

**Gratitude, Savouring, Acceptance and Cognitive Reappraisal: A Qualitative Study on  
the Perceived Benefits of Different Momentary Interventions on the Mental Health of  
Participants at Risk for Mental Health Disorders**

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## **Abstract**

With the number of individuals affected by or at risk for mental health disorders rising, the relevance of developing accessible and efficient treatment options is more important than ever. This study is part of a larger project that conducts a micro-randomised control trial using ecological momentary assessments to study different interventions for treating common mental disorders. It focuses on qualitatively investigating the perceived short- and long-term benefits of participants at risk for mental health disorders engaging in cognitive behavioural, positive psychology and acceptance and commitment-based ecological momentary interventions (EMIs). After engaging in 23 days of EMIs, 16 participants took part in semi-structured interviews held online by a team of three bachelor students. The researchers aimed to qualitatively investigate their perceived short- and long-term benefits based on a pre-constructed interview scheme. Thematic analysis of the transcribed data in Atlas.ti shows significantly short-term experienced positive feelings and a decrease in negatively experienced feelings after each individually offered EMI and generally improved well-being. Furthermore, experienced long-term benefits of mindfulness and a regained sense of control are observed as well as the creation of specific plans for further maintenance of learned changes. This study closes the gap of previous research and offers great insight into real-life experiences with EMIs and their potential to improve individuals' mental health. Even though it finds itself constrained by several limitations regarding social desirability and the feasibility of online interviews, the findings suggest that further investigation of the offered content in digital mental health is crucial to help aid the further development of EMIs to allow for appropriate support of affected individuals in improving their well-being via cost-effective and accessible treatment options.

*Keywords:* mental health, risk, EMIs, short-/long-term benefits

Mental illnesses are highly prevalent in today's society, with an estimated 1 billion people worldwide suffering from a mental disorder stated in the most recent WHO report as well as an equally as high number of individuals who are expected to be at risk for developing a mental disorder. This places a major burden on affected individuals as well as society and the economy (World Health Organization, 2022). This suggests that there is a major need for solutions that are accessible, scalable and economically attainable. Besides traditional therapeutic interventions, systematic reviews by De Witte et al. (2021) suggest that digital mental health interventions can provide cost-effective and accessible mental health support that can act as significant tools in providing efficient support for affected individuals. Little is known about the impact that an approach that combines the use of digital mental health applications and psychological interventions which work towards the achievement of increased well-being and decreased symptoms could have on participants who are at risk for mental health disorders.

### **Digital mental health applications**

One psychological treatment option for the rising number of individuals affected by mental health disorders that has been gaining increasing attention throughout the development of recent years is the use of digital mental health interventions. These types of interventions may overcome many of the barriers of traditional face-to-face interventions (Lehtimäki et al., 2021). These barriers can best be presented by introducing the "mental health treatment gap" phenomenon. The mental health treatment gap highlights the strong gap between the urgent need for individuals affected by mental health disorders and the lack of access to care and includes factors such as limited financial resources, stigmatisation of mental illnesses and shortages of health care workers (Wainberg et al., 2017). With implementing digital mental health interventions, it is hoped that limiting factors such as access, costs and stigmatisation can be overcome and lead to easier and more efficient treatment of affected individuals.

One example of digital mental health interventions is ecological momentary interventions (EMIs), defined as “momentary health treatments provided via hand-held mobile technologies that deliver psychological interventions while people are engaged in their typical routines in their everyday lives” (Gee et al., 2015). They are defined by their interactive nature that uses momentary inputs delivered on the mobile device while simultaneously taking into account the individual's surrounding context and internal state while enabling the engagement in psychologically based interventions and recording of mental states. All of this is provided in individual surroundings and real-life situations. Research by Gee et al. (2015) has shown that digital tools such as EMIs have been proven to foster therapeutic interventions, facilitate positive behaviour change regarding making healthy life decisions and help decrease negatively experienced consequences of individuals affected by mental health disorders. Furthermore, a previous meta-analysis by Versluis et al. (2016) suggests that EMIs are not only cost-effective and able to reach large populations but also majorly effective in regards to the treatment of mild complaints concerning anxiety, depression and perceived stress.

### **Psychological approaches**

Four different EMIs have been chosen for this study including Positive Psychology (PP)-based *gratitude* and *savouring*, Acceptance and Commitment Therapy (ACT)-based *acceptance* and Cognitive Behavioural Therapy (CBT)-based *reappraisal* exercises. These cover a broad range of effectively proven therapeutic traditions and consist of different methods that are offered to the participants.

