The Effect of the 7Mind Mindfulness App on Well-Being

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Abstract

Introduction

Recent research has emphasized the effectiveness of positive psychological mindfulness exercises in promoting university student's well-being. Especially, digital tools such as mindfulness apps offer opportunities due to their feasibility. Consequently, the goal of this study is to investigate the effect of a one-week 7Mind mindfulness app intervention on university student's emotional, social, psychological, and total well-being. It was hypothesized that university student's emotional, social, and psychological, and total well-being will significantly increase from pre- to post-intervention.

Methods

To investigate the effect, the study employed a pre-post within-subjects' design using a sample of 47 university students between the ages 18 to 27. The participants underwent five to ten minutes of mindfulness exercises per day for a one-week period. Well-being was measured at baseline and post-intervention using the Mental Health Continuum Short-Form (MHC-SF) by Keyes. For normally distributed data, changes from pre- to post-intervention were assessed using paired samples t-tests and corresponding effect sizes by Cohen's d, while for non-normally distributed data, Wilcoxon signed-rank tests and rank-biserial correlations were used. Post-hoc power analyses were conducted for all variables.

Results

Emotional and psychological well-being met the assumption of normality. The results of paired samples t-tests indicated significant increases for emotional well-being ($p < .001$) with a small to medium effect size ($d = 0.38$), and psychological well-being ($p < .001$), with a medium effect size ($d = 0.45$). Conversely, social, and total well-being were shown to violate the assumption of normality. The results of the Wilcoxon signed-rank tests and rank-biserial correlations revealed significant increases and large effect sizes for social ($p < .001$; $r = .59$), and total well-being ($p < .001$; $r = .57$).

Conclusion

Findings support the potential effectiveness of the 7Mind mindfulness app in significantly enhancing dimensions of well-being in university students. The absence of a control group presents a limitation, since the improvements in well-being cannot be conclusively attributed to the intervention, as alternative explanations such as the novelty effect cannot be ruled out. The investigation presents implications for universities decision process about the inclusion of offering mindfulness applications to students to enhance well-being and support managing university related well-being declines, essentially serving as a reference for future studies.

The Effect of the 7Mind Mindfulness App on Well-Being

In an increasingly fast-paced and continuously demanding world, the interest in well-being became a central concern to society. The modern world delivers rising varieties of stressors and obstacles such as digitally induced cognitive overloads or increasing performance demands (Matthews et al., 2025). Especially, among university students, the pressure is often intensified due to academic, social, and financial demands, which can act as a barrier to student's well-being (Adams et al., 2016). Further, conventional mental health services do not effectively target student's well-being concerns due to limited accessibility and long waiting times. Therefore, there is a heightened need for accessible and time-efficient interventions such as mobile applications. Moreover, while traditional approaches to well-being in psychology have often focused on symptom reduction and the elimination of illnesses, a growing shift towards positive psychological approaches has enabled to focus on fostering well-being (Sheldon et al., 2000). For example, mindfulness practices such as breathing exercises or body scans foster well-being through increased awareness and acceptance (Cardaciotto et al., 2008). This shift promoted a growing body of strength-based approaches which not only help individuals to overcome distress but also to thrive on an emotional, social, and psychological level.

Vulnerabilities among University Students

Due to a combination of developmental and environmental factors, university students seem to represent a particularly vulnerable group. Since most university students are between the ages of 18 and 27, developmentally they are often stuck between identity formation and forming deep social connections. In line with that, Erikson's (1956) developmental stage theory outlines how individuals in that age range are often in the transition from identity vs. role confusion to intimacy vs. isolation. Within the academic context, before they find deep interpersonal connections, they should first have integrated their new academic role into their identity (Erikson, 1956). Further, this developmental transition is often exacerbated within the academic environment which poses a variety of stressors. For instance, university students often face ongoing financial, academic, and social pressure and due to time pressure, their focus often lies on their academic performance and not on their personal development (Sayers, 2001; Gusy et al., 2021). Altogether, such intrinsic and extrinsic academic pressures place students in a uniquely challenging position.

Barriers to support

Even though students are in a vulnerable position, the global treatment gap often poses a barrier to adequately support students who face developmental or academic pressure. In this context, the global treatment gap refers to the gap between the number of students who need support, and the number of students who receive it (Roberts et al., 2022). According to the World Health Organization (WHO), one main factor which contributes to the high treatment gap is a fragmented healthcare system in which university students often struggle to access support. For instance, there are significant financial barriers to access support, which further burdens university students who often face financial struggles (Adu et al., 2024; Sayers, 2021). Another factor that poses a barrier to accessing support are long waiting times and lists, since students already face time-pressures such factors hinder them from receiving time-efficient and feasible support (Adu et al., 2024; Gusy et al., 2021). Considering these barriers, there is a growing need for time-efficient and feasible options to support university students.

App-Based Solutions

One main solution to closing the treatment gap and supporting students are mobile application-based (app) interventions, because they directly address barriers to contemporary support options. For example, the results of an umbrella review delineated multiple benefits of app-based interventions that make it a promising tool (Koh et al., 2022). First, Koh et al. (2022) suggested that such interventions are available on-demand, therefore the user has complete access to support whenever they need it. Second, Koh et al. (2022) compared them to traditional measures such as therapy, which often cost 100 to 200$ per hour, and concluded that app-based interventions present a cost-efficient alternative. Lastly, Koh et al. (2002) proposed that app-based interventions are far more time-efficient and reduce stigma through anonymity that commonly exists with accessing public support. Altogether, these points highlight the significant benefits of using app-based interventions in offering support, potentially serving as a solution to closing treatment gap.

Well-Being within Positive Psychology

While most app-based interventions focus on the reduction of symptoms and illness, there was a positive psychological paradigm shift to cultivation of strengths such as resilience (Wong et al., 2022). This shift is particularly valuable for university students who are denied clinical treatment because they do not meet the diagnostic criteria, but still need support during academic transitions or just want to cultivate extra strengths (DeBate et al., 2022). Regarding this, Keyes' (2002) positive psychological model of well-being is significantly more relevant, as it does not conceptualize well-being as the mere absence of clinical symptoms but rather as

flourishing on a multidimensional level. Concerning these dimensions of his well-being model, he proposed the Mental Health Continuum Short-Form (MHC-SF) questionnaire. He categorized well-being into three distinct sub-categories: social, emotional, and psychological well-being. First, social well-being was conceptualized as an individual's role within society and relationships, encompassing concepts of social acceptance, contribution, and integration (Keyes, 2002). Second, emotional well-being refered to hedonic concepts including an individual's affect, life satisfaction and happiness (Keyes, 2002). Third, he conceptualized psychological well-being as positive functioning on an individual level surrounding themes of self-acceptance and personal growth (Keyes, 2002). Together, these interrelated dimensions form a holistic conceptualization of well-being. Consequently, app-based intervention can be significantly better analyzed regarding their effectiveness on multidimensional well-being.

Mindfulness and Well-Being

This is especially relevant in the context of positive psychological mindfulness-based interventions, who aim to foster well-being. The American Psychological Association (APA) defines mindfulness as the "awareness of one's internal states and surrounding" and states that it can help individuals to reduce destructive responses through observing "their thoughts, emotions, and other present-moment experiences without judging or reacting to them". Furthermore, mindfulness has been increasingly integrated into interventions which aim to improve well-being. For example, a meta-analysis of 10 studies involving a sample of 958 university students found that mindfulness-based application interventions significantly enhance well-being levels in comparison to the corresponding control groups (Leung et al., 2023). Nevertheless, most studies measure the effect of mindfulness-based interventions on one-dimensional well-being. Therefore, Keyes' (2002) MHC-SF questionnaire could capture the effect of mindfulness interventions on multidimensional well-being. In conclusion, the findings not only highlight the potential of mindfulness intervention as an effective approach to foster a state of flourishing but more specifically indicate the promotion of well-being among university students. Lastly, a point of improvement regarding current research on the effectiveness of mindfulness would be to implement a multidimensional well-being measure such as the MHC-SF.

Mindfulness and Emotional Well-Being

For example, research on the effectiveness of mindfulness interventions have been shown to increase one-dimensional emotional well-being in university students which seemed to be related to specific personality traits and intervention designs. The results of a cross-

sectional study with 1443 Filipino psychology and non-psychology majors revealed that mindfulness practice elicited higher levels of emotional well-being levels in non-psychology students compared to psychology students (Pangngay, 2025). According to Pangngay (2025) these findings may be partially explained by non-psychology students showing lower levels of judgment related traits. Conversely, psychology students comparative lower score on emotional well-being could be associated to higher levels of judgment traits (Pangngay, 2025). Therefore, Pangnay (2025) concluded that mindfulness-interventions which are less analytical are better at increasing emotional well-being within a diverse student population, including students from majors that require analytical thinking such as psychology. Thereby, less analytical refers to mindfulness-practices which use experimental techniques such as breathing exercises, motivational exercises or awareness techniques over journaling or cognitive restructuring (Hayes & Wilson, 2003). This might also be explained by bypassing intellectual defenses such as rationalization, which in turn more accurately promotes empathy, self-awareness, or emotional regulation (Rosenbaum et al., 2020). Altogether, this highlights the need for targeted mindfulness interventions when aiming to increase emotional well-being in a diverse university student sample.

Mindfulness and Social Well-Being

Further, research indicated a positive impact of mindfulness interventions on social well-being which seemed to be mediated through fostering social mindfulness. Social mindfulness was conceptualized as the tendency to incorporate other perspectives into one's own decision-making process, and was therefore highly associated with prosocial orientation (van Doesum et al., 2013). Individuals who engaged in mindfulness practice have been shown to exhibit higher levels of altruistic behaviour, in turn resulting in a higher likelihood for socially favourable interactions, in turn fostering stronger emotional bonds. In addition, a study by Engert et al. (2023) delineated that mindfulness not only had positive effects on the individual but also on a societal level through enhancing social cooperation and social connectedness. These concepts are closely linked to Keyes' (2002) conceptualization of social well-being, which strongly emphasized constructs of social integration and acceptance. Altogether, mindfulness interventions seem to play a significant role in the cultivation of social well-being through the mechanism of social mindfulness, a concept closely linked to further increase sub-variables belonging to the social well-being dimension.

Mindfulness and Psychological Well-Being

First, extending beyond the general well-being benefits, research indicates that mindfulness interventions have been shown to enhance psychological well-being by decreasing psychological distress in university students. More specifically, a comparative study by Stallman (2010) revealed that university students experienced significantly higher levels of psychological distress compared to the general population. These results identified university students as an at-risk group for psychological distress while simultaneously highlighting the need for targeted interventions (Stallman, 2010). In this regard, a meta-analysis showed that 21 mindfulness-based interventions studies indicated significant reductions in psychological distress across various intervention types and durations (Galante et al., 2023). Regarding the duration, Galante et al. (2023) concluded that a minimum of 90 minutes of weekly mindfulness sessions rendered significant improvements in university students psychological distress levels. These findings indicate that mindfulness interventions can be an effective and time-efficient tool in decreasing psychological distress in vulnerable university student populations, thereby increasing psychological well-being. As seen, most of the existing research and mindfulness interventions focus on negative symptom reduction such as distress, in turn hoping for enhanced well-being. Hence, this highlights the need for research on the effectiveness of mindfulness interventions on the promotion of psychological well-being.

Research Gap Regarding the 7Mind App and Multidimensional Well-Being

While well-established mindfulness applications such as Headspace and Calm have been widely studied regarding their positive effects on general well-being, few studies have assessed well-being and more specific dimensions using the MCH-SF by Keyes (Torous et al., 2022). For instance, a randomized control trial by Conley et al. (2024) which utilized Headspace as a mindfulness app, indicated significant increases in university students positive affect, happiness, and self-regulation. However, even though these concepts closely align with Keyes conceptualization of well-being, the study did not utilize the MHC-SF. Unlike Headspace and Calm, the 7Mind application was approved by the German Zentrale Prüfstelle Prävention (ZPP) [Central Prevention Certification Agency] and is recognized as a preventative intervention option under § 20 SGB V of the German Social Code (*GWQ Service Plus*, 2024). Due to this certification, the 7Mind app is freely offered as a preventative intervention by most German health insurances. This certification was largely based on the findings of a German study conducted by Möltner et al. (2018), who are co-founders of the application, which indicated a significant positive effect on variables closely linked to social well-being. The 7Mind app is therefore already utilized in real-world settings, still its effect on multidimensional well-being

remains underexplored. Despite its already established use within a practical setting, there is a clear research gap concerning the evaluation of the effect of the 7Mind mindfulness app on multidimensional well-being by Keyes (2002).

Current Research

Consequently, the current study aims to bridge this research gap by examining the effect of a one-week 7Mind mindfulness app intervention on university students' emotional, social, and general well-being. Bridging this research gap with a multidimensional model allows not only for a holistic evaluation of well-being, but also a targeted understanding of how mindfulness impacts specific dimensions. Thereby, enabling a preliminary analysis paving a way for future interventions in the academic setting, aimed at the promotion of well-being beyond mere symptom reduction. Therefore, based on this and Keyes (2002) definition of well-being and its corresponding sub-dimensions such as emotional, social, and psychological well-being, the following hypotheses were formulated:

H1: Total well-being will significantly increase from pre- to post-intervention.

H2: Emotional well-being will significantly increase from pre- to post-intervention.

H3: Social well-being will significantly increase from pre- to post-intervention.

H4: Psychological well-being will significantly increase from pre-to post-intervention.

Method

Design

This study adopted a quantitative, quasi-experimental design, employing a within-subjects pre-post design to assess the effect of the one-week 7Mind mindfulness application intervention on university students' well-being and corresponding dimensions. This design was justified serving as a preliminary analysis often used in early-stage intervention research aimed to explore naturally occurring, short-term effects of the 7mind app intervention. The exclusion of the manipulation of variables and absence of a control group was justified due to feasibility and the preservation of ecological validity. Furthermore, the independent variable within this design was intervention time, (a) at baseline, before the intervention, and (b) after the intervention. The dependent variable is well-being, which includes (a) emotional, (b) social, (c) psychological, and (d) total well-being, as a composite of all three dimensions.

Consequently, this design assessed the relationship between intervention time and total well-being and its dimensions, at two measurement points. To gain ethical approval for the study design an application for ethical review was created on March 19, 2025, and can be found in Appendix A (see Figure A1- A6). Ethical approval was granted from the Ethics Committee of the University of Twente on March 20, 2025 (see Figure B1 in Appendix B)

Participants

Participant Inclusion and Exclusion Criteria

Since the at-risk group for diverse stressors is university students, they are the chosen target group for this study. Further, participants were eligible for inclusion, if they (a) were enrolled within higher education, specifically university, (b) were 18 years old, (c) under 27 years old, (d) completed the pre- and post-test questionnaire, (e) gave their consent, (f) participated in the complete one-week mindfulness plan, and (g) had a proficient level of English skills. Conversely, participants were excluded because they (a) participated in the pre-test but did not participate in the post-test (n = 10), (b) were not enrolled within higher education (n = 2), (c) did not complete the whole questionnaire (n = 11), (d) did not consent or withdrew their consent (n = 2) (see Figure 1).

Participant Recruitment

The recruitment of participants took place from March 31, 2025, and ended on May 18, 2025. The Participants were recruited using non-probability sampling methods including convenience and snowball sampling. Additionally, the recruitment had purposive elements due to participants being deliberately chosen by targeting the at-risk group: university students. Recruitment took place through online advertisements via Instagram (see Figure C1 in Appendix C) and WhatsApp (see Figure C2 in Appendix C). Furthermore, locations which were targeted to promote the study are the University of Bielefeld and University of Twente, and the corresponding E-mail systems were used to send study invitations. Lastly, no incentive was offered.

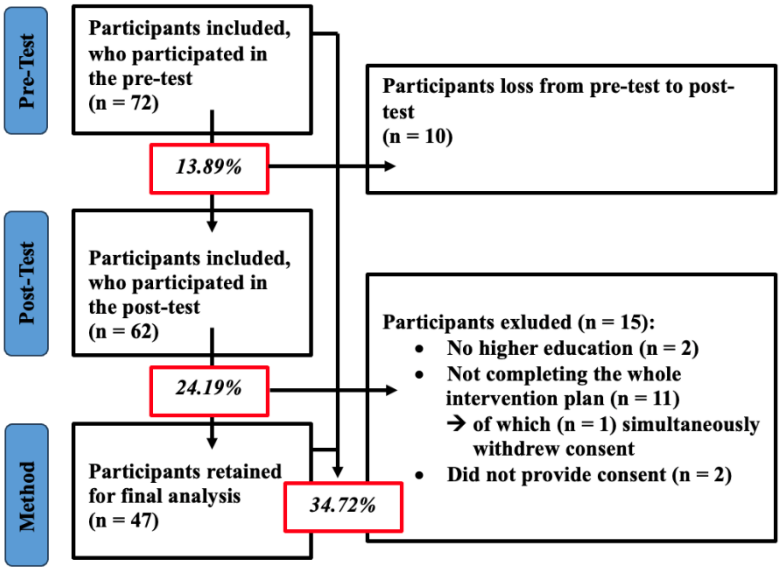
Sample Size Determination

The study aimed to achieve sufficient statistical power (0.80) to detect a medium effect ($dz = 0.50$) using a within-subjects design. An a priori power analysis was conducted using the G*Power software version 3.1. The results for the design of a paired samples t-test revealed that a minimum sample size of 34 was required to detect a statistically significant effect ($\alpha = .05$; two-tailed). The results can be found in Appendix D (see Figure D1). The study originally

aimed to recruit 100 participants prior to conducting the analysis. As seen in Figure 1, despite the high attrition rate, the final sample size of 47 exceeds the minimum sample limit of 34, thereby the statistical power of the analyses was increased and in turn the probability of the occurrence of a Type II error was reduced.

Figure 1

Flowchart of Participant Screening for Eligibility and Sample Size Determination



Note. The picture depicts the process of the sample size determination from pre-test to post-test to final sample size. The red boxes include the attrition rate.

Materials

Prior Mindfulness Experiences

In the pre-test questionnaire, participants were asked: "In the last month, how often have you performed a mindfulness exercise?". This item was measured on a 5-point Likert scale, ranging from one indicating (a) never, to five indicating (b) very often. Since this measure was self-developed and tested in the pre-test questionnaire, no psychometric properties are available, and this measure was strictly collected for descriptive purposes.

Well-Being Questionnaire (MHC-SF)

The measurement of the dependent variable well-being was operationalized using the English version of the MHC-SF self-report scale by Keyes (2002), which can be found in the Appendix E (see Figure E1). This scale consists of 14 items of which all are positively worded,

therefore reverse coding was not needed. Additionally, the items were rated on a 6-point Likert scale ranging from (a) 0 indicating “never”, interpreted as low well-being to (b) 6 indicating “every day”, interpreted as high well-being. Moreover, all the 14 items start with “During the past month, how often did you feel…”, each item completes this sentence differently, for instance the first item completes the standard prompt with “happy”. Furthermore, distinct item groups assessed specific well-being dimensions. Specifically, while items 1-3 assessed emotion well-being, items 4-8 measured social well-being and items 9-14 psychological well-being. The full item wordings are depicted in the Figure E1 of Appendix E. The psychometric properties of the MCH-SF were demonstrated to be strong across various studies. For instance, studies revealed high internal consistency ranging from α = .74 to α = .89, as well as good construct validity ranging from r = -.45 to r = -.71, both using a non-clinical population (Lamers et al., 2011; Yeo & Suárez, 2022).

7Mind Mindfulness Application and Intervention Plan

7Mind is a mobile app which was designed to serve as a supportive mindfulness exercise guide and is used to deliver the intervention in this study. This app is commercially available, and evidence based since it is certified by the ZPP (*GWQ Service Plus*, 2024), therefore the app meets German standards of well-being promotion. In this study, participants were instructed to access the structured mindfulness exercises by subscribing to the 7-day free trial through either the Google Play Store or Apple App Store. Both versions provided identical content and functionality.

Each day of the one-week intervention plan, participants are instructed to engage in a new voice-guided exercise from the app, with sessions of 5-20 minutes in length (Berghoff et al., 2017). Further, the intervention plan covered varying themes such as motivation, relaxation, or breathing. While the app is available in (a) English, (b) German, (c) French, (d) Italian, and (e) Spanish, the available content was not consistent across languages. Therefore, participants were instructed to use the English version to ensure consistency in data.

Participants were encouraged to set a daily reminder via the app’s reminder function and the intervention plan offered recommendations about when to engage in a specific exercise, for instance either in the morning or evening. Since these were only recommendations, the plan allowed for flexibility to choose a time fitting to the university students schedule. Since the app served as a guide for the execution of mindfulness exercises, no actual data was collected within the app. Hence, the pre-test included a self-reported adherence question, checking whether participants followed all seven days of the intervention.

Figure 2 shows the mindfulness intervention plan, which depicts the chosen exercises used within this study, and their corresponding day and time duration, as well as an engagement recommendation. While Figure 3 depicts the general start screen of the 7Mind intervention, Figure 4 depicts the first exercise of the intervention plan within the 7Mind intervention to further showcase the app's interface.

