

**Evaluation of the effectiveness of #SelfCare - a mobile self-help app - to increase youth's emotion regulation (ER) strategies**

Magalie Viezens

s1952641

PCPT: Master Thesis Positive Clinical Psychology & Technology

University of Twente

Faculty of Behavioral, Management and Social Sciences

Department of Psychology

Supervisors:

Dr. Hanneke Scholten

Dr. Christina Bode

June 29, 2021

## Table of Contents

Abstract.....	3
Introduction.....	4
Mental Health in times of COVID-19.....	5
Emotion regulation.....	7
#SelfCare.....	10
Design and Hypotheses.....	12
Methods.....	13
Participants.....	13
Procedure.....	14
Materials and Measures.....	16
Data Analysis.....	23
Results.....	25
Descriptive Statistics.....	25
Pearson Correlations.....	25
Repeated measures ANOVA.....	26
Discussion.....	33
ER strategy training #SelfCare.....	33
Depression, Anxiety, and Stress.....	34
#SelfCare Minigames.....	36
Strengths and limitations of the study.....	37
Practical implications and directions for future research.....	38
Conclusion.....	40
References.....	41
Appendix.....	56

## Abstract

**Introduction.** Research showed that Emotion Regulation (ER) training could decrease youth's mental health problems, such as depression, anxiety, and stress due to approaching underlying mechanisms like rumination and hopelessness. However, ER strategies training was until now mainly examined in therapeutic and face-to-face settings. Especially in times of COVID-19, youth relies on digital media, wherefore this study introduced '#SelfCare', a self-help app constructed to train youth's adaptive ER strategies in a one-week intervention via different minigames. It was expected that (1) ER strategies are increased after one week of using #SelfCare, that (2) the adaptive ER strategies are respectively more increased in participants who indicate higher depression, anxiety, and stress scores, and (3) who mostly played evidence-based minigames compared to the ones playing non-evidence-based games.

**Methods.** Participants were randomly collected through social media and the SONA system at the Radboud University, leaving a sample of 136 participants. Inclusion criteria were 1) being female; 2) being 18 to 29 years old; 3) possessing an Android phone; and 4) reporting mild to moderate levels of depression, anxiety, and stress.

**Results.** A repeated measures ANOVA showed that one week of playing #SelfCare led to significantly increased ER strategies of the participants. However, neither the higher versus lower levels of depression, anxiety, and stress nor the evidence-based versus non-evidence-based minigames could account for significant differences in the ER strategies.

**Conclusions.** This study provided promising results due to increased ER strategies and a low number of dropouts in an online game-like setting. Therefore, future applications of #SelfCare could act as preventive measures for students or possible transitory periods until young people receive psychotherapy. However, in order to provide additional explanations, future studies might want to include a control condition next to ecological momentary assessments (EMA) and back end information about who played which minigames to get further insights into the participants' daily ER strategies usage during the intervention.

## **Evaluation of the effectiveness of #SelfCare - a mobile self-help app - to increase youths' emotion regulation (ER) strategies**

Young people in today's society become more and more vulnerable to mental health problems (Gustavson et al., 2018; Kutcher, 2017; Sutton, 2019). Even though most of these mental health problems are diagnosed prior to the age of 25, the number of young people suffering increased immensely over the last decade, with the highest increase in people aged 20-21 (Canady, 2019). Since adolescence and emerging adulthood implicate maturation, social role transitions, and high expectations of oneself and society, this phase highlights the importance of supporting youth in their life spans and offering them options to prevent the development of mental health issues (Kutcher, 2017; Sawyer et al., 2018). In this study, adolescents and emerging adults between the ages of 18 and 29 are specifically referred to as *youth*, representing young people who have become more independent and responsible, however, still need some protection and security (Sawyer et al., 2018).

The most prevalent mental health problems for youth seem to be depression, anxiety, and stress, often diagnosed too late for treatment (e.g., Braveman, 2014; Canady, 2019; Kessler et al., 2005; Oppenheimer et al., 2013; Sutton, 2019). Next to high psychological stress, indicating a prevalence of 24.8%, anxiety disorders are among the most common mental health disorders in youth with a prevalence of 19.1% till 26.7%, closely followed by major depressive disorders with a prevalence of 14.3% (Barker et al., 2019; Benjamin et al., 2011; Canady, 2019; Cooke et al., 2021; Gustavson et al., 2018; Meeus, 2016). This development of depression, anxiety, and stress is often evoked by uncertainty due to social, emotional, physical, and sexual changes next to high needs for belonging to matching peer groups (Arnett, 2007; Beardslee et al., 2012; Bogle, 2020; Erikson, 1968; Eriksson et al., 2020; Hardgrove, 2014). Considering the high comorbidity of depression, anxiety, and stress in youth, a number of similar underlying psychological problems have been identified (Barlow et al., 2004; Garber & Weersing, 2010; Gross & John, 2003). These can if targeted

accurately, lead to increased wellbeing and therefore prevent mental health issues (Barlow et al., 2004).

The underlying mechanisms that are involved in the development and maintenance of the comorbid mental health issues of depression, anxiety, and stress include dysfunctional physiological responses to stressful situations, rumination, hopelessness, and negative memory biases (Abramson et al., 1989; Brozovich, 2014; Dillon & Pizzagalli, 2018; Hoffart et al., 2020; Liu et al., 2015; Nolen-Hoeksema et al., 2008; Russell & Lightman, 2019).

*Dysfunctional physiological responses to stressful situations* refer to changes in the bodily response due to major chronic stressors and continuous cortisol exposure, possibly leading to heart-related issues, sleep dysregulation, and mental health problems in general (Freeman, 1975; Russell & Lightman, 2019). Next, *rumination* is defined as continuously thinking about one's problems and negative feelings, heightening the vulnerability for developing mental health issues, especially depression (Nolen-Hoeksema et al., 2008; Scaini et al., 2021).

Furthermore, *hopelessness*, a significant marker for psychological issues, is defined by having no or negative expectations about future events as well as feelings of incapability to prevent these adverse events from happening (Abramson et al., 1989). Last, *negative memory biases* refer to a superior recall of negative information over more neutral and positive information, leading to increased affective disorders (Duyser et al., 2020; Gotlieb & Joorman, 2010).

### **Mental health in times of COVID-19**

In current times of COVID-19, the underlying mechanisms and mental health issues are at risk to increase even more. COVID-19 induced sudden social isolation and distancing both privately and professionally due to the necessity of staying home, which may be especially damaging for youth (Block et al., 2020; Brehl et al., 2021; Rowe, 2020). Their critical developmental phase got disrupted, leading them to develop high psychological distress (Hoffart et al., 2020). Furthermore, the withdrawal of important social environments like school, hobbies, and peer groups entails high levels of uncertainty in young people

(Nelson et al., 2020). Therefore, technology gives them the only option to keep up with their social contacts online, resulting in an increased digital media usage (Granic et al., 2020; Lathika & Soman, 2021). While some young people might not be adversely affected by these increased online circumstances, others may develop extensive feelings of loneliness due to the virtual social environment in the lockdown (Kelly, 2019; Lathika & Soman, 2021; Savina et al., 2017). Especially youth with problematic health histories and coming from neglected families and areas with significantly higher infection and death rates due to COVID-19, tend to be distressed (Mazza et al., 2020; Rowe, 2020).

These feelings of loneliness and insecurity implicate further negative consequences such as higher depression, anxiety, and stress due to increased psychological mechanisms of dysfunctional physiological responses to stressful situations, rumination, hopelessness, and negative memory biases (Hoffart et al., 2020). Often evoked by worrying about loved ones, especially female students report critical dysfunctional physiological responses, including sleeping problems and hypervigilance due to continuous cortisol releases (Nikolova et al., 2020; Russell & Lightman, 2019; Schwartz et al., 2021). Furthermore, mainly women have shown to be vulnerable to rumination in COVID-19 times due to repeated exposure to uncontrollable situations such as medical problems and infected family members, ending up in a lot of worrying (Brehl et al., 2021; Mazza et al., 2020; Nikolova et al., 2020). In COVID-19 times, hopelessness was especially increased in females, who experienced problematic life conditions related to financial difficulties, mental and physical health issues next to illnesses and deaths of loved ones (Erdođdu et al., 2020; Hacimusalar et al., 2020). Last, as COVID-19 brings up memories about previous threatening pandemics, lonely and unhappy people have issues recalling positive aspects, wherefore they develop high negative memory biases towards COVID-19 (Giacco et al., 2016; P. Zhang et al., 2021; W. Zhang et al., 2021).

Often evoked by increases in the aforementioned underlying mechanisms, individuals frequently report increased problems in their emotion regulation skills when confronted with a

continuous stressor such as COVID-19, initiating higher levels of mental health issues (Brehl et al., 2021). Therefore, to decrease depression, anxiety, and stress, the need to fight the underlying psychological mechanisms is accentuated. To efficiently target each of these mechanisms directly, accurate and adaptive emotion regulation may provide a possible solution, leading to increased positive mental health accordingly (Sandner et al., 2019).

### **Emotion regulation**

Emotion regulation (ER) plays an essential role in wellbeing as it includes behavioral and cognitive processes that affect and influence emotional reactions and experiences, either in adaptive or maladaptive ways (Gross, 1998). *Adaptive* ER is the key to positive mental health due to utilizing appropriate techniques in response to situations that evoke specific emotions or psychological and physiological experiences (Aldao, 2013; Gross, 1998; Sandner et al., 2019). Adaptive ER strategies can involve different techniques like mindfulness, relaxation, reappraisal, and distraction leading to more resilience, flexibility, and happiness in youth (Brockman et al., 2017; Gross, 1998; Morrish et al., 2018). In contrast, *maladaptive* ER strategies, such as suppression, rumination, giving up, and self-devaluation can expire into negative effects on youth's mental health like developing depression and anxiety at a young age (e.g., Brans et al., 2013; Brehl et al., 2021; Chambers et al., 2015; Gross, 1998; Gross & John, 2003; Ochsner & Gross, 2007; Schäfer et al., 2017). In the current study, the focus is on the adaptive ER strategies relaxation, distraction, reappraisal, and goal-setting (Gross, 1998; Pichardo et al., 2014).

*Relaxation* is an ER strategy that directly affects the physiological response of an individual, used to decrease adverse physiological and experience-based aspects of negative emotions such as anxiety and stress (Gross, 1998). *Distraction* aims to shift the attentional focus away from negative emotions towards more neutral or pleasant aspects in a situation (Gross, 1998; Gross & John, 2003). It is quite contrary to rumination, a maladaptive ER strategy that changes attentional focus towards negative emotions and thoughts about future

threats (Gross, 1998; Nolen-Hoeksema, 1991). The ER strategy *reappraisal* is a form of cognitive change, that cognitively transforms and reinterprets a situation in order to decrease its negative emotional impact, leading to decreased negative emotion-loaded experience (Gross, 1998; Gross & John, 2003; Brockman et al., 2017). Last, *goal-setting* is defined by the intention to accomplish specific, challenging, measurable, and relevant objectives within a manageable timeframe (Eckhoff & Weiss, 2020; Locke, 1982).

Research has found that youth often tend to develop more difficulties in using these adaptive ER strategies in daily life when suffering from depression, anxiety, and stress (e.g., Aldao, 2013; Davoodi et al., 2019; Fresco et al., 2013; Renna et al., 2020; Sandner et al., 2019; Schäfer et al., 2017). To prevent or decrease the development of these mental health problems, it has been found that an integration of adaptive ER strategies in therapeutic inpatient settings is beneficial in improving wellbeing and leads to fewer mental illness-related symptoms (e.g., Berking et al., 2013; Brockman et al., 2017; Yildiz & Dui, 2019). To clarify further, due to applications of adaptive ER strategy training in wellbeing interventions, ER strategies might increase significantly in daily life (Berking et al., 2008; 2013). Hereinafter, those increased adaptive ER strategies show more positive effects in decreasing depression, anxiety, and stress due to reducing dysfunctional physiological responses to stressful situations, rumination, hopelessness, and negative memory biases (e.g., Chambers et al., 2015; Fresco et al., 2013; Renna et al., 2020; Schäfer et al., 2017; Yildiz & Duy, 2019).

For example, relaxation ER strategies showed positive effects in distressed youth by lowering high tensions and cortisol releases in the body, thereby targeting the dysfunctional physiological responses to stressful situations (Bouvet & Coulet, 2016; Chambers et al., 2015). This made the participants' bodies more persevering to extreme emotions, leading to improved physiological responses to stress and increased wellbeing in general (Bouvet & Coulet, 2016; Chambers et al., 2015). Related to distraction, studies showed that it is beneficial in targeting rumination due to switching the focus to more achievable and positive



future goals (Huffziger & Kuehner, 2009), next to negative memory biases due to evoking memories that are noncorresponding with the negative emotions (Gross, 1998). Furthermore, using the ER strategy reappraisal has shown to increase positive emotions and reduce negative memory biases due to reinterpretations of negatively loaded situations (Levine et al., 2012). As demonstrated by Marchetti and colleagues (2018), the two mechanisms of negative memory biases and hopelessness are strongly correlated, wherefore, reappraisal may be helpful in reducing both due to reconstructing more positive memories and emotions (Marchetti, 2019). Last, goal-setting is important in targeting hopelessness and rumination (Marchetti, 2019). An explanation may be provided by the so-called ‘blocked goal processing’, meaning that a pursuit of goals is difficult for hopeless and ruminating individuals especially (Marchetti, 2019). Therefore, active goal-setting might counteract and lead to more hope and positive thinking. For an illustration of the connectedness of ER strategies and underlying psychological mechanisms, see Table 1.

Even though the previous paragraphs reveal positive effects of adaptive ER strategies training, Chambers and colleagues (2015) indicated that the training was not as effective in individuals showing lower levels of depressive symptoms. This means that especially people with high levels of mental health problems before the intervention and more maladaptive ER strategies usage tend to benefit from adaptive ER strategies training in therapeutic settings (Chambers et al., 2015). This might be explained due to more room for improvement and reconstruction in people with higher depression, anxiety, or stress, and more difficulties in using adaptive ER strategies than people who already show accurate levels of ER strategies usage (e.g., Davoodi et al., 2019; Wang et al., 2017).

Previous studies by Berking and colleagues (2008; 2013) showed that the usage of adaptive ER strategies is increased after a training in therapeutic inpatient settings, wherefore ER strategies training needs to be examined in ‘outpatient’ game-like settings as well. This investigation is especially essential in times of COVID-19, in which face-to-face settings

often cannot be provided and young people highly rely on the digital environment to keep up their social contacts and reduce feelings of loneliness (Granic et al., 2020; Lathika & Soman, 2021). In order to examine the effects of ER strategies training related to the aforementioned underlying psychological mechanisms in a digital context, it may be beneficial to provide different technologies that youth can use (Gleeson et al., 2020). In this study, we tested #SelfCare – an app that includes multiple ER training minigames to decrease mental health issues (see Table 1).