PP focuses on the attainment of a sense of well-being by strengthening the individual's resilience and the building of psychological resources based on the positive features within the individual (McTiernan et al., 2021). Even though results differ between studies, meta-analyses suggest that a positive indication can be made about the effectiveness of PP exercises in reducing depressive symptoms, symptoms of anxiety and stress and increasing well-being

(Hendriks et al., 2019). Two specific types of this approach that have been shown to be effective are *gratitude* and *savouring* exercises, as engagement in these exercises has proven to result in greater happiness, positive affect, optimism and decreased symptoms of anxiety and depression (D'raven & Pasha-Zaidi, 2014).

ACT focuses on the teaching of coping mechanisms through the deliberate embrace of difficult thoughts, feelings and bodily sensations to in the end be able to increase present consciousness, nonjudgemental awareness and lastly the acceptance of potentially difficult situations. Current meta-analyses have shown evidence for the effectiveness of ACT as a psychological intervention for mental health disorders and suggest effective treatment of pain, depression and anxiety (Gloster et al., 2020). Besides the aspects of contact with the present moment, taking oneself as context, engaging in committed action, staying connected to personal values and stepping back from unwanted experiences, the aspect of acceptance is part of the core concepts that ACT relies on. Individual or combined use of these different aspects has proven to effectively treat symptoms of depression and anxiety (Bai et al., 2020).

CBT is a problem-focused and active psychological approach that aims to reduce emotional distress while increasing the adaptive behaviour of the individual. It is seen as highly efficacious in the treatment of mental health disorders, especially depression, anxiety and insomnia. Furthermore, it has the potential to decrease the risk of developing other mental health disorders and has proven to be effective in increasing well-being regarding aspects of happiness and hopefulness (Wenzel, 2017).

As a conclusion of the gathered information, it can be assumed that each approach itself contains the significant potential to facilitate the well-being of participants during the study and improve several aspects of mental health.

## Research gap and relevance

Besides the effectiveness in reducing symptoms of mental disorders, current research by De Vries et al. (2020) also suggests a gap stating that qualitative studies are missing the investigation of the impact of differing EMIs contained in one research approach. Qualitative research findings can help better understand the mechanisms underlying EMIs, which may potentially inform future research and interventions (Versluis et al., 2016). Additionally, there also hasn't been a qualitative study that investigated the impact of four different EMIs. By doing so in this study, the understanding of specific benefits of different interventions can be improved and their effects can be investigated and compared.

## Current study

Throughout this study, various EMIs based on PP, ACT, and CBT will be tested in a micro-randomized trial (MRT). Especially regarding the qualitative perspective, the experienced short-term benefits right after doing the EMIs and the long-term benefits after the whole intervention will be investigated. The participants will be individuals with an increased level of distress, which heightens their risk of developing mental health disorders. Consequently, the current study aims to qualitatively investigate the short- and long-term benefits of different EMIs and the participant's experiences with those. The EMIs include PP-based *gratitude* and *savouring* exercises, ACT-based *acceptance* exercises and CBT-based *reappraisal* exercises. The research question that will guide the process of the study can be stated as the following:

*“What are the perceived benefits in the short- and long-term of engaging in EMI-based CBT, PP and ACT exercises as reported by participants at risk for mental health disorders?”*

## **Methodology**

### **Design**

The current study was conducted within the framework of a larger project, namely an MRT using ecological momentary assessments and EMIs to investigate different interventions against common mental disorders and has been registered on OSF (<https://osf.io/z645p/>). The initial study took 23 days in total to complete and consisted of a one-week baseline period followed by a 16-day intervention period. During the baseline period, the participants received four questionnaires per day at random times, resulting in 28 questionnaires in the first week. During the intervention period, participants were randomly assigned to either receive an EMI or not four times per day for 16 days, leading to two EMIs per day. Immediately before and after each exercise, questionnaires were administered to the participants, resulting in 128 questionnaires and 32 EMIs delivered in the intervention period.

For the current study, a qualitative design was employed. Semi-structured interviews were conducted to investigate the participants' experienced benefits of EMI-based exercises on the mental health of participants. Semi-structured interviews were identified as being most appropriate as they allow for free and open speech whilst at the same time allowing the researcher to control the direction of the conversation, use a combination of closed and open-ended questions and structure the conversation depending on the participant's responses (Alamri, 2019). The qualitative interviews were conducted by three bachelor's students who collected the interview data together but conducted the data analysis individually to be able to answer the differing research questions.

### **Participants**

For the overall study, the planned sample size included 72 participants. Inclusion criteria specified that participants must be aged 18 or older, able to understand English to a

sufficient level and must achieve results on the Kessler Psychological Distress Scale indicating a distress level of 10 or higher to be included in the study (Umucu et al., 2021).

Furthermore, for the qualitative part of the study, participants had to be part of the initial pool of participants to be able to be selected, meaning that they must have completed the baseline and intervention phase of the study after going through the official briefing. 20 people from this sample were contacted for the qualitative part. In the end, the sample of participants that were included after the initial contact and screening for the qualitative part consisted of 16 people, 10 females and six males. Within this sample, the age ranged from 19 to 32 years. Most participants were of German heritage, others included Dutch, Indonesian, Vietnamese and French.