Figure 2

7Mind One-Week Mindfulness Meditation Intervention Plan

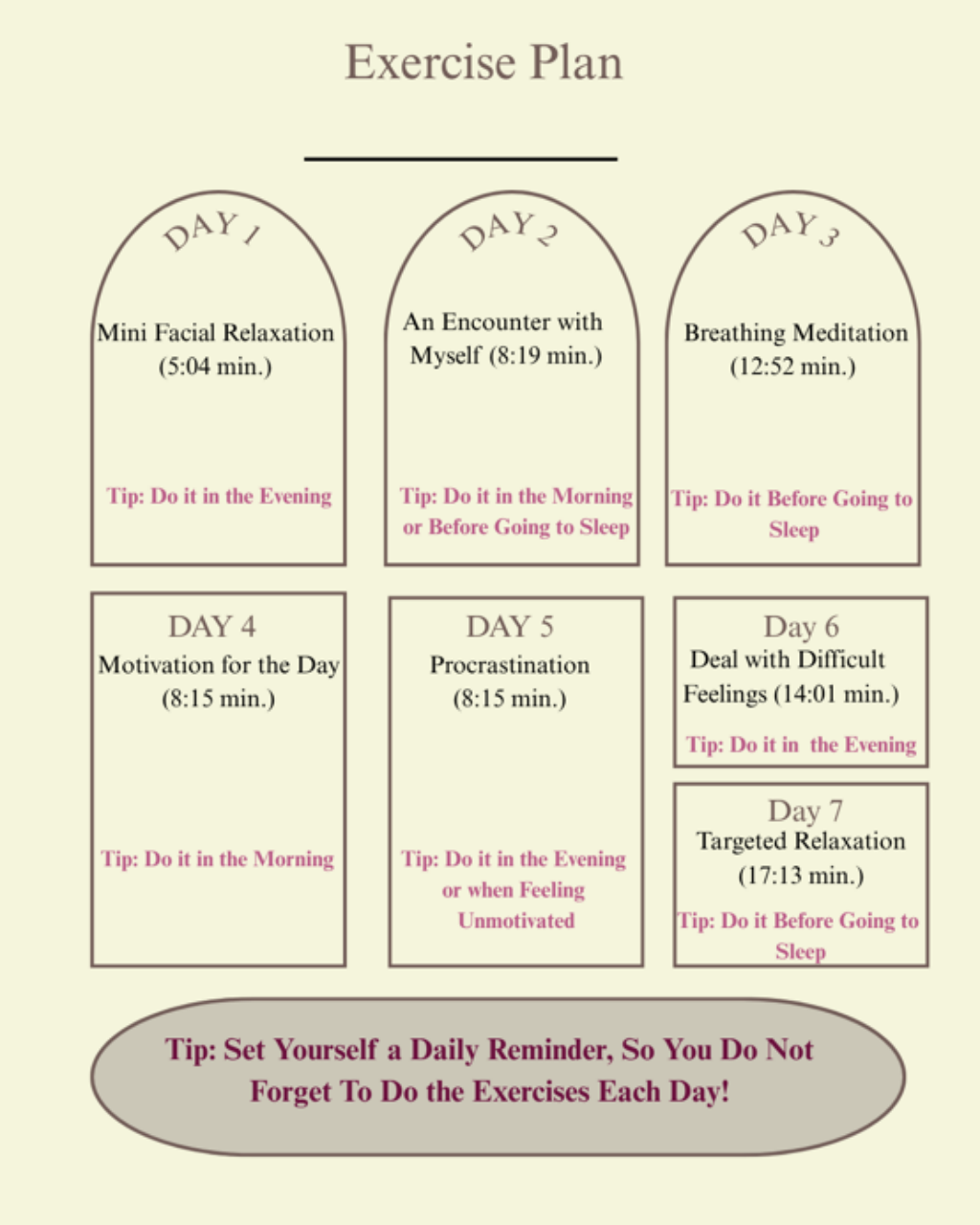


Figure 3

Screenshot of the Start Screen of the 7Mind App

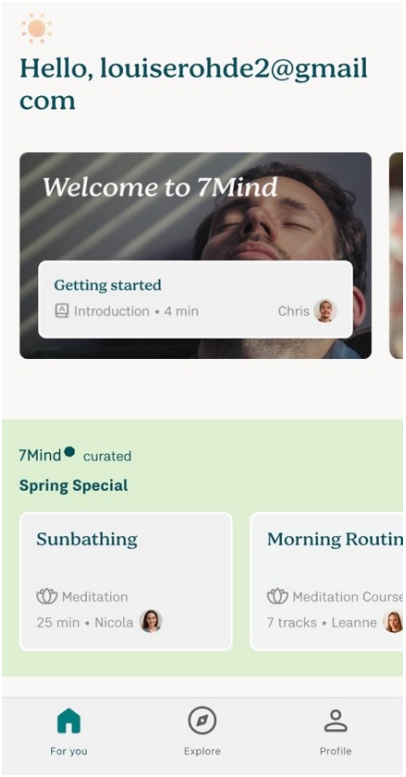
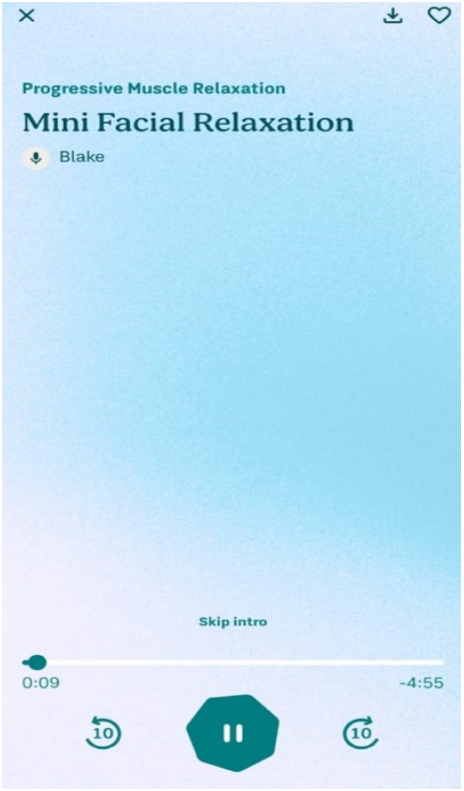


Figure 4

Screenshot of the First Exercise "Mini Facial Relaxation" in the App

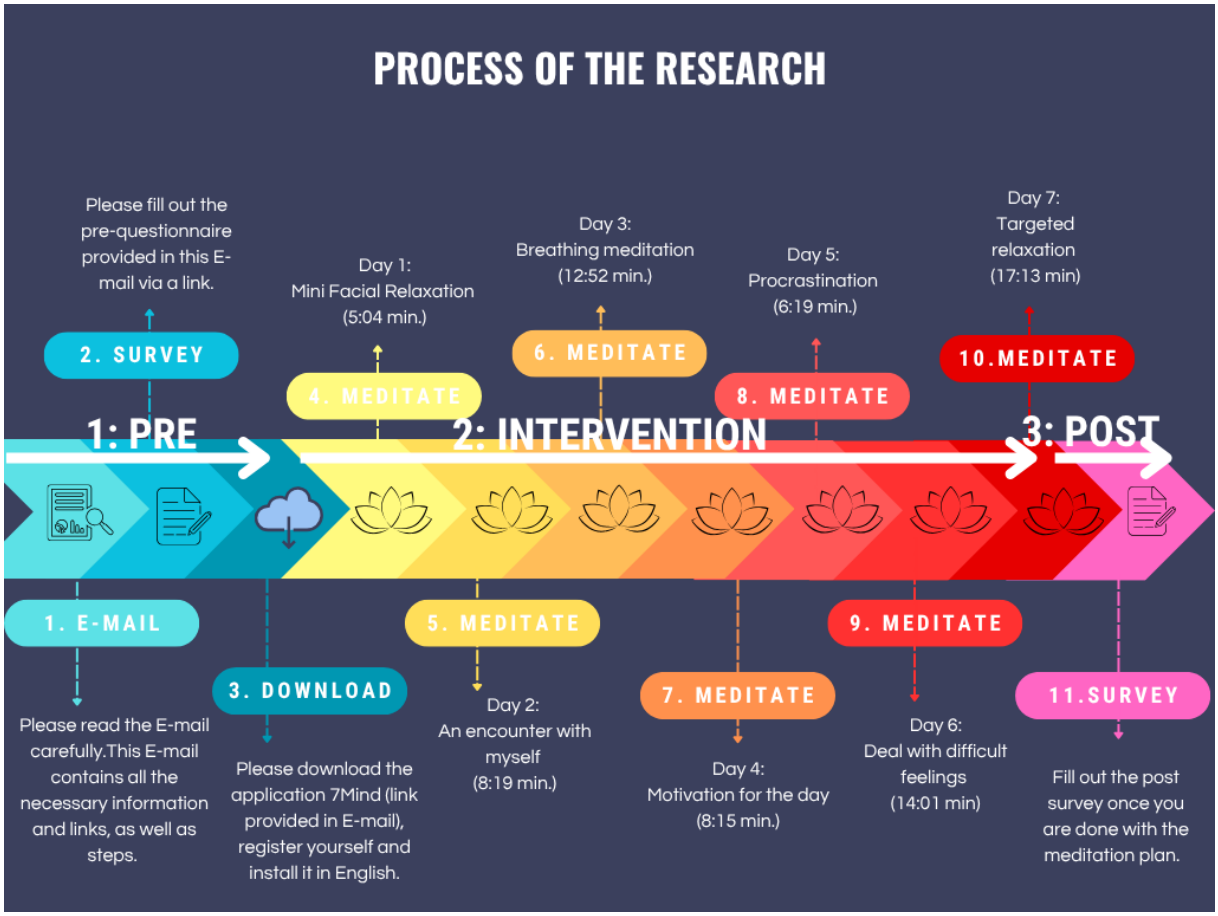


Procedure

The study followed a procedure consisting of 11 individual steps, which can be categorized into three phases (a) pre-intervention, (b) intervention, (c) post-intervention. The individual steps within these phases can be seen in Figure 5.

Figure 5

The Procedure of the Study Including the Individual Processes



More specifically, each step of the three phases followed a distinct procedure. For instance, the pre-intervention phase. First, participants received an invitation email or link (see Appendix G, Figure G1). Second, via the link they accessed the pre-test questionnaire which was administered via the online survey distribution platform Qualtrics XM (see Appendix F, Figures F1-F10). This pre-test began with an introduction which included (a) the aim and nature of the study, (b) the inclusion and exclusion criteria, (c) an outline of the entire procedure of the intervention, beyond the pre-test, (d) information of ethical guidelines, (e) contact information, and (f) the consent form. Participants could provide their digital informed consent

by clicking “Yes” and were informed about their right to withdraw from the study at any given moment, in line with article 7, paragraph 3 of the GDPR (European Union, 2016). The next steps within the pre-test included (a) an abbreviation for pseudo anonymization, (b) demographic data, (c) MHC-SF items, and (d) instructions to follow the intervention plan and links to the app download. The third and last step in the pre-intervention procedure was to download and install the 7Mind app. The next seven steps of the intervention procedure belong to the intervention phase, which are depicted in Figure 2 and Figure 5. In these steps participants follow the intervention plan. The last steps of the process belong to the post-intervention phase of the procedure. Within which participants receive a reminder email to fill in the post-survey (see Figure G2 in Appendix G). This survey was also administered via Qualtrics XM (see Figure H1-H12 in Appendix H). The last and eleventh step was that participants filled out the post-test, which entailed, (a) informed consent, (b), self-reported intervention adherence question, (c) demographic data, (d) MCH-SF items. Altogether, the procedure took place from March 21, 2025, to May 18, 2025, and was entirely conducted in accordance with the ethical guidelines and adhered to the codes of the General Data Protection Regulation (GDPR).

Data Analysis

The data was manually cleaned and prepared before the analyses. The data was then analysed using the statistical software R-studio version 2025.05.0+496. Before conducting the analyses, the working directory was loaded and set, then the final dataset was manually loaded while being in CSV format. Subsequently, the corresponding packages were installed and loaded.

First, descriptive statistics regarding the final sample characteristics, demographic data and prior mindfulness experience were assessed. Then, descriptive statistics such as the means, standard deviations and minimum and maximum scores were calculated for total well-being as well as emotional, social, and psychological well-being at baseline and after the intervention.

Next, inferential statistics were calculated. To test the first hypothesis, regarding total well-being, the data was visually analysed, and a Shapiro-Wilk test was performed to assess whether the assumption of normality was met. Due to a violation of the normality assumption, changes from pre- to post-intervention were analysed using the non-parametric Wilcoxon signed-rank test, and the corresponding effect size was calculated using the non-parametric rank-biserial correlation.

To test the second hypothesis, which refers to emotional well-being, the data was tested for normality through visual analysis, and afterwards tested using the Shapiro-Wilcoxon test. Since the data was normally distributed, changes from pre- to post-intervention were tested using a paired samples t-test, and the corresponding effect size using Cohen's d.

Third, to test the hypothesis regarding social well-being, it was tested whether the data was normally distributed by visual inspection and statistical analysis using Shapiro-Wilk test. Due to a violation of normality, changes from pre- to post-intervention were analysed using a Wilcoxon signed-rank test, and the corresponding effect size using the rank-biserial correlation.

To test the last hypothesis concerning psychological well-being, it was tested whether data is normally distributed by visual inspection and statistical analysis using Shapiro-Wilk test. Since the data met the normality assumption, changes from pre- to post-intervention were analysed using a paired samples t-test, and the corresponding effect size was calculated using a rank-biserial correlation. Lastly, for all variables post-hoc power analyses were calculated. All statistical tests used a significance threshold of $p < .05$, and the decision criterion was set at a 95% confidence level. The corresponding R-codes can be found in the Appendix J.

Results

Descriptive Statistics

Final Sample Characteristics

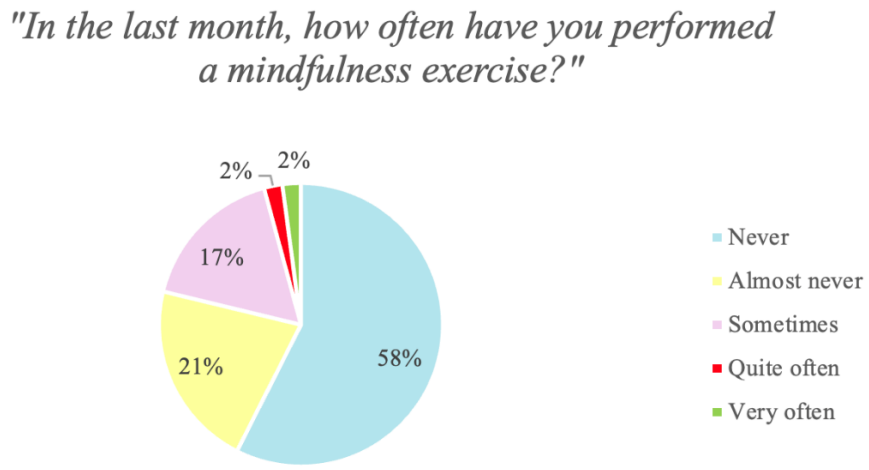
The final sample contained 47 participants, with a mean age of 22 years, ranging from 19 to 27 (*SD* = 1.46). Out of the 47 participants, 14 were male (29.8%), 32 female (68.1%), and one identified as non-binary (2.1%). Regarding ethnicity, 37 participants reported to be German, 4 reported to be French, and 6 reported a diverse background. From the six with the diverse background, one indicated to be Polish, one to be Turkish, one to be Chinese, and one to be Peruvian, lastly one reported a German-French background. None of the participants indicated to be Dutch.

Prior Mindfulness Experience

As depicted in Figure 6, the majority of participants had never or almost never practiced mindfulness exercises before during the month prior to the intervention (*M* = 1.70, *SD* = 0.98, min: 1, max: 5).

Figure 6

Distribution in Percentage Regarding Prior Mindfulness Experience



Note. $N = 47$. The percentages were rounded to whole numbers.

Well-Being Scores

Table 1 depicts the descriptive statistics for total well-being and its dimensions, emotional, social, and psychological well-being before and after the intervention. As depicted by Figure 7, the baseline was moderate for social and total well-being, with a slightly higher moderate baseline for emotional and psychological well-being.

Table 1

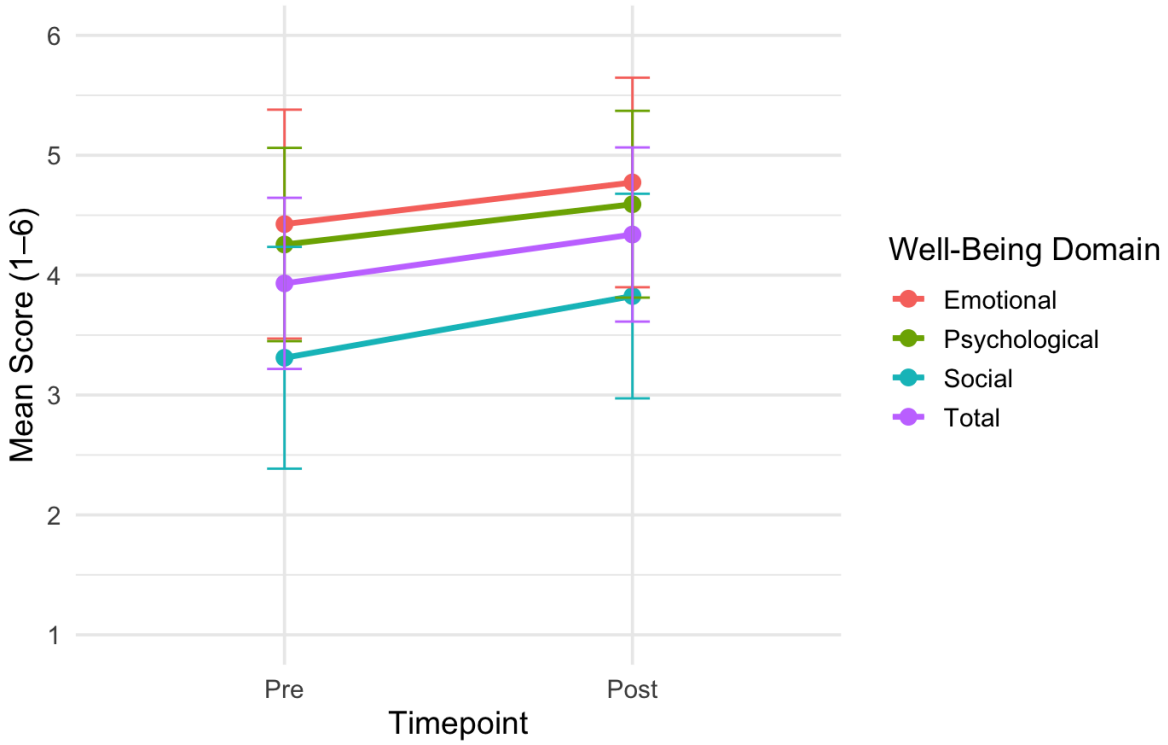
Descriptive Statistics for Well-Being and its Dimensions Pre- and Post-Intervention

	M	SD	Min	Max
		Pre-Intervention		
Emotional Well-Being	4.43	0.95	1.67	6.00
Social Well-Being	3.31	0.92	1.60	5.20
Psychological Well-Being	4.26	0.81	1.80	6.00
Total Well-Being	3.93	0.71	1.85	5.23
		Post-Intervention		
Emotional Well-Being	4.77	0.87	1.67	6.00
Social Well-Being	3.83	0.85	1.80	5.20
Psychological Well-Being	4.59	0.78	2.00	6.00
Total Well-Being	4.34	0.73	1.85	5.62

Note. $N = 47$. Scores represent mean values (M) and standard deviations (SD) for well-being and its dimensions before and after the intervention.

Figure 7

Visualization of Mean Scores for Well-Being and its Dimensions Pre- and Post-Intervention Including Error Bars



Inferential Statistics

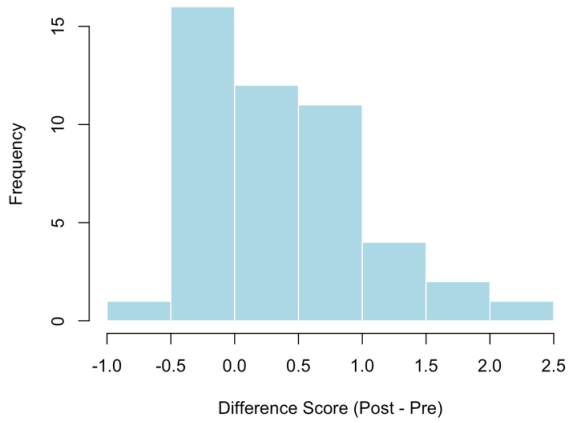
Total Well-Being

"H1: Total well-being will significantly increase from pre- to post-intervention."

