The effectiveness of micro-interventions via smartphones from the perspective of positive psychology

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Abstract

A pilot test for a large study on micro-interventions that aim to increase well-being was conducted. The large study will assess the mediating effect of engagement on the relationship between aspects of micro-interventions and its effectiveness. The pilot test assesses the perception of engaging and effective aspects from the perspective of the participants. 10 participants took part in the 2 week long micro-intervention and were interviewed in regard to their experience. The qualitative data were coded to identify perceived engaging and effective aspects. The pilot study identified elements that are perceived as engaging and effective by the participants, while also assessing the problems participants encounter while using the intervention. Recommendations for adjustments of the intervention were given on the basis of the pilot test´s results.

Keywords: micro-intervention, positive psychology, engagement, effectiveness

With the increase in recognition of the importance of well-being and its potential benefits among scientists in the field of psychology, a growing number of researchers investigates the value of positive psychology interventions and their impact on human well-being (Fuller-Tyszkiewicz, 2019). A new way to apply positive psychological interventions is through the use of web-based technology, which makes it possible to deliver and access these interventions via the web or smartphone applications. This study looks closely at micro interventions; a specific kind of web-based technological intervention which is delivered via smartphone and enables the user to access a variety of content online (Fuller-Tyszkiewicz, 2019). Micro-interventions have a much shorter time frame than most other types of intervention; the present research, for example, uses one that enables users to access a 2 week program, while most web-based interventions have a time frame of about 8 to 12 weeks (Eysenbach, 2005). The intervention used in this research was created to increase well-being and was based on recent developments in positive psychology, a relatively new branch of psychology that will be looked at more closely. This micro-intervention is delivered via smartphone and provides users with personalized content about well-being and various tasks, such as gratitude, relaxation and mindfulness exercises for two-weeks. The present study evaluates the perceived effectiveness and engagement of such an intervention in a *pilot test*. The following larger study will assess how content, feedback and design of the micro-intervention affect effectiveness. It will further evaluate to what extent engagement functions as a mediator between these elements of the intervention and its effectiveness.

Background in Positive Psychology

Positive psychology is a relatively new perspective on mental health and investigates well-being, measurements of the concept, as well as the treatment of individuals with a new strength-based approach (Seligman, 2012). Positive psychology describes the concept of mental health as not just the absence of mental illness, but as the perception and evaluation of one's own life in terms of psychological and social functioning (Keyes, 2002).

Research by Dodge, Daly, Huyton and Sanders (2012) indicates that scientists still find it challenging to define the term well-being. They investigated several notions throughout the history of positive psychology and contemporary psychology and consequently proposed well-being as a "balance point between an individual´s resource pool and the challenges faced" (Dodge et al., 2012). This definition is based on the understanding that individuals have a drive to return to a set-point between their psychological, social and physical resources and challenges. Moreover, the model emphasizes a person's need for homeostasis or equilibrium while fluctuating between resources and challenges. Seligman, one of the leaders

of the positive psychology movement and former president of the American Psychological Society has stated that the concept of flourishing can be seen as the gold standard for the measurement of well-being (Seligman, 2012). Flourishing has become a key concept within the field of positive psychology and describes optimal functioning of people, groups, and organizations (Gable & Haidt, 2005).

The measurement and conceptualization of well-being and flourishing are often assessed with the help of the Mental Health Continuum Short Form (MHC-SF), which is a well-known and common assessment instrument used in positive psychology (Keyes, 2007). The mental health continuum will also play a role in the assessment and understanding of well-being in the present study. It assesses well-being by using items representing the constructs of each facet of well-being, including emotional well-being, psychological well-being and social well-being. With the help of the MHC-SF a psychologist can diagnose an individual with flourishing mental health, which indicates complete mental health with a high level of well-being. Languishing mental health is diagnosed when an individual exhibits low levels of well-being and incomplete mental health. A person whose results indicate neither languishing nor flourishing will be diagnosed with moderate mental health (Keyes, 2007).

Positive psychological interventions aim to increase well-being and get people to flourish in their environment by using treatment methods and activities that cultivate positive feelings, cognitions, or behaviours. These include strategies such as writing a gratitude letter, remembering and mentally replaying positive experiences, and exercising optimistic thinking (Sin & Lyubomirsky, 2009). These new methods of intervention seem to be promising approaches to increase well-being. For instance, they can be used to address symptoms of depression like lack of positive effect and engagement (Seligman, Rashid, & Parks, 2006). Research also indicates that positive psychology interventions may be an alternative to conventional treatment in a wide range of other mental disorders, such as anxiety disorders (Fava et al., 2005).

Researchers have identified five components of great importance in the field of positive psychology, namely, positive emotion, engagement, relationships, meaning, and engagement (Seligman, 2012). There is a variety of exercises in the field of positive psychology which is based on scientific research and implemented in interventions to support the strengthening of these five components. These exercises have been tested and it was demonstrated that people using these interventions are able to boost their levels of happiness long lastingly. For example, the three good things exercise is about recording three positive experiences that happened during the day. Individuals who engaged in this exercise have been

shown to score higher on happiness and are less depressed three months later (Seligman & Steen, 2005).

Another exercise used in the study of well-being is mindfulness meditation. This form of meditation has been researched regarding its physiological and psychological effects and implemented in interventions (Shapiro & Walsh, 2006). Findings suggest that meditation is an effective method for a variety of physiological disorders and problems (Shapiro, Jazaieri, & de Sousa, 2016), and for treating major depressive disorders and reducing depressive symptoms and anxiety in nonclinical populations (Shapiro, Schwartz, & Bonner, 1998). Mindfulness meditation is also implemented in the intervention studied in the present research. Furthermore, researchers have looked closely at how life goals and the processes of goal-setting influence our ways of looking at life and found that successfully setting goals and reaching these increases individual´s optimism functions (Heatherton & Nichols, 1994).

Interventions in the field of positive psychology are also thought to reach people with anxiety, depression and stress problems more easily as they convey a well-being approach that stands in contrast with the conventional problem-focused approach of psychological interventions (Parks, Schueller, & Tasimi, 2013).

