls attention to the necessity to perform a more rigorous testing involving end-users. As the impact of design is, in its essence, indirect in stimulating engagement in positive activities, it should be researched whether these are actually promoted in teenagers via these interventions, paying specific attention to the influence of concepts' implementation and detailing and potential counteractive effects.

LIMITATIONS

The designers received the card deck in a digital format. Two out of three printed the cards before using them, while one consulted the cards digitally. In the feedback, one designer stated she printed the cards in black and white, hence not recognising the different colours of the cards. This was a limitation for the testing, as the physical appearance and shape of the cards had a precise function for their use.

Another important point that needs to be taken in consideration in such kind of testing is that cards can (positively) influence the work of designers, support them and provide information. However, they cannot guarantee that a designer will ideate meaningful concepts fitting the strategies. Another factor influencing the results might have been the difference in design brief (real ones or fictional one) and the process phase the designers were at when they ideated the interventions. To really test the cards rigorously, a larger number of designers should be involved, designing with and without the strategies on similar briefs and at the same project phase, comparing the results on a big scale.

A somehow similar argument can be raised regarding the testing with well-being experts. Given the novelty and the still high level of subjectivity of this field, experts might need to be really open-minded just accepting the idea of a well-being intervention provided via products, and even more to recognise the benefits of a product merely indirectly

promoting engagement in a positive (mental or physical) activity. A more extensive evaluation should involve a larger number of experts evaluating the same concepts, and eventually inviting experts disagreeing on a concept to discuss their reasons. This lacked in this evaluation due to time limitations and the availability of the experts during holiday.

The format of the testing could also be questioned: the online surveys were implemented in order not to require too extensive time investment from designers and experts, giving them flexibility regarding when to use the cards or provide feedback. However, this probably had an influence on communication and description of the concepts to experts, and reduced the possibilities to discuss what kind of feedback was expected. In one occasion it became apparent that the expert didn't precisely understand the details of an intervention. Other times, the experts' ratings and comments focused on the originality of the concept, rather than on the specific characteristic they were required to evaluate. All this could have been avoided by having the evaluation session in person rather than using a survey. On the other hand, the surveys made it possible to keep a detached approach, limiting the influence of the author in the evaluation of the card deck.

The last and most prominent limitation of this testing relies on the lack of involvement of the target users of the conceptualised interventions: teenagers. Due to time limitations, the decision to exclude them was taken. Nonetheless, as described in Appendix E, some interventions had been tested with couples of adolescents already in a previous phase of the project. These interventions were designed without the use of the cards; still, they were considered as valid examples of application of some strategies, being a product of the same research outcomes and having themselves inspired the creation of strategies. One example is the "Visualised setbacks" intervention, which was found relevant to transfer the step-by-step strategy, supporting the teenager in facing academic stress, when it was tested with users. Experts, on the other hand, had doubts regarding this, rating the intervention 3,5/7 on average (2/7 & 5/7) when asked if the intervention could support teenagers in being resilient when facing academic stress.

FUTURE RECOMMENDATIONS

A future, more meticulous testing should involve designers, experts and end-users altogether, in order to compare results. As recommended by Wiese et al. (2020), to assess interventions in real-time with users, short-term predictors of the probability of getting involved in positive activities should be measured: i.e. a proper user interaction with the product and the trigger of proper drivers of behaviour. Special attention should be given to the detailing of the intervention, its implementation, the risk of counteractive results emerging from interacting with it. This kind of testing would as well provide more information regarding the discrepancy between theory (coming from experts) and practice (user's results).

APPENDIX G. PROJECT BRIEF

DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Fonda 4719
initials: SF given name: Sofia
student number: 5160294
street & no.:
zipcode & city:
country:
phone:
email: s.