Assumption Testing. To determine which tests were appropriate for the first hypothesis, the assumption of normality was tested. The visual inspection of the histogram of difference scores (Post-Pre), seen in Figure 8, showed a slightly positively skewed distribution. This indicated a deviation of the normality assumption for total well-being, which was further examined with the Shapiro-Wilk test. These results revealed a significant deviance form normality ($W = 0.92$, $p < .004$), therefore the assumption of normality was violated.

Figure 8

Histogram of Difference Scores for Total Well-Being (Post-Pre)



Hypothesis Testing. To assess the first hypothesis, non-parametric tests were used, due to the violation of normality. The results of the Wilcoxon signed-rank test suggested a significant increase in total well-being from pre- to post-intervention (V = 739.5, p < .001). Consequently, in the context of this study that means that participants total well-being levels seemed to be significantly higher after the 7Mind intervention, compared to before. This indicates that the 7Mind intervention had a potential positive effect on university students' total well-being. Furthermore, the large effect size (r = .57), calculated by the rank-biserial correlation, suggested that the intervention had a substantial impact on the significant increase in total well-being. Consequently, the first hypothesis was retained.

Post-Hoc Power Analysis. Lastly, to test whether the first hypothesis, which was retained, can be supported by sufficient statistical power, a post-hoc power analysis was conducted. Since the assumption of normality was violated, the rank-biserial correlation (r = .57) was approximated to enable the power analysis by using the pwr package in R-studio. With an observed effect size of d = 1.39, α = .05 and a sample size n = 47, the achieved power was estimated to be greater than 0.99. Consequently, the study was well-powered for the detection of a significant effect of total well-being.

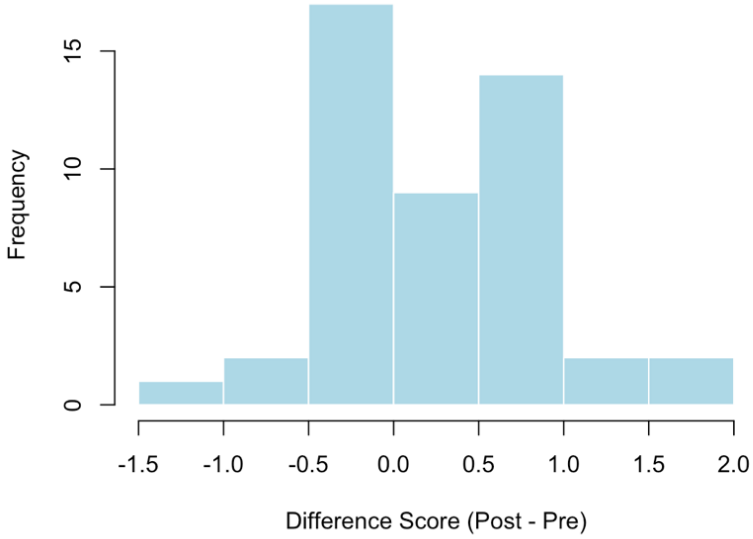
Emotional Well-Being

"*H2: Emotional well-being will significantly increase from pre- to post-intervention.*".

Assumption Testing. Before assessing the second hypothesis, the assumption of normality was visually inspected using the histogram in Figure 10. As depicted, the distribution seemed approximately normal. In line with that, the results of the Shapiro-Wilk test indicate, that the data met the normality assumption (W = 0.97, p = .221). Therefore, the second hypothesis was further assessed using parametric tests.

Figure 10

Histogram of Difference Scores for Emotional Well-Being (Post-Pre)



Hypothesis Testing. To test whether changes in emotional well-being significantly increased from pre- to post-intervention, a paired samples t-test was executed. The results indicated that emotional well-being increased significantly from pre- to post-intervention (t (46) = 3.76, $p < .001$, 95% CI [0.16, 0.53]). Hence, participants' emotional well-being significantly increased after taking part in the 7Mind manfulness intervention. The effect size was analyzed using Cohen's d, which revealed a small to medium effect size ($d = 0.38$). This further suggests that the 7Mind intervention had a medium impact on the significant increase in emotional well-being. Therefore, the second hypothesis was retained.

Post-Hoc Power Analysis. Lastly, to further test whether the study had sufficient power to detect changes in emotional well-being, a post-hoc power analysis was executed with the software G*Power version 3.1. More specifically, to evaluate the statistical power of the paired-samples t-test, Cohen's d of emotional well-being ($d = 0.38$), was taken as the effect size ($dz = 0.38$, $\alpha = .05$). With a sample size of n = 47, the observed power was 0.72. Therefore, the study was high-powered to identify changes in emotional well-being (see Figure I1 in Appendix I).

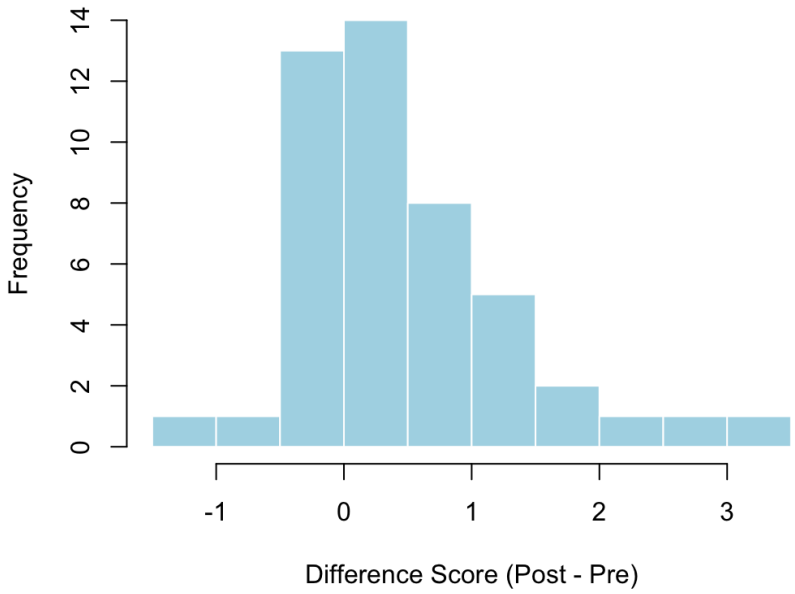
Social Well-Being

"*H3: Social well-being will significantly increase from pre- to post-intervention.*"

Assumption Testing. The normality assumption was visually assessed using the histogram depicted in Figure 11. The distribution indicates a slight positive skew and shows a high concentration of scores near to zero mostly accumulated along the right part of distribution's tail. This indicates that even though some participants experienced a strong positive change, others experienced no change, indicating a violation of the normality assumption. Further, results of the Shapiro-Wilk test confirmed this violation (($W = 0.89$, $p < .001$). Therefore, further hypothesis testing was done using non-parametric tests.

Figure 11

Histogram of Difference Scores for Social Well-Being (Post-Pre)



Hypothesis Testing. To test the second hypothesis, due to a violation of normality, the Wilcoxon signed-rank test was used to assess the significance and the rank-biserial correlation for the effect size. The results revealed a significant increase in social well-being from pre- to post-intervention ($V = 741.5$, $p < .001$). Hence, participants demonstrated significantly higher levels of social well-being after completing the 7Mind intervention. Further, the large effect size ($r = .59$) suggested that the 7Mind intervention had a substantial impact on the significant increase in social well-being. Consequently, the third hypothesis was retained.

Post-Hoc Power Analysis. Since the data was not normally distributed, the rank-biserial correlation ($r = .59$) was approximated to a similar equivalent, namely the effect size to enable the power analysis by using the pwr package. With the approximated effect size of $d = 1.46$, $\alpha = .05$ and a sample size $n = 47$, the achieved power was estimated to be greater than 0.99.

Consequently, the results suggested that the study was well-powered for the detection of a significant effect of social well-being.

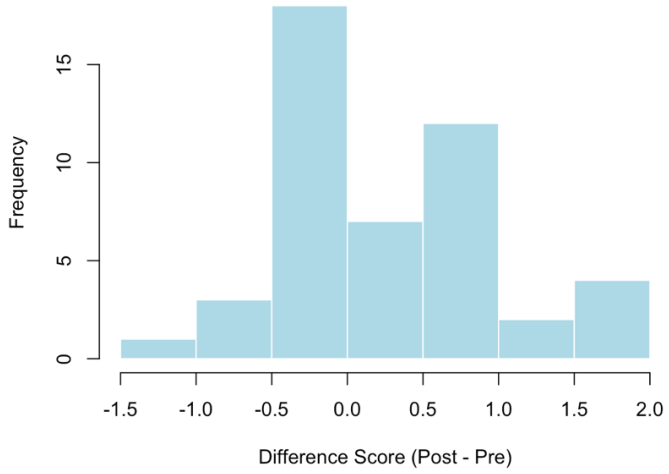
Psychological Well-Being

"*H4: Psychological well-being will significantly increase from pre- to post-intervention.*"

Assumption Testing. Before the last hypothesis was tested, the assumption of normality was visually assessed. As seen in Figure 12, the data is approximately normally distributed. In line, the results of the Shapiro-Wilk test revealed that the assumption of normality was met ($W = 0.96$, $p = .080$). Therefore, the hypothesis was further tested using parametric tests.

Figure 12

Histogram of Difference Scores for Psychological Well-Being (Post-Pre)



Hypothesis Testing. To investigate the third Hypothesis, a paired samples t-test was executed. The results showed that psychological well-being increased significantly over the course of the intervention ($t(46) = 3.30$, $p = .002$, 95% CL [0.13, 0.54]). Which means that participants demonstrated significantly higher levels of psychological well-being after they had completed the 7Mind intervention. Next, an analysis using Cohen's d revealed a medium effect size ($d = 0.45$). Hence, this suggested that that the 7Mind intervention had a substantial impact on the significant increase in psychological well-being. Altogether, the third hypothesis can be retained.

Post-Hoc Power Analysis. A post hoc power analysis was conducted to examine the statistical power of the paired sample t-test by taking Cohen's d of psychological well-being ($d = 0.45$) as the effect size ($dz = 0.45$, $\alpha = .05$) (see Figure K2 in Appendix K). With a

sample size of n = 47, the observed power was 0.86. Consequently, results suggested that the study was well-powered for the detection of a significant effect of psychological well-being (see Figure I2 in Appendix I).

Discussion

Summary and Interpretation of Key Findings

Total Well-Being

The Wilcoxon rank-signed test revealed a statistically significant increase in total well-being from pre- to post-intervention, with a large effect size detected by the rank-biserial correlation. Further, a post-hoc power analysis indicated that the study was well-powered. The results support the first hypothesis: "*H1: Total well-being will significantly increase from pre- to post-intervention."*. These findings are in line with previous findings by a meta-analysis by Leung et al. (2023), in which 10 mindfulness interventions with a sample of 958 participants were shown to increase total well-being compared to the control group.

One possible theoretical explanation for the increase in total well-being can be drawn from the contemporary eudaemonic model of well-being, rooted in Buddhist concepts. Thereby, eudaimonia "refers to the idea of living in accordance with one's true self and fulfilling one's potential" (Ryan & Deci, 2001). Although eudaimonia serves as a modern conceptualization of well-being, it is closely connected to traditional Buddhist principles, which centralize intrinsic concepts such as self-awareness and living in accordance with one's values over external pleasures. Further, mindfulness (sati) which is a practice of early Buddhist theorems is suggested to foster an intrinsic focus, which in turn contributes to an eudaemonic state (Kang & Whittingham, 2010). Since Keyes' (2002) definition of well-being was operationalized, which encompasses the eudaemonic dimensions of social and psychological well-being, it closely resembles this connection. Hence, from the perspective of the contemporary notion of eudaemonia, the 7Mind app, using the Buddhist mindfulness practice, might have promoted participants' intrinsic focus fostering eudaemonia, in turn shown as increased total well-being.

Emotional Well-Being

The results of a paired-samples t-test revealed that emotional well-being increased significantly from pre- to post-intervention, with a medium effect size calculated by Cohen's d. Further, a post-hoc power analysis indicated that the study was well-powered. Therefore, the second hypothesis: *"Emotional well-being will increase significantly from pre- to post-*

intervention", was retained. Similar to these results, previous literature has delineated that emotional well-being increases significantly in Filipino students, when using an experiential mindfulness design utilizing breathing or motivational exercises (Pangnay, 2025), which were also used within this study.

One significant factor which could explain the significant increase in emotional well-being could be that the 7Mind app taught participants to observe their emotions without explaining them, which might have allowed for deeper emotional regulation. According to a study by Rosenbaum et al. (2020), mindfulness interventions bypass intellectual coping skills such as rumination, shown in the significant reduction of activity in the brain's cognitive control network (CNN). Thereby, mindfulness interventions seem to be able to deeply target specific aspects of emotional well-being such as affect regulation, in turn decreasing emotional distress. This result was also observed for participants who scored high on the rumination tendencies, commonly found in university students, such as in the current study (Rosenbaum et al., 2020). Another factor which could have impacted this notion is the experiential design of the current study, using breathing exercises, motivational exercises, or relaxation techniques. Altogether, in the context of this study the 7Mind intervention might have circumvented the CNN which typically blocks deep emotional processing through intellectual defence mechanisms, thereby increasing emotional well-being.

Social Well-Being

The results of a paired-samples t-test revealed significantly increased social well-being from pre- to post-intervention. Furthermore, the rank-biserial correlation revealed a large effect size, and a post-hoc power analysis showed that it was well-powered. Consequently, the third hypothesis: *"Social well-being will significantly increase from pre- to post-intervention"*, was retained. In line with the results, previous literature indicated that the positive relationship between mindfulness meditation and social well-being was mediated through social mindfulness. Thereby, mindfulness was suggested to increase prosocial or altruistic behaviour which in turn led to more positively experienced social situations. Consequently, social well-being increased due to participants feeling more connected to their social surrounding (van Doesum et al., 2013).

One possible explanation for this result is that the 7Mind intervention specifically targeted prosocial behaviour through the exercise *"An Encounter with Myself"*. This specific exercise might have increased participants self-reflection and self-awareness. Such concepts are closely related to higher levels of authenticity and empathy in a social context (Engert et al., 2023). If participants expressed higher levels of such traits due to the meditation, they

might have been more likely to experience socially favorable interactions. In line with that, further research delineated that mindfulness meditation possibly positively effects social connectedness and social cooperation (Engert et al., 2023). Thereby, individuals who behave more prosaically by staying connected or cooperation with their social environment might be more likely to foster more positively experienced social bonds, which in turn foster their social well-being (van Doesum et al., 2013). Therefore, the significant increase in social well-being of university students might be attributed to the outcomes produced by the exercise *"An Encounter with Myself"*.

Psychological Well-Being

The results of the Wilcoxon signed-rank test revealed a significant increase in psychological well-being from pre- to post-intervention. Further, Cohen's d indicated a large effect size, and a post-hoc power analysis suggested that it was well-powered. Therefore, the fourth hypothesis: *"Psychological well-being will significantly increase from pre- to post-intervention"*, was supported.

Based on previous literature this result could be explained by the 7Mind interventions potential to decrease psychological distress. In general, mindfulness-based interventions have been demonstrated to be effective in significantly reducing psychological distress (Galante et al., 2023). Furthermore, decreased levels of psychological distress have been associated with higher levels of psychological well-being (Winefield et al., 2012). Additionally, mindfulness-based interventions have been shown to be effective in significantly reducing psychological distress with a minimum of 90 minutes of mindfulness training per week (Galante et al., 2023). This time frame aligns closely with the chosen time frame of the current study. In conclusion, significant increases in university students' psychological well-being levels might be attributed to the time frame of this study as well as to the studies potential to reduce psychological distress.

Theoretical and Practical Implications

Regarding the theoretical implication of this study, it goes beyond adding to the existing body of literature, by filling two research gaps concerning the evaluation of the effectiveness of the 7Mind app while using the multidimensional measure of well-being by Keyes (2002). For instance, the current study adds to the positive psychological paradigm shift by using an intervention that directs the focus from symptom reduction to well-being promotion and prevention. Further, this study supports most of the research on mindfulness using one-dimensional measures since the individual variables were all shown to significantly increase. Beyond that, next to commonly used apps within research such as HeadSpace or

Calm, the 7Mind app has been proven to be effective as well. Furthermore, this study introduces the positive psychological multidimensional well-being measurement (MHC-SF) into the field of mindfulness.

One practical implication regarding public health, is that the 7Mind intervention is supported to show strong potential as an accessible, time-efficient, and low-cost, preventative, or promotive mental health tool, which could aim to close the treatment gap. Since the app is commercially available in every app store, a diverse population could access it. Furthermore, due to the app's free trial and healthcare sponsoring no costs are involved. This study showed that just 5-17 minutes per day can produce significant increases, making the app relatively time-efficient, especially in comparison to conventional health support options. Altogether, by offering a scalable solution, 7Mind could be aimed at supporting a large population, thereby slowly closing the treatment gap.

Lastly, another practical implication concerning the academic field is that the 7Mind app could be integrated as a preventative and multidimensional well-being promotion tool. Therefore, it could aim to foster emotional, social, and psychological well-being, supporting students while transitioning between developmental stages. Further, it could be seen as a tool which buffers the negative effects of the stressful academic environment which students are vulnerably exposed to.

Limitations

Absence of Control Group

Since the study did not make use of a control group, therefore it limits any causal inference drawing from these findings. Even though the study produced significant findings, it cannot be certainly concluded that the changes in well-being and its dimensions were directly caused by the 7Mind intervention. Consequently, alternative explanation for the increases could be possible. For instance, since the participants in this sample were not familiar with the concept of mindfulness meditation, the results could also be attributed to the novelty effect. Furthermore, the results could have been produced as a mere-measurement effect. Lastly, third variables such as fluctuating exam stress cannot be excluded, hence it might have contributed to the results. In conclusion, while the results produced by this study seem promising, the absence of a control group suggests being cautious regarding interpretation.

Short-Term Design

Another methodological factor is the inclusion of a short-term design, which limits any interpretation regarding the sustainability of the observed results. Since no follow-up study was used but merely a pre- and post-test questionnaire, it cannot be surely said whether the produced changes were temporary or sustainable. However, in the context of a stressful academic environment, it could be crucial to infer whether changes were sustained or diminished, to inform students about the tenability of the impact.

Future Directions

Randomized Control Trial (RCT)

Since one limitation of the study is the absence of a control group, future research could make use of a randomized control trial (RCT), to allow potential causal inferences. In this context future research could examine whether the produced changes are mere coincidences or whether they are a response to the 7Mind mindfulness application, allowing for deeper insights. Future research could thereby either include no placebo or an alternative intervention such as guided tasks. Such a placebo could allow to differentiate whether the changes are attributed to the intervention or rather produced by any form of guidance. Furthermore, the inclusion of an RCT helps to diminish effects such as the novelty effect or the mere measurement effect. In conclusion, this serves as a critical next step towards the practical inclusion of the 7Mind intervention.

Longitudinal Research

Another future direction is directly linked to the limitation of the short design. While this study provided preliminary evidence that a short-intervention period can produce significant increases in well-being and its dimensions, future research could aim to measure long-term effects. In the simplest form this could include extending the duration of one week and raising it to four weeks. Moreover, researchers could even incorporate follow-up assessments, measuring the dimensions at different timepoints. For example, a follow-up assessment could be introduced before and after each of the four weeks. Consequently, it this would provide deeper insights into whether increases can be referred to the effect of the intervention.

Additional Scale Inclusion

Lastly, future research could aim to include scales which test the effectiveness regarding negative symptom reduction. For instance, negative symptoms such as anxiety, depression, or stress could be evaluated for a broader picture. Thereby, researchers should opt to include well-

established scales such as the Perceived Stress Scale (PSS) rather than establishing new scales to maintain statistical reliability and validity. Therefore, it could be determined whether the 7Mind app not only aims to promote well-being or prevent illness, but also whether it directly diminishes illness symptoms. Consequently, one inclusion criteria for such a design could be that participants have a formal diagnosis of for example anxiety. Therefore, the treatment gap would close regarding a clinical population, allowing for a more targeted intervention.

Conclusion

The current study aimed to evaluate the effectiveness of the one-week 7mind mindfulness app on university students' well-being levels and its dimensions of emotional, social, and psychological well-being. By measuring the effectiveness of the 7mind app with the multidimensional MHC-SF by Keyes (2002), this research was able to add to the existing body of positive psychological research and bridge the corresponding research gap. The main findings of the study are that university student's total well-being, as well as emotional, social, and psychological increase significantly over the course of the one-week 7Mind intervention. Nevertheless, these findings should be interpreted with caution regarding causality due to the absence of a control group. The investigation presents implications for universities decision process about the inclusion of offering mindfulness applications to students to enhance well-being and support managing university related well-being declines, essentially serving as a reference for future studies.

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Appendix A

Application for Ethical Approval

Figure A1

Page 1 of the Ethical Review Application

UNIVERSITY OF TWENTE.