## **Materials**

For the part of the study related to the different EMIs, the mobile device app named “m-path” was used. M-path is a highly tailorable platform for momentary assessment and is used widely in behavioural research and clinical practice while only requiring limited programming skills (Mestdagh et al., 2023). An interview scheme was developed in collaboration with the two other bachelor students investigating other qualitative research questions. Initial ideas regarding the scheme have been reviewed by the supervisors and reworked several times by the researchers so that an appropriate number of questions effectively investigated the different research questions while eliminating broad and unfitting questions. The final scheme contained nine questions and aimed to investigate the perceived benefits of the different exercises on mental health, user adherence and motivation and the emotion regulation strategies of the participants (Appendix A). It contained questions such as: “Has there been an exercise in the period of these interventions that has been particularly helpful regarding the improvement of your well-being?” After rehearsing the interviews with the supervisors, the research team conducted the studies interviews via Microsoft Teams.



## Interventions

The PP *gratitude* exercise aimed to cultivate an appreciation for the aspects of the individual's life that they were thankful for by reviewing positive aspects of their lives (Boggiss et al., 2020). Participants were asked to reflect on aspects they were feeling grateful for to boost their mental well-being (see Appendix B). The *savouring* exercise encompasses the recalling of happy memories joined by positive emotions (Cullen et al., 2024). The participants were guided in a step-by-step manner to reconstruct those memories and either write them down in the app or while using pen and paper to engage in a reflective writing element (see Appendix C).

The *acceptance* exercise originates from and acts as a basis for ACT and includes teaching the participants coping mechanisms through the deliberate embrace of difficult thoughts, feelings and bodily sensations to in the end be able to increase present consciousness, nonjudgemental awareness and lastly the acceptance of potentially difficult situations. The *acceptance* exercise aimed at introducing the participant to the experience of opening up (Zhang et al., 2020). The goal for the affected individual is to embrace negative emotions instead of resisting the unpleasant feelings by letting them pass through the body and neutrally observing them without any attached value or meaning (see Appendix D). Again, the participants therefore engaged in a reflective writing element.

Cognitive Behavioral Therapy (CBT) served as a ground for the last exercise of *cognitive reappraisal*, which is a problem-focused and active approach that aims to reduce emotional distress while increasing the adaptive behaviour of the individual. The *cognitive reappraisal* exercise was based on one of CBT's main strategies and focused on the active reframing of one's thoughts to perceive situations more positively and beneficially to modify unhelpful negative thinking (Clark, 2022). The participants, therefore, were guided by

instructions in the app to replace unpleasant thoughts with more positive ones, while doing reflective work applied through a writing element (Appendix E).

## **Procedure**

After the study was approved by the BMS ethics committee of the University of Twente (Ethical Approval Number: 240440), the recruitment of participants for the initial study started. The participants were recruited in various ways including the distribution of flyers at the University of Twente campus, sending the link to several social media channel groups as well as the verbal advertisement efforts that were made by the researchers in their close family and friends circles. All possible participants who initially signed up for the study received a link to the Kessler Psychological Distress Scale. If the participants were eligible and fulfilled the inclusion criteria, a prepared email was sent out to them, containing an invitation to a briefing session with a clinical psychology master student. If the participants were not eligible and did not fulfil the criteria, another prepared email was forwarded to inform them about the fact that participation in the study was not possible. For the briefing, the participants were able to choose a suitable time frame for the online meeting. They were then informed about the 23-day- duration of the study including the different assessments regarding PP, ACT and CBT, questionnaires and exercises, confidentiality, registration and assessment periods in a 20-minute session. It was explained that the participant had the opportunity to choose from SONA credits or financial rewards for participation and finally, the official start of the interventions was made clear. In the following days, the participants started using m-path and started engaging in four days each of PP, CBT and ACT exercises for a maximum of two times per day, adding up to a total of sixteen days of exercises.

The next step related to the participation in the study concerns the participation in the additional semi-structured interview that was conducted after the 23 days of interventions. After the 16 participants had been informed via email about the content and duration, the

informed consent form was shared, the participants indicated their preference for a specific timeslot and then received a link to an online meeting. All sixteen interviews were conducted via Microsoft Teams, and lasted approximately 20 to 30 minutes, whilst the researcher used the interview scheme with nine questions as the basis for the conversation and the investigation of the participants' feelings, thoughts and experiences. The conversation was voice-recorded and automatically transcribed by the Microsoft Teams software, which was explained and agreed to beforehand. Furthermore, it should be noted that on average one and a half minutes of text in four of the sixteen interviews were not able to be transcribed due to the circumstances of the online meeting and therefore left out in the results.