### **#SelfCare**

#SelfCare (TRU LUV Media Inc., 2020) is a mobile self-help app that provides users with several minigames aimed at improving wellbeing. It is commercially available and can be downloaded for free with an Android mobile phone or iPhone. The download rates have been passing four million in 2021, also including numerous positive reviews (TRU LUV Media Inc., 2020). The adaptive ER strategies of relaxation, distraction, reappraisal, and goal-setting are integrated into seven evidence-based minigames, each constructed to target some of the four underlying psychological mechanisms (see Table 1). Therefore, it is expected that playing #SelfCare will lead to an increased usage of adaptive ER strategies after the training, initiating better wellbeing in the long run (Berking et al., 2008; 2013). Also, six non-evidence-based minigames are included in #SelfCare, that are expected to not lead to any beneficial effects in ER strategies usage.

To specify, how the ER strategies are integrated into the evidence-based minigames, first the training of relaxation is provided by one minigame - the ‘Breathing exercise’ - to approach the participants’ dysfunctional physiological responses to stressful situations (e.g., Johnson et al., 2015; Kuehner, 2008; Lancaster et al., 2016). This is featured by receiving the instructions of slowly breathing in and out, leading to a decreased heart rate and cortisol release (Perciavalle et al., 2017). Three other minigames - including the ‘Massage circle’, ‘Crystal memory game’, and ‘Cleaning up laundry game’ - aim to train the ER strategy of

distraction, thereby targeting rumination (Huffziger & Kuehner, 2009; Nolen-Hoeksema & Morrow, 1993) and negative memory biases by switching the negative focus (Gross, 1998). Furthermore, by training reappraisal in two minigames - a 'Journal' and 'Word-completion puzzle' - hopelessness and negative memory biases are targeted (Levine et al., 2012; Perchtold et al., 2018). For instance, journals have shown to increase hope and positive thinking by writing and thinking about goals and future steps (e.g., Curran & Reivich, 2011; Rader, 2010; Snyder, 2002). Additionally, the word-completion puzzle practices reappraisal due to letting the user complete solely positive words, not including negative phrases that might lead to more negative thinking. Finally, two minigames - including the 'Journal' and the 'Candle prompt' - are training the ER strategy of goal-setting, aiming at decreasing hopelessness and rumination. This is provided by writing and thinking about goals and future steps, possibly leading to increased hope next to less negative thinking and ruminating by the user (e.g. Curran & Reivich, 2011; Rader, 2010; Snyder, 2002).

The ER strategies, the minigames, and underlying psychological mechanisms are summarized in Table 1.

**Table 1**

*Summary of ER strategies, the evidence-based minigames of #SelfCare, and underlying psychological mechanisms*

Adaptive ER strategy	#SelfCare minigame	Underlying psychological mechanism
Relaxation	Breathing exercise	Dysfunctional physiological response to stressful situations
Distraction	Massage circle, Crystal memory game, Cleaning up laundry game	Rumination, Negative memory biases

Reappraisal	Journal, Word-completion puzzle	Hopelessness, Negative memory biases
Goal-setting	Journal, Candle prompt	Hopelessness, Rumination

---

### **Design and hypotheses**

The current study aimed to investigate whether the self-help app #SelfCare can train ER strategies in young females aged 18-29 years. Specifically, it was investigated if the participants' ER strategies in daily life improved from before to after using #SelfCare for one week. Based on previous work showing that the use of adaptive ER strategies is increased after ER training in therapeutic inpatient settings (Berking et al., 2008; 2013), a similar effect may be likely in an outpatient game-like setting. Therefore, we expected that (H1) the participants' adaptive ER strategies are significantly increased after one week of playing #SelfCare. Furthermore, it was examined how the usage of adaptive ER strategies before and after one week of playing #SelfCare differed between participants with higher and lower levels of depression, anxiety, and stress. As previous research has shown, youth with higher depression, anxiety, and stress indicate less usage of adaptive ER strategies, wherefore, they have more room for growth in adaptive ER strategies (e.g., Davoodi et al., 2019; Chambers et al., 2015; Wang et al., 2017). Therefore, we hypothesized that (H2) the ER strategies are more increased in participants with higher depression, anxiety, and stress levels than participants with lower levels. At last, it was investigated if the minigames in #SelfCare, based on the evidence-based ER strategies relaxation, distraction, reappraisal, or goal-setting, accounted for differences in the participants' ER strategies. We expected that (H3) adaptive ER strategies are more increased in participants who reported playing one of the seven evidence-based minigames closely related to adaptive ER strategies (i.e., Breathing exercise, massage circle, etc.), compared to participants using the non-evidence-based minigames primarily.

## Methods

### Participants

Data were collected through the SONA system at the Radboud University and by promoting #SelfCare via social media. If individuals were interested in participation, they first went to an online screening to check whether they fit the inclusion criteria. To be eligible for participation, individuals had to 1) be female due to the feminine outlook of the app; 2) be aged between 18 to 29 years; 3) possess an Android smartphone; and 4) report mild to moderate levels of depression, anxiety, and stress. In total, 139 participants were invited to participate in the study. Next to one participant being excluded from the dataset as he appeared to be male, two further participants were excluded as they stopped taking part in the intervention after the pretest questionnaire. Thus, the final sample included 136 participants, ranging from 18 to 30 years ( $M = 21.16$ ,  $SD = 3.24$ ). Most of the participants were Dutch (57%), whereas the rest was either German (18%) or coming from other nationalities (24%). Furthermore, almost all participants were students (~90.4%). In Table 2, an overview of the participant characteristics is presented. The current study was approved by the ethics committee of the faculty of social sciences at Radboud University (ECSW-2019-162).

**Table 2**

*Demographics of participants (n=136)*

Variable	<i>n</i>	%	<i>M</i>	<i>SD</i>	Minimum	Maximum
Gender						
Female	134	98.53				
Gender variant	2	1.47				
Age	136	100	21.16	3.24	18	30
18-20	75	55.15				
21-23	29	21.32				
24-26	19	13.97				

27-30	13	9.56				
Nationality						
Netherlands	78	57.35				
Germany	25	18.38				
Other	33	24.26				
Occupation						
Student	123	90.44				
Private sector	4	2.94				
Unemployed	5	3.68				
Self employed	1	0.74				
Government employee	1	0.74				
Other	2	1.47				
DASS total scores <sup>a</sup>	136	100	19.71	9.10	2	43
Higher	68	50	27.13	6.52	19	43
Lower	68	50	12.29	3.54	2	18
DASS depression scores <sup>b</sup>	136	100	6.25	3.84	0	16
Higher	74	54.41	9.12	2.70	6	16
Lower	62	45.59	2.83	1.49	0	5
DASS anxiety scores <sup>c</sup>	136	100	4.54	3.69	0	16
Higher	85	62.5	6.49	3.36	3	16
Lower	51	37.5	1.29	.76	0	2
DASS stress scores <sup>d</sup>	136	100	8.91	4.04	0	20
Higher	74	54.41	11.85	2.78	9	20
Lower	62	45.59	5.41	2.02	0	8

*Note.* Means (*M*) and standard deviations (*SD*) are only presented for continuous variables.

<sup>a</sup>The cut-off score for the DASS total scores is 18.5; <sup>b</sup>for DASS depression 6; <sup>c</sup>for DASS anxiety 3; <sup>d</sup>and for DASS stress 9 conducted via the median split. All values that are lower than these cut-off scores indicate ‘Lower’, all values that are equal to or higher than the cut-off score indicate ‘Higher’.

## Procedure

The data used in this study were examined as part of a larger research project. The procedure of the study included different steps. First, potential participants had the option to

take part in an online screening through an open link available in the SONA system of the Radboud University and by promotion of the #SelfCare intervention on social media. If the participants did not fit one or more inclusion criteria, they were thanked by the research team and not included in the study. If participants reported severe or extremely severe DASS-21 levels, they were not invited for the study but called by the researchers and informed about their mental health status and possibilities for help. All eligible participants were invited to take part in the one-week #SelfCare study with an information mail including an extensive explanation about the study and the motivation to ask remaining questions (see Appendix A). If the participants agreed to take part, they received an online consent form (see Appendix B) and once that was filled out, a link to the pretest questionnaire via Qualtrics. The pretest questionnaire examined aspects like the participants' demographics, their ER strategies (RESS-24; see Appendix D), their depression, anxiety, and stress levels (DASS-21; see Appendix E), and multiple other measures that were not included in the current study (see Appendix C for an overview of questionnaires).

Once finished with the pretest questionnaire, all participants received instructions on installing the two following apps: the EARS tool and #SelfCare. The EARS tool was used for passive sensing of the apps the participants used each day and to send Ecological Momentary Assessments (EMA's) five times a day with questions about the participants' mood and social media use. Furthermore, the EARS tool sent the participants nudges twice a day, once in the morning and once in the evening, to remind them to use #SelfCare. Content of the participants' other online activities during their screen time was not recorded. The data collected by the EARS tool was not used in the current study.

After both apps were installed, the week of playing #SelfCare started. For seven days, participants played the minigames in #SelfCare and received five short questionnaires each day concerning their mood and social media use, which is not further specified in this paper. After seven days, the participants received a link for the posttest questionnaire and

information about how to deinstall and delete the #SelfCare and EARS apps. The posttest questionnaire existed of almost the same measures as the pretest questionnaire, with the addition of questions concerning the minigames (see Appendix C). After the participants filled out the posttest questionnaire, they all had the option to select a gift (20 Euros or 3 SONA points). Three months later, participants received a final shorter follow-up questionnaire to check for the long-term effects of #SelfCare on wellbeing, which was not further examined in this study. After the follow-up, all participants received a final ‘Thank You’ mail, including a smaller gift (5 Euros or 1 SONA point).

## **Materials and Measures**

### ***Emotion Regulation (ER) Strategies Use (RESS-24)***

The Regulation of Emotion Systems Survey (RESS-24; De France & Hollenstein, 2017) is a 24-item self-report measure examining the extent to which participants utilize one of six ER strategies to deal with negative emotions, such as anger, sadness, and stress. The six strategies are relaxation, distraction, reappraisal, rumination, engagement, and suppression. Additionally, a seventh subscale of four custom-made questions was constructed to measure the participants’ goal-setting. The construction of the items for the ER strategy goal-setting was based on the factor analysis provided by Pichardo-Martinez and colleagues (2014). However, the items were slightly changed and adapted accordingly to the present study. Each of the seven ER strategies consists of four items in the survey. In this study, only the subscales of the game-related adaptive ER strategies, namely relaxation (4 items,  $\alpha = .90$ ), distraction (4 items,  $\alpha = .85$ ), reappraisal (4 items,  $\alpha = .93$ ), and goal-setting (4 items,  $\alpha = .86$ ) were used, indicating good to excellent internal consistencies and reliability (16 items,  $\alpha = .87$ ). All items were rated on a 5-point Likert scale ranging from 1 (never) to 5 (always), examining how frequently the users did the following things in response to negative emotions. Example items include ‘Focusing on slowing my heart rate and breathing’ (Relaxation), ‘Immediately working on something to keep myself busy’ (Distraction), ‘Thinking of other



ways to interpret the situation' (Reappraisal), and 'Setting goals to tackle what was bothering me' (Goal-setting). In order to handle the raw data, mean total scales were created of each subscale and then added in order to have a total ER strategy usage score, with higher scores indicating higher levels of ER strategy usage. For an overview of the RESS-24 questionnaire see Appendix D.

### ***Depression, anxiety, and stress (DASS-21)***

The Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995) is a 21-items questionnaire based on the original DASS-42 scale, assessing the three related emotional states of depression, anxiety, and stress levels over the last week. Seven items are related to each subscale of depression (7 items,  $\alpha = .81$ ), anxiety (7 items,  $\alpha = .77$ ), and stress (7 items,  $\alpha = .81$ ), indicating acceptable to overall good internal consistencies and reliability (21 items,  $\alpha = .87$ ). In the DASS-21, the items are rated on a 4-point Likert scale from 0 ('Did not apply to me at all') to 3 ('Applied to me very much, or most of the time'). Example items include 'I couldn't seem to experience any positive feeling at all' (Depression), 'I was aware of dryness in my mouth' (Anxiety), and 'I found it hard to wind down' (Stress). In the current study, only the pretest DASS-21 scores were used, as we were interested in how depressed, anxious, and stressed the participants scored before the intervention and how that might influence their ER strategies. The raw data were examined by conducting the mean of all items belonging to each subscale of depression, anxiety, or stress, and by calculating the mean total scales of the three subscales. Based on a median split calculation, that examines the median of a scale and divides the data at that median value, a cut-off score of 18.5 for the total DASS scores, a cut-off score of 6 for the DASS depression scores, a cut-off score of 3 for the DASS anxiety scores, and a cut-off score of 9 for the DASS stress scores was used. Based on these cut-off scores, the participants were either allocated into the 'lower' (values below the cut-off score) or 'higher' (values above the cut-off score) half of DASS total, depression, anxiety, and stress scores. Consequently, the classification of higher and lower scores was

based on the median split of the raw data and not on clinical cut-off scores. For an overview of the DASS-21 questionnaire, see Appendix E.

### ***#SelfCare***

When opening the app #SelfCare, the user looks upon a small light-flooded room, as displayed in Figure 1. The app is grounded with meditating music, which can be turned on or off as preferred. In the menu, the user can indicate the skin color of the sleeping person. Furthermore, the user can indicate the color and pattern of the duvet and carpet by paying extra costs. The color of the room walls and the footwear lying on the ground can be changed without additional payment. The user can scroll around in the room, tapping on each object. By doing that, messages pop up, telling the user what the subject is and what can be done with it. For some, as for instance the mobile phone, the app gives the user the information that she will not use it today, while it shows short phrases when touching the plants, such as ‘This plant is a mirror. In a pot. Hungry for sun and water’ or ‘Just a little plant’.

### **Figure 1**

*User's view on #SelfCare room*



**#SelfCare Minigames.** The #SelfCare app includes thirteen different minigames that are played during the intervention phase of one week. The minigames are not based on winning or losing, however, solely on making the players feel better. More specifically, the evidence-based minigames that are related to ER strategies and assumed to show positive effects on the participants' ER strategies in daily life are the following: 'breathing exercise' (relaxation), 'massage circle' (distraction), 'crystal memory game' (distraction), 'cleaning up laundry game' (distraction), 'journal' (reappraisal and goal-setting), 'word-completion puzzle' (reappraisal), and 'candle 10 prompt' (goal-setting). The other non-evidence-based minigames, like 'Stroking the cat' and 'Painting puzzle' etc., are not assumed to show beneficial effects and will not be further specified here.