Web-based interventions and their application in the field of positive psychology

Positive psychology interventions can aim to increase well-being in the general population or might focus on specific target groups, such as populations with depression and anxiety symptoms (Fava et al., 2005). The application of web-based interventions already began in the early evaluation of interventions in this new branch of psychology and psychologists have long started to use the opportunities new technologies, such as mobile smartphone interventions, bring (Seligman, Steen, Park, & Peterson, 2005). This early movement in the field of positive psychology shaped the term “positive technology” (Botella et al., 2012). The term describes the application of technological products in order to improve the quality of an individual's personal experience, specifically aiming to increase well-being, and generate resilience and strengths in people. Online interventions are interventions delivered via the internet that aim to institute behavioral change and symptom improvement and therefore focus on behavioral issues (Ritterband, Gonder-Frederick, Cox, Clifton, & Borowitz, 2003). These interventions are mostly tailored to the user and interactive while giving them the ability to control the pace. The term online intervention is somewhat misleading since it often entails technology that is connected to the internet but can also be used offline, such as mobile applications, virtual reality, and sensors. Mohr, Burns, Schueller,

Clarke, and Klinkman (2013) therefore offered the term *behavioral intervention technologies* as an alternative.

Researchers found that online interventions or behavioral intervention technologies differ greatly from conventional interventions, such as educational face-to-face approaches (Proudfoot, 2004; Ritterband et al., 2003). These differences include the necessity for hardware (e.g., a smartphone or tablet) to access the intervention and the varying presence of professional support, since these interventions vary from no support or self-help. Further differences are the inclusion of contact information of professionals to even an integrated feature that allows the user to contact someone for face-to-face interventions. Online interventions also differ from conventional interventions in their high level of interactivity, which allows the user to engage in self-tests, exercises, chats, and gaming elements. As mentioned before, the behavioural intervention technologies access a broad variety of multimedia channels, while the number and types of channels included vary within the offer of these interventions. Furthermore, this type of intervention allows users to share content, with regard to ideas, emotions or the request for social support and help. Some behavioral intervention technologies even allow the connection to social media channels, such as Facebook (Bolier and Abello, 2014). The last difference to conventional intervention models is the length and flexibility of the intervention. Web-based interventions span from very simple designs to extended programs with highly personalized and structured content. This feature will be of special importance in the present study and looked at intensively.

A major problem with web-based interventions, such as these online interventions in positive psychology, is the high rate of dropouts which have been recorded in online trials (Eysenbach, 2005), and often forces researchers to exclude participants who did not complete the program in the common time frame of about 8 to 12 weeks. This often leads to limits in the generalizability taking into account that factors like motivation, specific disorders and personality coincide with differential drop-outs (Bolier & Abello, 2014). Using shorter and more intensive micro-interventions could be a practical way to overcome this problem.

Micro-interventions are to a varying extent self-guided and/or guided by a technological design which is capable of monitoring an individual's symptoms and is thus capable of indicating when to engage with resources of treatment provided in the product (Bunge, Beard, Stephens, Leykin, & Muñoz, 2017; King et al.; 2013). Micro-interventions can be divided into two types of small interventions: *just-in-time adaptive interventions* and *ecological momentary interventions* (Fuller-Tyszkiewicz, 2019). Just-in-time adaptive interventions are capable of providing the appropriate type and amount of support at the right

time (Nahum-Shani et al., 2018). This is done by algorithms that monitor symptoms and indicate when an individual´s internal and contextual state is in need of support that can be provided by the adaptive technology. Ecological momentary interventions are less sophisticated treatments that individuals can use in the course of their everyday lives and in their natural environment. The user is therefore able to use the intervention´s content whenever and wherever they want (Heron & Smyth, 2010). For example, a just-in-time adaptive intervention presents relaxation exercises to a user as soon as a high stress level is recorded by a technological device (such as a smart watch), while an ecological momentary intervention might enable users to do relaxation exercises whenever they want to decrease their overall stress level. The present study will apply an ecological momentary micro-intervention.

Micro-interventions often offer exercises which address specific symptoms, while ranging from one single exercise, over variations on the same operation, to multiple tasks that the user has to do (Elefant, Contreras, Muñoz, Bunge & Leykin, 2017). These interventions are designed to be used once or repeatedly over a specified testing period (Strauman et al., 2015). Furthermore, participants who engage in micro-interventions often have to rate their symptoms while using the behavioral intervention technology. The content enables them to evaluate and reflect upon these symptoms and their improvement (Lokman et al., 2017). Micro-interventions may be given to individuals who are suffering from milder mental health symptoms (such as mild depression) to enable them to find resources, which can already extinguish present symptoms and therefore prevent the need of more time-consuming and expensive treatment (Haaga, 2000). They are often used in addition to other forms of health care for a person's need, including for those who are already on waiting lists for treatment or other forms of interventions.

These interventions can also serve as additional therapies while complementing treatment for more potentially severe cases or can maintain participation after treatment to reduce suffering and prevent relapse. This type of behavioral intervention technology can give patients the assurance or certainty that they have the resources to decrease signs of illness or behavioral problems while working towards a long-term goal, for instance, well-being (Fuller-Tyszkiewicz, 2019).

Research in the field of health and psychology suggests many benefits of using micro-interventions in treatment in regard to the effect, usability, cost, and engagement. Heron and Smyth (2010) identified and evaluated twenty-seven ecological momentary interventions that could be accessed via mobile devices. These interventions delivered ambulatory treatment for

eating disorders, alcohol use, anxiety, smoking remission, diabetes management, as well as physical activity and healthy eating. The study indicates that ecological momentary interventions can be delivered successfully and are accepted by patients. They seem to be efficient in the treatment of a variety of unhealthy behaviors, as well as physical and psychological symptoms. For instance, incorporating a smartphone application that provides patients who suffer from anxiety symptoms with relaxation exercises and educational content into cognitive behavioral therapy allowed a reduction in the number of sessions by about half, while keeping up similar efficacy of the treatment (Heron & Smyth, 2010). Furthermore, meta-analyses of the effectiveness of web-based interventions, such as ecological momentary interventions, show positive results in regards to treatment efficacy for several problems, for instance anxiety and depression (Riper et al., 2009; Spek et al., 2007).

Studies have also shown that mental health apps can help individuals to self-monitor behavior which is thought to improve well-being, mental health and emotional self-awareness (O´Toole, Jensen, Fentz, Zachariae, & Hougaard, 2014). Low levels of emotional self-awareness are a common factor in depression and anxiety problems. Users of apps reported an increase in the ability of emotional self-awareness, after being asked to record their moods during several occasions during the day over an extended period of time (Morris, Burns, Schueller, Clarke, & Klinkmann, 2013). Self-monitoring functions, as implemented in these studies, are often part of micro-interventions delivered on smartphones. For instance, Kauer et al. (2012) used a smartphone application for self-monitoring of activity, stress, mood, diet, and exercise with a group of moderately to mildly depressed individuals. The experimental group using the application proved to experience greater positive development in emotional self-awareness and a greater decline in depressive symptoms. A study by Fuller-Tyszkiewicz et al. (2019) indicates that access to a micro-intervention in form of an eHealth platform containing video activities, such as gratitude tasks and relaxation exercises, may produce greater improvements in body satisfaction and a positive body image among women.