Humanities & Social Sciences (HSS)

250526 APPLICATION FOR ETHICAL REVIEW

Application nr:	250526	**Intro form:**	8 - Introduction
Researcher:	Roth, A.B-PSY)	**Middle form:**	7 - Humanities & Social Sciences (HSS)
Supervisor:	Serno, C. (BMS-PGT)	**Outro form:**	5 - Submission
Reviewer:	ten Klooster, P.M. (BMS-PHT)		
Status:	Positive advice by reviewer		
Date of application:	19-03-2025 16:24		
Application version:	1		

0. GENERAL

0.1. Personal details

Student/employee number: s3006336
Initials: A.
First name: Alicia
Last name: Roth
Email : a.roth@student.utwente.nl
Education/department: n/a
Faculty: n/a
Study field: B-PSY
Study level: BSC
Faculty/service department: BMS (Selected for this application)

0.2. Project title

The effect of the mindfulness app 7Mind on wellbeing and stress

0.3. Summary

With technology becoming increasingly used in psychological interventions, this study aims to analyse the effect of the mindfulness app 7mind on stress reduction and the well-being of students. The study is structured in a pre-post design. Students will use the app for a week by doing mindfulness exercises from the app 7Mind and fill out questionnaires before and after the week they use the mindfulness app. These theses will, therefore, analyse what effect the usage of the app 7mind has on the student's perceived stress level and general well-being.

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Figure A2

Page 2 of the Ethical Review Application

0.4. Start date (estimated) and end date (estimated) for your research project

Start date: 20-03-2025
End date: 04-07-2025

0.5. If additional researchers (students and/or staff) will be involved in carrying out this research, please name them: [Please include full name and email]

Full name	Email
Louise Christine Rohde	l.c.rohde@student.utwente.nl

0.6. In which context will you conduct this research?

Bachelor's thesis

0.6.1. Please select your supervisor (if applicable)

Serno, C. (BMS-PGT)

0.7. Please select an ethics committee

Humanities & Social Sciences (HSS)

1. GENERAL

1.1. Is this research project closely connected to a research project previously assessed by the Domain Humanities and Social Sciences (HSS) or BMS Ethics Committee?

No/Unknown

1.2. Are external organization(s) involved which commission or provide funding for your research?

No/Unknown

2. RESEARCH INVOLVING EXISTING DATA OR DOCUMENTS (SECONDARY DATA)

2.1. Will you be using existing (secondary) data pertaining to individuals, groups or organizations?

No

3. RESEARCH INVOLVING THE COLLECTION OF NEW DATA

3.1. Does your research project involve direct or indirect contact with human participants?

Yes

3.2. Will you be collecting new data from individuals acting as respondents, interviewees, participants or informants?

Yes

3.3. Can the research project be considered as medical research?

No

4. RESEARCH POPULATION

4.1. Please provide a brief description of the intended research population(s)

University students between 18 and 27 years old from Germany and the Netherlands.

Figure A3

Page 3 of the Ethical Review Application

4.2. How many individuals will be involved in your research?

We aim to approximately have 100 participants.

4.3. Which characteristics must participants/sources possess in order to be included in your research?

Participants must be university students between 18 and 27 years old. The inclusion criteria will be good proficiency in English because all mindfulness exercises the participants must complete are in English, as well as the questionnaires used. An exclusion criterion will also be if participants do not use the app for one week daily. We will provide participants with an exercise schedule that they will need to follow. People under 18 will be excluded, as well as people over 27. The focus will be on people from the Netherlands and Germany, but people from other countries will not be excluded. Additionally, people will need to have a smartphone on which they can download the mindfulness app.

4.4. Does this research specifically target minors (<16 years), people with cognitive impairments, people under institutional care (e.g. hospitals, nursing homes, prisons), specific ethnic groups, people in another country or any other special group that may be more vulnerable than the general population?

No

4.5. Are you planning to recruit participants for your research through the BMS test subject pool, SONA?

No

Figure A4

Page 4 of the Ethical Review Application

5. METHODS OF DATA COLLECTION

5.1. Please describe how you collect your data?

Participants will be recruited through snowball sampling and convenience sampling through contacts and via an Instagram story. First, participants will receive, through Qualtrics, an informed consent form that includes a description of the purpose of the study, and information on the voluntary nature of participation. Also, participants will be informed that their data will be handled anonymously and that they have the right to withdraw at any given time during the study without negative consequences. Participants will also provide their email addresses to get all the information and links needed to complete the participation in the study. Only participants who will consent will be forwarded to the questionnaire via Qualtrics, including the Perceived Stress Scale, the Mental Health Continuum Short form and questions about demographic information, including age, gender and nationality. After filling out the pretest questionnaire, participants will receive the one-week plan that describes which mindfulness exercises need to be done on which day to ensure consistency in the usage of mindfulness exercises across participants. When participants download the app, they have to create an account with an email, and they automatically can use the 7-day free trial. They can then select in the app the exercise they have to do each day and then complete the exercise. After using the app for one week, participants will fill out a post-experiment questionnaire that includes a question about whether participants completed all mindfulness exercises and both scales to measure their well-being and stress levels after the intervention. The post-experiment test will be sent to participants with the PDF of the exercise plan after they fill in the pre-test questionnaire, and then a reminder will be sent if they forget to fill in the post-test questionnaire. Participants will need to fill in a unique code on both the pre-and post-test so they can be matched to the participants. The unique code will consist of the last two letters of their last name and the first two letters of their first name. Regarding data manipulation, the data will be cleaned in the case of incomplete responses, missing data and outliers will be checked. Also, participants who do not meet the inclusion criteria or meet the exclusion criteria will be excluded from the data. The data will be transformed by computing well-being and stress level score and categorical variables will be changed to numercial formats.

6. BURDEN AND RISKS OF PARTICIPATION

6.1. Are there short-term or long-term burdens and/or risks to the participants?

No

6.2. Can the participants benefit from the research and/or their participation in any way?

Yes

By doing mindfulness exercises, participants can potentially increase their well-being and reduce their stress levels temporarily.

6.3. Will the study expose the researcher to any risks?

No

Figure A5

Page 5 of the Ethical Review Application

7. INFORMED CONSENT

7.1. Will you inform potential research participants completely about the aims, activities, burdens and risks of the research before they decide whether to take part in the research?

Yes

Participants will, before taking part in the study, read through a description of the study on Qualtrics that includes the aim and activities of the study.

7.2. Will you withhold information from participants and/or will you use deception?

No

7.3. Will you clearly inform research participants that they can withdraw from the research at any time without explanation/justification?

Yes

7.4. Who will provide the consent?

Participant

7.5. How will you obtain the voluntary, informed consent of the research participants (or their legal representatives in case of non-competent participants)?

Active, non-anonymous online consent will be used to obtain the voluntary, informed consent of the research participants.

7.6. Please upload your informed consent procedure/form here

Consent_form.pdf

7.7. Are the research participants somehow dependent on or in a subordinate position to the researcher(s) (e.g. students or relatives)?

No

7.8. Will participants receive any rewards, incentives or payments for participating in the research?

No

7.9. In the interest of transparency, it is a good practice to inform participants about what will happen after their participation is completed. How will you inform participants about what will happen after their participation is concluded?

Participants will receive the researcher's contact details, so that they can contact the researcher if they have questions/would like to know more.

8. CONFIDENTIALITY AND ANONYMITY

8.1. Does the data collected contain personal identifiable information that can be traced back to specific individuals/organizations?

No

9. DATA MANAGEMENT

9.1. I have read the UT data policy and/or info specific for students handling data.

Yes

Figure A6

Page 6 of the Ethical Review Application

9.2. I am aware of my responsibilities for the proper handling of data, regarding working with personal data, storage of data, sharing and presentation/publication of data.

Yes

10. OTHER POTENTIAL ETHICAL ISSUES/CONFLICTS OF INTEREST

10.1. Do you anticipate any other ethical issues/conflicts of interest in your research project that have not been previously noted in this application? Please state any issues and explain how you propose to deal with them. Additionally, if known indicate the purpose your results have (i.e. the results are used for e.g. policy, management, strategic or societal purposes).

The purpose of our results are of societal nature, specifically to bridge the research gap of the effect of the 7Mind app and to provide new research that can be expanded by testing the effect of other variables (except from well-being and stress).

11. CLOSURE

11.1. I have answered all questions truthful and complete

Yes

12. COMMENTS

No comments have been added to this application.

13. CONCLUSION

Status: Positive advice by reviewer

The BMS ethical committee / Domain Humanities & Social Sciences has assessed the ethical aspects of your research project. Based on the information you provided, the committee does not have any ethical concerns regarding this research project.

It is your responsibility to ensure that the research is carried out in line with the information provided in the application you submitted for ethical review. If you make changes to the proposal that affect the approach to research on humans, you must resubmit the changed project or grant agreement to the ethical committee with these changes highlighted.

Moreover, novel ethical issues may emerge while carrying out your research. It is important that you re-consider and discuss the ethical aspects and implications of your research regularly, and that you proceed as a responsible scientist.

Finally, your research may be subject to research compliance regulations such as the EU General Data Protection Regulation (GDPR), Codes of Conduct at UT related to (Scientific)Integrity or other codes of conduct that are applicable in your field, and the obligation to report a security incident (data breach or otherwise) at the UT.

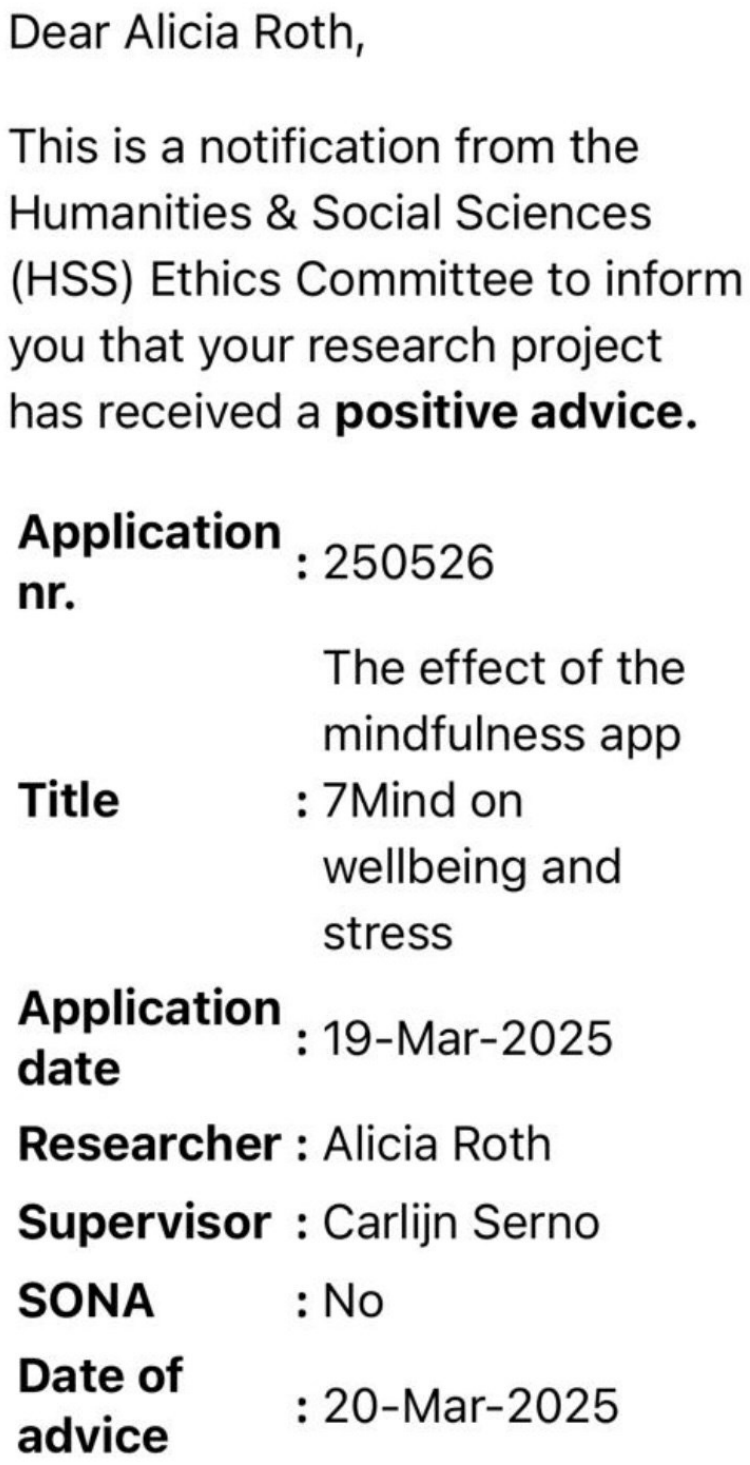
20-03-2025 18:27

Appendix B

Ethical Approval

Figure B1

Screenshot of the Ethical Approval or Positive Advice



Dear Alicia Roth,

This is a notification from the Humanities & Social Sciences (HSS) Ethics Committee to inform you that your research project has received a **positive advice.**

Application nr.	: 250526
Title	: The effect of the mindfulness app 7Mind on wellbeing and stress
Application date	: 19-Mar-2025
Researcher	: Alicia Roth
Supervisor	: Carlijn Serno
SONA	: No
Date of advice	: 20-Mar-2025

Appendix C

Participant Recruitment

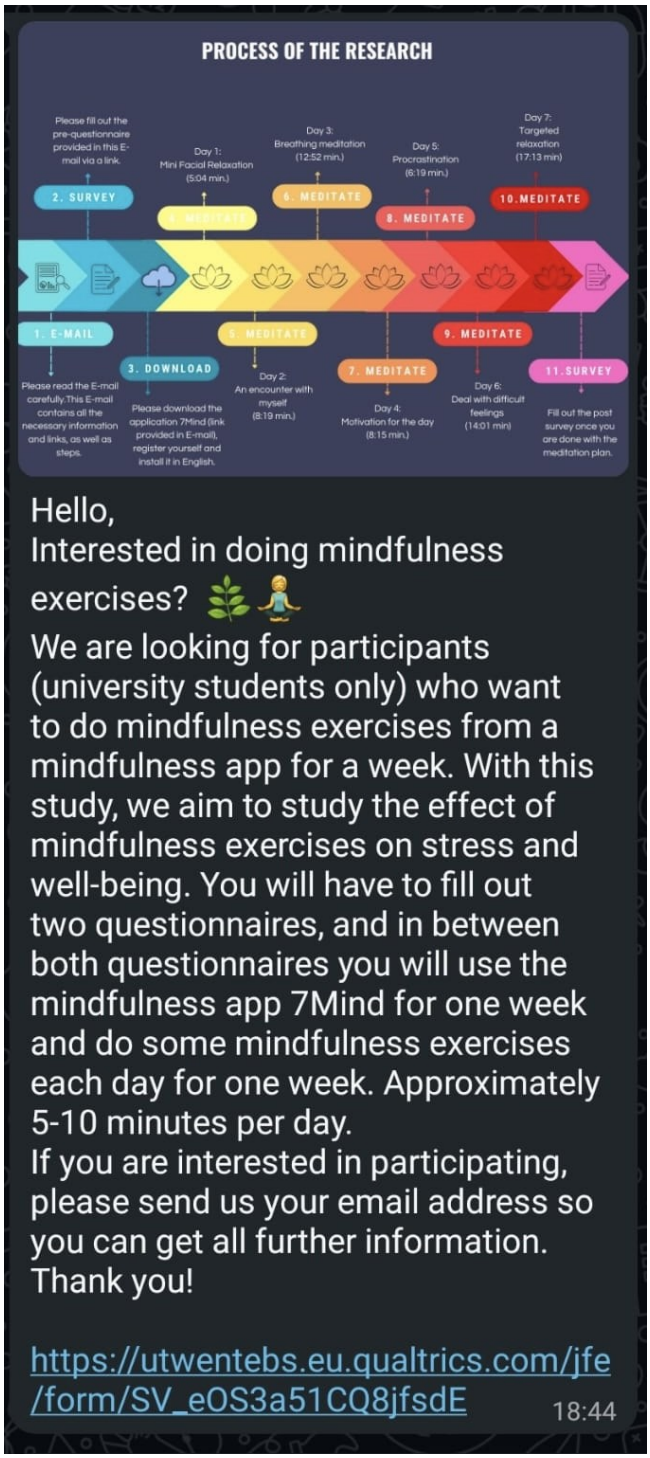
Figure C1

Advertisement of the Mindfulness Study via Instagram Story Function

Note. The following figure depicts the advertisement of the mindfulness study within the recruitment process via the Instagram story function. The advertisement includes a link to the pre-test questionnaire and enables participants to sign up for the study by sharing their E-mail via the direct message function of the Instagram story. This exact figure was first posted on March 31 and last April 18, 2025.

Figure C2

Screenshot of the Advertisement Message of the Mindfulness Study via WhatsApp Groups



Note. The figure entails a depiction of the intervention process and its individual steps.

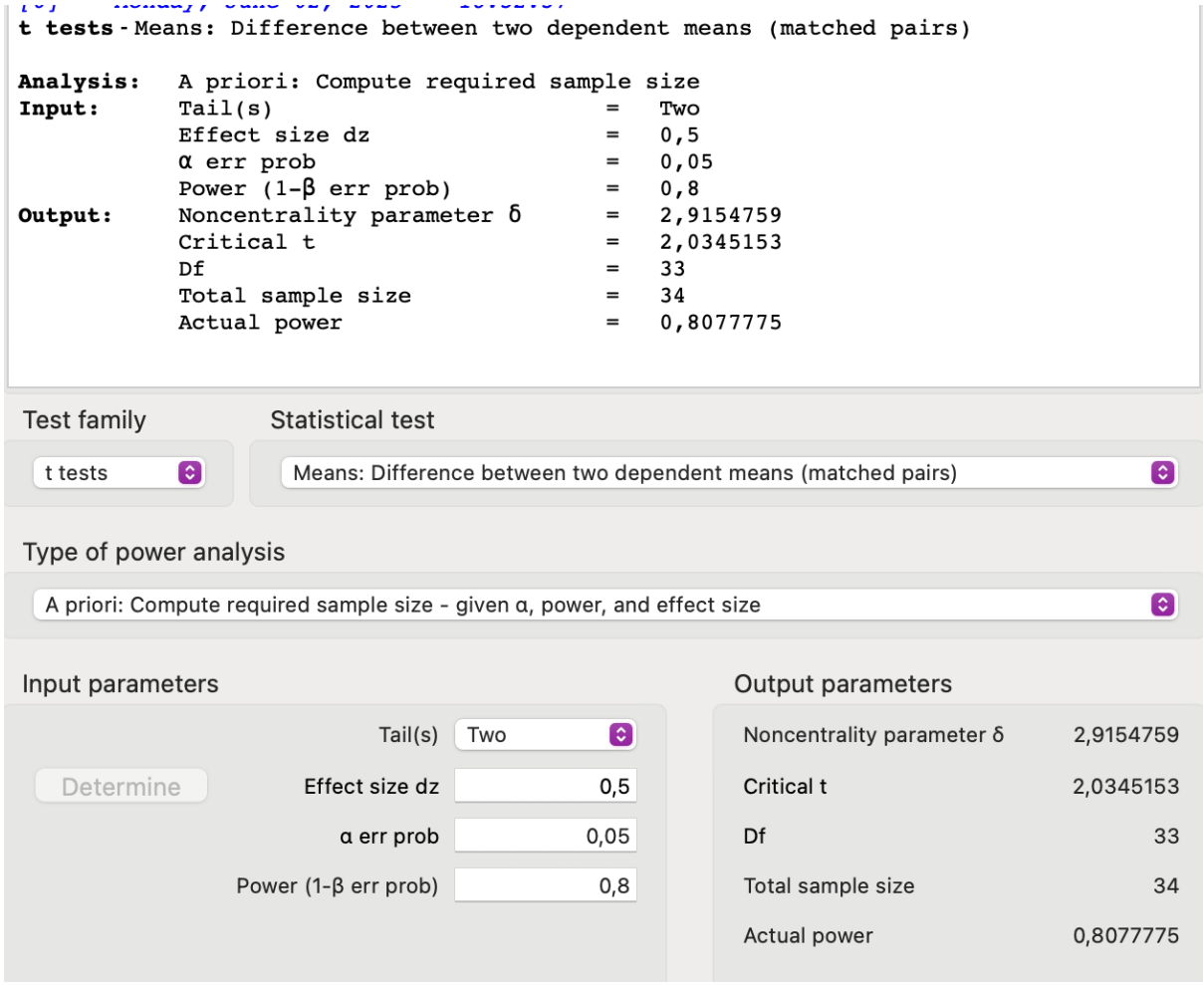
Furthermore, the message contains a link to the pre-test questionnaire on Qualtrics.