The last step during this study included a prepared email that was forwarded to the participants with all the necessary information about the possibility of a debriefing with one of the researchers. The participants' compensation either regarded SONA credits or monetary compensation in gift cards with varying values depending on their compliance with the study. In addition to the monetary reward for adherence to the EMIs, participants also received a reward of ten euros for participation in the last interview of the study.

## **Data Analysis**

All of the data was analysed using Atlas. ti, as it enabled the researchers to independently but simultaneously work on the given set of documents and create a set of codes (Gupta, 2024). Beforehand, the automatically generated transcripts from the conducted interviews were manually screened and grammatically corrected. Using Atlas. ti, the 16 datasets then were imported and each dataset was analysed for content to create a set of initial codes representing the overarching topics that were discussed. Here, thematic analysis was used as an analytic method to lead the identification and analysis of patterns (Braun & Clarke, 2006). Researchers therefore familiarized themselves with the data by re-reading through the transcripts while constructing codes around a common organising concept.

To ensure reliability, collaborative measures have been taken with two other bachelor students also involved in the qualitative data analysis. Specifically, three random transcripts were coded by each other concerning each of the researcher's three research questions. Each researcher received six coded transcripts in total from their colleagues, based on which the working definitions of codes were discussed and compared in a later meeting. Afterwards, each researcher was able to decide on a final set of appropriate codes that could be applied specifically to their research question based on the comparative reliability measure and their own, pre-defined coding scheme.

## **Results**

To answer the research question, the performed data analysis resulted in eight overall themes. Table 1 contains four themes, table 2 contains three themes and table 3 contains one theme. The excerpts given below have been slightly edited to enhance readability, the themes are presented together with their description and associated codes in Tables 1 to 3 and will be discussed in the texts below.

**Table 1***Benefits of specific EMIs for well-being*

<b>Theme</b>	<b>Description</b>	<b>Primary codes</b>	<b>Mentions</b>
Cognitive reappraisal	CBT based: reported experiences with this EMI	<ul style="list-style-type: none"> <li>-&gt; not a typical way of dealing with emotions</li> <li>-&gt; most helpful as I had to come up with evidence and action plan to resolve the problem</li> <li>-&gt; helps to lessen negative thoughts</li> </ul>	16
Gratitude exercise	PP based: reported experiences with this EMI	<ul style="list-style-type: none"> <li>-&gt; reminder that life is not that bad</li> <li>-&gt; more compassion towards myself</li> <li>-&gt; more aware, more grateful and calm</li> <li>-&gt; shifting focus to positive</li> </ul>	16
Acceptance exercise	ACT-based: reported experiences with this EMI	<ul style="list-style-type: none"> <li>-&gt; a challenge to look into negatives</li> <li>-&gt; made me feel at ease</li> </ul>	16
Positive memory exercise	PP-based: reported experiences with this EMI	<ul style="list-style-type: none"> <li>-&gt; helped when down or stressed</li> <li>-&gt; relaxed, moving forward</li> <li>-&gt; short escape to challenges in life</li> <li>-&gt; releasing pressure and forgetting about pain</li> <li>-&gt; cheered me up easily</li> </ul>	16

## **Cognitive reappraisal exercise**

The theme *cognitive reappraisal exercise* occurred in all sixteen interviews. Within this theme, the participants discussed their experiences, thoughts and feelings with and about the CBT-based cognitive reappraisal exercise, which was perceived as helping diminish unhelpful negative thoughts but also relatively difficult to engage in, boring and unlike any natural way that participants would normally deal with their emotions. In their daily lives, participants were not used to the aspect of reframing their thoughts. Participants reported this:

*“This exercise is not exactly the way I do things and engaging in it is not really the typical way of working with my emotions”.*

While some participants experienced difficulty with this exercise as they experienced it to be different from intuitive coping mechanisms, others mentioned cognitive reappraisal to be the most helpful out of all the exercises: “I had to come up with evidence and an action plan to resolve my problem, so this was very practical and helpful. I am a practical kind of person and like to tackle things actively”.

## **Gratitude exercise**

The theme *gratitude exercise* occurred as well in all sixteen interviews. Within this theme, the participants discussed their experiences, thoughts and feelings with and about the PP-based gratitude exercise, which was perceived as having a positive effect on how the participants were feeling, leading to creating more compassion for themselves and learning how to shift the focus on the more positive things in life. Participants reported already being grateful before the exercise and emphasising gratitude in their lives as it helped them not forget about positive things that have happened. Throughout this exercise, this gratitude increased and participants were able to review aspects that were important to them like “family, food and friends” which were before seen as basic necessities but then seen as

aspects that they could be grateful for. Participants reported that engagement in the exercise enables them to “shift the focus on the good things in life while realizing that in reality, things sometimes are not as bad as thought”. Furthermore, participants indicated short-term effects of calmness and relaxation and long-term effects of being more mindful of their surroundings and more compassionate with themselves.