An advantage of micro-interventions via smartphones is the fact that people with depressive and anxiety symptoms or those who are just looking to boost their well-being are easily reached with these accessible technologies, considering the over 2 billion smartphone owners worldwide (Statista, 2017). Smartphones thus have great potential as an engaging, low-cost tool for the improvement of well-being and mental health. Behavioral intervention technologies may also reinforce engagement and strengthen translation into everyday lives by implementing technological features that develop social connectivity and create intrinsic rewards (McGonigal, 2011). These features can offer the external support that is needed for

the sustainable behavioral change that is aimed at by the interventions. Micro-interventions are also designed to be “non-consumable” (Muñoz, 2010), meaning they can be used more than once and repeatedly without being used up, unlike a therapist´s time or the number of therapists available in a person's area or region. Evers (2006) found that many people already use the internet with the intention to find health-related information or support and that there is an increase in individuals looking for well-being and healthy lifestyle behavior-related content on the internet. Connecting health-related media with the treatment of symptoms and the enhancement of well-being and resilience is therefore not implausible for a lot of people.

The present study

This study will pilot test the feasibility of a large study on a micro-intervention delivered via smartphone that has been developed by a researcher of the University of Twente who investigates intervention designs of online positive psychology interventions (Kelders, 2019). The intervention provides participants with educational content on positive psychology and exercises, such as gratitude tasks, to increase well being over a period of two weeks. It also allows the participants to monitor and track their mental health by having them visualize their mental state during the time of participation. The large study will evaluate the effect of three aspects of the intervention (content, feedback, and design) on effectiveness and examine to what extent engagement functions as a mediator. The present pilot test assesses the how the effectiveness and engagement of the intervention are perceived by users.

Pilot studies are needed to assess the practicality of the steps that need to be taken to conduct a main study, to assess the resources and possible problems of a study, to assess and reflect on data and human optimization problems and to review the treatment, response of participants and effect on a small scale (Thabane et al., 2010). This pilot study will thus serve as a feasibility study, using the developed intervention on a small scale, while looking closely at the participant's perception of engagement and effectiveness. This will identify possible problems that might occur in the main study and prevent them, test whether certain designs are inappropriate or problematic, and detect technical issues. This type of study also highlights the value of the research for possible funding (Baker, 1994). The present pilot study is exploratory and intends to study the perceived aspects of engagement and effectiveness and make recommendations for improvements and possible design options, while assessing the problems participants encounter. On the basis of this pilot test, the researchers will hopefully see what is functional and what has to be adapted for the large study. The research questions will therefore concern aspects that increase and decrease the

effectiveness and engagement of the interventions, as well as problems concerning technical issues, understanding etc., that participants of the study might have.

Which aspect of the positive psychology micro-intervention do participants perceive as engaging and disengaging?

Which aspects of the positive psychology micro-intervention do participants perceive as effective and ineffective?

Which problems do participants encounter while participating in the positive psychology micro-intervention?

Methods

Design

In the present study, a semi-structured interview was used to collect qualitative data on the experience of a positive psychology micro-intervention that was used by 10 participants. Participants were contacted and recruited by convenience sampling. Since the inclusion criteria were applicable for individuals in the immediate environment of the study, this method of non-probability sampling was applied to collect data from people who were conveniently accessible for the study. The qualitative data was coded to identify effective and engaging aspects of the intervention from the perspective of the participants, as well as problems they encountered.

Participants

Inclusion criteria for participants were being above 18 years old, owning a smartphone and being proficient in English. Only participants who fulfilled these criteria were approached, so no participants had to be excluded from the study. The group of participants was made up of 3 males and 7 females, 9 of them university students from various study programs and 1 of them employed between the ages of 21 and 25 years ($M = 22.9$, $SD = 1.37$). 9 of the participants were German and 1 was Dutch.

Materials

The micro-intervention that was used by the participants was a two week long program that was delivered on the participant´s smartphone. The intervention was accessed via the app `The Incredible Intervention Machine` or TIIM; an application that enables researchers to perform interventions by sending questions and exercises to participants with predefined timing and the use of notifications. The behavioural intervention technology

presented the participants with educational content about positive psychology and well-being and with one exercise per day. These exercises were mostly gratitude exercises, which encourage the participant to compile a list of good things that happened throughout the day. Other exercises ask the participant to write a self-compassionate letter, set goals for the week and divide them into subgoals, engage in small talk with a stranger and perform random acts of kindness.

After completing the micro-intervention the participants were approached and participated in a semi-structured interview of 13 minutes on average with the longest interview being 23 minutes long and the shortest taking 8 minutes (see Appendix A). The interview was conducted within 1 week after completion of the intervention. It started by asking about the general impression of the participant (*1. How was your experience using the micro-intervention? 2. Did you manage to do the exercises? If not, which did you do?*). After that, the perceived user-friendliness was assessed (*3. How easy was it to use the app? 4. Were there aspects that were especially difficult to use?*). Next off were effectiveness (e.g. *5. How effective/ineffective would you say was the intervention in increasing your well-being?*) , and engagement (e.g. *9. Which aspects did you find especially fun/boring?*). Before concluding the interview the participants were asked if they wanted to add anything to encourage additional input that might have not been covered by the interview, but was of importance for the participant.

Procedure

A web-link was sent including the recruitment message and enabling the participant to access the app that was available in the TIIM. Peers and acquaintances were contacted via email and social media platforms, such as WhatsApp. After using the link, participants were also presented with an informed consent form and only proceeded after having agreed upon the informed consent to participate in the study. Participation was voluntary and participants could withdraw from the study. They were also informed that their data would be anonymised and only used for the present study.

Data collection started once the participant had signed up via the received web-link and was enabled to use the app. While enabling the participant to use the application a predefined timing was set to 8 o'clock in the morning, so that participants would receive a notification and a new exercise at that time every day. The exercises and content could be accessed via smartphones so participants were able to use the intervention in different environments. The intervention was used for about 5 to 15 minutes on a daily basis for a period of 2 weeks. After the completion of the micro-intervention the participants were

interviewed using the semi-structured interview that was created for the study (see Appendix A). After the interview participants were thanked for their participation and were still able to contact researchers in case they had any concerns or questions.