Appendix D

Results of the A-Priori Power Analysis Using G*Power

Figure D1

Results of the A-Priori Power Analysis



Appendix E

Mental Health Continuum-Short Form

Figure E1

Table Containing the Items and Questions of the Mental Health Continuum-Short Form

Adult MHC-SF (ages 18 or older)

Please answer the following questions are about how you have been feeling during the past month. Place a check mark in the box that best represents how often you have experienced or felt the following:

During the past month, how often did you feel …	NEVER	ONCE OR TWICE	ABOUT ONCE A WEEK	ABOUT 2 OR 3 TIMES A WEEK	ALMOST EVERY DAY	EVERY DAY
1. happy						
2. interested in life						
3. satisfied with life						
4. that you had something important to contribute to society						
5. that you belonged to a community (like a social group, or your neighborhood)						
SEE BELOW 6. that our society is a good place, or is becoming a better place, for all people						
7. that people are basically good						
8. that the way our society works makes sense to you						
9. that you liked most parts of your personality						
10. good at managing the responsibilities of your daily life						
11. that you had warm and trusting relationships with others						
12. that you had experiences that challenged you to grow and become a better person						
13. confident to think or express your own ideas and opinions						
14. that your life has a sense of direction or meaning to it						

Note: The original wording for item 6 was "that our society is becoming a better place for people like you." This item does not work in all cultural contexts. However, when validating the MHC-SF, test both versions of item 6 to see which one works best in your context.

Appendix F

Pre-Test Questionnaire in Qualtrics

Figure F1

Screenshot of Page 1 of the Pre-Test Questionnaire

Consent

Dear Participant, Thank you for your interest in this research study. This study aims to explore the effects of mindfulness practices on well-being and stress levels, particularly using the 7Mind mindfulness app. As mindfulness-based interventions are increasingly integrated into digital platforms, it is important to assess their effectiveness in enhancing overall mental health. Your participation will contribute valuable insights into how such interventions can support mental health related problems among university students.

The eligibility requirements or inclusion criteria for this study are:
- Being above the age of 18 and under 27
- Proficient level of Englisch skills
- Level of higher education (university)

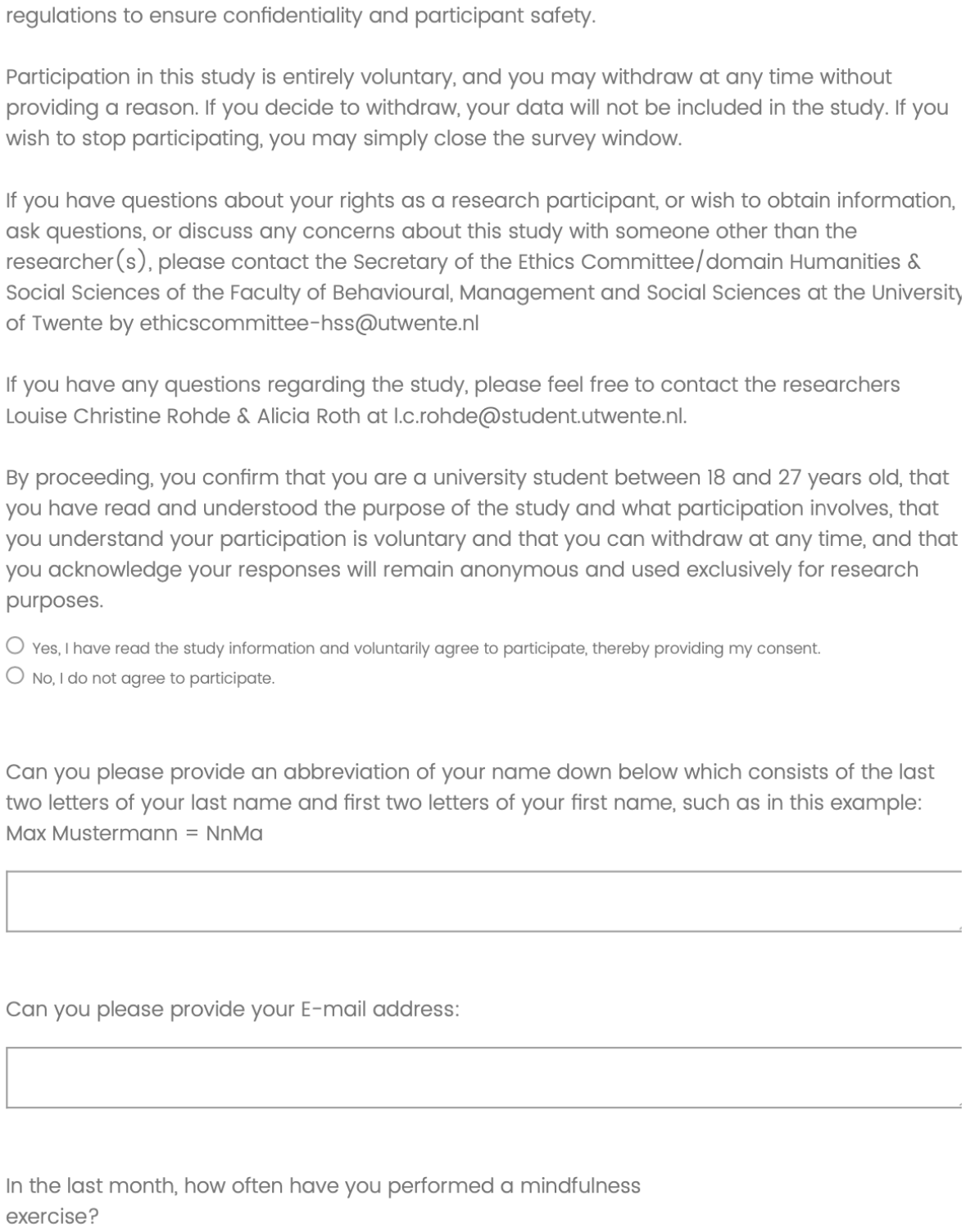
The exclusion criteria are:
- Being under the age of 18 or above the age of 27
- No proficient level of Englisch skills
- No level of higher education (university)
- Not engaging in all seven days of the intervention

If you decide to participate, you will be asked to complete a pre-questionnaire before beginning the mindfulness intervention. This questionnaire will assess your current level of well-being and stress level prior to the one week experimental trial. Following this, you will engage in a one-week mindfulness intervention using the 7Mind app, where you will be guided through specific mindfulness exercises designed to enhance well-being, information like the mindfulness exercise plan will be provided to you via E-mail. At the end of the intervention, you will complete a post-questionnaire to measure any changes in well-being. The questionnaires will take approximately 10-15 minutes each to complete, and the mindfulness exercises themselves will require a few minutes of daily engagement with a total time of approximately one hour.

Your participation in this study is partly anonymous, since personal data like your E-mail address will be collected to provide the mindfulness exercise plan. The E-mail will be used solely for this purpose and after the research is completed all personal data including your E-mail address will be deleted. Your responses will be stored securely and used solely for research purposes. The study follows ethical research guidelines and complies with data protection

Figure F2

Screenshot of Page 2 of the Pre-Test Questionnaire



regulations to ensure confidentiality and participant safety.

Participation in this study is entirely voluntary, and you may withdraw at any time without providing a reason. If you decide to withdraw, your data will not be included in the study. If you wish to stop participating, you may simply close the survey window.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

If you have any questions regarding the study, please feel free to contact the researchers Louise Christine Rohde & Alicia Roth at l.c.rohde@student.utwente.nl.

By proceeding, you confirm that you are a university student between 18 and 27 years old, that you have read and understood the purpose of the study and what participation involves, that you understand your participation is voluntary and that you can withdraw at any time, and that you acknowledge your responses will remain anonymous and used exclusively for research purposes.

○ Yes, I have read the study information and voluntarily agree to participate, thereby providing my consent.
○ No, I do not agree to participate.

Can you please provide an abbreviation of your name down below which consists of the last two letters of your last name and first two letters of your first name, such as in this example: Max Mustermann = NnMa

Can you please provide your E-mail address:

In the last month, how often have you performed a mindfulness exercise?