The breathing exercise instructs the user with the terms 'Breathe in' and 'Breathe out' via an opening and closing flower (see Figure 2). The rhythm of breathing in and out can be changed into slower or faster, while the symbol of the blooming flower can be exchanged with a breath-following growing and sinking mountain, a melting cube, or coalesce.

## Figure 2

### *Breathing Exercise*

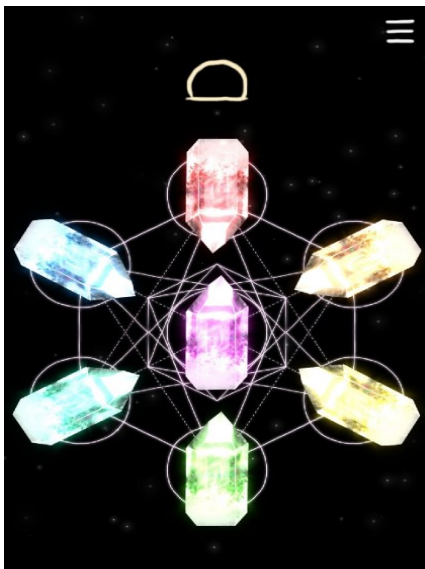


The minigame ‘massage circle’ is a big circle (pink, blue, yellow, purple), which the user needs to rub with the finger to change the color and reveal a new layer. After a few times of ‘massaging’ the circle, the circle becomes bigger. The circle’s color can be changed manually from ‘Solids’ into ‘Darks’ and ‘Bright’s’.

The ‘Crystal memory game’ shows five crystals in different colors that shine in different orders, as illustrated in Figure 3. According to the order in which the crystals start to shine, the user must try to remember and tap on the crystals in the same order.

**Figure 3**

*Crystal Memory game*



The ‘Cleaning up laundry game’ shows the user little circles with small pieces of laundry, which need to be picked up. After a few rounds of picking up laundry, additional subjects are shown that are no clothes (buttons, paper, broken pencils, etc.) and are not supposed to go into the laundry basket. The user has the option to change the color of the clothes from black basics to rose, violet, or warm neutral-colored clothes.

The journal, illustrated in Figure 4, is a pink book, which the user can open at any time. It can be used to write down how the user feels or what she thinks about at the moment.

Once the user opens the journal, a page with the date and time is presented, where, at the top, the user can see sticky notes showing different colors and symbols. Those are the journal prompts the user can click on and that give some advice on what to write about, such as ‘Maybe we could remember a time when we quietly accomplished something important.’. Once written about a specific prompt or topic, it will be shown as a sticker on the journal’s front. For instance, an eye stands for expanding knowledge and beliefs and pineapples are symbols for fun and celebration, etc. It is possible for the user to tear out pages if she has the need to remove unwanted thoughts and feelings.

#### Figure 4

*Journal Cover #SelfCare*

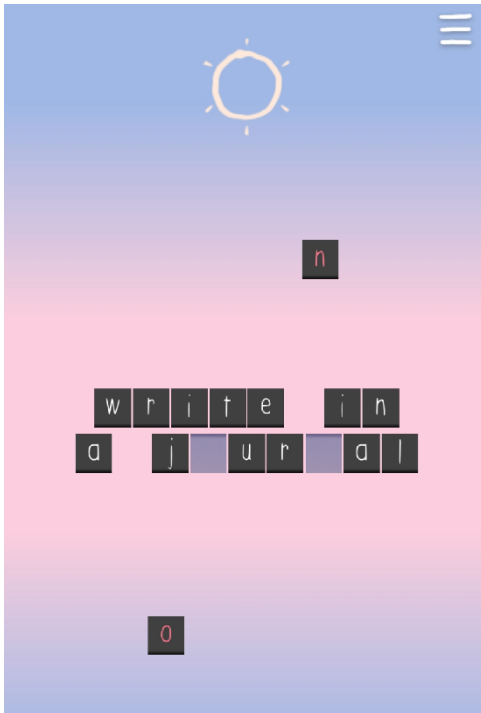


The word-completion puzzle shows incomplete words and short phrases which need specific letters to be filled in (see Figure 5). An example is ‘m\_rni\_g’ with the missing letters of ‘o’ and ‘n’. After dropping them into the right place, a new letter combination shows up. In this minigame, the user has options to change the layout and context of words that need to be

completed. Next to words related to ‘Self-care’, the game offers words related to ‘Soft mornings’, ‘Affirmations’, and ‘Tips’, additionally to some chargeable options.

**Figure 5**

*Word-completion puzzle*



The minigame ‘Candle prompt’ instructs the user to light a candle. Before, the user can click on two symbols, indicating either an intention (e.g. ‘love’) or something to let go of (e.g. ‘stress’). The intention-related words slowly appear as the candle is lighted, the words related to something the user wants to let go of, slightly disappear the longer the candle burns.

The app includes a little altar, where the user can store things and subjects she gets after playing the minigames, which mean something to her. For instance, a ‘Cone incense’ can be combined with a meaning (e.g. ‘It makes me smile’), memory (e.g. ‘My mum used to put them up in the living room all the time.’), and intention (e.g. ‘I will use it every Sunday in the afternoon when I have tea’) the user can fill in herself or can be put away in the shelf if not needed.

**#SelfCare Measure.** To attain frequency data for the thirteen minigames, the

following question was asked in the posttest questionnaire: *Which minigame have you played the most within #SelfCare?* If the participant played one of the seven evidence-based minigames primarily, she received the value ‘1’ in the dataset; if she liked to play one of the six non-evidence-based games more, the value ‘0’ was assigned. Based on that, a categorical dummy variable for the ‘most-played minigames’ was constructed by SPSS, dividing the participants into those who mostly played evidence-based games (‘1’) versus non-evidence-based games (‘0’).

### **Data analysis**

Basic descriptive statistics of all variables of interest were examined in SPSS version 25 (IBM Corp., 2017) to inspect general statistics as means and standard deviations next to irregularities in the data. Except for three cases, there were no missing data, wherefore, no Little’s MCAR test had to be used in order to examine if the data are missing at random or not. Pearson correlations were calculated for all continuous variables of the ER strategies at pre- (T1) and posttest (T2), the DASS total, depression, anxiety, and stress scales, and age.

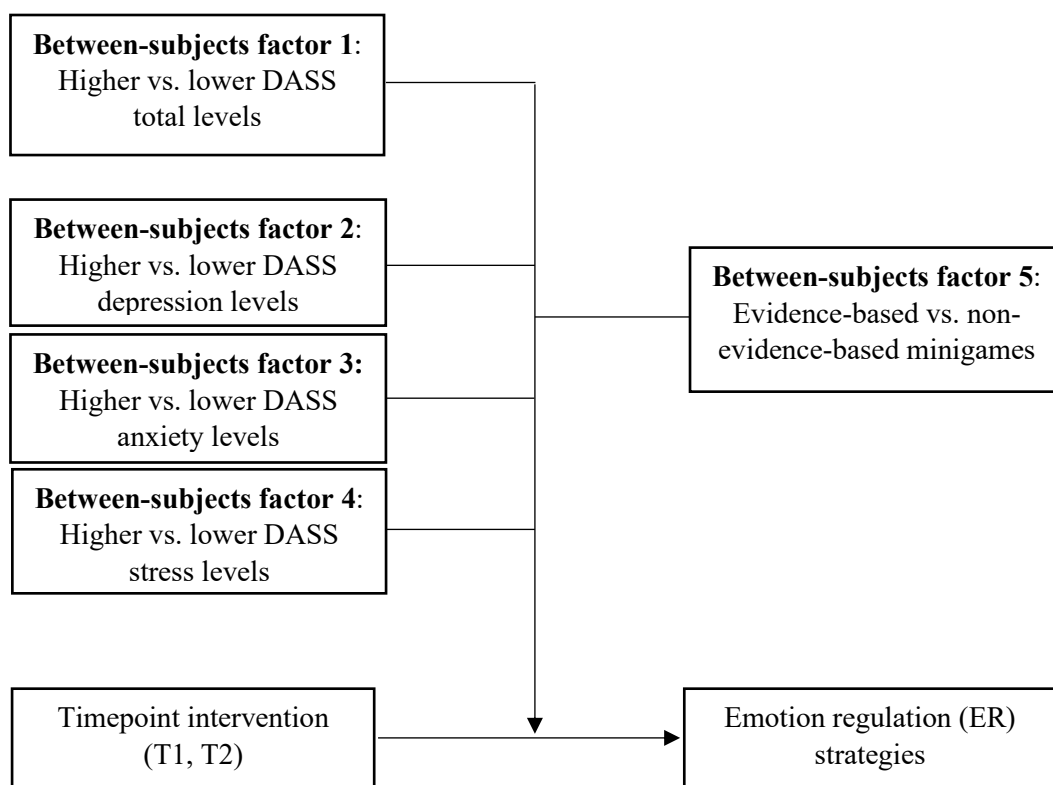
### ***Repeated measures ANOVA***

To test whether there are differences in the ER strategies use of participants between pre- (T1) and posttest (T2), a linear one-way repeated measures analysis of variance (RM-ANOVA) was conducted. This RM-ANOVA included one within-subjects factor (ER strategies at timepoints T1 and T2) and several between-subjects factors: the four between-subjects factors of participants’ DASS total, depression, anxiety, and stress scores (higher versus lower levels) and one between-subjects factor of the different minigames that were most used by the participants (evidence-based versus non-evidence-based minigames). These are illustrated in Figure 6. The independent variable is the timepoint of intervention (timepoint T1, T2), whereas the dependent variable indicates the ER strategies. To conduct a one-way RM-ANOVA, it must be reassured that the data is approximately normally

distributed via looking at the skewness of the data and the Shapiro-Wilk test of normality. In this case, the data of some variables were slightly violated in normality, wherefore an additional log10 transformation of the needed data is recommended (Rummel, 1988). It was calculated additionally in this study to see if there are significant differences between the transformed and original data. However, as no significant differences in the results of the log10-transformed data could be found, we chose to work with the original non-transformed data for better interpretations.

**Figure 6**

*Conceptual model of the one-way RM-ANOVA*





## Results

### Descriptive statistics

To test the assumption of normality, the Shapiro Wilk test was conducted, initiating nonsignificant results for both the pre- (T1;  $p = .05$ ) and posttest (T2;  $p = .06$ ) measures of ER strategies (RESS-24). Furthermore, the two variables of pre- and posttest ER strategies did not show highly skewed values, whereas an approximately normal distribution could be reassured. Also, the stress variable of the DASS showed nonsignificant results ( $p = .09$ ), initiating an approximately normal distribution. However, the total, depression, and anxiety DASS scores showed significant results ( $p < .01$ ) additionally to skewed values above 1, indicating nonnormality. The assumption of an approximately normal distribution could therefore be met for the two ER variables and the stress scale of the DASS questionnaires, however not so for the total, depression, and anxiety DASS variables. However, the variables were not highly violated, wherefore, based on the reasonable number of participants ( $n = 136$ ) and a nonextreme skewness (Harwell & Serlin, 1997), a repeated measures ANOVA was still conducted without utilizing a nonparametric test.

### Pearson Correlations

Pearson correlations of all continuous variables used in this study can be viewed in Table 3. The correlations were interpreted based on the guidelines of Cohen (1988). Age did not significantly correlate with any other variable, however, it showed a weak significant positive correlation with the stress scores of the DASS questionnaire. This indicates that with the age of the participants, the DASS stress scores increased. In addition, a weak positive correlation between posttest ER strategies and the DASS anxiety scale could be determined, initiating that with greater usage of posttest ER strategies the participants' DASS anxiety scores increased too. A moderate positive correlation occurred between the subscales of DASS depression and DASS stress, indicating that with higher DASS depression scores, the

DASS stress scores were higher as well. Strong positive correlations occurred between the subscales of DASS anxiety and DASS stress, pointing to higher DASS stress scores in the case of higher DASS anxiety scores. Furthermore, as expected, strong correlations of DASS total and respectively DASS depression, anxiety, and stress were found. This initiates that greater DASS total scores of the participants were associated with higher DASS depression, anxiety, and stress. Lastly, a strong positive correlation could be seen between the pre- and posttest measurement of the ER strategies, indicating that higher pretest ER strategies are associated with higher posttest ER strategies (see Table 3).

**Table 3**

*Pearson Correlations among ER strategies scores, DASS scores, and age*

	1.	2.	3.	4.	5.	6.	7.
1.Age	-						
2.DASS anxiety	-.023	-					
3.DASS stress	.203*	.549**	-				
4.DASS depression	.114	.291**	.431**	-			
5.DASS total	.131	.772**	.849**	.732**	-		
6.T1 ER strategies	-.086	.094	-.147	-.104	-.071	-	
7.T2 ER strategies	-.116	.180*	-.086	-.060	.009	.683**	-

\*Correlation is significant at the 0.05 level (2-tailed)

\*\*Correlation is significant at the 0.01 level (2-tailed)

### **Repeated measures ANOVA**

A one-way RM-ANOVA was used to examine whether the usage of ER strategies was increased after one week of playing #SelfCare. An RM-ANOVA with one within- and five between-subjects factors was conducted to compare the effect of time on ER strategies in higher versus lower DASS levels and evidence-based versus non-evidence-based usage of

minigames. The means and standard deviations of the ER variables T1 and T2 with all five between-subjects factors are presented in Table 4.