Your master programme (only select the options that apply to you):
IDE master(s): ( ) IPD ( ) DfI ( ) SPD
2nd non-IDE master:
individual programme: - - (give date of approval)
honours programme: ( ) Honours Programme Master
specialisation / annotation: ( ) Medisign ( ) Tech. in Sustainable Design ( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Paul Hekkert dept. / section: HCI / DA
** mentor: Nazli Cila dept. / section: HCI / HICD
2nd mentor:
organisation:
city: country:

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

comments (optional)

Procedural Checks - IDE Master Graduation

TU Delft

APPROVAL PROJECT BRIEF
To be filled in by the chair of the supervisory team.

chair Paul Hekkert date 10 - 02 - 2021 signature phekkert Digitally signed by phekkert Date: 2021.02.10 11:43:39 +01'00'

CHECK STUDY PROGRESS
To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 12 EC
Of which, taking the conditional requirements into account, can be part of the exam programme 12 EC
List of electives obtained before the third semester without approval of the BoE

★ YES all 1st year master courses passed

NO missing 1st year master courses are:

name J. J. de Bruin date 16 - 02 - 2021 signature J. J. de Bruin, SPA Digitally signed by J. J. de Bruin, SPA Date: 2021.02.16 11:00:49 +01'00'

FORMAL APPROVAL GRADUATION PROJECT
To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: ★ APPROVED NOT APPROVED

Procedure: ★ APPROVED NOT APPROVED

comments

name Monique von Morgen date 02 - 03 - 2021 signature

Personal Project Brief - IDE Master Graduation

TU Delft

Intervention design strategies for boosting youth's mental resilience project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple.
Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 08 - 02 - 2021 16 - 07 - 2021 end date

INTRODUCTION **
Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Adolescence is one of the most vulnerable part of a human being life, with more than 75% of all mental disorders rising from the age of 12 to 25 (Kesler, et al. 2007). In recent years, a Dutch epidemiological research indicated a growth in school-related pressure, a decrease in school appreciation and an increase in divorces (Stevens et al., 2017). We are also witnessing an increase in stress-related complaints (Kleinjan et al., 2020) and in the percentage of youth receiving youth care in the Netherlands, reaching 1 out of 8 in 2018 (NJI, 2019), while the Netherlands Youth Institute indicated the current Dutch youth care system as 'not suitable to supply the high demands' (NJI, 2019). Moreover, adolescents have a negative perception of current assistance, e.g. therapeutic counseling, perceived as not appropriate to their needs (Leijsdorf et al., 2020). A research for alternative solution appears necessary.

Young people aged 12 to 25 make heavy use of smart-phones with continuous internet access: 98,9% (CBA, 2018). It is common practice, especially for young people, to keep the smart-phone close, checking it many times per day (Andrews et al. 2015, Eadicicco 2015).
Smart-phones are ubiquitous and allow to collect a large variety of data. We shall consider two kinds: (1) Passively collected data, which is characterized by unobtrusive use of sensors and (almost) no engagement by the user. This can be collected through smart-phone's sensors (e.g. GPS location, screen on and off time) or by detecting interactions with its software (e.g. use of applications, keyboard interaction). (2) Actively collected data, which needs to be actively provided by the user (e.g. through self-report). Together, these data offer the opportunity of deducting, measuring and tracking human behavior in real time and in the context of use; practice described as "digital phenotyping" (Insel, 2018). While research in the field of digital phenotyping is still at the dawn, it appears promising and of great potential in identifying behaviors related to mental health, consequently revolutionizing mental healthcare (Mohr et al, 2017). This kind of continuous, contextual monitoring would allow us to provide meaningful just-in-time adaptive interventions, 'aiming to provide the right type/amount of support, at the right time, by adapting to an individual's changing internal and contextual state' (Nahum-Shani et al., 2017). Still, serious consideration must be given to ethical and feasibility issues rising from this practice (Mohr et al, 2017).

"Smart-cueing" is a Dutch multidisciplinary research project involving experts in design, mathematics and clinical psychology, currently being initiated. The term derives from "bio-cueing", which refers to the practice of cueing users when physiological values detected by wearable sensors indicate a risk for health (Paradiso et al., 2011; Riley et al., 2015). The goal of "Smart-cueing" is to create a mobile heath tool, an alternative source of care provided through a smart-phone application. This app would be capable of collecting data from passive and active smart-phone interactions, evaluating the mental state of adolescents in order to provide appropriate interventions to boost mental resilience. From the collected data, a self-learning algorithm would be able to (a) identify patterns of behaviors indicating mental states, (b) provide just-in-time adaptive interventions to improve mental resilience of the user, and (c) continuously learn about both individual users and general behaviors, improving and enriching the correlation between data, behaviors and mental states.