### **Acceptance exercise**

The theme *acceptance exercise* occurred as well in all sixteen interviews. Within this theme, the participants discussed their experiences, thoughts and feelings with and about the ACT-based acceptance exercise which was reported to be very impactful but also challenging. Specifically, this exercise encouraged the participants to sit with their emotions and instead of resisting the unpleasant feelings, let them pass through. It can be seen that “sitting with it for a second” and “observing that I did not have to immediately change my emotion” have been perceived as positive aspects of this exercise, which was relatively unknown to most of the participants. On the other hand, participants also reported that it was a challenge to “look into the negative and not trying to avoid it” and “having no further instructions on how to deal with those painful moments” were seen as negative aspects of this exercise. Short-term effects were therefore reported as oftentimes being able to sit still with their emotions.

### **Positive memory exercise**

The theme *positive memory exercise* occurred in all sixteen interviews. Within this theme, the participants discussed their experiences, thoughts and feelings with and about the PP-based positive memory exercise, which reportedly led to great effectiveness and major usefulness in reducing negative symptoms and increasing feelings of hope, calmness, relaxation and happiness while making participants “feel better and more satisfied”. Participants reported this exercise to be more natural, practical, helpful, interesting and close to their preferred way of dealing with emotions than the other exercises. Additionally, some

participants mentioned being more excited about the future after reviewing positive aspects of their lives.

*“It helped me to recount all the positive things and made me feel very excited about the future because I know that some of these things will happen again”.*

Furthermore, some participants reported the exercise to be useful in releasing pressure, controlling high levels of anxiety and depression appropriately and enabling the participants to forget about sorrows, pain and perceived difficulties in their personal lives for at least the duration of the exercise. This can be seen here: “I thought of a particular moment and somehow forgot the pain I was going through at that moment”. Besides the short-term effects that participants reported to perceive right after this exercise, long-term effects regarding the change in mental health were also mentioned. Participants reported being happier in general and catching themselves in their daily routines thinking about positive aspects more than before while focusing more on the positive aspects of life than the negative ones.

*“I do notice that even after the exercise has stopped towards the end of the study, I more regularly think of positive things that happen to me and I notice that this exercise still easily cheers my mood.”*



**Table 2***Benefits of exercises for well-being*

<b>Theme</b>	<b>Description</b>	<b>Primary codes</b>	<b>Mentions</b>
Experience of improved well-being and short-term benefits	Participants report about effects of improved well-being	<ul style="list-style-type: none"> <li>-&gt; happier and more aware</li> <li>-&gt; calmer and less stressed</li> <li>-&gt; helpful to be able to change mindset and perspective</li> <li>-&gt; taking a break</li> <li>-&gt; nice to have a timeframe just for myself</li> <li>-&gt; seeing mental well-being as a priority now</li> <li>-&gt; better overall well-being</li> <li>-&gt; reminding me of what is good</li> <li>-&gt; feeling closer to beloved partner and family</li> </ul>	16
Neutral effects on well-being and short-term benefits	Participants report about neutrally perceived effects	<ul style="list-style-type: none"> <li>-&gt; not feeling a lot of change</li> <li>-&gt; at the moment it helps but After 20 minutes I forgot</li> <li>-&gt; effect went away quickly and didn't last long</li> </ul>	5
Long-term benefits	Participants report about long-term benefits after the whole intervention	<ul style="list-style-type: none"> <li>-&gt; deeper understanding of myself</li> <li>-&gt; better connection to myself</li> <li>-&gt; more compassionate, positive and hopeful</li> </ul>	11

## **Experience of improved well-being and short-term benefits**

The theme *experience of improved well-being and short-term benefits* was mentioned by all participants throughout the interviews. This theme specifically regards the experience with the app to help the participant's mental health by decreasing mental health symptoms of anxiety, stress and depression and increasing comfort, happiness and flourishing mental health. Participants reported short-term effects of being “happier and more aware” and “calmer and less stressed”.

*“It was just so nice to be able to take a break and create a timeframe just for myself. This made me feel less stressed and gave me the time to calm down”.*

Furthermore, they reported to have finally understood the issues behind some of the problems they were facing in their daily lives, leading them to be able to try to fix them.

## **Neutral effects on well-being and short-term benefits**

The theme *neutral effects on well-being and short-term benefits* has been reported five times throughout the interviews and specifically regards the participants who reported not feeling a lot of or not even any change at all due to the engagement in the exercises. The reported experiences in some of the interviews show that for some participants if there was a noticeable change or effect, “it went away after like 20 minutes” and the effects “didn’t last long”. It can be observed that for some participants, “not much change was noticed” and that well-being was not improved substantially.