**Table 4**

*Observed values for both timepoints of the ER strategies measurements (T1, T2) and the five between-subjects factors*

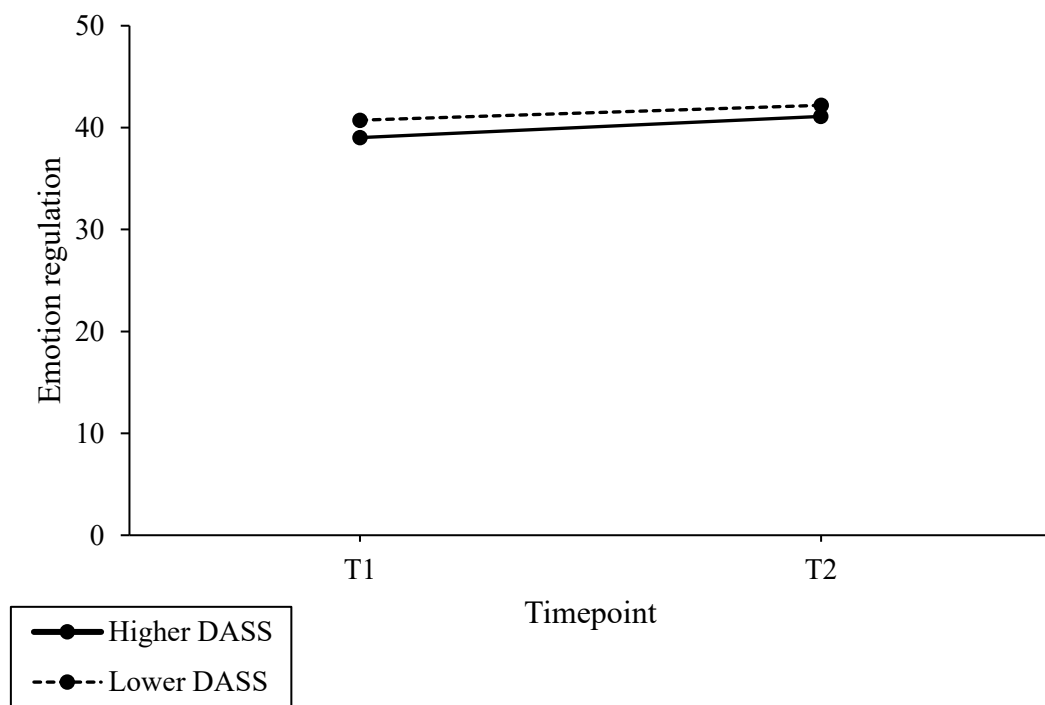
Between-subjects factor	ER strategies			
	ER pretest (T1)		ER posttest (T2)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1.DASS total				
Higher	39.02	9.82	41.10	10.98
Lower	40.73	10	42.19	10.62
2.DASS depression				
Higher	39.51	9.53	40.80	10.84
Lower	40.32	10.40	42.66	10.69
3.DASS anxiety				
Higher	41.29	10.12	42.81	10.55
Lower	37.51	9.17	39.69	10.96
4.DASS stress				
Higher	39.31	10.49	41.38	11.18
Lower	40.56	9.21	41.95	10.36
5.Minigames				
Evidence-based games	39.40	10.09	41.16	10.58
Non-evidence-based games	40.95	9.51	42.75	11.26

The RM-ANOVA revealed a main effect of time on the ER strategies,  $F(1, 135) = 6.13, p = .01$ , indicating a significant general increase of ER strategies usage from pre- (T1) to posttest (T2). However, concerning the first between-subjects factor, no significant effect of the DASS total scores could be found,  $F(1, 134) = .74, p = .39$ , initiating that the DASS total scores did not account for significant differences in the ER strategies. Furthermore, there was

no significant interaction effect of Time \* DASS total scores,  $F(1, 134) = .18, p = .67$ , initiating that the usage of ER strategies increased similarly among participants with higher and lower DASS total scores (see Figure 7).

**Figure 7**

*Between-subjects factor of the higher versus lower DASS total scores*

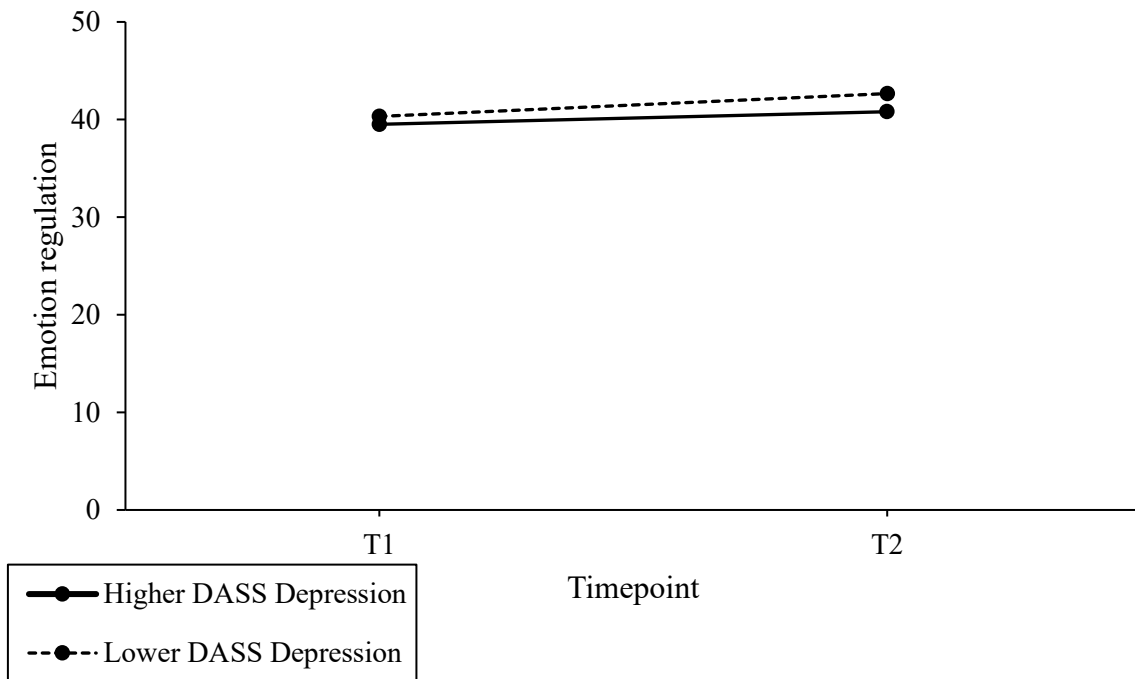


*Note.* The time of the intervention is presented on the x-axis (pre T1 and post T2), the values of emotion regulation (ER) are shown on the y-axis; The lines in the diagram represent how that relationship is moderated by the between-subjects factor.

Secondly, there was no significant effect of the DASS depression scores either,  $F(1, 134) = .67, p = .41$ , indicating that the DASS depression did not account for significant differences in ER strategies. Also, there was no significant interaction effect of Time \* DASS depression,  $F(1, 134) = .56, p = .46$ , indicating that the ER strategies increased similarly in both participants with lower and higher depression scores (see Figure 8).

### Figure 8

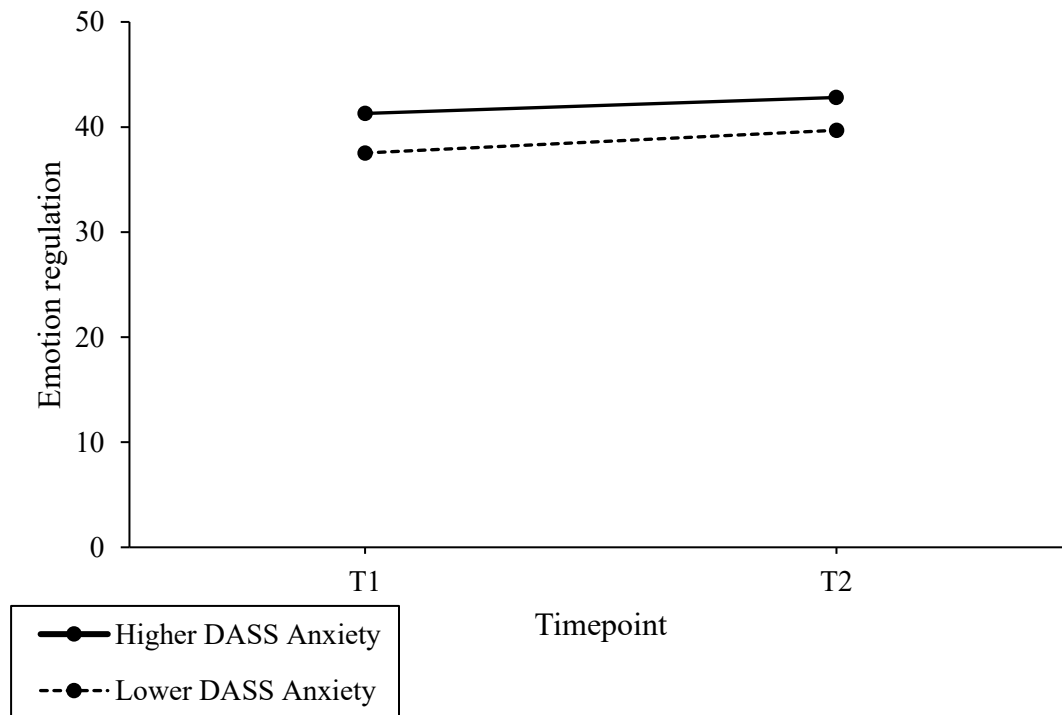
*Between-subjects factor of higher versus lower DASS depression scores*



There was a significant effect of the DASS anxiety scores,  $F(1, 134) = 4.30, p = .04$ , indicating that the DASS anxiety could account for significant differences in ER strategies. However, there was no significant interaction effect of Time \* DASS anxiety,  $F(1, 134) = .19, p = .66$ , indicating that the ER strategies increased similarly in both lower and higher anxiety scores participants (see Figure 9).

**Figure 9**

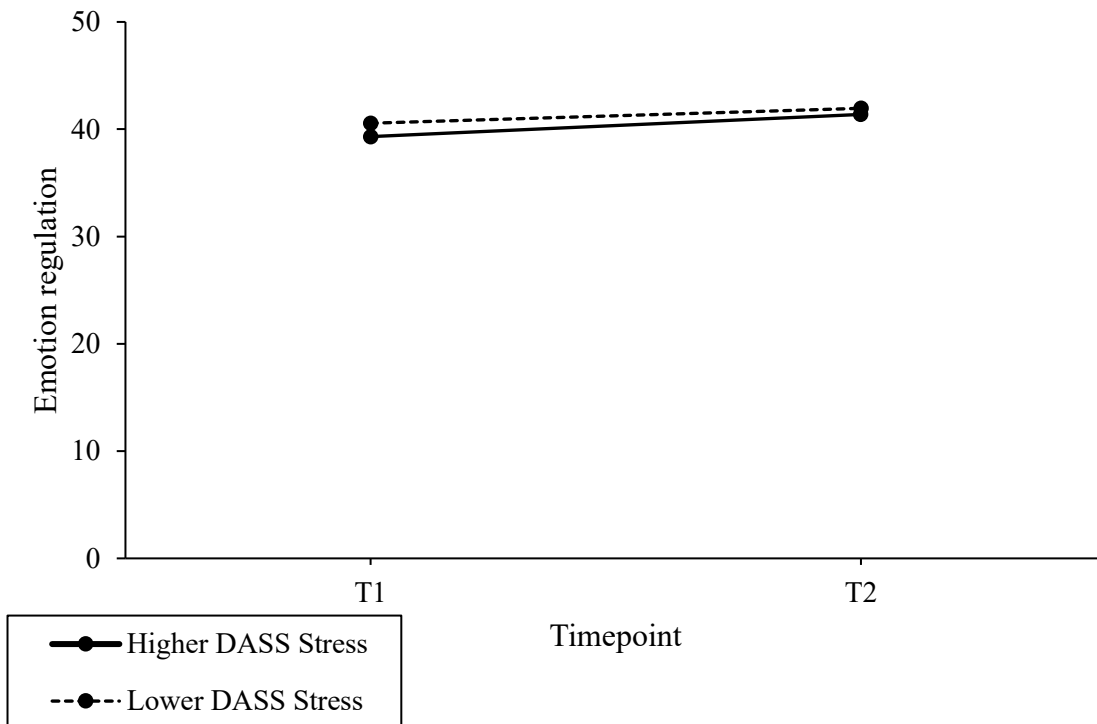
*Between-subjects factor of higher versus lower DASS anxiety scores*



There was no significant effect of the DASS stress scores,  $F(1, 134) = .31, p = .58$ , indicating that DASS stress could not account for significant differences in ER strategies. Furthermore, there was no significant interaction effect of Time \* DASS stress,  $F(1, 134) = .23, p = .64$ , indicating that the ER strategies increased similarly in both lower and higher stress scores participants (see Figure 10).

**Figure 10**

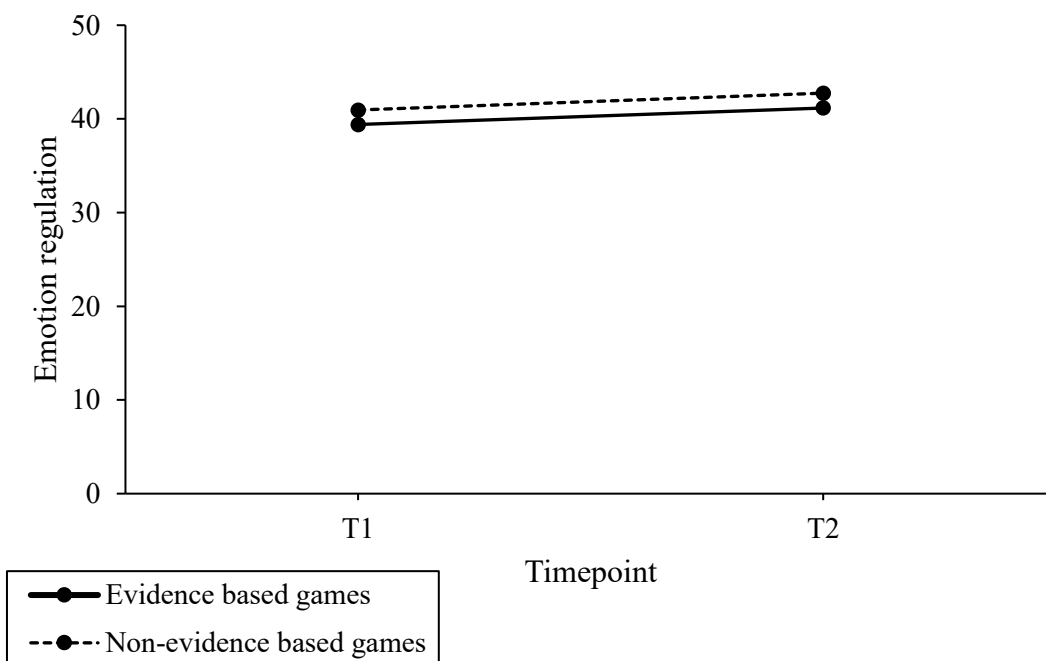
*Between-subjects factor of higher versus lower DASS stress scores*



At last, no significant effect could be examined for the fifth between-subjects factor, the minigames,  $F(1, 134) = .77, p = .38$ , indicating that the minigames did not account for significant differences in ER strategies. Furthermore, no interaction effect of Time \* Minigames could be found,  $F(1, 134) = .002, p = .96$ , initiating similar increases in participants who used evidence-based and participants who used the non-evidence-based minigames primarily (see Figure 11).

**Figure 11**

*Between-subjects factor of the evidence-based versus non-evidence-based minigames played in #SelfCare*





## Discussion

This study aimed to determine the effect of the self-help app #SelfCare on the ER strategies of young participants after one week of using #SelfCare. In line with the first hypothesis, it was found that #SelfCare had a positive effect on the participants' ER strategies after playing for one week. Secondly, it was examined if depression, anxiety, and stress were initiating differences in the ER strategies of the participants. Not supporting the second hypothesis, the ER strategies did increase similarly in both participants with higher and lower levels of depression, anxiety, and stress. Last, it was examined if the #SelfCare minigames accounted for differences in the ER strategies. However, contradicting the third hypothesis, no differences in the usage of ER strategies could be found in participants who used evidence-based versus non-evidence-based games primarily.