With positive design we can try and answer the question "how can interactive behavioral design based on smart-phone data, support youngsters to influence their emotional well-being?". Considering the three components of subjective well-being: pleasure, personal significance and virtue (Desmet & Pohlmeyer, 2013), and the importance of individuals' actions in sustaining well-being, highlighted by positive psychology, it is possible to consider product-mediated activities as meaningful interventions to improve resilience (Wiese, Pohlmeyer, & Hekkert, 2019).

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Personal Project Brief - IDE Master Graduation

introduction (continued): space for images

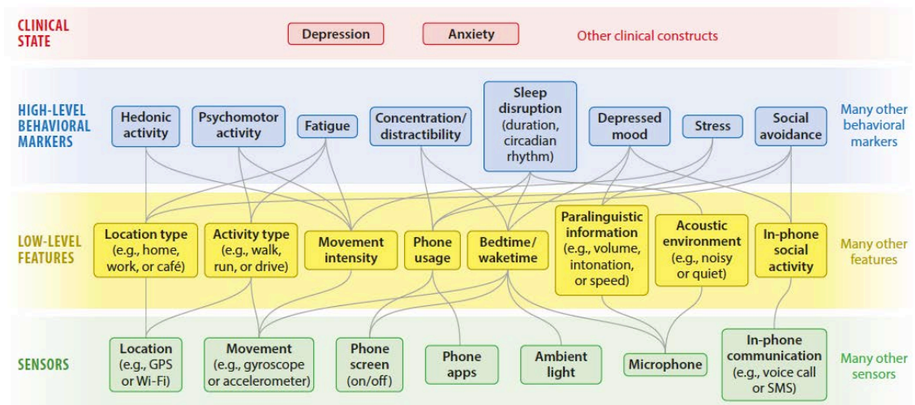


image / figure 1: Example of a layered, hierarchical sensemaking framework to interpret data (Mohr et al, 2017)

Smart-cueing research project

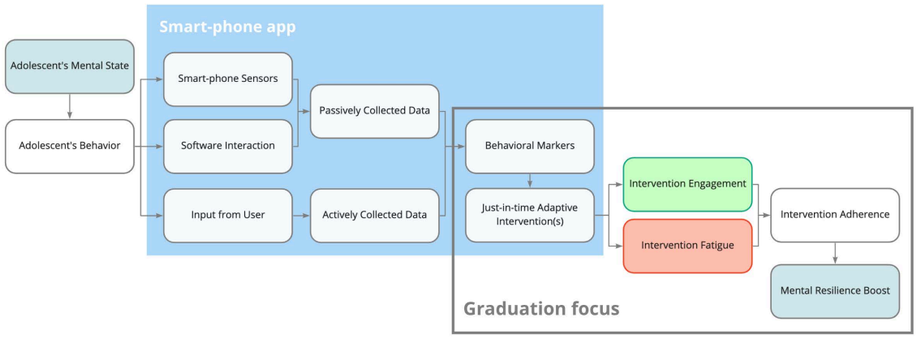


image / figure 2: Schematic representation of the graduation focus related to the Smart-cueing research project

Personal Project Brief - IDE Master Graduation

PROBLEM DEFINITION **
Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

Digital phenotyping has the potential to provide game-changing benefits in the field of mental health care by (a) transforming the way care is delivered, (b) early identification of mental health problems and (c) prompting a new generation of mHealth (mobile health) tools (Mohr et al, 2017).
The "Smart-cueing" research project aims at creating one of these tools, integrating different disciplines in the creation of a smart-phone application.