Figure F3

Screenshot of Page 3 of the Pre-Test Questionnaire

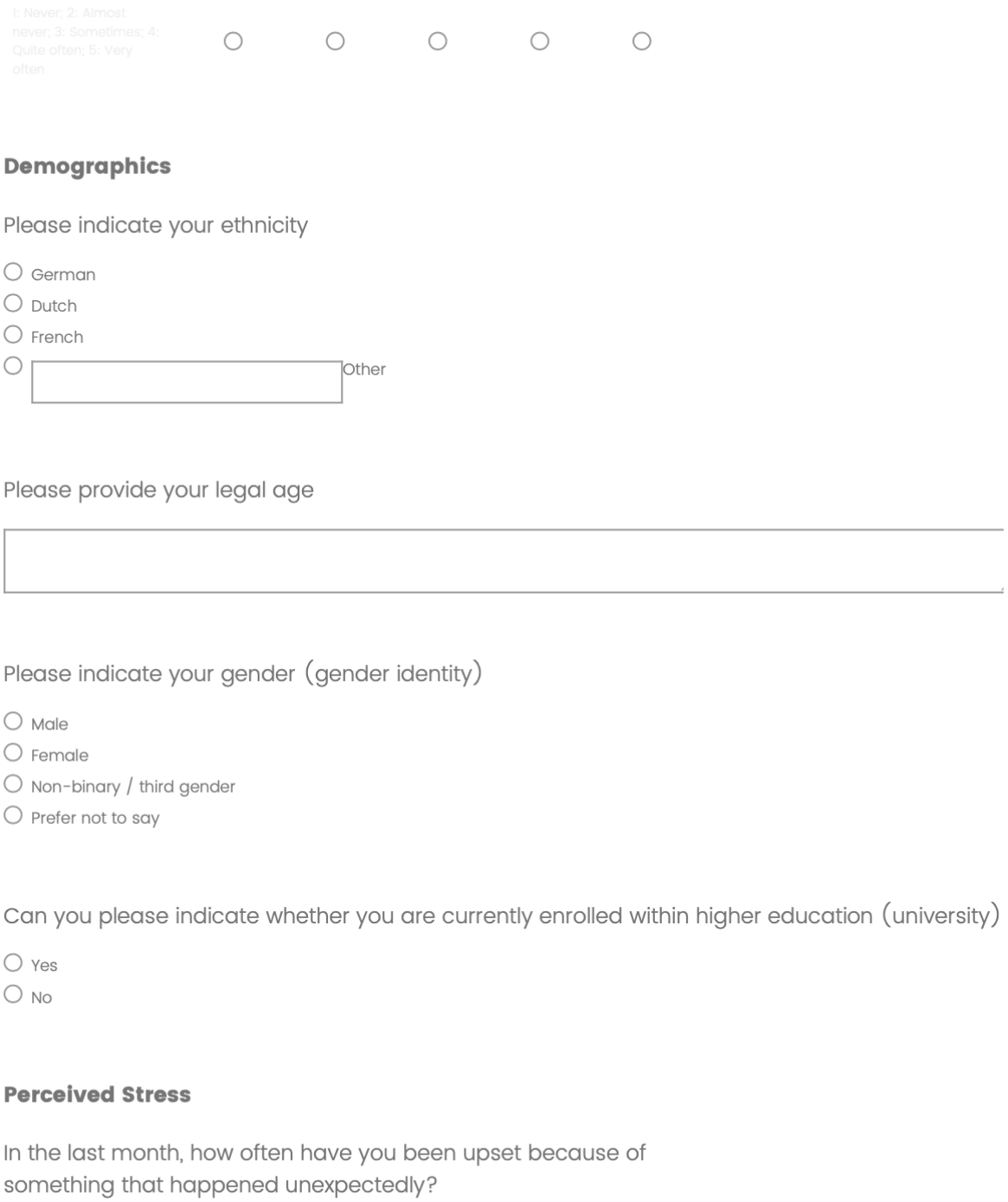


Figure F4

Screenshot of Page 4 of the Pre-Test Questionnaire

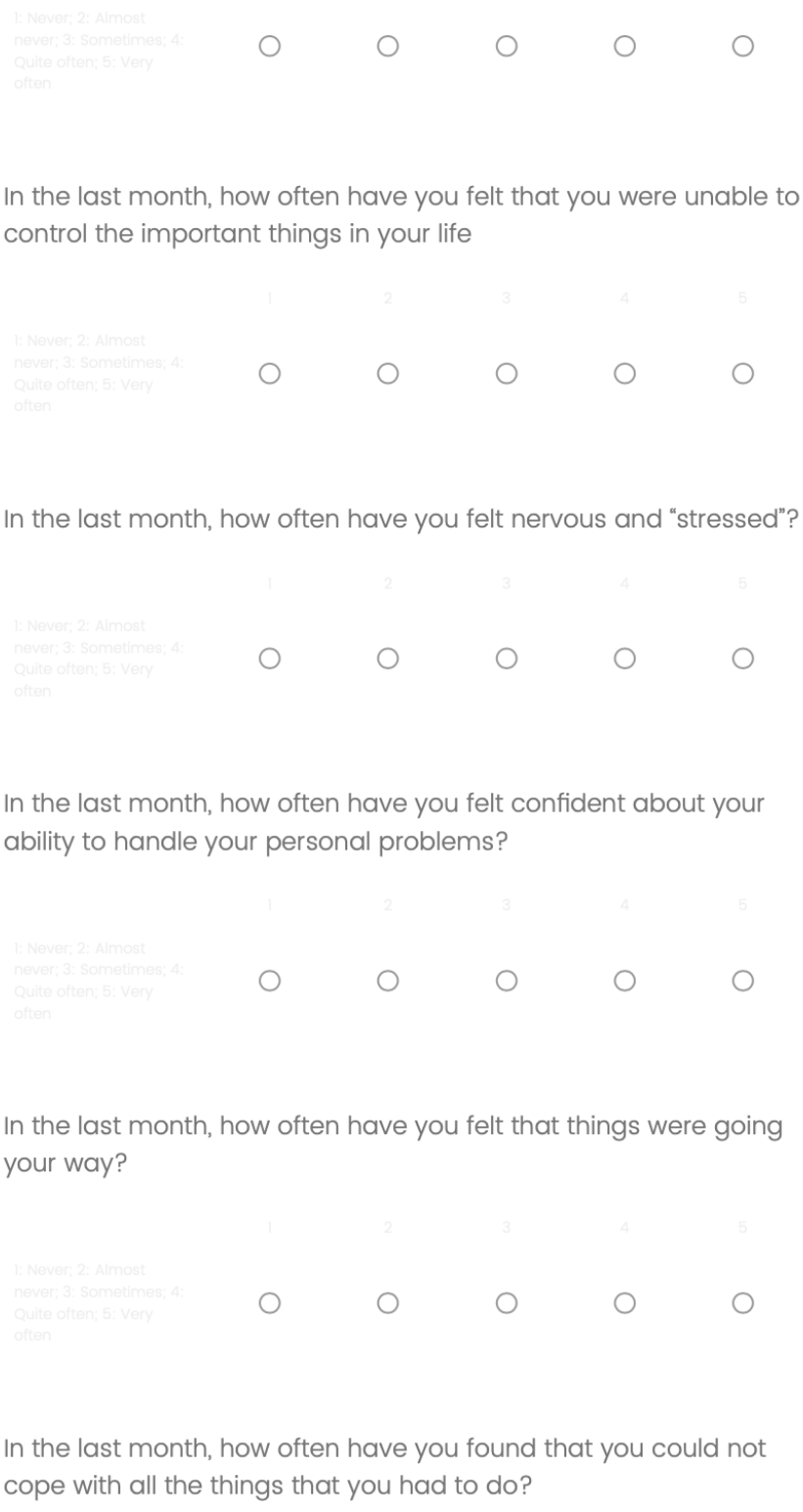


Figure F5

Screenshot of Page 5 of the Pre-Test Questionnaire

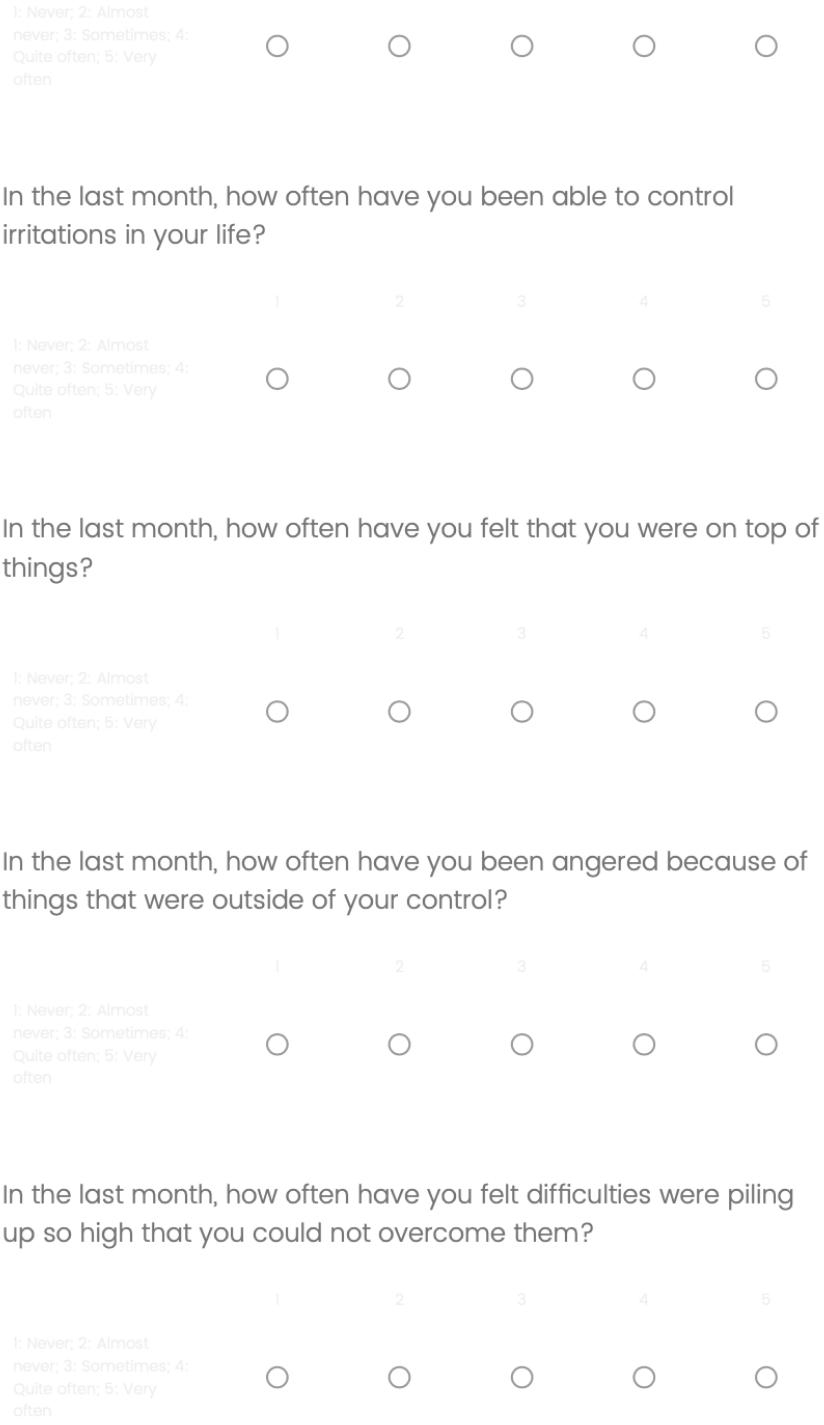


Figure F6

Screenshot of Page 6 of the Pre-Test Questionnaire

Figure F7

Screenshot of Page 7 of the Pre-Test Questionnaire

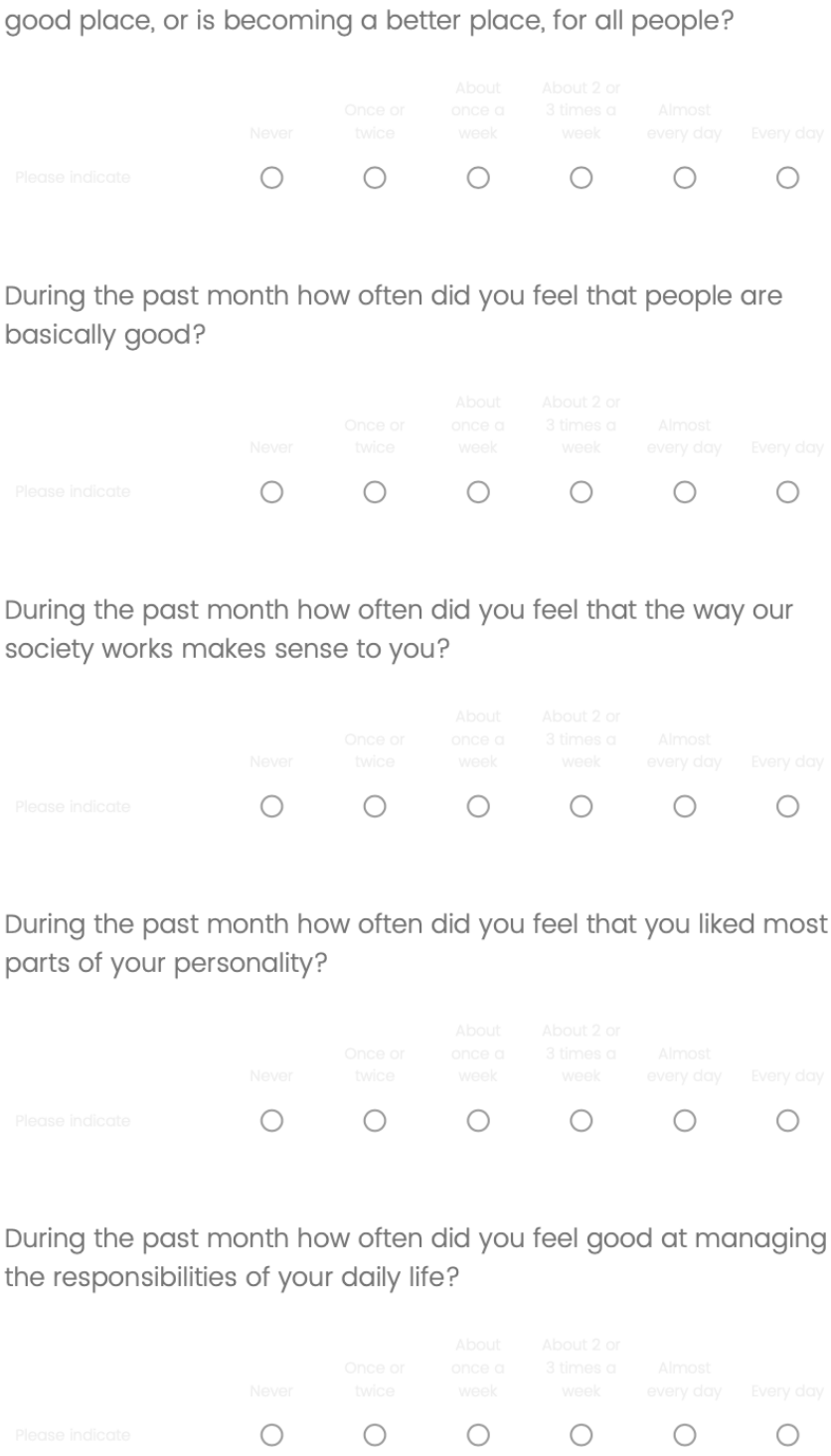


Figure F8

Screenshot of Page 8 of the Pre-Test Questionnaire

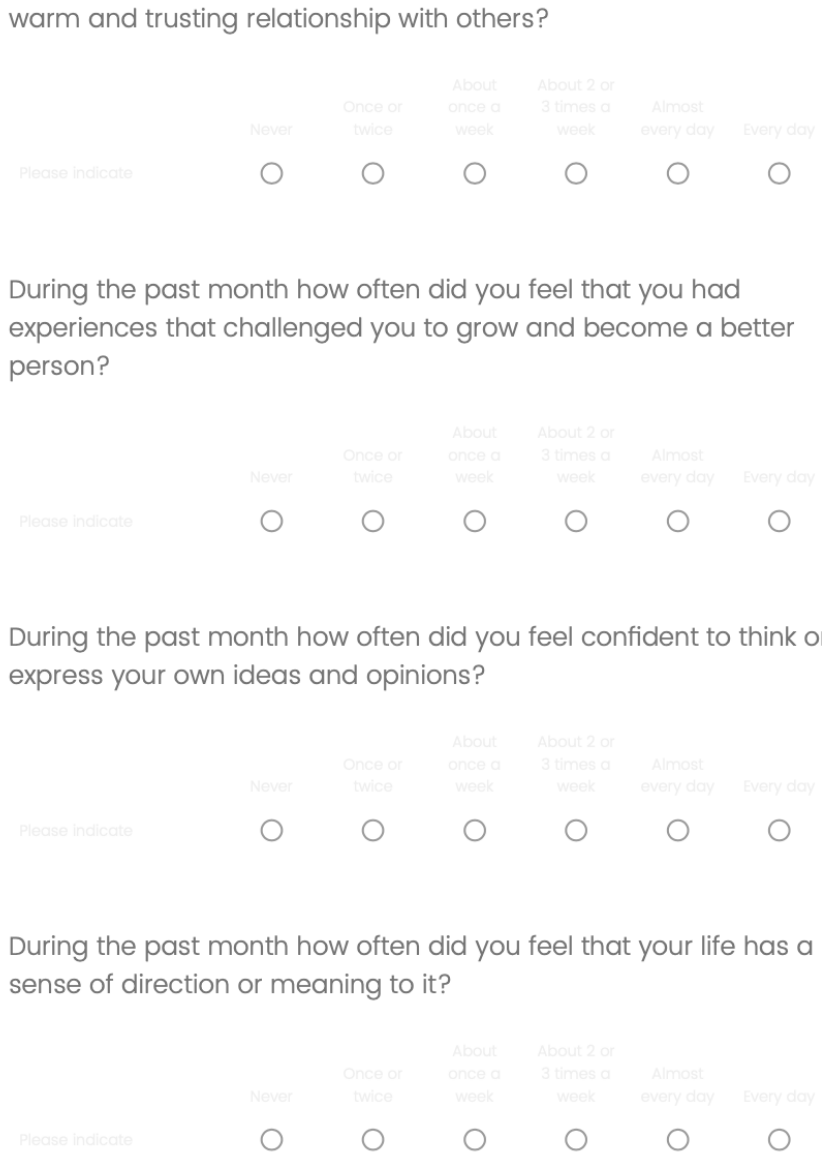
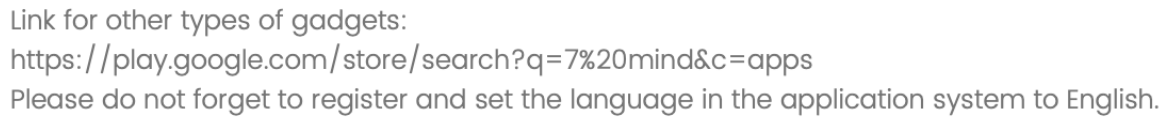


Figure F9

Screenshot of Page 9 of the Pre-Test Questionnaire

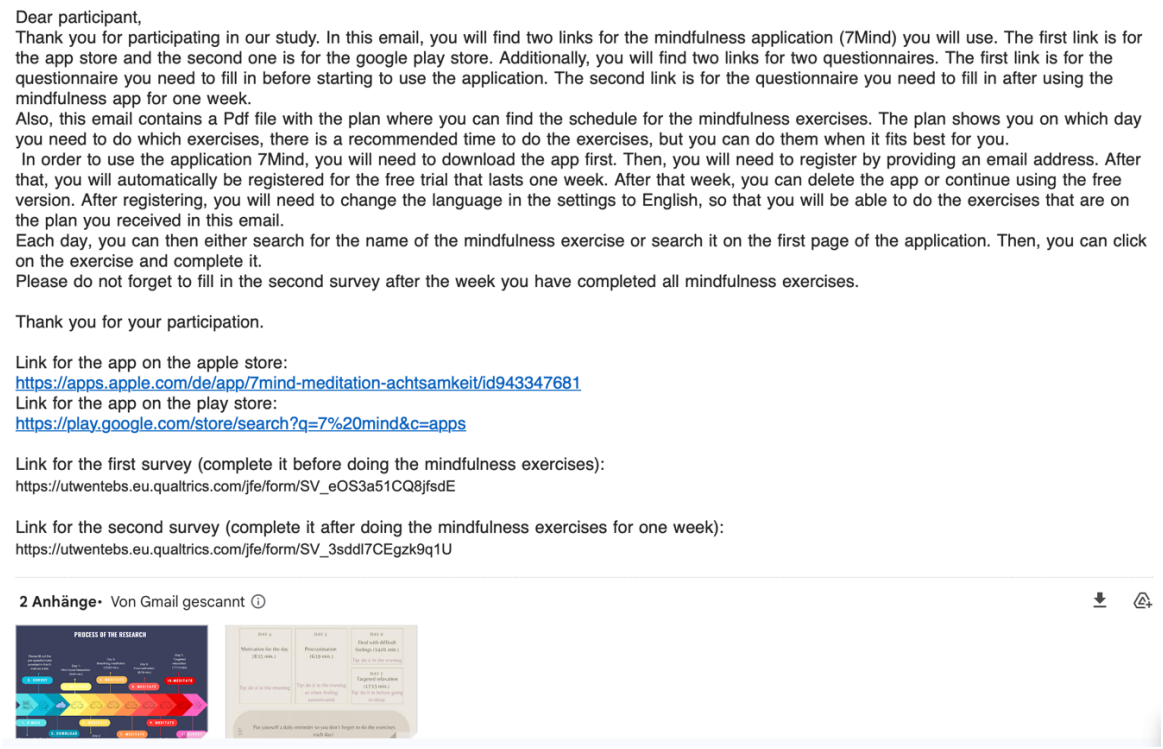


Appendix G

Emails Sent to Participants

Figure G1

Screenshot of the Invitation E-Mail to the Study



Dear participant,
Thank you for participating in our study. In this email, you will find two links for the mindfulness application (7Mind) you will use. The first link is for the app store and the second one is for the google play store. Additionally, you will find two links for two questionnaires. The first link is for the questionnaire you need to fill in before starting to use the application. The second link is for the questionnaire you need to fill in after using the mindfulness app for one week.
Also, this email contains a Pdf file with the plan where you can find the schedule for the mindfulness exercises. The plan shows you on which day you need to do which exercises, there is a recommended time to do the exercises, but you can do them when it fits best for you.
In order to use the application 7Mind, you will need to download the app first. Then, you will need to register by providing an email address. After that, you will automatically be registered for the free trial that lasts one week. After that week, you can delete the app or continue using the free version. After registering, you will need to change the language in the settings to English, so that you will be able to do the exercises that are on the plan you received in this email.
Each day, you can then either search for the name of the mindfulness exercise or search it on the first page of the application. Then, you can click on the exercise and complete it.
Please do not forget to fill in the second survey after the week you have completed all mindfulness exercises.

Thank you for your participation.

Link for the app on the apple store:
https://apps.apple.com/de/app/7mind-meditation-achtsamkeit/id943347681
Link for the app on the play store:
https://play.google.com/store/search?q=7%20mind&c=apps

Link for the first survey (complete it before doing the mindfulness exercises):
https://utwentebs.eu.qualtrics.com/jfe/form/SV_eOS3a51CQ8jfsdE

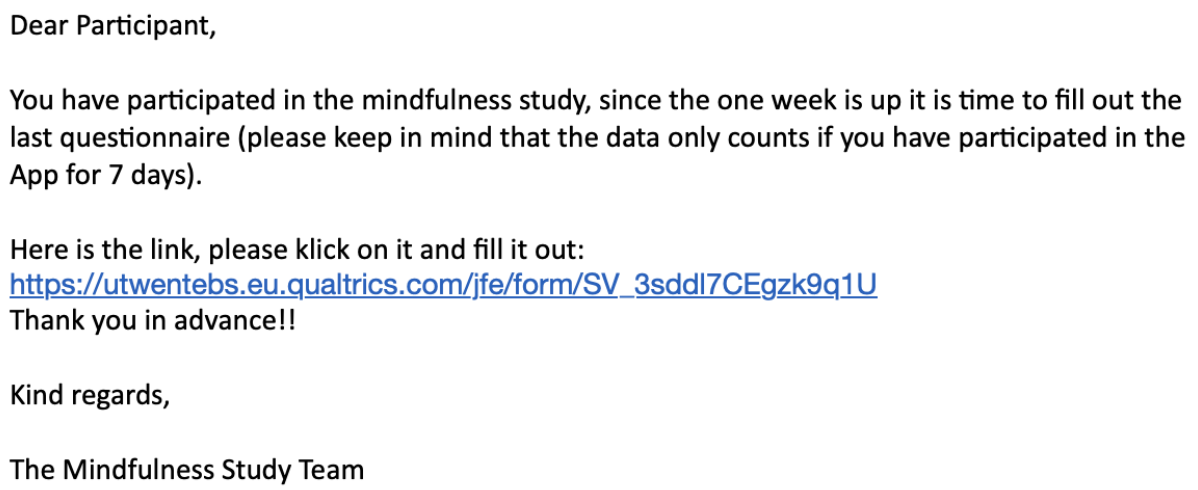
Link for the second survey (complete it after doing the mindfulness exercises for one week):
https://utwentebs.eu.qualtrics.com/jfe/form/SV_3sddl7CEgzk9q1U

2 Anhänge · Von Gmail gescannt

Note. The E-mail contains two attached documents which contain the intervention process shown in the Figure C2 of Appendix C, and the exercise plan shown in Figure E1 of Appendix E.

Figure G2

Screenshot of the Reminder E-Mail



Dear Participant,

You have participated in the mindfulness study, since the one week is up it is time to fill out the last questionnaire (please keep in mind that the data only counts if you have participated in the App for 7 days).

Here is the link, please klick on it and fill it out:
https://utwentebs.eu.qualtrics.com/jfe/form/SV_3sddI7CEgzk9q1U
Thank you in advance!!

Kind regards,

The Mindfulness Study Team

Appendix H

Post-Test Questionnaire in Qualtrics

Figure H1

Screenshot of Page 1 of the Post-Test Questionnaire

Consent

Dear Participant,
At this point you have completed the experimental phase of the study and are at the point of the post-questionnaire. Thank you for your participating in this post-test-questionnaire. This study aims to explore the effects of mindfulness practices on well-being and stress levels, particularly using the 7Mind mindfulness app. As mindfulness-based interventions are increasingly integrated into digital platforms, it is important to assess their effectiveness in enhancing overall mental health. Your participation will contribute valuable insights into how such interventions can support mental health related problems among university students.

The eligibility requirements or inclusion criteria for this post-test are:
- Being above the age of 18 and under 27
- Proficient level of Englisch skills
- Level of higher education (university)

The exclusion criteria are:

Figure H2

Screenshot of Page 2 of the Post-Test Questionnaire

- Being under the age of 18 or above the age of 27
- No proficient level of Englisch skills
- No level of higher education (university)
- Non-completion the whole mindfulness exercise plan (all 7 days)

Your participation in this post-test is partly anonymous, since personal data like your E-mail address had to be collected to provide the mindfulness exercise plan. This E-mail was used solely for this purpose and after the research is completed all personal data including your E-mail address will be deleted. Your responses will be stored securely and used solely for research purposes. The study follows ethical research guidelines and complies with data protection regulations to ensure confidentiality and participant safety.

Participation in this post-test is entirely voluntary, and you may withdraw at any time without providing a reason. If you decide to withdraw, your data will not be included in the study. If you wish to stop participating, you may simply close the survey window.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