### ER strategy training #SelfCare

The increase of ER strategies due to #SelfCare is consistent with general ER studies that discovered and identified significant increases in ER strategies after interventions utilizing extensive ER strategies training (e.g., Berking et al., 2008; 2013). However, although the examinations of Berking and colleagues (2008; 2013) are in line with the outcomes of this study, the context and setting of the interventions differed. The current study took place in an online game-like setting, whereas the studies by Berking and colleagues (2008; 2013) occurred in an inpatient therapeutic context. Therefore, this study represents one of the first direct demonstrations that a utilization of ER strategies training in online game-like settings might be as effective as in therapeutic settings.

Counteracting to studies of Berking and colleagues (2008; 2013) this study did not include a control group to examine efficacy. Even though, we did find a significant effect of #SelfCare, the risk of misinterpretations and correlating outcomes to the treatment condition may be heightened when not including control groups, possibly leading to falsified and

nonreliable results (Choi & Lam, 2017). Therefore, we cannot tell certainly, if the positive training effect can be attributed to #SelfCare alone. Hence, next to the participants playing #SelfCare for one week, it might have been beneficial to compare the #SelfCare group to at least one other condition, for instance, a control condition playing #SelfCare with only using the non-evidence-based minigames or a ‘no-intervention’ control condition playing no games at all. Consequently, one could examine the similarities and differences in pre and post ER strategies that might give further insights into which factors influence the effectiveness of the ER strategies training used in #SelfCare.

### **Depression, Anxiety, and Stress**

Secondly, although a significant increase in ER strategies was detected, the ER strategies did not increase differently in participants with higher or lower depression, anxiety, and stress levels in the DASS-21 questionnaire. Contrasting our results, a study by Chambers and colleagues (2015) found that ER strategies were more increased in participants with, for instance, severe depression-related symptoms. Furthermore, past studies showed that individuals with higher depression, anxiety, and stress show generally lower utilization of adaptive ER strategies (e.g., Davoodi et al., 2019). However, in the current paper, the ER strategies of the participants before they started playing #SelfCare, did not differ significantly in lower or higher depression, anxiety, and stress scores.

The in this study established cut-off scores might provide an explanation for the similar usage of ER strategies in participants both higher and lower in depression, anxiety, and stress scores. According to the evaluation of the DASS-21 questionnaire, the three subscales of depression, anxiety, and stress have specified scores, at which the values are allocated into either normal, mild, moderate, severe, and extremely severe levels (Lovibond & Lovibond, 1995; also see Dunstan et al., 2017). However, using a cut-off score based on those clinically provided values, the participants’ depression, anxiety, and stress values showed to be highly unequally distributed in this study, initiating less reliable results. In such cases, also

including nonnormal distributed data, a median split is often recommended (Iacobucci et al., 2015). Therefore, it was decided to construct the cut-off scores in all subscales based on the median split of depression, anxiety, and stress, so that these can be equally distributed into higher and lower levels at the median value. However, although non-clinically based median splits are valid and helpful analytical tools, they may increase the risk for Type I or II errors and misleading results (Iacobucci et al., 2015).

When comparing the here established cut-off scores to the clinical scores of the DASS-42 (Lovibond & Lovibond, 1995), it becomes clear that generally participants in this study scored very low in the subscales of depression, anxiety, and stress. For instance, the scores for mild anxiety are clinically predefined between values of 8-9 (Lovibond & Lovibond, 1995). However, the cut-off score for higher and lower depression in this study was 6 due to multiplying the original value of 3 by two to make it comparable to the DASS-42. The here established cut-off at value 6 may indicate a possible bottom effect in anxiety, as the value 6 counts as clinically normal, not indicating mild to moderate levels. Therefore, the 'higher' anxiety participants, namely those who scored above the cut-off score 6, may still have had normal to mild symptoms when clinically viewed, indicating why there was a nonsignificant difference in ER strategy usage to participants who scored below 6, therefore, are clinically normal in anxiety. Due to these possible misinterpretations in the data, the nonsignificant difference of ER strategies in participants with higher and lower depression, anxiety, and stress may be partly explained.

Furthermore, past studies examining the DASS-21 questionnaire found that it is generally helpful to measure depression, anxiety, and stress in clinical populations (NG et al., 2007; Sukantarat et al., 2007) as well as nonclinical settings (Antony et al., 1998). However, it is still unclear how emotional responses in the DASS-21 differ between clinical and non-clinical groups (Osman et al., 2012). The current study aimed at including a solely non-clinical population with the exclusion of participants with no or severe to very severe

depression, anxiety, and stress symptoms. By only including the central part of the DASS-21, the study could account for mild to moderate levels only, initiating a smaller range between lower and higher levels of depression, anxiety, and stress. Therefore, also acknowledged in the previous paragraph, the results imply that the levels of depression, anxiety, and stress might have been too similar or even too low to account for significant differences in ER strategies.

### **#SelfCare minigames**

Contradicting the third hypothesis of this paper, ER strategies increased similarly in both participants using the evidence-based or non-evidence-based minigames of #SelfCare. One explanation for this finding may be provided by the lower structure and guidance in #SelfCare. This idea is supported by past studies showing that both too much structure and not structuring the player can negatively impact the player's engagement (Huang, 2011; Van Merriënboer & Sweller, 2005). Generally, #SelfCare encourages the player to be very autonomous and independent, as the app does not give any specific directions on which minigame to play next. This might have beneficial aspects, however, on the other hand, it could lead to disengagement and slight frustration, and therefore little time spent playing the minigames (Van Merriënboer & Sweller, 2005). Consolidating this aspect, the current study did not include further information about how much time the players effectively spent playing the evidence-based and non-evidence-based games, initiating possible short periods in which the players played the game. In future research, this could be tackled by including more information about the frequency and time spent playing minigames to possibly see differences in players who spent more and players who spent less time playing #SelfCare.

Another explanation for the similar ER strategies usage in evidence-based and non-evidence-based minigames may be provided by the idea that the ER strategies usage might differ based on the participants' age and maturity. As shown by past studies, training for the ER strategy reappraisal seemed to be more effective in teenagers compared to older people

(Brockman et al., 2017; Opitz et al., 2012). Furthermore, persons usually become more skilled in applying ER strategies the older and more mature they get, having less need for specific ER strategies training (Sahdra et al., 2016). In this study, the age ranged from 18 – 30 years, also containing individuals who were older and no teenagers anymore. Therefore, there might have been important differences in how the minigames showed effectiveness in younger and older players. In future studies, age could be added as a between-subjects factor to examine additionally which minigames were mostly used by whom. By that, research could further examine, if the difference in ER strategies usage of younger and older individuals is also significant in threatening and uncontrollable pandemics such as COVID-19.

### **Strengths and limitations of the study**

A major strength of this study is the low number of missing values. Except for three participants who had to be excluded from the study, no missing values were reported. For this, the frequent reminder mails might have been beneficial. Also supporting this idea, since digital media generally has more value for youth than for older people, the young participants might have been highly motivated to take part in the intervention (Uhlhaas & Torous, 2019). Although previous literature states that nonclinical settings might be difficult to control (Van Deursen et al., 2013), this game-like training and setting might have been beneficial for many participants as they felt more comfortable and disinhibited due to being anonymous (Clark-Dorgon et al., 2019). Especially in times of COVID-19, youth depend and rely on digital media (Gleeson et al., 2020), wherefore #SelfCare provides them with one of the few available options. Taken together, the #SelfCare intervention seems to be useful and practical due to successfully providing youth with a motivating and effective digital option for increasing their ER strategies.

Although the present results support the usage of #SelfCare, it is appropriate to recognize several potential limitations. Two first limitations concern the aforementioned not included control group and usage of self-established non-clinical cut-off scores in this study.

An additional limitation is that the study had the inclusion criteria of girls only due to the layout of the self-help app #SelfCare. As we live in a generation in which gender neutrality develops and should also be more respected in psychological research (Cameron & Stinson, 2019), male participants who like the aesthetics of #SelfCare, should be able to take part. Furthermore, the sample mainly consisted of students (90.4%), initiating limited generalizability to young people additionally. Since not all young people are students, including individuals who might not have the money to go to college or university (Cellini & Darolia, 2017), future studies might include more varied groups of young people, as digital media interventions such as #SelfCare might be beneficial for them too.

### **Practical implications and directions for future research**

Despite the aforementioned limitations, the results suggest several implications for future research. The significant increase in the participants' usage of ER strategies due to the #SelfCare training might provide a first potential intervention implication. As youth live in a generation where digital media plays an increasingly important role, especially in times of COVID-19, the importance of wellbeing technologies is highly accentuated (Gleeson et al., 2020). Furthermore, since youth in COVID-19 times often tend to maladaptively regulate their emotions, a beneficial technology is provided by #SelfCare. Also supported by the outcomes of this study, #SelfCare may prevent the development of mental health issues due to training how to use ER strategies adaptively. Therefore, #SelfCare could be applied in schools or universities and further used as a preventive option for students to learn how to regulate emotions in adaptive ways. Even though #SelfCare cannot replace and account for psychotherapy alternatives, it gives further promising results to use for individuals who are currently waiting to start their psychotherapy and might, therefore, help to bring down waiting lists.

In terms of future research, it may be useful to extend the current findings by examining the effect of #SelfCare in longer intervention periods. Contrasting the short-term

nature of the one-week intervention in this study, past studies examined significant effects, however, in treatments of approximately 7 till 16 weeks (Berking et al., 2013; Renna et al., 2020). Therefore, the time frame of this study may have been too short to develop significant ER strategy differences in either baseline depression, anxiety, and stress levels next to the #SelfCare minigames. For future studies, it might be helpful to increase the length of intervention to find more significant and balanced effects. Also, the general ER training may then have more chances to improve.

It might also be important to further evaluate which factors in the #SelfCare training played essential roles in increasing ER strategies. To solve this problem, it might be helpful to use the backend data of the #SelfCare intervention. This may include data on how often the participants used certain minigames, at what moments during the day they played #SelfCare, and if they only opened the app when getting a reminder or also independently. These investigations are needed and may explain what factors account for additional explanations in the relation between the #SelfCare training and usage of ER strategies.

Furthermore, although this study included ecological momentary assessments (EMA) of mood, it did not measure ER strategies usage in the EMA data collection. Including this in future analyses might account for more important explanations (also recommended by English & Eldesouky, 2020). As shown by English and Eldesouky (2020), individuals' ER strategies show high flexibility in different situations and contexts. Due to only measuring ER strategies before and after the #SelfCare intervention, this study could not gather important information about the ER strategies *during* the process. In a study by Kneeland and colleagues (2020), they applied an EMA and examined how moderately depressed individuals regulated their emotions in different events over one week. By doing that, possible fluctuations and more specific timepoints and contexts at which the participants use adaptive or rather maladaptive ER strategies could be identified (Kneeland et al., 2020). This may also be applied in the current study context. For instance, EMA questions like 'Which minigame did you play or

like the most *today?*', 'Did you switch between different games?' etc., might be included in future studies to gather more context-specific information.

### **Conclusion**

In conclusion, the current study revealed improvements in the usage of ER strategies due to the one-week intervention #SelfCare. However, neither depression, anxiety, and stress, nor the #SelfCare minigames could account for any differences in the usage of ER strategies. Still, this examination of the one-week #SelfCare intervention for youth provides promising results due to showing efficacy in helping young people to increase their ER strategies usage in a one-week period only. Imagining that young people use it in their daily life over a longer period might assure even higher beneficial effects, prompting youth to increase their ER strategies and possibly wellbeing as well. Additionally, ER strategies training was, to the author's knowledge, not yet used in online game-like settings before. Due to few dropouts, #SelfCare proved that online training for ER strategies may be as effective as in therapeutic settings, yielding high expectations for future usage of #SelfCare. Future work should build on the application of #SelfCare in practical settings so that young people can use it to bypass the time until their therapy starts or generally in prevention contexts. Also, next to including a control group, clinical cut-off scores, and investigating in-game backend data, more effort needs to be put into examining ER strategies during interventions, for instance, by using EMA designs to see if the usage of ER strategies differs among different daily settings and contexts.



## References

- Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: A theory-based subtype of depression. *Psychological Review*, *96*(2), 358–372.  
<https://doi.org/10.1037/0033-295X.96.2.358>
- Aldao, A. (2013). The future of emotion regulation research: Capturing context. *Perspectives on Psychological Science*, *8*(2), 155-172. <https://doi.org/10.1177/1745691612459518>
- Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the depression anxiety stress scales in clinical groups and a community sample. *Psychological Assessment*, *10*(2), 176–181. <https://doi.org/10.1037/1040-3590.10.2.176>
- Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for? *Child Development Perspectives*, *1*(2), 68-73.  
<https://doi.org/10.1111/j.1750-8606.2007.00016.x>
- Barker, M. M., Beresford, B., Bland, M., & Fraser, L. K. (2019). Prevalence and Incidence of anxiety and depression among children, adolescents, and young adults with life-limiting conditions: A systematic review and meta-analysis. *JAMA Pediatrics*, *173*(3), 835-844. <https://doi.org/10.1001/jamapediatrics.2019.1712>
- Barlow, D. H., Allen, L. B., & Choate, M. L. (2004). Toward a unified treatment for emotional disorders. *Behavior Therapy*, *35*(2), 205-230.  
<https://doi.org/10.1016/j.beth.2016.11.005>
- Beardslee, W. R., Gladstone, T. R. G., & O'Connor, E. E. (2012). Developmental risk of depression: Experience matters. *Child and Adolescent Psychiatric Clinics of North America*, *21*(2), 261-278. <https://doi.org/10.1016/j.chc.2011.12.001>

- Benjamin, C. L., Beidas, R. S., Comer, J. S., Puliadico, A. C., & Kendall, P. C. (2011). Generalized Anxiety Disorder in youth: diagnostic considerations. *Depression and Anxiety*, 28(2), 173-182. <https://doi.org/10.1002/da.20747>
- Berking, M., Ebert, D. D., Cujpers, P., & Hofman, S. G. (2013). Emotion regulation skills training enhances the efficacy of inpatient cognitive behavioral therapy for major depressive disorder: a randomized controlled trial. *Psychotherapy and Psychosomatics*, 82(4), 234-245. <https://doi.org/10.1159/2F000348448>
- Berking, M., Wupperman, P., Reichardt, A., Pejic, T., Dippel, A., & Znoj, H. (2008). Emotion-regulation skills as a treatment target in psychotherapy. *Behavior Research and Therapy*, 46(11), 1230-1237. <https://doi.org/10.1016/j.brat.2008.08.005>
- Block, P., Hoffman, M., Raabe, I. J., Beam Dowd, J., Rahal, C., Kashyap, R., & Mills, M. C. (2020). Social network-based distancing strategies to flatten the COVID-19 curve in the past-lockdown world. *Nature Human Behavior*, 4, 588-596. <https://doi.org/10.1038/s41562-020-0898-6>
- Bogle, J. (2020). Youth, health, and suicide. *The Linacre Quarterly*, 87(2), 239-240. <https://doi.org/10.1177%2F0024363920906990>
- Bouvet, C., & Coulet, A. (2016). Relaxation therapy and anxiety, self-esteem, and emotional regulation among adults with intellectual disabilities: A randomized controlled trial. *Journal of Intellectual Disabilities*, 20(3), 228-240. <https://doi.org/10.1177/1744629515605942>
- Brans, K., Koval, P., Verduyn, P., Lim, Y. L., & Kuppens, P. (2013). The regulation of negative and positive affect in daily life. *Emotion*, 13(5), 926–939. <https://doi.org/10.1037/a0032400>