## **Long-term benefit**

The theme *long-term benefit* has been reported 11 times throughout the interviews and contains participants' reported experiences about perceived benefits after the whole intervention. This theme reports the experiences that are not linked to the specific exercises but broadly describes the participant's experiences with long-term effects in general and is

therefore directly connected to the RQ. Some participants reported to have gained a feeling of control over the reactions arising from intense emotions:

*“Regarding long-term effects, I would say that I have gained a deep understanding of myself after this study. After always having struggled with my way of coping with emotions after something bad has happened in my life, I finally feel like I have learned some healthy ways to deal with those. Maybe it has given me a sense of power, or control? I just no longer feel helpless.”*

Other participants have reported looking more positively towards the future and being happier in general since their perspectives on the good and bad things happening in their lives have changed for the better. Furthermore, others reported building a “deeper connection” to themselves and their bodies and being “more mindful” of their own and others' emotions. Other participants reported being more hopeful after seeing that change regarding their dysfunctional behaviour towards a healthier one is possible and that they are “the ones who are responsible, and nobody else”. Therefore, it can be observed that for most participants, positive long-term benefits were experienced.

**Table 3**

*Maintenance and sustainability of exercises*

<b>Theme</b>	<b>Description</b>	<b>Primary codes</b>	<b>Mentions</b>
Maintenance of changes	Participants indicating how they are planning to keep up with the changes	-> real journal to write down positive things -> imagine thinking about things I am grateful for -> everyday checking in on how I am feeling	7

## **Maintenance of changes**

The theme *maintenance of changes* was reported in seven interviews and contained the changes initiated and felt during and after the exercises. Participants indicated to be mostly very motivated to maintain the changes from the study: “I think you need to do them now and then to maintain the effect”. Others also reported to “take a real journal and write down positive things”, more often “think about things to be grateful for” and “be more on the lookout for the positive things in life”. The positive things that were mentioned here were family and friends.

## **Discussion**

This research investigated the short- and long-term benefits of different EMIs on the well-being of participants while aiming to precisely report the participant's thoughts, feelings and experiences to in the end be able to aid the further development of digital mental health treatment approaches.

### **Individual differences in perceived benefits and preferences**

Firstly, the results indicated several positive short-term effects that participants experienced after each of the different EMIs. An aspect that has become apparent is the individual differences that suggest that some participants greatly appreciated and liked some exercises, while others disliked those specifically. As reported, the cognitive reappraisal exercise by some participants has been perceived as a helpful way of dealing with emotions which specifically helped to lessen negative thoughts through its practical nature while others perceived them to be boring. The participant's reports on the acceptance exercise indicated some perceived challenges with looking into the negative aspects of life but also feelings of hope towards the future and happiness were increased and the exercise has been regarded as an easy, practical and natural way of dealing with emotions. This demonstrates individual

differences. Research by Liddon et al. (2017) suggests that these individual differences specifically could originate from gender aspects and states that there are striking differences in help-seeking, awareness of their problems and coping behaviour. Specifically, they suggest that women prefer emotion-related approaches as coping strategies more than men and that they are more likely to realise that their problems are affecting them negatively due to more self-reflective thoughts, which the reports of the participants can affirm. Further research by Denhag et al. (2017) indicates that individual differences can also stem from personal aspects. Characteristics such as awareness of the problem and its negative consequences can lead to a preference for action-based approaches. This can be seen in the participants' reports specifically about the cognitive reappraisal exercise, where they voiced their problematic situations and consequently reported this exercise to be their preferential one. All in all, these aspects suggest great individual differences due to different influential reasons.

### **Maintenance of changes**

After reporting on the mainly short-term benefits experienced by the participants, it can be assumed that this points towards the importance of exercising and integrating this into daily life in the future to maintain an overall positive effect and maintain having reflective and engaging moments that potentially help the participants to improve their well-being momentarily. Research by Kirby and Gilbert (2020) suggests that learned behaviours that aim at improving the individual's mental health are most effective when an effort is exercised to maintain those changes in the future, suggesting a high relevance of continued exercise. A continuous practice of psychological treatment approaches such as CBT, ACT or PP can lead to the flourishing of individuals in their daily lives as they improve in using their resources to help themselves whenever difficult situations arise. This takes determination for continued engagement in the learned exercises in the future, which were aspects that were also reported by the participants during the interviews. More specifically, it has been reported that the

participants' main reasoning for continued engagement is that they have noticed the significantly beneficial effects of some exercises which motivated them to use them in the future. Several participants reported having specific plans for how they wanted to keep up with the learned changes. This included taking physical journals with them in their daily lives, checking in about their feelings more often and imagining things to be grateful for when they perceive stress and anxiety. Therefore, maintaining the learned exercises in the future could not only improve the individual's mental health in the long run but also keep up the perceived long-term benefits.