Figure H3

Screenshot of Page 3 of the Post-Test Questionnaire

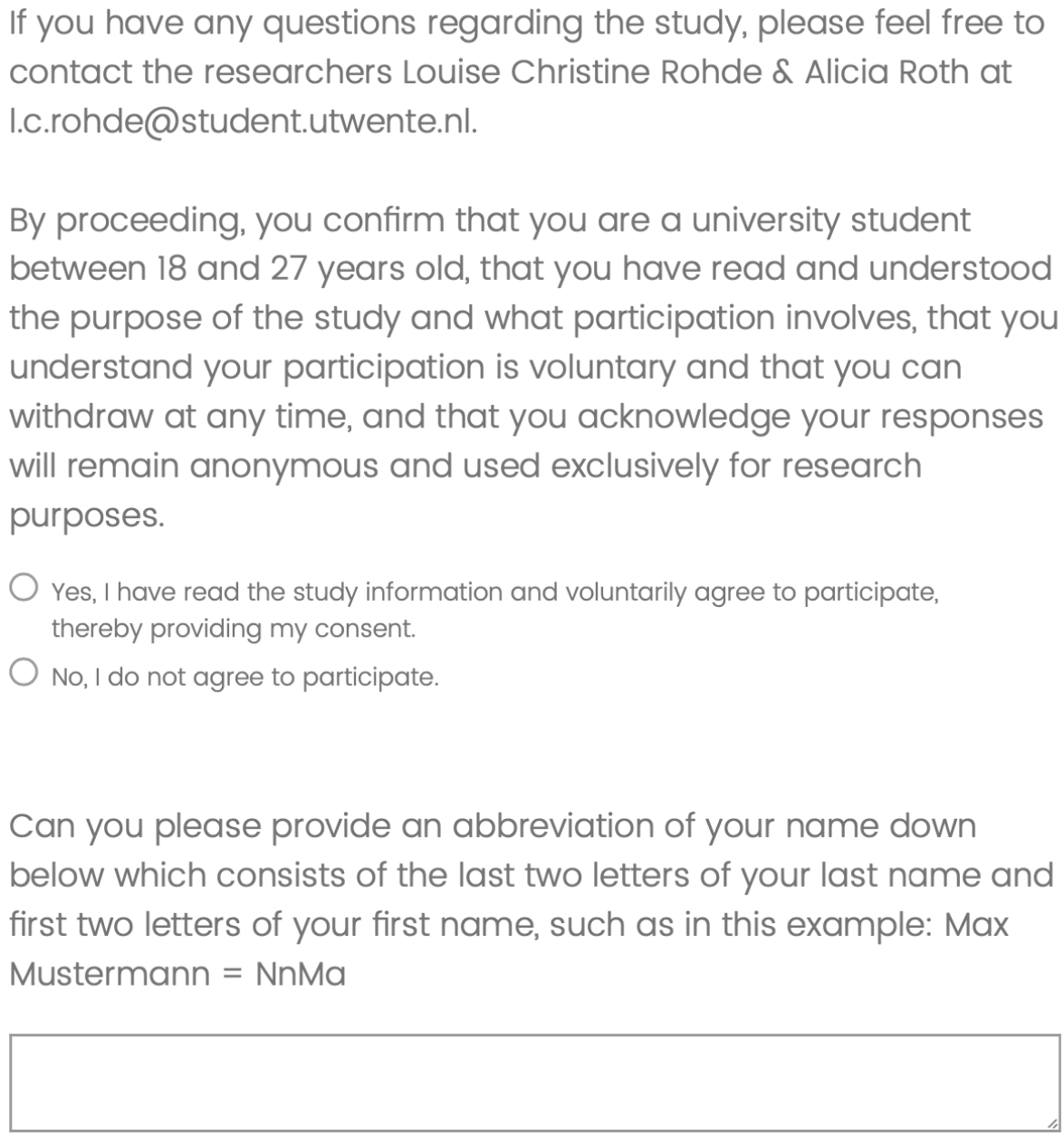


Figure H4

Screenshot of Page 4 of the Post-Test Questionnaire

Figure H5

Screenshot of Page 5 of the Post-Test Questionnaire

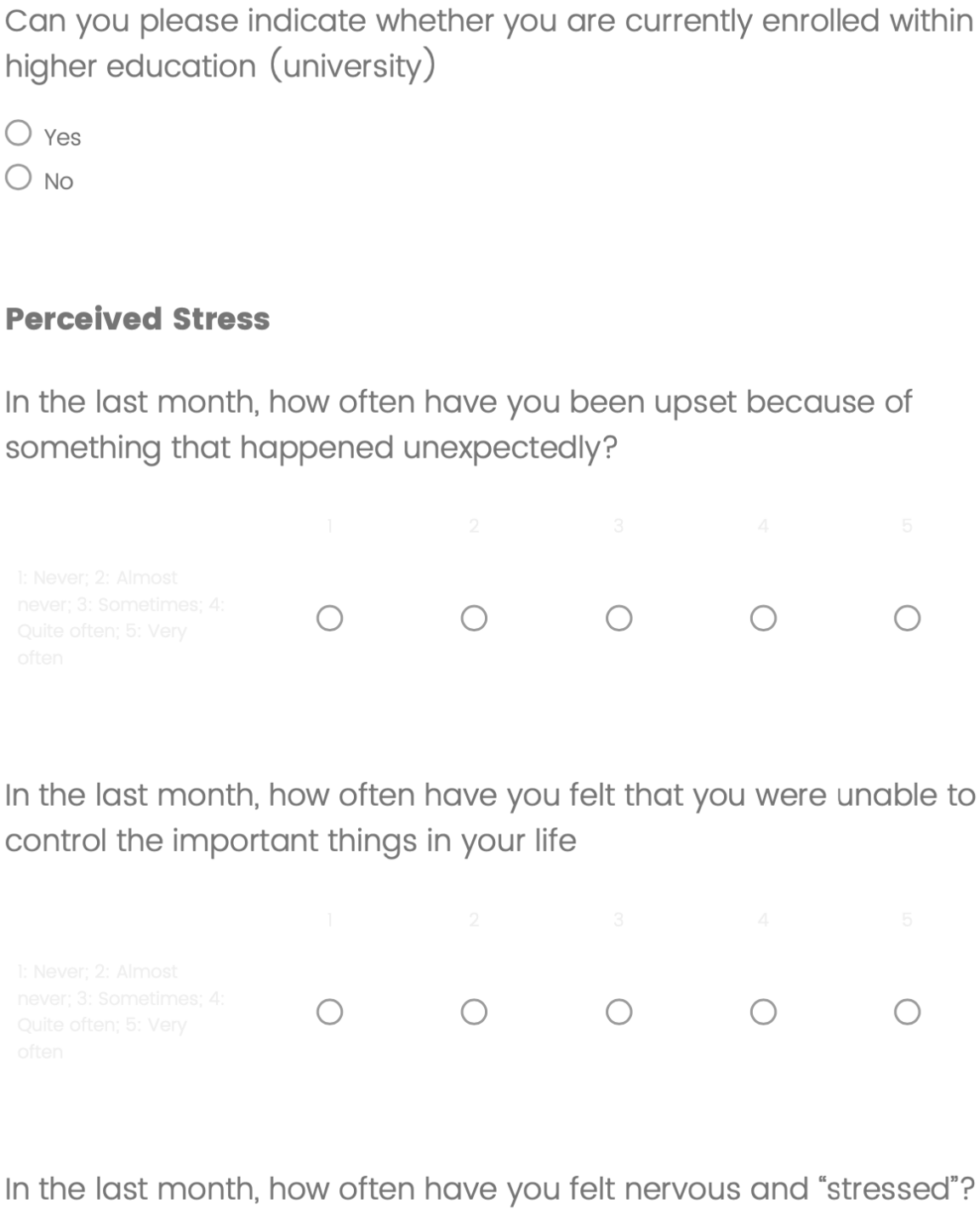


Figure H6

Screenshot of Page 6 of the Post-Test Questionnaire

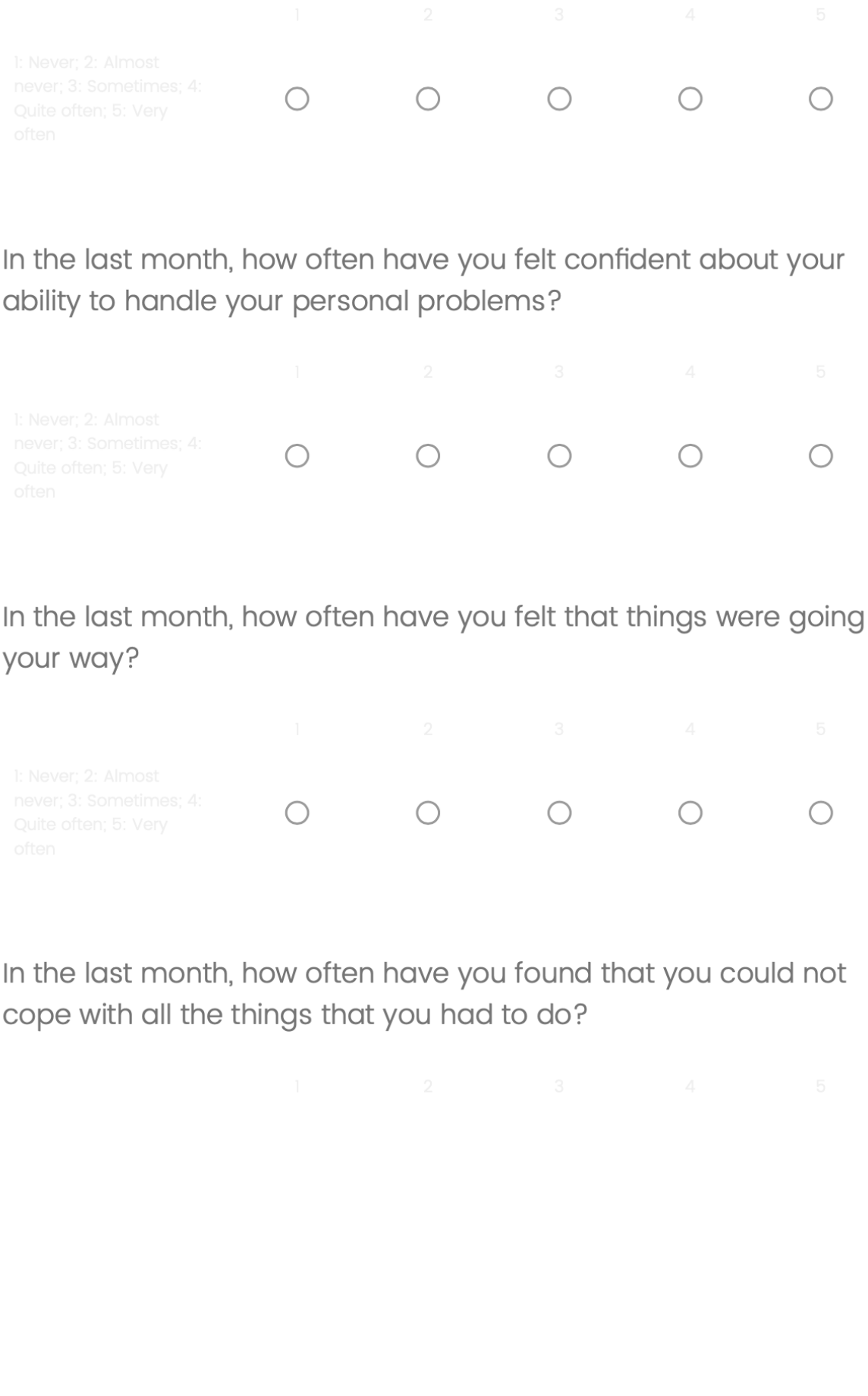


Figure H7

Screenshot of Page 7 of the Post-Test Questionnaire

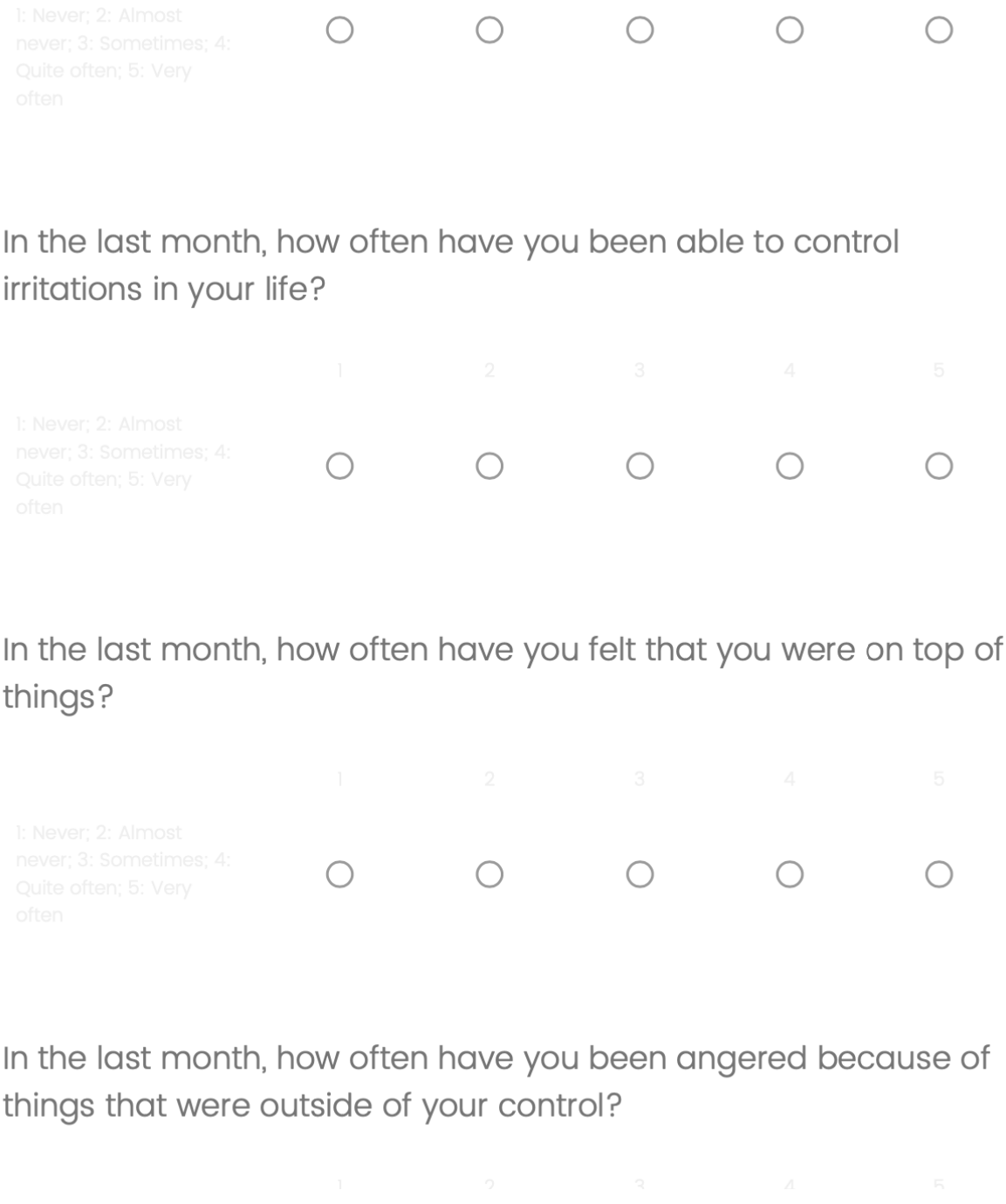


Figure H8

Screenshot of Page 8 of the Post-Test Questionnaire

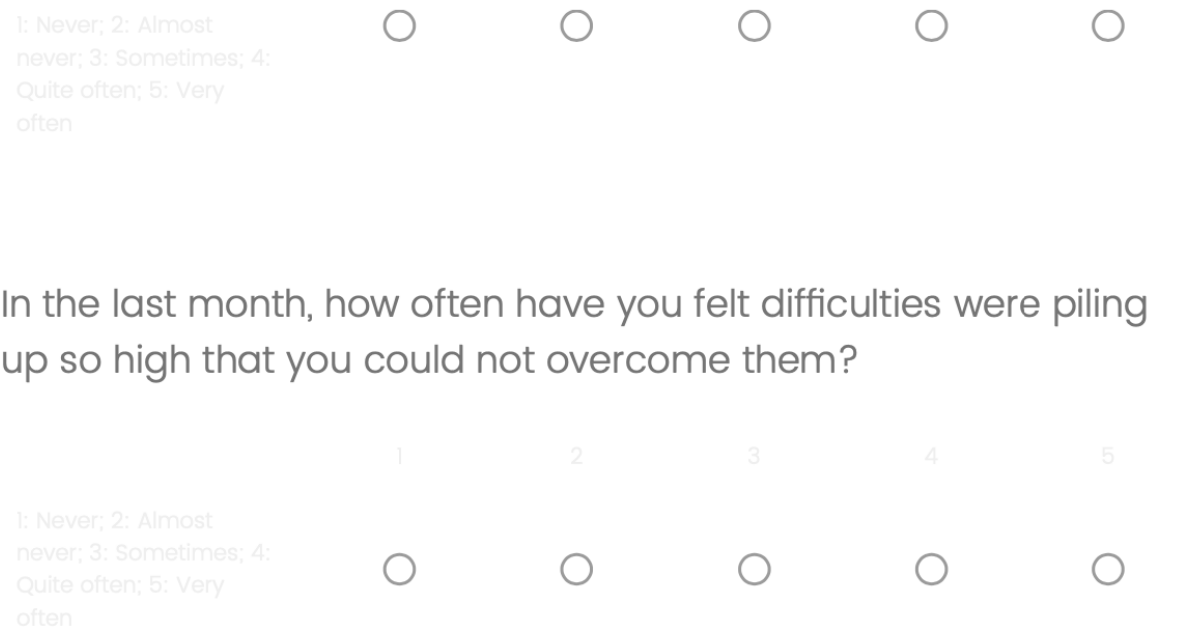


Figure H9

Screenshot of Page 9 of the Post-Test Questionnaire

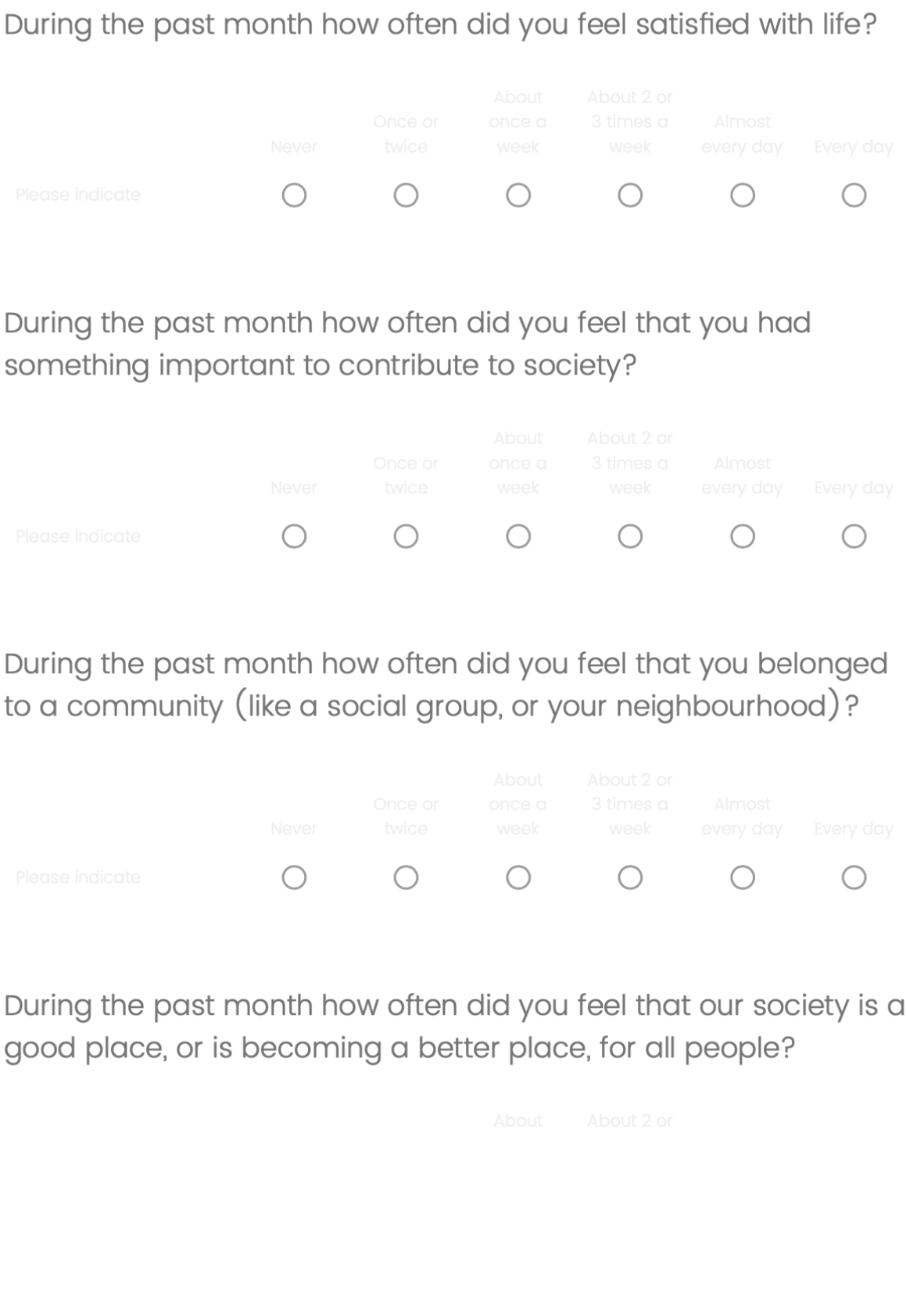


Figure H10

Screenshot of Page 10 of the Post-Test Questionnaire

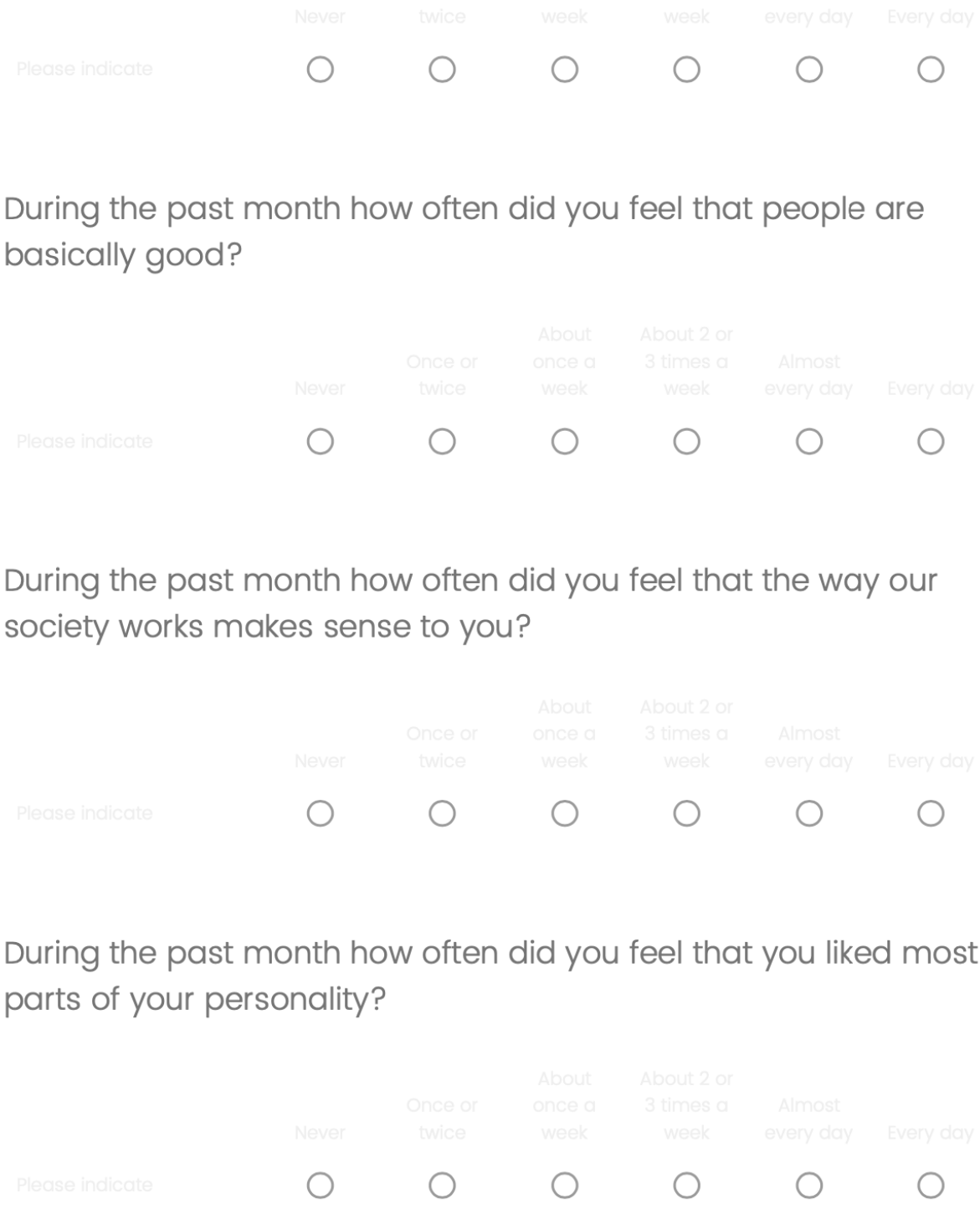


Figure H11

Screenshot of Page 11 of the Post-Test Questionnaire

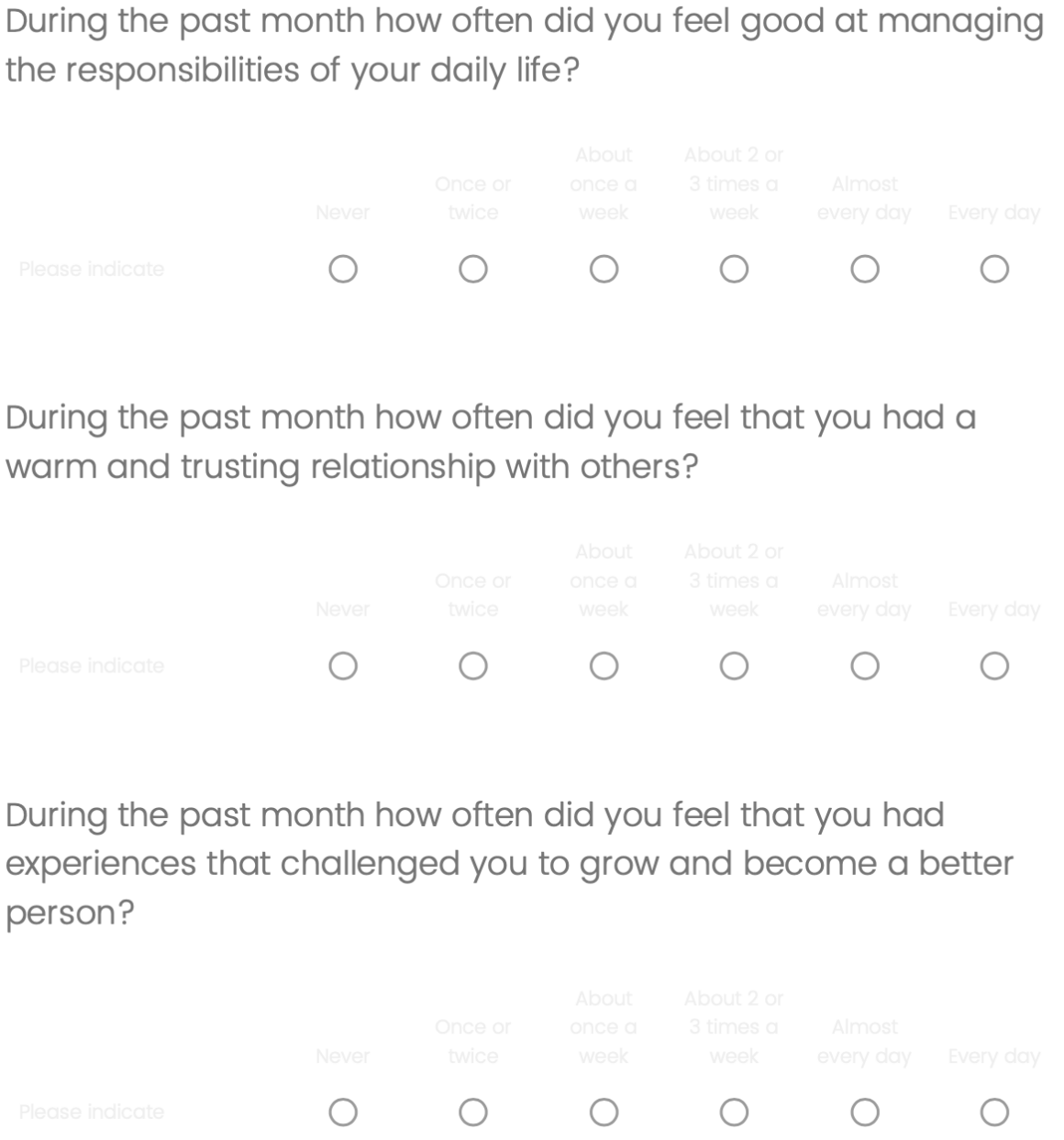
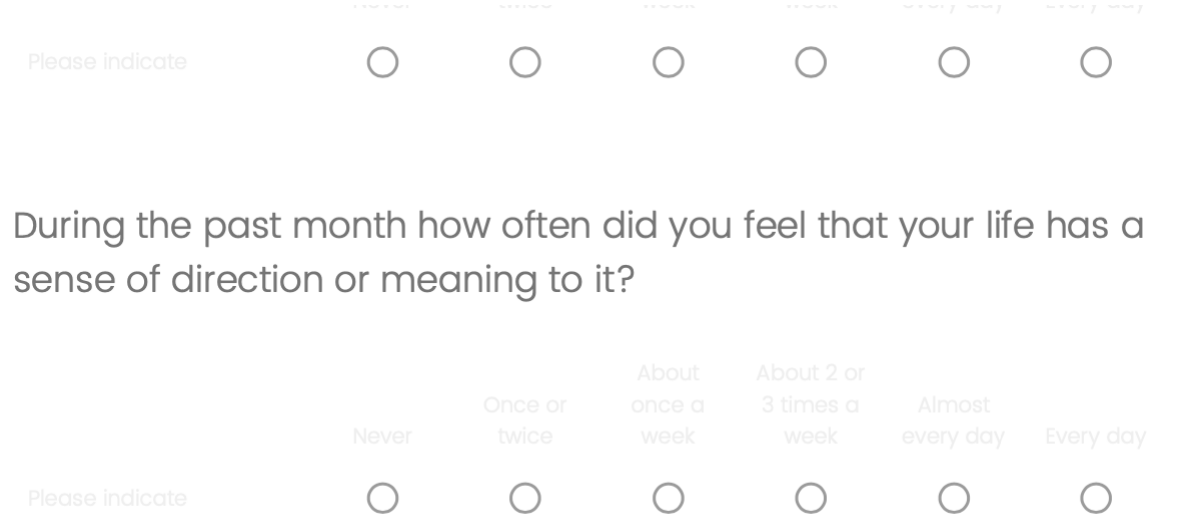


Figure H12

Screenshot of Page 12 of the Post-Test Questionnaire



Appendix I

Post-Hoc Power Analysis Results Using G*Power Software

Figure I1

Results of the Post-Hoc Analysis for Emotional Well-Being

```
[5] -- Saturday, May 31, 2025 -- 01:29:03
t tests - Means: Difference between two dependent means (matched pairs)

Analysis:   Post hoc: Compute achieved power
Input:      Tail(s)                        =   Two
            Effect size dz                 =   0,38
            α err prob                     =   0,05
            Total sample size              =   47
Output:     Noncentrality parameter δ      =   2,6051487
            Critical t                     =   2,0128956
            Df                             =   46
            Power (1-β err prob)           =   0,7225656
```

Figure I2

Results of the Post-Hoc Analysis for Psychological Well-Being

```
[6] -- Monday, June 02, 2025 -- 18:32:37
t tests - Means: Difference between two dependent means (matched pairs)

Analysis:   A priori: Compute required sample size
Input:      Tail(s)                        =   Two
            Effect size dz                 =   0,5
            α err prob                     =   0,05
            Power (1-β err prob)           =   0,8
Output:     Noncentrality parameter δ      =   2,9154759
            Critical t                     =   2,0345153
            Df                             =   33
            Total sample size              =   34
            Actual power                   =   0,8077775
```

Appendix J

R- Code

```
#installing packages

install.packages("readr")

library(readr)

install.packages("ggplot2")

library(ggplot2)

install.packages("effsize")

library(effsize)

install.packages("coin")

library(coin)

install.packages("rstatix")

library(rstatix)

install.packages("pwr")

library(pwr)


##Reading the dataset: "Prepost_data_1.csv"

data <- read.csv("Final_pre_post.csv", sep = ";", stringsAsFactors = FALSE)

Final_pre_post <- read_delim("Final_pre_post.csv",

                             delim = ";", escape_double = FALSE, trim_ws = TRUE)

View(Final_pre_post)


##Renaming dataset: "Final_pre_post.csv" to "data1"

file.rename("Final_pre_post.csv", "data1")
```

```
data1 <- read.csv("data1", sep = ";")



-------------------------------------------


##### Demograhic Data #####


#Ethnicity: distribution

table(data1$Ethnicity)

#Output: 1: 37 (37 German students), 2: 0 (0 Dutch students), 3: 4 (4 French students), 4: 6 (1 Polish student; 1 German-French student; 1 Türkish student; 1 Bahraini student; 1 Chinese, 1 Peruvian)


#Age: mean

mean(data1$Age, na.rm = TRUE)

#Output: 22


#Age: range

min(data1$Age, na.rm = TRUE) #Lowest age

max(data1$Age, na.rm = TRUE) #Highest age

#Output: min: 19, max: 27


#Age: sd

sd(data1$Age, na.rm = TRUE)

#Output: 1.46 sd for age
```

```
#Gender: distribution
table(data1$Gender)
#Output: 1: 14 (14 male students), 2: 32 (32 female students), 3: 1 (1 non-binary student)

#Gender: percentage
gender_counts <- table(data1$Gender)
gender_percentage <- prop.table(gender_counts[c("1", "2", "3")]) * 100
round(gender_percentage, 1)
#Output: 1: 29.8 (29.8% of students are male), 2: 68.1 (68.1% of students are female), 3: 2.1
(2.1% of students are non-binary)

#Mindfulness: mean
mean(data1$Mindfulness, na.rm = TRUE)
#Output: mean: 1.70

#Mindfulness: sd
sd(data1$Mindfulness, na.rm = TRUE)
#Output: 0.98

#Mindfulness: range
min(data1$Mindfulness, na.rm = TRUE)
max(data1$Mindfulness, na.rm =TRUE)
#Output: min: (1), max: (5)
```

```
#Mindfulness: percentages
Mindfulness_percentages <- prop.table(table(data1$Mindfulness)) * 100
round(Mindfulness_percentages, 1)
#Output: 1: 57.4 (57.4% participants performed mindfulness never before), 2: 21.3 (21.3% participants performed mindfulness almost never before), 3: 17.0 (17.0% participants performed mindfulness sometimes before), 4: 2.1 (2.1% participants performed mindfulness quite often before, 5: 2.1 (2.1% perfomed mindfulness very often )) -> in the last month

#Creating total well-being scores
data1$PRE_total_wellbeing <- rowMeans(data1[, c("PRE_EWB_1", "PRE_EWB_2",
"PRE_EWB3",
                                                "PRE_SWB_1", "PRE_SWB_2", "PRE_SWB_3",
"PRE_SWB_4", "PRE_SWB_5",
                                                "PRE_PWB_1", "PRE_PWB_2", "PRE_PWB_3",
"PRE_PWB_4", "PRE_PWB_5")],
                                    na.rm = TRUE)

data1$POST_total_wellbeing <- rowMeans(data1[, c("POST_EWB_1", "POST_EWB_2",
"POST_EWB_3",
                                                 "POST_SWB_1", "POST_SWB_2", "POST_SWB_3",
"POST_SWB_4", "POST_SWB_5",
                                                 "POST_PWB_1", "POST_PWB_2", "POST_PWB_3",
"POST_PWB_4", "POST_PWB_5")],
                                     na.rm = TRUE)
-----------------------------------------------
```

```
##### Descriptive Statistics #####

#Emotional Well-Being: Mean, Range, Sd:

###Total Scores###
##Emotional Well-Being
#mean Pre
data1$PRE_EWB_total <- rowMeans(data1[, c("PRE_EWB_1", "PRE_EWB_2",
"PRE_EWB3")], na.rm = TRUE)
mean(data1$PRE_EWB_total, na.rm = TRUE)
sd(data1$PRE_EWB_total, na.rm = TRUE)
#Output: mean: 4.43, sd: 0.95

#mean Post
data1$POST_EWB_total <- rowMeans(data1[, c("POST_EWB_1", "POST_EWB_2",
"POST_EWB_3")], na.rm = TRUE)
mean(data1$POST_EWB_total, na.rm = TRUE)
sd(data1$POST_EWB_total, na.rm = TRUE)
#Output: mean: 4.77, sd: 0.87

#Min max Pre
min(data1$PRE_EWB_total, na.rm = TRUE)
max(data1$PRE_EWB_total, na.rm = TRUE)
#Output: min: 1.66, max: 6
```

```
#Min max Post
min(data1$POST_EWB_total, na.rm = TRUE)
max(data1$POST_EWB_total, na.rm = TRUE)
#Output: min: 1.67, max: 6

## Social Well-Being
#mean Pre
data1$PRE_SWB_total <- rowMeans(data1[, c("PRE_SWB_1", "PRE_SWB_2",
"PRE_SWB_3", "PRE_SWB_4", "PRE_SWB_5")], na.rm = TRUE)
mean(data1$PRE_SWB_total, na.rm = TRUE)
sd(data1$PRE_SWB_total, na.rm = TRUE)
#Output: mean: 3.31, sd: 0.92

#mean Post
data1$POST_SWB_total <- rowMeans(data1[, c("POST_SWB_1", "POST_SWB_2",
"POST_SWB_3", "POST_SWB_4", "POST_SWB_5")], na.rm = TRUE)
mean(data1$POST_SWB_total, na.rm = TRUE)
sd(data1$POST_SWB_total, na.rm = TRUE)
#Output: mean: 3.83, sd: 0.85

#Min max Pre
min(data1$PRE_SWB_total, na.rm = TRUE)
max(data1$PRE_SWB_total, na.rm = TRUE)
#Output: min: 1.60, max: 5.20
```

```
#Min max Post
min(data1$POST_SWB_total, na.rm = TRUE)
max(data1$POST_SWB_total, na.rm = TRUE)
#Output: min: 1.80, max: 5.20

##Psychological Well-Being
#mean Pre
data1$PRE_PWB_total <- rowMeans(data1[, c("PRE_PWB_1", "PRE_PWB_2",
"PRE_PWB_3", "PRE_PWB_4", "PRE_PWB_5")], na.rm = TRUE)
mean(data1$PRE_PWB_total, na.rm = TRUE)
sd(data1$PRE_PWB_total, na.rm = TRUE)
#Output: mean: 4.26, sd: 0.81

#mean Post
data1$POST_PWB_total <- rowMeans(data1[, c("POST_PWB_1", "POST_PWB_2",