There are some serious feasibility issues in the development of this tool, which need to be addressed. One of them is ensuring consistent use, intervention adherence and retention by the users. A lack of engagement or an excess of intervention fatigue may prevent the application from having the wished positive impact (Nahum-Shani et al., 2017). Previous research indicates that motivation, engagement and psychological well-being require the satisfaction of three basic psychological needs, namely (1) autonomy, (2) competence and (3) relatedness (Peters, 2019). These could be provided, for example, by allowing users some control on the tool, providing short term benefits, and/or creating an infrastructure that is a social machine (Mohr et al, 2017).

The aim of this graduation project would be to explore ways to design relevant and meaningful resilience boosting interventions of a mobile health tool for adolescents, maximizing engagement, motivation and effectiveness.

The research question will then be:
How can we design interventions for a smart-cueing smart-phone application improving mental resilience in adolescents, maximising intervention adherence and retention by users?

ASSIGNMENT **
State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

The deliverable will be a set of design strategies for designing relevant, meaningful, engaging and motivating design interventions for a mobile health tool, in order to improve adolescents' mental resilience. This graduation needs to be considered as an integrated and initial part of the much wider "Smart-cueing" research project, whose researchers will be involved in the process.

- Initially, the goal will be to select a few of the most relevant high-level behavioral markers (see figure 1) that could reasonably be identified by the smart-phone application using a machine learning algorithm to interpret a combination of passively and actively collected data. The research will also focus on activities that can improve and boost mental resilience, and on how to provide motivation and engagement in these activities, with a focus on adolescents. This part of the research will be performed implementing literature research, interviews with experts (including researchers from the "Smart-cueing" project) and the Vision in Product design method (Hekkert & Van Dijk, 2011).
- To design appropriate interventions improving mental resilience, adolescents will be involved in research and co-design activities inspired by generative and Contextmapping techniques (Sanders & Stappers, 2013). There will be space for prototyping and iterations on the interventions.
- Finally, I will collect the strategies identified along the project and evaluate them with experts.

The aim is to find and match meaningful and engaging interventions to the behavioral markers, in order to identify strategies that can guide future design of appropriate (just-in-time adaptive) interventions. The final delivery will eventually include meaningful examples of interventions and/or (rough) prototypes that will be built along the project. The design strategies are going to guide and support the "Smart-cueing" research project in further research and development.

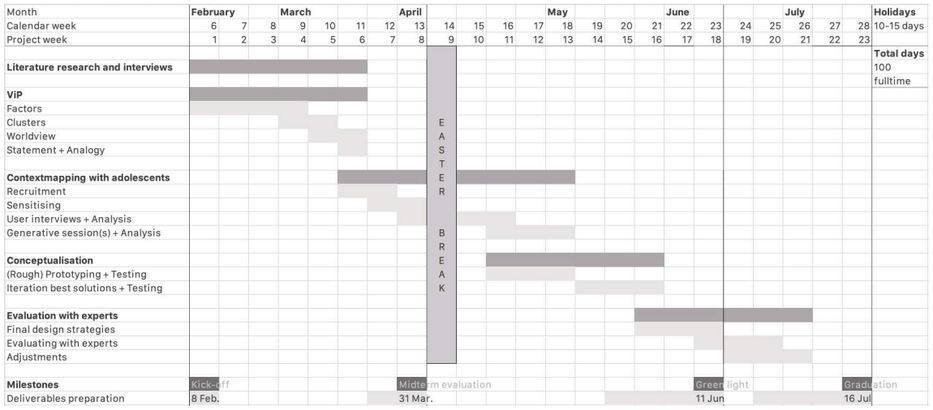
Personal Project Brief - IDE Master Graduation

TU Delft

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 8 - 2 - 2021 16 - 7 - 2021 end date



Initially, I will perform literature research and interviews with experts from the field and people involved in the "Smart-cueing" research project. In the meanwhile I will apply the ViP method.

Later I will apply generative techniques inspired by Contextmapping, involving adolescents recruited through opportunistic sampling. I will consider whether to involve them in one-to-one interviews or group sessions. According to this I will prepare sensitizing material and material for the interviews/sessions. I will later analyze the results. This will be useful to get first-hand knowledge and insights on the adolescent's life, the relationship with their smart-phones and with (mental) well-being activities.