### **Strengths and limitations**

The current study demonstrates a variety of strengths and limitations. Its qualitative nature allowed the researchers to thoroughly investigate the impact of differing EMIs and make use of personal and lived experiences to answer the research question. This contains the potential to help better understand the mechanism that underly differing EMIs and inform future research in regards to the improvement of EMIs for treating symptoms of mental disorders. Furthermore, up to the current day, there has not been a qualitative study that investigated the impact of four different EMIs in one research approach, which allowed for a broad range of treatment options to be studied.

After having considered the strengths, some limitations also have to be taken into account. Firstly, conducting the interviews online led to some difficulties for the researchers, namely considerable amounts of text being incomprehensible due to a poor internet connection or outdated technical devices transferring the sound in poor quality. This led to communication difficulties during the interviews and problems regarding the transcription and later coding during the data analysis. Secondly, the aspect of social desirability has to be considered. As the interviews were conducted with the researchers themselves, the participants could potentially have been inhibited from disclosing full information. Social

desirability is an unavoidable aspect of qualitative measures that include communication and discussion with other people and oftentimes leads to a reserved stance and the disclosure of information that is regarded as commonly accepted and appropriate. This aspect could also have influenced the participants in this study, leading to biased or only halfway true shared information.

### **Implications for future research**

Taking into account the previously mentioned results, implications and limitations of this study, some recommendations for further research should be investigated. Research on this topic in the future should take other approaches to qualitative investigation into account. The interviews could be conducted in person to minimise miscommunication due to lacking internet connection and other disruptive circumstances and to allow for a more efficient conversation flow. To account for the investigated individual differences in future research regarding EMIs, it can be assumed that offering the participants a self-directed responsibility for which exercise they want to engage in could lead to great benefits, which do not force them to engage in exercises they do not find fitting or helpful. Another possible suggestion would be to introduce a trial of exercises, allowing the participants to test out the different EMIs, collect some thoughts and experiences on their perceived fit, usability and benefits and ultimately let them decide which ones to engage in during the study.

All in all, future research should continue to investigate the given study topic even further due to the significant relevance of the contemplation of mental health disorders and possible treatments for affected individuals and due to the importance of making efficient approaches accessible to everyone. Specifically, interview circumstances have to be investigated and individual differences and preferences of participants have to be taken into consideration while designing future EMIs that make room for the participants' individual likings.



## **Conclusion**

In conclusion, this study can be seen as a meaningful investigation, exploring the detailed experiences of participants regarding the perceived benefits of different EMIs while combining different approaches into one research which closes the gap identified in previous research. It offered profound insights into experienced short- and long-term benefits and more precise accounts of how individuals experienced the change in their well-being. Reports indicate several positively experienced short-term benefits such as increased well-being through happiness, hopefulness and relaxation as well as long-term benefits of regained feelings of control, connection and mindfulness. By continuing research on this topic, the further development of cost-effective and accessible EMIs can be aided to help affected individuals appropriately.

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## Appendix A

### Interview Scheme

1. Test yourself if the audio recording and transcription work in MS teams
2. Ask the participants if they have filled in ICF/Qualtrics
3. Give introduction: mention the three main parts (Effects, Emotions, and User Experience)
4. Starting audio recording (no image!)
5. Proceed to our questions:

(Questions Marieke)

1. How would you describe the impact of the 16 days of exercise on your well-being? Can you describe what exactly changed? How do you notice these changes in your daily life?
2. Do you think you will maintain the changes initiated during the exercises? Why?
3. Has there been an exercise in the period of these interventions that has been particularly helpful regarding the improvement of your well-being? Why do you think that is and how did it help you to improve your well-being?
4. Do you think you will be applying some of the exercises further in your daily life? Which ones and why? And how will you do that?

(Questions Shujie)

1: Some of these exercises were aimed to help you in handling unpleasant thoughts or emotions or support you in the way you deal with stressful situations. Do you have the feeling that these exercises changed the way you look at or deal with unpleasant thoughts or emotions?

In what way? And how is that different from what you would do before?

Why not, do you think? What would have helped you better with unpleasant thoughts or emotions?

Were there specific exercises that helped you more with this? Or less?

2: Other exercises were aimed at letting you experience more positive emotions. Do you have the feeling that these exercises helped you with managing your emotions?

In what way? And how is that different from what you would do before?

Why not, do you think? What would have helped you better to experience more positive emotions?

Were there specific exercises that helped you more with this? Or less?

(Questions Lukas)

1: Did you find the exercises clear?

Was it clear for you how to do them?

What made them clear?

What could have made them clearer?

2: How doable was it for you to do the exercises?

What things made it easier to do an exercise? What things made it more difficult to do an exercise?