Data analysis

The semi-structured interviews were recorded and transcribed for the qualitative analysis. The data analysis was conducted with the software program Atlas.ti. The software can be used to analyse qualitative data by coding semantic information with a variety of tools, such as highlighted segments, codes, memos, hyperlinks, groups, and networks.

In the present study Atlas.ti was used to structure the content of the interviews with codes. The codes were in line with the research questions introduced in the introduction and therefore focussed on engagement, effectiveness and problems.

The coding approach chosen for this research was the top-down or deductive approach. The deductive coding method uses an already established general scheme and identifies specific aspects that fit into general categories. This scheme was based on the previously introduced research on positive psychological micro-interventions which use treatment methods and activities that effectively cultivate positive behaviours, cognitions, or feelings to increase well-being and get people to flourish in their environment. Another crucial aspect of micro-interventions and positive psychology is engagement, since the previously discussed drop-out rates and success of this type of intervention is highly dependent on engaging aspects of the intervention. In order to identify problematic aspects of the study, as commonly done in pilot tests, the coding scheme also analyses problematic aspects mentioned in the interviews. The general categories therefore make up the five codes: engaging aspects, disengaging aspects, effective aspects, ineffective aspects, and problems. These codes are used as labels that serve to explain commonality of variations within the data. The coding was performed by the author of this study using the coding scheme in Atlas.ti to structure and analyse the data. The table below lists all codes, a definition of each code, examples of utterances and number of occurrences. An extended table with key aspects for every code and examples is included in Appendix B. The variations within the code will be used to answer the corresponding research questions. The key aspects refer to specific data that are identified as crucial elements within one coding category, therefore, representing the variation inside the categories.

Tabel 1

Coding Scheme

Code	Definition	Example	Occurrence
Engaging aspects	Aspects of the micro-intervention that are perceived as engaging by the participants	"*I liked the variety of exercises that we had. It would have been fine if you just had the same exercise, but I think now it was more interesting, because they were different*"	23 20.72%
Disengaging aspects	Aspects of the micro-intervention that are perceived as engaging by the participant	*"Sometimes it was not fun to fill in the five acts of kindness, but that was just for me because I was struggling to find something. So I got a bit irritated, oh my god I have to fill something in and I don't what…"*	15 13.51%
Effective aspect	Aspects of the micro-intervention that are perceived as effective by the participant	*"That what you are grateful for (was effective), because you just had to recall, even if it was a bad day somehow, you still had things that make you happy".*	31 27.92%
Ineffective aspect	Aspects of the micro-intervention that are perceived as ineffective by the participant	*"Just when you do not want to increase your well-being. So when you think to yourself "I am just sad right now and I do not want to think about how to feel happy again"."*	21 18.02%
Problem	Problems that participants encountered during their experience with the micro-intervention	*"I was so busy and thought I will do it later and then it went downhill and I kept postponing every time the exercises and also others*"	22 19.82%

"Something that bothered me was that I had to log in every time."	
Total	**112**

Results

The data from the 10 interviews with individuals who participated in the micro-intervention were analyzed with the beforehand mentioned coding scheme. The occurrence of codes is illustrated with numbers and percentages in table 1. The code that was assigned most often to passages of what participants said during the interviews was effective aspects, followed by the codes engaging aspects, problems and ineffective aspects. The code used most seldomly was disengaging aspects (see Table 1).

The data from the interviews with participants of this pilot test were analysed with the beforehand mentioned coding scheme and structured in regard to key aspects to answer the research questions about engagement, effectiveness and problems.

Engagement

The participants of the intervention identified several characteristics of the exercises that were perceived as engaging. They strongly valued variety and stated that the fact that they were able to do several different exercises made the micro-intervention more interesting. ("*I liked the variety of exercises that we had. It would have been fine if you just had the same exercise, but I think now it was more interesting, because they were different").* One participant also mentioned that the challenges the exercises entailed were fun and that they pushed her out of her comfort zone to encounter positive experiences in her everyday life. This was especially so in the "acts of kindness" exercise, for which participants had to perform kind acts for strangers (*"I think it was really fun and sometimes also a bit challenging, with the acts of kindness for example, also sometimes pushing you a bit out of your comfort zone").* Furthermore, one participant stated that he enjoyed writing about people in his life and putting feelings concerning relationships into words (*"(...) you write down things about other people around you and that was always fun to see… to have a look at your relationships (...) That was something new and was fun for me.*). Two participants found it engaging that they learned about positive psychology and well-being (*"What I thought was cool was that you did not only get the exercises, but also some background knowledge –in one*

sentence or so- (…) that way they also explain the background of an exercise to you."). One participant highlighted the freedom she perceived while working on the exercises as an engaging aspect, referring to the absence of pressure to do the exercises in a specific way or having to structure what she wrote in the gratitude and three-good-things exercise (*"I thought it was very good that you could just write down things for you (…) and that it was not like "you have to write it this or that way", but you were relatively free in the use."*).

The application of the content of the app in the everyday life of the participants was an aspect that was often highlighted by participants. Most participants perceived the application of the exercises and what the micro-intervention taught them as engaging. They stated that they became more aware of positive experiences in their everyday life and evaluated them differently (*"(…) now you were more mindful of certain things and in your day to day life you would think "Oh wait, That´s is something I have to still do today." Then you thought more actively about these things").*

Among the aspects that were perceived as engaging, two were visual aspects of the behavioural intervention technology. The micro-intervention included some illustrations that included a character on a bike who was guiding the participant throughout the 2 weeks through the process of the intervention. This aspect of the intervention was perceived as engaging by several participants (*"I thought the animation was… because he drove around with his bike and was like "Good job!" (…) I had someone who guided me on this adventure. That was sweet!"*). Furthermore, the function of the app that enabled participants to visualize mental states and moods within a matrix or quadrant was perceived as engaging by three participants (*"I thought the matrix was cool – where you could put down how you feel, just because there was also this visual aspect."*).

Other aspects perceived as engaging were rather functional characteristics of the smartphone app. One participant experienced the setting goals function as very engaging and enjoyed the process of creating and changing goals in the process of the intervention (*"I thought it was pretty cool, that with the goals. You would put them in the beginning and could then look at them in the middle and change them."*). Another participant stated that the intervention was fun, due to the simplicity of the instructions of the various exercises that facilitate the use of the app in the beginning.