In the Conceptualization phase, I'll collect all the insights gained earlier to create rough experiential prototypes. Depending on lockdown situation, I will try and test them with the adolescents, preferably during generative sessions. The best solutions will be iterated on and tested again.

In the Evaluation phase I plan to prepare the final delivery, in this case probably a booklet of design strategies. This will be evaluated with experts in the field, especially people involved in the "Smart-cueing" research project. I will analyse the results and make final adjustments.

I will work on the project full time during the 4th semester of my master. However, I will take 10 to 15 days of holidays: 5 for Easter break, the others to be spread along the entire project.

Personal Project Brief - IDE Master Graduation

TU Delft

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

As a designer, my biggest aim is to be able to improve the world through design interventions.

The possibility to support the "Smart-cueing" research project in my graduation was proposed to me by professor Paul Hekkert, my chair, with whom I share the vision of design as a holistic discipline, with strong potential impact on people and society. He is one of the main researchers in "Smart-cueing", in which professor Nazli Cila, my mentor, is involved as well.

I have myself a personal interest in psychology and mental well-being, which is reflected in the projects I was previously involved in during my master.
During these projects, I greatly enriched my knowledge on design, methods and techniques. I here provide a brief list of the main competences I acquired, which I desire to apply in my graduation project.
- In Exploring Interactions my vision was to remove the stigma on menstruation by letting women clean their menstrual cup in public toilets. During this project, I practiced interviews with users, (rough) prototyping, prototype testing and concept evaluation.
- In the courses Context and Conceptualisation and Contextmapping Skills I learned and applied the Contextmapping method, dealing with sensitising material, user interviews, analysis of qualitative data, workshop facilitation.
- In the Joint Master Project elective, a fellow student and I decided on the topic of sexual violence, put together a team of students and found a client together. We took first an explorative approach, which lead us to design with a focus on male victims, who are usually neglected in the general discourse on sexual violence. During this project we applied the ViP method, took advantage of interviews and generative sessions with experts in order to create and evaluate concepts, made rough prototypes and tested them to reach final design and recommendations.
- In the Vision in Product design elective, I got more confident with the ViP method while learning and reflecting on the state of and the possible approaches to morality.

In my graduation project I wish to apply the ViP method and generative design techniques in order to identify the most suitable solutions to motivate and engage adolescents in a mobile health tool. I will also involve experts to gain insights on the topic and later evaluate and adjust the design strategies.
All of this would support the "Smart-cueing" research, which I consider a very valuable project regarding innovation in mental healthcare. As previously mentioned, this new approach to mental health has the potential to provide game-changing benefits.

My ambitions for this project are:
- Learning more about digital phenotyping, just-in-time adaptive interventions and (adolescents') mental resilience
- Learning to deal with a complex process, involving multidisciplinary stakeholders all by myself (with the support of the graduation committee), discovering how I will adapt to unpredictable events or insights that will most probably change my view and my planning;
- Trying and experimenting with alternative sensitising and interviewing tools inspired by Contextmapping techniques (if and when relevant) and eventually applying new methods and/or strategies;
- Proving and improving my abilities in (design) research, with the vision of obtaining a PhD position in the faculty and keep on working on research.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

On this report cover, card deck and testing instructions:
"Celebration" icon by Chanut, "Compass" icon by Pascal Heß, "Rainbow" icon by HeadsOfBirds, "Purpose" icon by priyanka, "Muscle" icon by Mohammad Iqbal, "help" icon by supalerk laipawat, "to do list" icon by Icons Bazaar from thenounproject.com. "Step free icon": Flaticon.com.

Design for Youth's Flourishing is a master graduation project contributing to the field of Design for Well-being. Starting from literature research on mental resilience, exploring eHealth tools, interviewing well-being experts, and involving teenagers in her research, the author explores the current state and future context of resilience practices, in order to identify 14 design strategies. These strategies can inform and guide designers in the creation of positive design interventions promoting teenagers' resilience and well-being, and are finally presented in a card deck.