Were there any moments where you did find the exercises particularly helpful, or unhelpful?

What would have made it easier for you to do an exercise?

3: How motivated were you to do the exercises?

What motivated you?

Did your motivation change over time?

How could you have been more motivated?

What factors influenced your motivation to do the exercises?

Can you recall any instances where you felt tempted to stop doing the exercises? What motivated you to continue?

What would the intervention/ exercises need for you to stay motivated over prolonged periods?

## PROBES

- I'm unsure I understood ... Could you tell me more about that?
- I'm not certain what you mean by... Could you give me some examples?
- Could you tell me more about your thinking on that?
- You mentioned.... Could you tell me more about that? What stands out in your mind about that?
- This is what I thought I heard... Did I understand you correctly?
- So what I hear you saying is

## Appendix B

### Gratitude Journal

This activity, the **Gratitude Journal**, is designed to focus on things in your life you're thankful for. This practice can be about anything from simple pleasures (like enjoying a delightful lunch) to major life events (such as the birth of a healthy niece).

Viewing positive experiences as gifts helps prevent taking them for granted. Research indicates that regularly engaging in this exercise can significantly boost well-being.

#### *Instructions*

1. **List down three things** currently in your life – events, experiences, people, or any other aspect – that you feel grateful for. You can write them down in the textbox below or on paper.
2. Reflect on **why** you are grateful for these particular things. You can write these reflections down in the textbox below, use pen and paper, or simply ponder them without writing.
3. **Pay attention to the feelings that arise** during your reflection on them. You can ask yourself the following questions:

Which emotions do you notice as you reflect on what makes you grateful right now?

How does your body react to these feelings of gratitude? Do you feel warmer, more relaxed, or perhaps a smile forming on your face?

What changes do you observe in your mood as you focus on these grateful feelings?



## Appendix C

### **Savouring: Positive Memory**

Experiencing positive emotions can often be achieved by revisiting joyful memories. The **Positive Memory** exercise is an effective way to do just that.

This exercise involves recalling a happy memory in as much detail as possible and focusing on how you felt during that moment. Good example memories for this exercise are those where you felt significant positive emotions such as joy, love, or inspiration, but it can also be any other memory you experienced as pleasant.

#### *Instructions*

1. Think of a memory where you experienced strong positive emotions.
2. Aim to reconstruct the memory in as much detail as possible. If you like, you can write your thoughts in this textbox or use pen and paper. Consider these questions to guide your writing:
  - o What exactly happened in the memory you selected?
  - o What were your feelings at the moment it occurred?
  - o How do you feel now as you revisit this memory?
  - o What changes do you observe in your mood as you focus on this positive memory?

Try to include many details to vividly recall the experience, but remember to keep the writing process enjoyable.

## Appendix D

### Opening up/Acceptance

The goal of this exercise is to accept and embrace negative thoughts and emotions instead of trying to get rid of them. Resisting unpleasant feelings may cause them to become stronger and more frequent. By embracing our thoughts and feelings and accepting that they are there, we don't need to suffer from our struggles in trying to control them.

1. What have you been struggling with lately (e.g., stress, anger, sadness, insecurity, guilt, shame, pain, worries...)? You can write it down in the text box below
2. See if you can open up to these unpleasant thoughts and feelings, allowing them to just be there.
3. Explore what there is to experience—Are the feelings getting heavier, or lighter, do they remain the same, or do they fluctuate?
4. Can you stay present with these difficult thoughts and feelings and keep in touch with them?
5. See if you can continue giving some space to these unpleasant feelings for a while, instead of trying to control them or trying to get rid of them.

## Appendix E

### Cognitive Reappraisal Exercise

With this exercise, we will have a good look at unpleasant thoughts you may have and help you to investigate if they are really helpful and true, or if there are more positive alternative thoughts that are more realistic. The unpleasant thoughts you may have, such as worries about the future, negative thoughts about yourself or others, or memories about an unpleasant situation in the past, are often unrealistically negative and not helpful. With this exercise, we will see if we can replace these unpleasant thoughts with more positive, more realistic thoughts.

#### *Instructions*

1. Think of an unpleasant thought that is causing you stress or negative emotions lately. Take a moment so you have the unpleasant thought clear in your mind, and write it down in the text box below
2. Now try to challenge this unpleasant thought a little: Is it true? What evidence do you have for it? Is this unpleasant thought helping you?
3. What would you tell a close friend if they were having these thoughts?
4. Now try to come up with another, more positive interpretation, and write it in the text box below. What evidence do you have for this more positive thought? Is this thought more helpful to you?
5. Take a moment to think about both thoughts. Is it possible that your unpleasant thoughts are not the most realistic or helpful ones? See if you can challenge your unpleasant thoughts this way for a while, and replace them with more helpful, more positive thoughts.