The participants also talked about aspects of the micro-intervention that were perceived as disengaging. Several of these characteristics were directly linked to the exercises that were part of the program. During the three-good-things exercises, the gratitude exercises, and the acts of kindness exercises, participants had to write down positive moments they

experienced during the day or in life in general. Several participants occasionally struggled to fill in these exercises and experienced this as frustrating and disengaging (*"Sometimes it was not fun to fill in the five acts of kindness, but that was just for me because I was struggling to find something. So I got a bit irritated, oh my god I have to fill something in and I don't what…"*). The repetition of exercises throughout the two weeks was an aspect that was most often described as disengaging (*"(...) when the same exercise was repeated on the third day I thought that was a bit boring."*). This was connected to the little variation of exercises that was perceived by a few participants, especially throughout the first week in which they had to do the three-good-things exercise almost every day (*I thought there was not really a lot of variety especially in the first week, because you mostly got the same exercise with the five good things."*). Two participants criticized the lengthy descriptions that they had to write as part of some of these exercises and found them disengaging. Lastly, some of these exercises could not be done well in all environments, as one participant stated; she had trouble engaging in a type of journaling activity on her metro ride to work (*"…I think you need a different environment sometimes. (…) that was a bit dumb to do that in the metro."*).

In regard to disengaging aspects of the intervention participants also mentioned visual aspects as important. Two participants thought the aesthetics of the app were dissatisfying and therefore lowered their engagement (*"The design of the app – I thought it looked very amateur-like and sometimes a bit unclear (...)")*. One aspect that was highlighted as especially disengaging by almost all participants was the perceived pressure of having to do the exercises, sometimes to such an extent that the intervention was experienced as a burden or stress factor (*"But you had the feeling you do this not that much for yourself but because someone tells me to do so."*). Furthermore, one participant found it disengaging to experience disappointment with the results of the exercises and a feeling of demotivation (*"(...) and then I thought "then it does not even work" and did it even less for myself, because it did not have the effect."*).

Effectiveness

During the interview participants talked about aspects of the micro-intervention they perceived as effective and ineffective in increasing their well-being. The exercises that were done during the two weeks were all mentioned by the participants: this included the three good things exercise, the gratitude exercise, and the acts of kindness exercise (*"For example, holding open the door for someone or giving someone 20 cents who is missing them at the supermarket – I wouldn't have labelled it that way before. That was a bit – "Okay, that is really interesting now!""*). Having to state how they feel by using the quadrant to visualize

their mental state and mood was also perceived as effective. According to one participant, these exercises helped to make him become more self-aware (*"What I mean with self-awareness: Just that you reflect a bit more on yourself. (...) And the app really helped with that, so that you asked yourself "Okay, but why is it that way? Should it be like that? Why is like that? (...) That, I think, is something valuable."*), which was evaluated positively in regard to the effectiveness of the intervention. Many participants also acknowledged that the app helped them focus on the positive aspects in their life (*"Because you just recall, even if it was a bad day, that you still have things that make you happy."*) and made them realize that there already are positive things in their lives which they now evaluate differently (*"Or for me it was the fact that I already do this in my everyday life –for example, that you are kind to the people around you and that is something that I always like to do."*). Furthermore, several participants evaluated the aspect of being able to integrate the app into their everyday lives to recognize pleasant things as effective (*"Because it was just well-integrated in everyday life I did not think about it every day. You rather realized during the process towards the end that it was for example nice to fill it out or to do something nice for someone and that really helped."*).

One participant stated that the fact that by just using the app she acknowledged that well-being is important, which she perceived as an effective aspect of the intervention (*"Just that you have done it; that yoúve exposed yourself to it and that you tell yourself, this is something important and with what I want to do something and I think that alone helps."*).

Two educational aspects of the micro-intervention were regarded as effective, namely the possibility of learning about strategies and techniques to increase one´s well-being (*"Just that I know in how far it can give me information or techniques to increase my well-being. I have to say, it did that."*), and the content presented in the app about positive psychology (*"You know you do it to apply positive psychology, but it was nice to have the app explain it to you."*).

One participant perceived the notifications she received on her phone as part of the intervention as effective, because they reminded her to do the exercises. Another participant regarded the positive messages within the app in the beginning or end of use as effective (*"I think the positive messages in the beginning or the end – it was really uplifting."*).

Several aspects related to the exercises were perceived as ineffective by participants. For instance, a lack of understanding of the acts of kindness exercise was mentioned by several participants. Not being able to clearly understand what the exercise entailed through the instructions seemed to cause frustration (*"For me personally the acts of kindness because*

it was hard for me to distinguish between what were mundane tasks and what really was an act of kindness"). Frustration was also caused by not being able to fill out exercises due to lack of ideas or experiences, which was also rated as ineffective (*"Sometimes when I thought about it and just came up with 3 of 5 things (...) then I thought maybe it was not a good day."*). Several participants thought it was ineffective to have to do the exercises every day, since that was perceived as difficult, and sometimes even as stressful or being a burden (*"It was really difficult for me to do that every day. So thinking about it excessively every day was sometimes a bit – not stressful – (...) that was a bit difficult sometimes."*). Some people felt they were at times unable to apply exercises to their day (*"It was a bit bothersome sometimes to think about what was good today or what was something kind that I did for someone else, when you did not even leave the house."*).

Furthermore, two participants experienced times throughout the two weeks when they did not want to increase their well-being (*"Just when you do not want to increase your well-being. So when you think to yourself "I am just sad right now and I do not want to think about how to feel happy again"."*); they then rated the exercise as ineffective because it did not fulfil their needs. One participant also mentioned that she did not think it was effective to write things done for exercises, such as the three-good-things exercise, and would have rather just thought about it.

Problems

The participants of the micro-interventions all encountered some kind of problem while using the micro-intervention. One problem mentioned in every interview was postponing and forgetting exercises (*"I was so busy and thought I will do it later and then it went downhill and I kept postponing every time the exercises and also others*") and some mentioned that this was mostly due to stress or inefficient time management. Another encountered problem was the experience of the app as a burden according to one participant (*"In general, I have to say, did I experience the app during the last four days, rather as a burden. Just because the daily exercises repeated themselves."*). One participant perceived the difficulty of not knowing what to write down as a problem, which often was due to her thinking her thoughts were too trivial (*"Sometimes I just thought these things were so trivial. I just did not really know what to put down there."*).

Other problems that were encountered during the two weeks of participation were technological issues. One participant experienced times when she could not access the intervention due to a deficient internet connection. This participant also encountered problems when trying to log in to fill out the last questionnaire at the end of the intervention (*"Only in*

the end with the email address –it didn't recognize my email address for a while, with the last questionnaire.").