- Braveman, P. (2014). What is health equity: And how does a life-course approach take us further toward it? *Maternal and Child Health Journal*, *18*(2), 366-372.  
<https://doi.org/10.1007/s10995-013-1226-9>
- Brehl, A., Schene, A., Kohn, N., & Fernández, G. (2021). Maladaptive emotion regulation strategies in a vulnerable population predict increased anxiety during the Covid-19 pandemic: A pseudo-prospective study. *Journal of Affective Disorders Reports*, *4*.  
<https://doi.org/10.1016/j.jadr.2021.100113>
- Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. (2017). Emotion regulation strategies in daily life: mindfulness, cognitive reappraisal and emotion suppression. *Cognitive Behavior Therapy*, *46*(2), 91-113. <https://doi.org/10.1080/16506073.2016.1218926>
- Brozovich, F. A., Goldin, P., Lee, I., Jazaieri, H., Heimberg, R. G., & Gross, J. J. (2015). The effect of rumination and reappraisal on social anxiety symptoms during cognitive-behavioral therapy for social anxiety disorder. *Journal of Clinical Psychology*, *71*(3), 208–218. <https://doi.org/10.1002/jclp.2015.71.issue-3>
- Canady, V. A. (2019). Mental health crises among youth worsens over past decade. *Mental health weekly*, *29*(12), 5-6. <https://doi.org/10.1002/mhw.31829>
- Cameron, J. J., & Stinson, D. A. (2019). Gender (mis)measurement: Guidelines for respecting gender diversity in psychological research. *Social and Personality Psychology Compass*, *13*(11). <https://doi.org/10.1111/spc3.12506>
- Cellini, S. R., & Darolia, R. (2017). High costs, low resources, and missing information: Explaining student borrowing in the for-profit sector. *The Annals of the American Academy of Political and Social Science*, *671*(1), 92-112.  
<https://doi.org/10.1177/0002716217696255>

- Chambers, R., Gullone, E., Hased, C., Knight, W., Garvin, T., & Allen., N. (2015). Mindful emotion regulation predicts recovery in depressed youth. *Mindfulness*, 6(3), 523-534. <https://doi.org/10.1007/s12671-014-0284-4>
- Choi, S. W., & Lam, D. M. H. (2017). Credible control groups and blinding. *Anaesthesia*, 72(3), 402-404. <https://doi.org/10.1111/anae.13811>
- Clark-Gordon, C. V., Bowman, N. D., Goodboy, A. K., & Wright, A. (2019). Anonymity and online self-disclosure: A meta-analysis. *Communication Reports*, 32(2), 98-111. <https://doi.org/10.1080/08934215.2019.1607516>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum Associates.
- Cooke, J. E., Eirich, R., Racine, N., & Madigan, S. (2021). Prevalence of posttraumatic and general psychological stress during COVID-19: A rapid review and meta-analysis. *Psychiatry Research*, 292(10), 113347. <https://doi.org/10.1016%2Fj.psychres.2020.113347>
- Curran, K., & Reivich, K. (2011). Goal Setting and hope. *Communique*, 39(7), 44-46. <https://eric.ed.gov/?id=EJ934059>
- Davoodi, E., Wen, A., Dobson, K. S., Noorbala, A. A., Mohammadi, A., & Farahmand, Z. (2019). Emotion regulation strategies in depression and somatization disorder. *Psychological Reports*, 122(6), 2119-2136. <https://doi.org/10.1177/0033294118799731>
- De France, K., & Hollenstein, T. (2017). Assessing emotion regulation repertoires: The Regulation of Emotion Systems Survey. *Personality and Individual Differences*, 119, 204-215. <https://doi.org/10.1016/j.paid.2017.07.018>

- Dillon, D. G., & Pizzagalli, D. A. (2018). Mechanisms of memory disruption in depression. *Trends in Neurosciences*, *41*(3), 137-149. <https://doi.org/10.1016/j.tins.2017.12.006>
- Dunstan, D. A., Scott, N., & Todd, A. K. (2017). Screening for anxiety and depression: reassessing the utility of the Zung scales. *BMC Psychiatry*, *17*(1), 329. <https://doi.org/10.1186/s12888-017-1489-6>
- Duyser, F. A., van Eijndhoven, P. F. P., Bergman, M. A., Collard, R. M., Schene, A. H., Tendolkar, I., & Vrijksen, J. N. (2020). Negative memory bias as an transdiagnostic cognitive marker for depression symptom severity. *Journal for Affective Disorders*, *274*, 1165-1172. <https://doi.org/10.1016/j.jad.2020.05.156>
- English, T., & Eldesouky, L. (2020). Emotion regulation flexibility. *European Journal of Psychological Assessment*, *36*(3), 456-459. <https://doi.org/10.1027/1015-5759/a000581>
- Erdoğan, Y., Koçoğlu, F., & Sevim, C. (2020). An investigation of the psychosocial and demographic determinants of anxiety and hopelessness during COVID-19 pandemic. *Klinik Psikiyatri Dergisi*, *23*(1), 24-37. <https://doi.org/10.5505/kpd.2020.35403>
- Erikson, E. H. (1968). *Identity: Youth and crisis*. W. W. Norton & Company.
- Eriksson, P. L., Wängqvist, M., Carlsson, J., & Frisé, A. (2020). Identity development in early adulthood. *Developmental Psychology*, *56*(10), 1968–1983. <https://doi.org/10.1037/dev0001093>
- Freeman, B. M. (1975). Physiological basis of stress. *Proceeding of the Royal Society of Medicine*, *68*(7), 427-429. <https://doi.org/10.1139/y91-100>
- Fresco, D. M., Mennin, D. S., Heimberg, R. G., & Ritter, M. (2013). Emotion regulation therapy for generalized anxiety disorder. *Cognitive and Behavioral Practice*, *20*(3), 282-300. <https://doi.org/10.1016/j.cbpra.2013.02.001>

- Garber, J., & Weersing, V. R. (2010). Comorbidity of anxiety and depression in youth: Implications for treatment and prevention. *Clinical Psychology: Science & Practice*, 17(4), 293-306. <https://doi.org/10.1111/j.1468-2850.2010.01221.x>
- Giacco, D., Palumbo, C., Strappelli, N., Catapano, F., & Priebe, S. (2016). Social contacts and loneliness in people with psychotic and mood disorders. *Comprehensive Psychiatry*, 66, 59–66. <https://doi.org/10.1016/j.comppsy.2015.12.008>
- Gleeson, J. F., Riper, H., & Alvarez-Jimanez, M. (2020). Editorial: Transforming youth mental health treatment through digital technology. *Frontiers in Psychiatry*, 11, 1-3. <https://doi.org/10.3389/fpsy.2020.606433>
- Gotlieb, I. H., & Joormann, J. (2010). Cognition and depression: current status and future directions. *Annual Review of Clinical Psychology*, 6, 285-312. <https://doi.org/10.1146/annurev.clinpsy.121208.131305>
- Granic, I., Morita, H., & Scholten, H. (2020). Young people's digital interactions from a narrative identity perspective: implications for mental health and wellbeing. *Psychological Inquiry*, 31(3), 258-270. <https://doi.org/10.1080/1047840X.2020.1820225>
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, 2(3), 271-299. <https://doi.org/10.1037/1089-2680.2.3.271>
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85(2), 348–362. <https://doi.org/10.1037/0022-3514.85.2.348>
- Gustavson, K., Knudsen, A. K., Nesvåg, R., Knudsen, G. P., Vollset, S. E., & Reichborn-Kjennerud, T. (2018). Prevalence and stability of mental disorders among young

- adults: Findings from a longitudinal study. *BMC Psychiatry*, 18(1), 1-15.  
<https://doi.org/10.1186/s12888-018-1647-5>
- Hacimusalar, Y., Kahve, A. C., Yasar, A. B., & Aydin, M. S. (2020). Anxiety and hopelessness levels in COVID-19 pandemic: A comparative study of healthcare professionals and other community sample in Turkey. *Journal of Psychiatric Research*, 129, 181-188. <https://doi.org/10.1016/j.jpsychires.2020.07.024>
- Hardgrove, A. (2014). *What's the problem? Youth and vulnerability in a global perspective*. United Nations Development Programme.  
<http://hdr.undp.org/en/content/youth-and-vulnerability-global-perspective>
- Harwell, M. R., & Serlin, R. C. (1997). An empirical study of five multivariate tests for the single factor repeated measures model. *Communications in Statistics-Simulation and Computation*, 26(2), 605-618. <https://doi.org/10.1080/03610919708813400>
- Hoffart, A., Johnson, S. U., & Ebrahimi, O. V. (2020). Loneliness and social distancing during the COVID-19 pandemic: Risk factors and associations with psychopathology. *Frontiers in Psychiatry*, 11, 1-9. <https://doi.org/10.3389/fpsy.2020.589127>
- Huffziger, S., & Kuehner, C. (2009). Rumination, distraction, and mindful self-focus in depressed patients. *Behaviour Research and Therapy*, 37(3), 224-230.  
<https://doi-org/10.1016/j.brat.2008.12.005>
- Iacobucci, D., Posavac, S. S., Kardes, F. R., Schneider, M. J., & Popovich, D. L. (2015). The median split: Robust, refined, and revived. *Journal of Consumer Psychology*, 25(4), 690-704. <https://doi.org/10.1016/j.jcps.2015.06.014>
- IBM Corp. (2017). *IBM SPSS Statistics for Windows, Version 25.0*. IBM Corp.  
<https://www.ibm.com>

- Johnson, S., Gur, R. M., David, Z., & Currier, E. (2015). One-session mindfulness meditation: a randomized controlled study of effects on cognition and mood. *Mindfulness*, 6(1), 88–98. <https://doi.org/10.1007/s12671-013-0234-6>
- Kelly, K. (2019, February 12). *AR will spark the next big tech platform - call it mirror world*. Wired. <https://www.wired.com/story/mirrorworld-ar-next-big-tech-platform/>
- Kelly, Y., Zilanawala, A., Booker, C., & Sacker, A. (2019). Social media use and adolescent mental health: Findings from the UK Millennium cohort study. *EClinicalMedicine*, 6, 59-68. <https://doi.org/10.1016/j.eclinm.2018.12.005>
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, 62(6), 593-602. <https://doi.org/10.1001/archpsyc.62.6.593>
- Kneeland, E. T., Goodman, F. R., & Dovidio, J. F. (2020). Emotion beliefs, emotion regulation, and emotional experiences in daily life. *Behavior Therapy*, 51(5), 728-738. <https://doi.org/10.1016/j.beth.2019.10.007>
- Kutcher, S. (2017). Children and youth mental health: Investing in the front end. *Canadian Journal of Psychiatry*, 62(4), 232-234. <https://doi.org/10.1177/0706743717698670>
- Lancaster, S. L., Klein, K. P., & Knightly, W. (2016). Mindfulness and relaxation: A comparison of brief, laboratory-based interventions. *Mindfulness*, 7(3), 614-621. <https://doi.org/10.1007/s12671-016-0496-x>
- Lathika, A. R., & Soman, B. (2021). COVID-19 on youth mental health. *Medical Journal Armed Forces India*, 77(1), 111-112. <https://doi.org/10.1016/j.mjafi.2020.10.006>



- Levine, L. J., Schmidt, S., Kang, H. S., & Tinti, C. (2012). Remembering the silver lining: Reappraisal and positive bias in memory for emotion. *Cognition and Emotion*, 26(5), 871-884. <https://doi.org/10.1080/02699931.2011.625403>
- Liu, R. T., Kleiman, E. M., Nestor, B. A., & Cheek, S. M. (2015). The hopelessness theory of depression: A quarter-century in review. *Clinical Psychology: Science and Practice*, 22(4), 345–365. <https://doi.org/10.1037/h0101732>
- Locke, E. A. (1982). Relation of goal level to performance with a short work period and multiple goal levels. *Journal of Applied Psychology*, 67(4), 512-514. <https://doi.org/10.1037/0021-9010.67.4.512>
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states. Comparison of the Depression Anxiety Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behavior Research and Therapy*, 33(3), 335-343. [https://doi.org/10.1016/0005-7967\(94\)00075-U](https://doi.org/10.1016/0005-7967(94)00075-U)
- Marchetti, I. (2019). Hopelessness: A network analysis. *Cognitive Therapy and Research*, 43(3), 611-619. <https://doi.org/10.1007/s10608-018-9981-y>
- Marchetti, I., Everaert, J., Dainer-Best, J., Loeys, T., Beevers, C. G., & Koster, E. H. W. (2018). Specificity and overlap of emotional biases in depression. *Journal of Affective Disorders*, 225, 404–412. <https://doi.org/10.1016/j.jad.2017.08.037>
- Mazza, C., Ricci, E., Biondi, S., Colasanti, M., Ferracuti, S., Napoli, C., & Roma, P. (2020). A nationwide survey of psychological distress among Italian people during the COVID-19 pandemic: Immediate psychological responses and associated factors. *International Journal of Environmental Research and Public Health*, 17(9), 31-65. <http://doi.org/10.3390/ijerph17093165>

- Meeus, W. (2016). Adolescent psychosocial development: A review of longitudinal models and research. *Developmental Psychology*, 52(12), 1969-1993.  
<https://doi.org/10.1037/dev0000243>
- Morrish, L., Rickard, N., Chin, T. C., & Vella-Brodrick, D. A. (2018). Emotion regulation in adolescent well-being and positive education. *Journal of Happiness Studies*, 19(5), 1543-1565. <https://doi.org/10.1007/s10902-017-9881-y>
- Nelson, B. W., Pettitt, A. K., Flannery, J., & Allen, N. B. (2020). Rapid assessment of psychological and epidemiological correlates of COVID-19 concern, financial strain, and health-related behavior change in a large online sample. *Public Library of Science ONE*, 15(11), 1-16. <https://doi.org/10.31234/osf.io/jftze>
- Ng, F., Trauer, T., Dodd, S., Callaly, T., Campbell, S., & Berk, M. (2007). The validity of the 21-item version of the Depression Anxiety Stress Scales as a routine clinical outcome measure. *Acta Neuropsychiatrica*, 19(5), 304–310.  
<https://doi.org/10.1111/j.1601-5215.2007.00217.x>
- Nikolova, I., Caniels, M. C. J., & Curseu, P. L. (2021). COVID-19 rumination scale (C-19RS): Initial psychometric evidence in a sample of Dutch employees. *The International Journal of Health Planning and Management*, 1-12.  
<https://doi.org/10.1002/hpm.3165>
- Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, 4(100), 569–582.  
<https://doi.org/10.1037/0021-843X.100.4.569>
- Nolen-Hoeksema, S., & Morrow, J. (1993). Effects of rumination and distraction on naturally occurring depressed mood. *Cognition and Emotion*, 7(6), 561-570.  
<https://doi.org/10.1080/2F02699939308409206>