A major problem was encountered by one student who could not access the intervention via her smartphone using her registered email address. She was still able to log in on her computer, which lowered the quality of the experience, since the intervention was created for smartphones (*"It did not work, so I had to log into it on my browser, that's why it was a bit… it just was not handy (...), because I just did not receive any notifications."*). Another technical aspect that did not work properly for a few participants was the touch screen function during the visualization of the participant´s mental state before and after an exercise. They had problems moving the circle they had to position on the matrix (*"In the beginning with the matrix that you had to swipe what you are feeling now, I had to look like, what do I have to do and sometimes it was not really responding in the first seconds, but I got used to that and then I knew where I had to click a few times and then it would respond"*). A few participants also noted that they did not know where to fill in things during some exercises in which they were asked to write some things down. They stated that sometimes they would put everything into one row and then realized after going to the next page that what they wrote down already what had to be put there (*"I often put it into one row and later I realized that there was a row for every (thing), because they were not numbered."*). One participant also thought it was a problem that he had to log in every time he wanted to use the app (*"Something that bothered me was that I had to log in every time."*). Two participants encountered problems because they were using old phones; they did not receive notifications at all or could not do exercises when they wanted to do them, because the battery suddenly died (*"And also because my phone is so old and my battery dies very often, that was bad, because then I could not do it in the metro, because my phone was off."*).

Discussion

Main findings

This exploratory pilot study aimed to assess which aspects participants of the micro-intervention perceived as effective and ineffective, engaging and disengaging, and also which problems they encountered while taking part in the study.

The findings show that the participants perceived the variety of exercises and content of the micro-intervention, positively challenging elements (such as the random acts of kindness exercise), and the possibility to apply the content of the app in their everyday lives

as engaging aspects of the intervention. Learning about positive psychology and well-being, the experience of freedom while doing the exercises and the visual aspects of the intervention were also recognized elements that added to their experienced engagement during the two-week program. This is in line with research by Kelders (2019) who found that the design of online positive psychology interventions influences the engagement, by visualizing progress or implementing a character, as done in the micro-intervention used in this study.

The findings regarding engagement of participants in micro-interventions highlight that this type of micro-intervention offers elements that facilitate engagement with aspects such as variety of exercises and easily accessible learning content. This conforms to research by Bolier and Abello (2014) who found that the use of technology and the internet, as it was done in the present study, can help to increase the engagement of users. According to the researchers the new technologies increase engagement by helping individuals translate knowledge into practice; an aspect that was often mentioned by participants of this study. Bolier and Abello (2014) further mention rewards that are implemented in technologies and that increase engagement. This is also coherent with the results of the present study, since they indicated that participants valued the positive feedback within the app and the kind regard of the character that guided them through the process.

Disengaging aspects named by the participants of this pilot-study were mostly connected to the exercises and included: struggling to fill in exercises, repetition, lengthy descriptions they had to write and not being able to do exercises in all environments. They further mentioned the dissatisfying aesthetics of the app, perceiving the app as a burden that added pressure to their lives, and disappointment with the results as disengaging factors.

The participants talked most extensively about effective aspects. They rated all exercises as generally helpful in regard to an increase in their well-being and often mentioned that having to state how they feel made them more self-aware, which was also regarded as effective. Other effective aspects that were mentioned were the help of the app to focus on more positive aspects in their lives, the notifications, and the educational aspects of the app, which entailed learning about strategies and content of positive psychology.

The perceived general effectiveness of the micro-intervention is in concordance with scientific evidence that supports self-monitoring apps as an effective means to increase mental well-being (Bakker & Rickard, 2017). The findings of this pilot-test suggest that self-monitoring is a crucial aspect of effective micro-interventions since the visualization of mental states that was part of the exercises was often perceived as especially effective in regard to an increased feeling of well-being by participants. Several participants of the pilot-

study described a perceived positive impact of the intervention on their well-being due to the exercises or the mere focus on mental health.

When participants did not understand exercises or were not able to fill out exercises due to a lack of ideas or positive experiences they regarded this as ineffective. Having to do the exercises every day was also often perceived as ineffective by participants. Furthermore, some participants identified not being able to apply exercises to their day, constantly having to write things down, and not wanting to increase their well-being but being forced to do so as aspects that were perceived as ineffective.

Participants shared the problems they encountered during their participation in the intervention. The problem that was mentioned most often was postponing and forgetting to do exercises due to stress or high work or study load. A number of participants experienced the app as a burden, because they felt they had an extra responsibility or duty to fulfil. Some problems were rather technological issues and included not being able to access the intervention due to a lack of internet connection, not being able to access the intervention on their smartphone and the malfunctioning touch screen function during the mental state monitoring in the beginning and end of each exercise.

Given the fact that different age groups adopt differently to new technologies as shown by Morris and Venkatesh (2000), who investigated adoption to technology in the workforce, it would also be of interest to assess how different age groups interact with this type of behavioural intervention technology. Their research found that younger individual´s technology use was highly impacted by their attitudes towards the technology in question, whereas older individuals were more strongly controlled by their perception of whether they were actually able to use the technology and their perceived judgments of others to use a technology. If micro-interventions were to be implemented on a large scale in the general population research on how different age groups interact and perceive these technologies would be crucial in order to ensure effective and engaging use and prevent problems.

Parks, Della Porta, Pierce, Zilca and Lyubomirsky (2012) identified two groups of individuals who actively look for interventions that increase their happiness. Their findings indicate that half of the individuals who actively look for positive psychology interventions are not exceptionally happy but not suffering from depression. Another subgroup of people looking for happiness increasing interventions are very distressed individuals who are likely to suffer from mental health conditions. Future research should therefore either exclude atypical participants of positive psychology interventions, meaning individuals who do not typically use these interventions, or assess how different groups react to these interventions.

Limitations

A key limitation of this study is the lack of assessment of interrater-reliability of the coding scheme. To create a coding scheme of high quality double-blind trials are usually applied to test the reliability of a coding scheme and to alter the coding scheme continuously until a high interrater-reliability is achieved. Due to a lack of resources this method was not applied in the present pilot test, which might have diminished the reliability and led to a partial approach to coding.

Second, the present pilot study did not limit participation to individuals with moderate and languishing mental health. If participants of this study were already flourishing the perception of effectiveness could have been influenced by the absence of need for a positive psychology intervention. This could explain the difference in attitude among participants towards the positive psychology micro-intervention and whether they already engaged in these types of exercises to increase their well-being before.

Moreover, a study by Elefant and colleagues (2017) assessed short-term and long-term effects of micro-interventions on mood and distress and found significant decreases in negative mood and distress shortly after the intervention was completed, whereas a significant long-term effect could not be found. These findings would suggest that micro-interventions are only beneficial for immediate effects but not for long-lasting change. The interviews for this pilot-study were conducted a week after completion of the intervention and thus assessed short-term effects.Whether the 10 participants of this pilot-study will experience long-lasting effects is therefore not known.

Despite these limitations the pilot test enabled new insights into user´s perception of engagement and effectiveness of the developed intervention. It was able to gather detailed and varied data, despite a small group of participants, which lead to concrete recommendations and ideas for the main study design.

Recommendations for main study

The findings of this pilot-test established that a variety of aspects of the positive psychology micro-intervention is perceived as effective and engaging. Nonetheless, adjustments could be made to improve or eliminate aspects that were perceived as disengaging and ineffective and to prevent problems.

The recurring aspect of repetition was identified in the interviews that were conducted. The exercises could be repeated less or a greater variety of exercises could be introduced, given the fact that the variety was regarded as an engaging factor. Furthermore, participants perceived writing long texts in the app as disengaging and ineffective. An option for an

adjustment would be to present the exercises, such as the three good things exercise, as a mere thought provoking feature without asking the user to write things down. The main study could compare the effectiveness and engagement among variations of this option and the standard exercise.

To make the micro-intervention more effective from the perspective of the participants, the app could provide a more detailed description of the random acts of kindness exercise, since many participants experienced frustration caused by a lack of understanding of the exercise. The app could give further information on how to apply the exercises into everyday life, since some participants seemed to think, they were not able to apply them to every day of the two weeks, especially when having to study indoor throughout the whole day or when being on vacation. The app could thus provide further encouragement to apply well-being exercises to different circumstances.

Regarding the problems participants encountered, many participants postponed the exercises (often due to stress and time management) and would have appreciated more notifications. Nonetheless, it should be assessed whether more notifications would be perceived as stressful by some participants, since several individuals interviewed in this study remarked that the app was at times perceived as a burden. The problems were often of technological nature, so participants were often not able to log into the application and one participant was only able to access the intervention on her computer. Moreover, the touch screen function when moving the circle on the mental state quadrant was not working properly at times. These technological issues should be assessed in detail before conducting the main study. A minor problem was that participants did not know where to fill in things at times, so the lines for writing could include numerations (e.g. in the three good things exercise) or the descriptions could state where things had to be written down to prevent confusion about where to write texts.

As mentioned in the theoretical framework, micro-interventions can be used as preventive measures for mental health problems, such as depression, or as a complementary element of a bigger treatment plan (Haaga, 2000). The main study could thus also evaluate how effectiveness and engagement differ within stand-alone use and as a complementary measure in psychotherapeutic treatment in terms of prevention and treatment of mental health problems and the increase of well-being.

Some of the findings of the pilot test seem contradictory. For instance, while several participants perceived having to do exercises every day as stressful, others liked the repetition and felt like it enabled them to get into the exercises more easily. Moreover, some participants

liked to take some time to think about well-being, while others did not want to focus on well-being on some days. These differences in perception of the micro-intervention could possibly be tackled with an intervention design that enables the user to customize the content of the app according to their needs and preferences. This way, users could determine the frequency of exercises and specific content they want to engage in. How this influences the engagement and effectiveness of the micro-intervention could be assessed in the main study.

Conclusion

The study shows that behavioural intervention technologies serve as an engaging means to deliver positive psychological interventions and that participants perceive a variety of effective aspects, such as the diverse collection of exercises and the simple presentation of educational content. Even though the study identified aspects that were perceived as disengaging or ineffective by participants it formulated suggestions for the main study to better assess the effectiveness of this micro-intervention in regard to an increase in well-being among participants. The specific aspects that were identified as engaging and effective by this study underline the opportunity of micro-intervention usage via smartphones in the field of positive psychology.

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Appendix A

Interview Scheme – Micro Intervention Positive Psychology

Introduction: Thanking the participant for participation in the study, asking for approval in regard to recording the interview, introducing briefly what I will want to discuss with participant,

General impression / Experience:

1. How was your experience using the micro-intervention?
2. Did you manage to do the exercises? If not, which did you do?

User-Friendliness:

3. How easy was it to use the app?
4. Were there aspects that were especially difficult to use?

Effectiveness:

5. How effective/ineffective would you say was the intervention in increasing your well-being?
6. Which aspects did you find especially helpful regarding the increase of your well-being?
7. Which aspects were not helpful?

Engagement:

8. Did you experience the intervention as fun/boring and if so, why?
9. Which aspects did you find especially fun/boring?
10. Which aspects were not helpful?

Other:

11. Do you want to add anything?

Conclusion: Thanking participant for time and input,

Appendix B

Sub-category of Codes	Code	Code Definition	Number of Codes	Variations within the code/key aspects with examples of coded utterances
Engagement	*Engaging aspects*	Aspects of the micro-intervention that are perceived as engaging by the participants	23 20.72%	Variety of exercises "*I liked the variety of exercises that we had. It would have been fine if you just had the same exercise, but I think now it was more interesting, because they were different*" Challenges *"I think it was really fun and sometimes also a bit challenging, with the acts of kindness for example, also sometimes pushing you a bit out of your comfort zone"* Key aspect: - Sharing experience with friends *"I told my friends that I had to do five kind things for others and it was fun, because they tried to use that for their advantage"* Key aspect: - Being able to apply what you learn in your daily life *"(...) now you were more mindful of certain things and in your day-to-day life you would think "Oh wait, That is something I have to still do today." Then you thought more actively about these things"*

Key aspect: -Learning about new things/positive psychology/well-being

"What I thought was cool was that you did not only get the exercises, but also some background knowledge –in one sentence or so- (…) that way you they also explain the background of an exercise to you."

Key aspect: -Freedom while working on exercises

"I thought it was very good that you could just write down things for you (…) and that it was not like "you have to write it this or that way", but you were relatively free in the usage."

Key aspect: -Visualizing your mental state and how you feel with the matrix/quadrant

"I thought the matrix was cool – where you could put down how you feel, just because there was also this visual aspect."

Key aspect: -Setting goals

"I thought it was pretty cool, that with the goals. You would put them in in the beginning and could then look at them in the middle and change them."