- Ochsner, K. N., & Gross, J. J. (2007). The neural architecture of emotion regulation. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 87–109). Guilford Press.
- Opitz, P. C., Rauch, L. C., Terry, D. P., & Urry, H. L. (2012). Prefrontal mediation of age differences in cognitive reappraisal. *Neurobiology of Aging*, *33*(4), 645–655.  
<https://doi.org/10.1016/j.neurobiolaging.2010.06.004>
- Oppenheimer, C. W., Hankin, B. L., Young, J. F., & Smolen, A. (2013). Youth genetic vulnerability to maternal depressive Symptoms: 5-HTTLPR as moderator of intergenerational transmission effects in a multiwave prospective study. *Depression & Anxiety*, *30*(3), 190-196. <https://doi.org/10.1002/da.22056>
- Osman, A., Wong, J. L., Bagge, C. L., Freedenthal, S., Gutierrez, P. M., & Lozano, G. (2012). The Depression Anxiety Stress Scales-21 (DASS-21): Further examination of dimensions, scale reliability, and correlates depression anxiety scales. *Journal of Clinical Psychology*, *68*(12), 1322-1338. <https://doi.org/10.1002/jclp.21908>
- Perchtold, C. M., Fink, A., Rominger, C., Weber, H., de Assuncao, V. L., Schultze, G., Weiss, E. M., & Papousek, I. (2018). Reappraisal inventiveness: Impact of appropriate brain activation during effort to generate alternative appraisals on the perception of chronic stress in women. *Anxiety Stress Coping*, *31*(2), 206-221.  
<https://doi.org/10.1080/10615806.2017.1419205>
- Perciavalle, V., Blandini, M., Fecarotta, P., Buscemi, A., Di Corrado, D., Bertolo, L., Fichera, F., & Coco, M. (2017). The role of deep breathing on stress. *Neurological Sciences*, *38*(3), 451-458. <https://doi.org/10.1007/s10072-016-2790-8>
- Pichardo-Martinez, M. C., De la Fuente, J., Martinez-Vicente, J. M., & Berben, A. B. G. (2014). Factor structure of the self-regulation questionnaire (SRQ) at Spanish

- universities. *The Spanish Journal of Psychology*, 17(62), 1-8.  
<http://doi.org/10.1017/sjp.2014.63>
- Rader, L. A. (2010). Goal setting for students and teachers six steps to success. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 78(3), 123-126.  
<https://doi.org/10.3200/TCHS.78.3.123-126>
- Renna, M. E., Fresco, D. M., & Mennin, D. S. (2020). Emotion regulation therapy and its potential role in the treatment of chronic stress-related pathology across disorder. *Chronic Stress*, 4, 1-10. <https://doi.org/10.1177/2470547020905787>
- Rowe, W. (2020). COVID-19 and youth in detention. *Child & Youth Services*, 41(3), 310-312. <https://doi.org/10.1080/0145935X.2020.1835184>
- Rummel, R. J. (1988). *Applied factor analysis*. Northwestern University Press.
- Russell, G., & Lightman, S. (2019). The human stress response. *Nature Reviews Endocrinology*, 15(9), 525-534. <https://doi.org/10.1038/s41574-019-0228-0>
- Sahdra, B., Ciarrochi, J., & Parker, P. (2016). Nonattachment and mindfulness: Related but distinct constructs. *Psychological Assessment*, 28, 819–829.  
<https://doi.org/10.1037/pas0000264>
- Sandner, M., Rimpel, J., Zeier, P., & Wessa, M. (2019). Emotion regulation under stress. *Psychoneuroendocrinology*, 107(5), 66.  
<https://doi.org/10.1016/j.psyneuen.2019.07.190>
- Savina, E., Mills, J. L., Atwood, K., & Cha, J. (2017). Digital media and youth: a primer for school psychologists. *Contemporary School Psychology*, 21(1), 80-91.  
<https://doi.org/10.1007/s40688-017-0119-0>

- Sawyer, S. M., Afifi, R. A., Bearinger, L. H., Blakemore, S. J., Dick, B., Ezeh, A. C., & Patton, G. C. (2012). Adolescence: A foundation for future health. *Lancet*, *379*, 1630-1640. [https://doi.org/10.1016/S0140-6736\(12\)60072-5](https://doi.org/10.1016/S0140-6736(12)60072-5)
- Sawyer, S. M., Azzopardi, P. S., Wickremarathne, D., & Patton, G. C. (2018). The age of adolescence. *The Lancet Child & Adolescent Health*, *2*, 223-228. [https://doi.org/10.1016/S2352-4642\(18\)30022-1](https://doi.org/10.1016/S2352-4642(18)30022-1)
- Scaini, S., Palmieri, S., Caselli, G., & Nobile, M. (2021). Rumination thinking in childhood and adolescence: A brief review of candidate genes. *Journal of Affective Disorders*, *280*, 197-202. <https://doi.org/10.1016/j.jad.2020.11.008>
- Schäfer, J. Ö., Naumann, E., Holmes, E. A., Tuschen-Caffier, B., & Samson, A. C. (2017). Emotion regulation strategies in depressive and anxiety symptoms in youth: A meta-analytic review. *Journal of Youth and Adolescence*, *46*(2), 261-276. <https://doi.org/10.1007/s10964-016-0585-0>
- Schwartz, K. D., Exner-Cortens, D., McMorris, C. A., Makarenko, E., Arnold, P., Van Bavel, M., Williams, S., & Canfield, R. (2021). COVID-19 and student well-being: Stress and mental health during return-to-school. *Canadian Journal of School Psychology*, *36*(2), 166-185. <https://doi.org/10.1177/08295735211001653>
- Snyder, C. R. (2002). Hope theory: Rainbows in the mind. *Psychological Inquiry*, *13*(4), 249-275. [https://doi.org/10.1207/S15327965PLI1304\\_01](https://doi.org/10.1207/S15327965PLI1304_01)
- Sukantarat, K. T., Williamson, R. C. N., & Brett, S. J. (2007). Psychological assessment of ICU survivors: A comparison between the Hospital Anxiety and Depression scale and the Depression, Anxiety and Stress Scale. *Anaesthesia*, *62*(3), 239-243. <https://doi.org/10.1111/j.1365-2044.2006.04948.x>

- Sutton, H. (2019). Mental health problems increasing for youth, access to services not adequate. *Disability Compliance for higher Education*, 25(4), 9.  
<https://doi.org/10.1002/dhe.30740>
- Tru Luv Media Inc. (2020). #SelfCare [mobile app]. App store.  
<https://play.google.com/store/apps/details?id=com.truluv.android.selfcare&gl=NL>
- Uhlhaas, P., & Torous, J. (2019). Digital tools for youth mental health. *NPJ – Digital Medicine*, 104(1), 1-3. <https://doi.org/10.1038/s41746-019-0181-2>
- Van Deursen, D. S., Salemink, E., Smit, F., Kramer, J., & Wiers, R. W. (2013). Web-based cognitive bias modification for problem drinkers: protocol of a randomized controlled trial with a 2x2x2 factorial design. *BMC Public Health*, 13(674).  
<https://doi.org/10.1186/1471-2458-13-674>
- Wang, R. A. H., Nelson-Coffey, S. K., Layous, K., Jacobs Bao, K., Davis, O. S. P., & Haworth, C. M. A. (2017). Moderators of wellbeing interventions: Why do some people respond more positively than others?. *Public Library of Sciences ONE*, 12(11).  
<https://doi.org/10.1371/journal.pone.0187601>
- Wängqvist, M., & Frisé, A. (2016). Who am I online? Understanding the meaning of online contexts for identity development. *Adolescent Research Review*, 1(2), 139-151.  
<https://doi.org/10.1007/s40894-016-0025-0>
- Yildiz, M. A., & Duy, B. (2019). The Predictive Role of Emotion Regulation Strategies on Depressive and Psychosomatic Symptoms in Adolescents. *Current Psychology: A Journal for Diverse Perspectives on Diverse Psychological Issues*, 38(2), 387-396.  
<https://doi.org/10.1007/s12144-017-9616-6>
- Zhang, P., Piao, Y., Chen, Y., Ren, J., Zhang, L., Qiu, B., Wei, Z., & Zhang, X. (2021). Outbreak of COVID-19 altered the relationship between memory bias and depressive

degree in nonclinical population. *iScience*, 24(2).

<https://doi.org/10.1016/j.isci.2021.102081>

Zhang, W., Gao, F., Gross., J., Shrum, L. J., & Hayne, H. (2021). How does social distancing during COVID-19 affect negative moods and memory?. *Memory*, 29(1), 90-97.

<https://doi.org/10.1080/09658211.2020.1857774>

## Appendix

### Appendix A. Information letter

#### INFORMATION LETTER

For participation in the scientific study:

#SelfCare

#### 1a. Introduction/Aim of the study

We are researchers at the Behavioural Science Institute of the Radboud University Nijmegen. In this study, we would like to examine how your social media use and your mood and psychological well-being are influencing each other. Besides these general effects of social media use, we are also interested in what you do on social media. Which apps do you use for instance, and why? Finally, we are interested in a specific app, called #SelfCare. This app is developed to help young adults regulate their stress and anxiety levels. We are curious to see whether you will use the app, which parts of the app you like the most, and of course whether the app was able to you through busy or stressful days.

#### 1b. The study

The study will consist of several phases, of which you have already done the first part - the screening. You can do the rest of the study at home. In total, you will spend 2-3 hours on the full study and your participation does not come with any potential risks or inconveniences. The study is approved by the Ethics Committee of the Faculty of Social Sciences of the Radboud University.

If you indicate by e-mail or telephone that you are interested in participating in this study, we will contact you to discuss the study and answer any questions. If you still want to participate, you will receive a link with the first questionnaire that you can fill out completely. After completing that questionnaire, we will call you to help you install two apps on your phone. The first app - the EARS tool - is used to track your app usage in the background and send you short questionnaires. When tracking your app usage, we only have access to how often and for how long you use certain apps, for example how often you are on a news app like Nu.nl, how long you use YouTube, or how often you use WhatsApp. What you do in these apps, for example the content of your WhatsApp messages or your music choice on YouTube, is not recorded. Thus, the tool will only record the duration and frequency of your app usage, not the content of your app usage. Other information, such as your location or your images and videos, are also not recorded by the tool. More detailed information about the EARS tool can be found under point 1c below.

In addition to the EARS tool, we will also ask you to install the app #SelfCare on your mobile phone. #SelfCare is an app aimed at alleviating feelings of stress and anxiety. The app includes mini-games that can help you take your mind off a busy study or work week and a journal in which you can write down how you feel. For this app we also track how often and how long you use it, which mini-games you use etc. After both apps are installed, you can get started. During a week (7 days) you will receive short questionnaires five times a day, which you can then complete. These questionnaires only last 1 to 2 minutes and are about how you



feel at the time and what your experiences with social media are at that moment. Try to complete these questionnaires as soon as possible after you receive them. After this week we will contact you again to help you delete the apps from your mobile phone. After this, you will complete another questionnaire via a link that we will send you. Finally, three months later you will receive a final and very short questionnaire with some questions about how you feel at that moment.

### 1c. The EARS tool

Here is some more information about what the EARS tool does, what you need to do and what the risks/discomforts might be for participating in this study:

If you agree to be in this study, we would ask you to do the following things:

- ***Install EARS using in-app instructions, and use your phone freely for a week following installation:*** We will collect the frequency and duration of your app usage from your phone. This data will be encrypted (stored in way that is unreadable by anyone who does not have the “keys”) on a secure server.
- ***Fill out short questionnaires:*** Over the course of the study, you will be asked to participate in one week of repeated short surveys 5 times a day. These one-minute surveys will ask several questions about how you are feeling and whether you used social media and will appear on your phone every few hours. They will appear between the hours of 9AM to midnight. You may decline to answer any of the surveys.

The following types of information will be collected via the EARS application:

- ***App usage.*** EARS will collect the frequency and duration of each application usage, as well as the total time that your screen is in use per day.

*Risks/Discomforts of participating in the study:*

- Although data collection of this type may raise privacy concerns, because of the sensitivity of mobile phone data, the EARS team and Radboud University have highly skilled teams of programmers and data scientists whose job it is to ensure the privacy of your data. Only staff associated with this research project will have access to your data. A set of unique IDs will connect your mobile phone data to data collected from other sources. Your name and contact information will not be connected to your data and will be kept in locked, password-protected databases at Radboud University (only accessible for the research team of this study). All of your mobile phone data and survey responses will be encrypted (locked) after being uploaded to secure servers for storage and processing. The upload process uses secure methods as well, so your data is protected in transfer. Therefore, although it is technically possible that your private information could be lost or stolen (as with any research study), this is very unlikely because your data is transferred, stored, and accessed in an extremely secure manner.
- If at any time after the application is installed you wish to discontinue the study, we ask you to contact us so we can make sure that the tool is completely uninstalled from

your phone. At that time you can let us know whether it is okay for us to keep the data we already have, or whether you want us to destroy it.

- We recommend that you add a passcode to open your phone if you do not already use one. This will help prevent the data on your phone from being stolen.

## **2a. Usage and storage of your personal data**

In order to execute the study, we need to collect, use and store some of your personal data. These are the following personal data: questionnaires about your social media use and game experience, activities and social support in times of social distancing, social support that you receive, self-compassion, fear of missing out, emotion regulation, rejection sensitivity, avoidance, rumination, your expectations regarding this study, your values, frequency and duration of app use, frequency and duration of #SelfCare use, and opinion on the app #SelfCare. The use and storage of these personal data are necessary for scientific purposes, but also because of administrative purposes. We need to register your active consent for participation in this study and we are obliged to inform you (through your telephone number) in case of clinically relevant findings.

For the present study it is also necessary to collect specific personal data in order to answer the research question and to publish the found results. These specific personal data are your name, age, sex, telephone number, e-mail address, questionnaires regarding your anxiety, depression and/or stress symptoms and questionnaires regarding your mood. In the informed consent form we ask you to give permission for collecting, using and storing all the above mentioned (specific) personal data. In case you do not give permission for this, you cannot participate in the study.