Key aspect: - Cartoon character/illustration in the app

			"I thought the animation was… because he drove around with his bike and was like "Good job!" (…) I had someone who guided me on this adventure. That was sweet!" Key aspect: -Easy and simple instructions *"Like I said, it was really easy. Simple instructions in the beginning, so that it was fun."* Key aspect: -writing about people and relationships in your life *"(…) you write down things and you write down things about other people around you and that was always fun to see… to have a look at your relationships (…) That was something new and was fun for me."*
● *Disengaging aspects*	Aspects of the micro-intervention that are perceived as disengaging by the participant	15 13.51%	Key aspect: - Struggling to fill in exercise *"Sometimes it was not fun to fill in the five acts of kindness, but that was just for me because I was struggling to find something. So I got a bit irritated, oh my god I have to fill something in and I don't what…"* Key aspect: - Repetition of exercises *"(…) when the same exercise was repeated on the third day I thought that was a bit boring."*

Key aspect: - Long-stretched exercises on various pages

"I think that sometimes the exercises were a bit stretched out. So there was the description of the task, then beneath an exercise and then you had to go further again."

Key aspect: - Dissatisfying aesthetics of the app

"The design of the app – I thought it looked very amateur-like and sometimes a bit unclear (...)"

Key aspect: - Little variation of exercises

"I thought there was not really a lot of variety especially in the first week, because you mostly got the same exercise with the five good things."

Key aspect: - Feeling pressure to do exercises and doing things, because you are told to do so

"But you had the feeling I you do this not that much for yourself but because someone tells me to do so."

Key aspect: - Having to write lengthy descriptions and typing on your phone

"Just writing these long texts, but that is also because I do not like to type on my phone. Maybe it is just better to write things down."

				Key aspect: - Disappointment with results and therefore feeling demotivated *"(...) and then I thought "then it does not even work" and did it even less for myself, because it did not have the effect."* Key aspect: - Not being able to do some exercises in all environments *"...I think you need a different environment sometimes. (...) that was a bit dumb to do that in the metro."*
Effectiveness	*Effective aspect*	Aspects of the micro-intervention that are perceived as effective by the participant	31 27.92%	Positive messages in the beginning or end *"I think the positive messages in the beginning or the end – it was really uplifting."* Three good things exercise *"I think really that you think about which good things happened to you (was really helpful) (...)"* Gratitude exercise *"That what you are grateful for (was effective), because you just had to recall, even if it was a bad day somehow, you still had things that make you happy".* Doing exercises often and internalizing them through routine

	"(...) I used to do that a lot to write them down or think about that, so that was a bit more in my system."
	Stating how you feel
	"I thought it was helpful that you had to state how you feel, because that inspired you to think about it."
	Acts of kindness exercise
	"For example, holding open the door for someone or giving someone 20 cents who is missing them at the supermarket – I wouldn't have labelled it that way before. That was a bit – "Okay, that is really interesting now!""
	Integrating app in everyday life to recognize pleasant things
	"Because it was just well-integrated in everyday life I did not think about it every day. You rather realized during the process towards the end that it was for example nice to fill it out or to do something nice for someone and that that really helped."
	Acknowledging that well-being is important by using the app
	"Just that you have done it; that you´ve exposed yourself to it and that you tell yourself, this is something important and with what I want to do something and I think that alone helps."

			Focussing on positive aspects *"Because you just recall, even if it was a bad day, that you still have things that make you happy."* Realizing that you already do positive things and evaluating them differently *"Or for me it was the fact that I already do this in my everyday life – for example, that you are kind to the people around you and that is something that I always like to do."* Becoming more self-aware *"What I mean with self-awareness: Just that you reflect a bit more on yourself. (...) And the app really helped with that, so that you asked yourself "Okay, but why is it that way? Should it be like that? Why is like that? (...) That, I think, is something valuable."*
Ineffective aspect	Aspects of the micro-intervention that are perceived as ineffective by the participant	21 18.02%	Learning about strategies and techniques to increase well-being *"Just that I know in how far it can give me information or techniques to increase my well-being. I have to say, it did that."* Being reminded to do exercises on your phone (notifications) *"What I thought was good was that it reminds you like "Hey, now it is time*

	you do your exercise" –that you had this reminder."
	Learning about positive psychology
	"You know you do it to apply positive psychology, but it was nice to have the app explain it to you."
	Understanding of acts of kindness exercise
	"For me personally the acts of kindness because it was hard for me to distinguish between what were mundane tasks and what was really an act of kindness"
	Feeling frustrated, because of not being able to fill out exercise
	"Sometimes when I thought about it and just came up with 3 of 5 things (...) then I thought maybe it was not a good day."
	Having to do exercises every day/feeling burdened by it
	"It was really difficult for me to do that every day. So thinking about it excessively every day was sometimes a bit – not stressful – (...) that was a bit difficult sometimes."
	Not being able to apply exercise to your day
	"It was a bit bothersome sometimes to think about what was good today or what was something kind that I

				did for someone else, when you did not even leave the house." Not wanting to feel better, but having to work on well-being *"Just when you do not want to increase your well-being. So when you think to yourself "I am just sad right now and I do not want to think about how to feel happy again"."* Not helpful to write things down *"I did not find it helpful to write it down, like I said."*
	● *Problem*	Problems that participants encountered during their experience with the micro-intervention	22 19.82%	Postponing and forgetting exercises *"I was so busy and thought I will do it later and then it went downhill and I kept postponing every time the exercises and also others*" Touch function was not responding when using the visualization/quadrant *"In the beginning with the matrix that you had to swipe what you are feeling now, I had to look like, what do I have to do and sometimes it was not really responding in the first seconds, but I got used to that and then I knew where I had to click a few times and then it would respond"* Not knowing where to fill in things *"I often put it into one row and later I realized that there was a row for*

	every… , because they were not numbered."
	Not doing exercises due to stress/time management
	"It was mostly because of stress."
	No internet connection
	"One time during my vacation during the intervention where there was no internet connection."
	The system did not recognize mail address
	"Only in the end with the email address –it didn't recognize my email address for a while, with the last questionnaire."
	Not being able to access intervention on smartphone and having to use computer
	"It did not work, so I had to log into it on my browser, that's why it was a bit… it just was not handy to every time, because I just did not receive any notifications."
	Experiencing difficulty when having to write things down
	"Sometimes I just thought these things were so trivial. I just did not really know what to put down there."
	Old cell-phone
	"And also because my phone is so old and my battery dies very often,

		that was bad, because then I could not do it in the metro, because my phone was off."
		Experiencing the app as a burden
		"In general, I have to say, did I experience the app during the last four days, rather as a burden. Just because the daily exercises repeated themselves."
		Having to log in every time you want to use the intervention
		"Something that bothered me was that I had to log in every time."
	Total	
	112	