## **2b. Confidentiality of your data and data processing**

The information that you provide for the study will be treated carefully and is only accessible for the qualified researchers. Personal data collected by the researcher during the study, will be confidential. In order to guarantee your privacy, the research stores these personal data coded. Your name and other data that make direct identification possible will be encrypted and stored separately from the scientific data on the secure servers of the Radboud University. Only qualified members of the research group have access to these encrypted data. Other parties involved in the study will not receive any personal data about you. Your scientific data will only be shared with these other parties while coded. It is not possible for other parties to identify you directly. Also in reports or publications about the study, only your coded scientific data will be mentioned.

Your personal data will be protected following the General Data Protection Regulations (GDPR) and the researcher will make sure that your privacy and other related conditions will be protected. The researcher, while executing this study, will comply with the Netherlands Code of Conduct for Research Integrity and the policy of the university for the storage and management of personal and scientific data (the privacy statement of the Radboud University can be found on <https://www.ru.nl/english/vaste-onderdelen/privacy-statement-radboud-university/>).

## **2c. Retaining your data**

The informed consent form that you signed and your (anonymised) scientific data will be retained for at least 10 and maximally 15 years after the completion of the study. The file that links your personal data and scientific data will be retained for maximally 1 month after completion of the

study. This means that you can request the deletion of your scientific data up to maximally 1 month after completion of the study (by sending an email to [h.scholten@pwo.ru.nl](mailto:h.scholten@pwo.ru.nl)). After this period, scientific data cannot be deleted anymore, because these data are only retained anonymously. Therefore we do not know anymore which scientific data belong to you.

## **2d. Sharing your data**

For the importance of monitoring, reusability and/or replication of the research findings, your scientific data will be shared or made public in a progressive way. Before sharing any of the scientific data, they will be anonymised. This means that you are (no longer) identifiable based on the scientific data. All data that make direct identification possible (e.g., name or telephone number) will be deleted and the other data (e.g., sex and age) will be retained, under the condition that individuals are not identifiable. All anonymised scientific data of this study will be shared with other researchers on request. The data regarding #SelfCare will be shared with the developers of the app, in order to help them improve the app, using the opinions and comments of participants. If you do not want to share your anonymised scientific data, you can request the deletion of your scientific data up to maximally 1 month after completion of the study.

## **2e. Access of supervising authorities for monitoring the study.**

Some people and organisations need access to your personal and scientific data. This is necessary for monitoring whether the study is executed well and in a reliable manner. These people and organisations that have access to your data for monitoring can be: qualified people of *the Behavioural Science Institute* of the Radboud University (for instance a dean, director or data manager) and (inter)national supervising authorities (for instance the Dutch Data Protection Authority and The Netherlands Board on Research Integrity). They will keep your data confidential. We ask you to give permission for this monitoring. If you do not want to give permission for this, you cannot participate in the study.

## **2f. More information about your rights regarding the processing of your personal data**

The Radboud University is responsible for adhering to the General Data Protection Regulations (GDPR) and protecting your rights related to the processing of your personal data. You always have the right to withdraw your permission for processing your personal data. Your personal data will be deleted when you do so. When you have questions about your privacy, you can contact the Data Protection Officer of the Radboud University through email: [privacy@ru.nl](mailto:privacy@ru.nl). More information about your rights related to the processing of your personal data can be found at <https://www.ru.nl/privacy/english/> and on the website of Dutch Data Protection Authority (<https://autoriteitpersoonsgegevens.nl/en>).

## **3. Personally and clinically relevant findings**

The obtained scientific data will not be examined from a medical and/or clinical view point. Your participation in the study cannot be seen as a medical/clinical test. In exceptional cases new findings can be obtained regarding your well-being. For example, think about alarming scores and/or scores that can be of personal clinical relevance. In these particular cases, you will be informed about this by the researcher, maximally 1 month after your participation in the study. If you do not want to get informed about this, you cannot participate in the study.

#### **4. Future studies**

After participation we might want to contact you for future studies related to the further development of the app #SelfCare. On the informed consent form you can indicate whether or not you give permission for this. When you give permission, your contact details will be retained for maximally 2 years. Also for potential future studies, your participation is completely voluntarily and before participating in a new study you always need to give your informed consent again. You can have your contact details deleted and/or withdraw your permission to be contacted for future studies at any moment.

#### **5. Voluntary participation**

Participation in this study is completely voluntarily and you can decide to withdraw your participation at any moment. This will not have any negative consequences for you. If you withdraw from participation, than we are no longer allowed to process your personal data. These will therefore be deleted immediately.

#### **6. Reimbursement**

For participation in the whole study you will receive 25 euros. If you are more interested in obtaining participant credit (ppu), this is also possible and you will receive 4 ppu for your participation. If you decide to withdraw your participation during the study, we will provide you with an amount or a number of ppu that matches the effort you put in the study so far (for instance when you invested one hour in the study, you will receive one ppu or ten euros).

#### **7. Contact information**

For questions, comments or worries about this study, you can contact the responsible researcher: Hanneke Scholten (06-23721158 or [h.scholten@pwo.ru.nl](mailto:h.scholten@pwo.ru.nl); see complete contact details below). We are curious about your experiences as a participant in this study at the Behavioural Science Institute of the Radboud University. For this you can, anonymously if you want, fill out an online survey (in English). If you have questions, comments or worries that you do not want to share with the responsible researchers, you can contact the BSI Research Data Officer via [dataofficer@bsi.ru.nl](mailto:dataofficer@bsi.ru.nl). De BSI Research Data Officer is an independent confidant for research related matters and is not involved in this study.

Kind regards,

Hanneke Scholten; 0623721158 or [h.scholten@pwo.ru.nl](mailto:h.scholten@pwo.ru.nl)

Nastasia Griffioen; [n.griffioen@pwo.ru.nl](mailto:n.griffioen@pwo.ru.nl)

Isabela Granic; [i.granic@pwo.ru.nl](mailto:i.granic@pwo.ru.nl)

Behavioural Science Institute  
Radboud University Nijmegen  
Montessorilaan 3, kamer 06.21  
6525 HR Nijmegen

## Appendix B. Consent form

Radboud Universiteit



### Participant Informed Consent Form

for participation in the scientific study: #SelfCare

I declare that:

- I was satisfactorily informed, both verbally and on paper, about the study;
- I thoroughly read the information letter;
- I had the opportunity to ask questions about the study;
- the questions that I had (if any) were answered satisfactorily;
- I had enough time to thoroughly think about participating in this study;
- I participate voluntarily in this study.

I give permission for:

- the collection of my personal (e.g., sex and age) and study related data for scientific goals and that these data will be stored for at least 10 and maximum 15 years, such that they are available for monitoring, re-use, and replication;
- storing my personal data, that will only be used for administrative purposes, for maximally 1 month after the end of this study. Administrative purposes include for instance: the ability to invite you for follow-up measures of this study (but you can give permission below to retain your data for a longer period for future studies);
- the use of my personal and study related data by monitoring authorities.

I understand that:

- I have the right to withdraw my permission at any time without stating any reasons and without any negative consequences for myself, by sending an email to [h.scholten@pwo.ru.nl](mailto:h.scholten@pwo.ru.nl);
- I have the right to have my study related data destroyed until one month after the end of the study;
- I have the right to withdraw my permission for processing of my personal data; my personal data are processed according to the European Privacy Laws (General Data Protection Regulation, GDPR);
- my personal data will be processed according to the privacy statement of the Radboud University (<https://www.ru.nl/english/vaste-onderdelen/privacy-statement-radboud-university/>);
- the measurements and questionnaires that are administered to me are no medical / clinical tests, but the researchers are obligated to inform me about the scores of these measurements that can be important to me personally.

**I understand that I have to answer all the following questions with an asterisk (\*) with 'yes' to participate in this study.**

I give permission for:

- processing the following personal data:
  - sex\*

YES	NO
-----	----

- age\* 

YES	NO
-----	----
- depression, anxiety, or stress symptoms (as measured by the STAI and the DASS) \* 

YES	NO
-----	----
- mood related questionnaires (as measured by the PANAS) \* 

YES	NO
-----	----
- tracking my smartphone use with the E.A.R.S. tool. \* 

YES	NO
-----	----
- getting contacted by the researchers about scores that can be of personal clinical importance for me\*. 

YES	NO
-----	----
- retaining my contact information for a period of maximally two years, to be contacted for further participation in future studies (thus longer than the normal 1 month period as described above). 

YES	NO
-----	----

**I give my consent to participate in the study.**

Name :

Signature :

Date :

**To be filled out by the researcher:**

Undersigned hereby declares that the person named above is both on paper and verbally informed about the before mentioned.

Name :

Role / research institution :

Signature :

Date :

## Appendix C. Overview of questionnaires

<p>Passive sensing + ESM</p>	<p><b>Standardized:</b></p> <p><b>Well-being</b></p> <ul style="list-style-type: none"> <li>• Depression, Anxiety &amp; Stress Questionnaire (Lovibond &amp; Lovibond, 1995) (screening, pre, post, FU)</li> <li>• State-Trait Anxiety Inventory – Trait (Spielberger et al., 1983) (pre, post, FU)</li> <li>• Self-Compassion Scale (SCS; Raes et al., 2011) (pre, post; FU)</li> <li>• Interpersonal Support Evaluation List -- General Population (Bauman et al., 2012) (pre, post; FU)</li> </ul> <p><b>Moderators/Mediators</b></p> <ul style="list-style-type: none"> <li>• Fear of Missing Out Scale (Przybylski et al., 2013) (pre)</li> <li>• Rejection Sensitivity Questionnaire Adults (Berenson et al., 2013) (pre, post)</li> <li>• State/Trait Rumination (pre, post)</li> <li>• Avoidance → MEAQ (pre, post)</li> <li>• Regulation Of Emotion Systems Survey (RESS-24) (pre, post, FU)</li> <li>• Signature strengths; positive psychology (pre)</li> </ul> <p><b>Non-standardized/Adapted:</b></p> <ul style="list-style-type: none"> <li>• Social media use/screen time (pre, post, FU)</li> <li>• Game experience – GEMH lab wide questionnaire (pre, post, FU)</li> <li>• Expectations – GEMH lab wide (pre)</li> <li>• Demographics (screening, pre)</li> <li>• Type of mobile phone – Apple vs Android (screening)</li> <li>• Additional demographics corona/social distancing (pre, post, FU)</li> <li>• Friends and family in times of COVID-19 (pre)</li> <li>• Screen time and COVID-19 (pre)</li> <li>• Activities in times of COVID-19 (pre, post, FU)</li> <li>• Stress in times of COVID-19 (pre, post, FU)</li> <li>• FIVE-adult (pre)</li> </ul> <p><b>Ecological momentary assessment (see document “EMA questions + Selfcare overview”)</b></p> <ul style="list-style-type: none"> <li>• PANAS (9q, 35x; 7-day intervention period)</li> <li>• Social media/screen time questions (7-day intervention period)</li> </ul> <p><b>Passive sensing (7-day intervention period)</b></p> <ul style="list-style-type: none"> <li>• Screen time → frequency and duration app usage (real-time)</li> </ul> <p><b>#SelfCare</b></p> <ul style="list-style-type: none"> <li>• Exit questionnaire → what did you like/did you not like/what could be improved etc. (post)</li> <li>• Intrinsic motivation inventory (post)</li> <li>• Back-end data from #SelfCare app itself (real-time; 7-day intervention period)</li> </ul>
------------------------------	--

### Appendix D. Regulation of Emotion Systems Survey (RESS-24)

T1\_RESS Please indicate how you respond right away to negative emotions as they arise. Do not choose your answers based on what you think you should do or wish you do. Instead, choose your answers thoughtfully, and make your answers about what you actually do. Please answer every item. There are no “right” and “wrong” answers, so choose the most accurate answer for YOU – not what you think “most people” would say or do. For each statement below, please click the answer that best indicates how frequently you did the following things in response to feeling a negative emotion, such as anger, sadness, or stress.

Never (1) Sometimes (2) Half of the time (3) Most of the time (4) Always (5)

Thinking repeatedly about what was bothering me (T1\_RESS\_1)

Using facial expressions to show that I was upset (T1\_RESS\_2)

Thinking of other ways to interpret the situation (T1\_RESS\_3)

Acting like I was not upset (T1\_RESS\_4)

Vocalizing how I was feeling (T1\_RESS\_5)

Focusing on slowing my heart rate and breathing (T1\_RESS\_6)

Trying to set goals that match my values (T1\_RESS\_gs1)

Immediately working on something to keep myself busy (T1\_RESS\_7)

Continually thinking about what was bothering me (T1\_RESS\_8)

Making sure no one could tell what I was feeling (T1\_RESS\_9)

Setting goals to tackle what was bothering me (T1\_RESS\_gs21)

Doing something else to distract myself (T1\_RESS\_10)

Letting my emotions show (T1\_RESS\_11)

Trying to see the emotional event from a different perspective (T1\_RESS\_12)

Pretending I was not upset (T1\_RESS\_13)

Going over the emotional event again and again in my mind (T1\_RESS\_14)

Keeping track of the goals that I set for myself (T1\_RESS\_gs3)

Looking at the emotional event from a different perspective (T1\_RESS\_15)

Trying to slow my heart rate and breathing (T1\_RESS\_16)

Engaging in something else to keep busy (T1\_RESS\_170)

Hiding my feelings (T1\_RESS\_18)

Taking deep breaths (T1\_RESS\_19)



Showing my feelings (T1\_RESS\_20)

Continually trying to decide what went wrong (T1\_RESS\_21)

Engaging in activities to distract myself (T1\_RESS\_22)

Identifying different angles to see the situation (T1\_RESS\_23)

Trying to set goals for myself (T1\_RESS\_gs4)

Decreasing the tension in my body (T1\_RESS\_24)

### **Appendix E. Depression, Anxiety, and Stress Scale (DASS-21)**

T1\_DASS Please read each statement and indicate how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

Did not apply to me at all (0) Applied to me to some degree, or some of the time (1) Applied to me to a considerable degree, or a good part of time (2) Applied to me very much, or most of the time (3)

I found it hard to wind down (1)

I was aware of dryness in my mouth (2)

I couldn't seem to experience any positive feeling at all (3)

I experienced breathing difficultly (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion) (4)

I found it difficult to work up the initiative to do things (5)

I tended to over-react to situations (6)

I experienced trembling (e.g., in the hands) (7)

I felt that I was using a lot of nervous energy (8)

I was worried about situations in which I might panic and make a fool of myself. (9)

I felt that I had nothing to look forward to. (10)

I found myself getting agitated. (11)

I found it difficult to relax. (12)

I felt down-hearted and blue (13)

I was intolerant of anything that kept me from getting on with what I was doing. (14)

I felt close to panic. (15)

I was unable to become enthusiastic about anything. (16)

I felt I wasn't worth much as a person. (17)

I felt that I was rather touchy. (18)

I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat). (19)

I felt scared without any good reason. (20)

I felt that life was meaningless. (21)