"POST_PWB_3", "POST_PWB_4", "POST_PWB_5")], na.rm = TRUE)
mean(data1$POST_PWB_total, na.rm = TRUE)
sd(data1$POST_PWB_total, na.rm = TRUE)
#Output: mean: 4.59, sd: 0.78

#Min max Pre
min(data1$PRE_PWB_total, na.rm = TRUE)
max(data1$PRE_PWB_total, na.rm = TRUE)
#Output: min: 1.8, max: 6
```

```
#Min max Post
min(data1$POST_PWB_total, na.rm = TRUE)
max(data1$POST_PWB_total, na.rm = TRUE)
#Output: min: 2, max: 6

##Total Well-Being
#mean Pre
mean(data1$PRE_total_wellbeing, na.rm = TRUE)
sd(data1$PRE_total_wellbeing, na.rm = TRUE)
#Output: mean: 3.93, sd: 0.71

#mean Post
mean(data1$POST_total_wellbeing, na.rm = TRUE)
sd(data1$POST_total_wellbeing, na.rm = TRUE)
#Output: mean: 4.34, sd: 0.73

#Min max Pre
min(data1$PRE_total_wellbeing, na.rm = TRUE)
max(data1$PRE_total_wellbeing, na.rm = TRUE)
#Output: min: 1.85, max: 5.23

#Min max Post
min(data1$POST_total_wellbeing, na.rm = TRUE)
max(data1$POST_total_wellbeing, na.rm = TRUE)
```

```
#Output: min: 1.85, max: 5.62

##### Inferential Statistics #####
## 1. Assumption Checks ##
#Testing whether the differences between pre and post scores are normally distrubuted with Shapiro's test

#Normality: Emotional-Well-Being
shapiro.test(data1$POST_EWB_total - data1$PRE_EWB_total)
#Output: W: 0.97; p-value: .221 = Assumption met, therefore normally distributed data -> t-test

#Normality: Social-Well-Being
shapiro.test(data1$POST_SWB_total - data1$PRE_SWB_total)
#Output: W: 0.89; p-value < .001 = Assumption violated, therefore non-normally distributed data -> instead of t-test, we need to proceed with a non-parametric test: Wilcoxon signed-rank test

#Normality: Psychological-Well-Being
shapiro.test(data1$POST_PWB_total - data1$PRE_PWB_total)
#Output: W: 0.96, p-value: .080 = Assumption met, therefore normally distributed data -> t-test

#Normality: Total Well-Being
shapiro.test(data1$POST_total_wellbeing - data1$PRE_total_wellbeing)
```

```
#Output: W = 0.92248, p-value: .004 = Assumption is violated, therefore non-normally distributed data -> instead of t-test, we need to proceed with a non-parametric test: Wilcoxon signed-rank test

#Visually checking the assumption of normality: normality of difference scores
#EWB total score: histrogram visualization (if data is normally distributed)
hist(
  data1$POST_EWB_total - data1$PRE_EWB_total,
  main = "Distribution of Change Scores: Emotional Well-Being",
  xlab = "Difference Score (Post - Pre)",
  ylab = "Frequency",
  col = "lightblue",
  border = "white"
)
#Output interpretation: distribution: roughly symmetric slightly skweded to the left), tails: not strong -> normality assumption appears to be met

#SWB total score: histrogram visualization (if data is normally distrubuted)
hist(
  data1$POST_SWB_total - data1$PRE_SWB_total,
  main = "Distribution of Change Scores: Social Well-Being",
  xlab = "Difference Score (Post - Pre)",
  ylab = "Frequency",
  col = "lightblue",
  border = "white"
```

```
)
#Output interpretation. distribution: positively skewed, bulk responses close to 0 -> normality violated

#PWB total score: histogram visualization (if data is normally distributed)
hist(
  data1$POST_PWB_total - data1$PRE_PWB_total,
  main = "Distribution of Change Scores: Psychological Well-Being",
  xlab = "Difference Score (Post - Pre)",
  ylab = "Frequency",
  col = "lightblue",
  border = "white"
)
#Output interpretation: distribution: no extreme skewness, reasonably symmetric -> normality assumption appears to be met

#Total Well-Being: histogram visualization
hist(
  data1$POST_total_wellbeing - data1$PRE_total_wellbeing,
  main = "Distribution of Change Scores: Total Well-Being",
  xlab = "Difference Score (Post - Pre)",
  ylab = "Frequency",
  col = "lightblue",
  border = "white"
)
```

#Output interpretation: distribution is positively skewed with a tail to the right: most participants only had a small increase in well-being or even no change, some participants had larger increases than others, some even had decreases: normality assumption violated

#WB total score: histogram visualization (if data is normally distributed)

2.Running the paired t-tests for normally distributed data: EWB; PWB##

EWB

t.test(data1$POST_EWB_total, data1$PRE_EWB_total, paired = TRUE)

#Output: t: 3.76; df: 46, p-value: p < .001, alternative hypothesis: true mean difference is not equal to 0, 95% CI [0.16; 0.53], sample estimates: mean difference: 0.35

PWB

t.test(data1$POST_PWB_total, data1$PRE_PWB_total, paired = TRUE)

#Output: t: 3.30, df: 46, p-value: .002, alternative hypothesis: true mean difference is not equal to 0, 95% CI [0.13; 0.54], sample estimate: mean difference: 0.34

3. Running the non-parametric Wilcoxon signed-rank-test for non-normally distributed data: SWB##

#SWB

wilcox.test(data1$POST_SWB_total, data1$PRE_SWB_total, paired = TRUE, exact = FALSE)

#Output: V: 741.5, p-value: p < .001, alternative hypothesis: true location shift is not equal to 0

```
#WB total
wilcox.test(data1$POST_total_wellbeing, data1$PRE_total_wellbeing,
        paired = TRUE, exact = FALSE)
#Output: V: 739.5, p < .001, significant increase in well-being

## 4.Optional: Calculate Effect Sizes (Cohen's d) for normally distrubuted data: EWB,
PWB##
#Cohen's d: Emotional-Well-Being
cohen.d(data1$POST_EWB_total, data1$PRE_EWB_total, paired = TRUE)
#Output: d = 0.38, 95% CI [0.17, 0.58]

#Cohen's d: Psychological-Well-Being
cohen.d(data1$POST_PWB_total, data1$PRE_PWB_total, paired = TRUE)
#Output: d = 0.42, 95% CI [0.16, 0.69]

## 5. Optional: Calculate non-parametric Effect Size (Rank-Biserial Correlation) for non-
normally distributed data: SWB and WB##

#Wilcoxon signed-rank test for social well-being
wilcox_result <- wilcoxsign_test(POST_SWB_total ~ PRE_SWB_total, data = data1,
distribution = "approximate")
#standardized z-statistic for social well-being
z_value <- statistic(wilcox_result, type = "standardized")
n <- nrow(data1)
#rank-biserial correlation or effect size r for social well-being
```

```
r_effect_size <- as.numeric(z_value) / sqrt(n)

r_effect_size

#Output: R: 0.59 -> large effect size


#Wilcoxon signed-rank test for total well-being

wilcox_result_total <- wilcoxsign_test(POST_total_wellbeing ~ PRE_total_wellbeing,

                                       data = data1,

                                       distribution = "approximate")

#stadardized z-statistic for well-being (total)

z_value_total <- statistic(wilcox_result_total, type = "standardized")

n <- nrow(data1)

#rank-biserial correlation or effect size r for well-being (total)

r_total <- as.numeric(z_value_total) / sqrt(n)

r_total

#Output: 0.57 -> large effect size


## 6. Creating a graphic visualization of the pre and post total mean scores for PWB, SWB,

EWB

#creating a data frame which includes column names

means_df <- data.frame(

  Time = rep(c("Pre", "Post"), times = 4),

  Score = c(

    mean(data1$PRE_EWB_total, na.rm = TRUE),

    mean(data1$POST_EWB_total, na.rm = TRUE),

    mean(data1$PRE_SWB_total, na.rm = TRUE),
```

```
    mean(data1$POST_SWB_total, na.rm = TRUE),
    mean(data1$PRE_PWB_total, na.rm = TRUE),
    mean(data1$POST_PWB_total, na.rm = TRUE),
    mean(data1$PRE_total_wellbeing, na.rm = TRUE),
    mean(data1$POST_total_wellbeing, na.rm = TRUE)
  ),
  Domain = rep(c("Emotional Well-Being", "Social Well-Being",
                 "Psychological Well-Being", "Total Well-Being"), each = 2)
)

#ensuring that pre-values come before post-values
means_df$Time <- factor(means_df$Time, levels = c("Pre", "Post"))
#creating the corresponding plot to these values
ggplot(means_df, aes(x = Time, y = Score, group = Domain, color = Domain)) +
  geom_line(size = 1.2) +
  geom_point(size = 3) +
  scale_y_continuous(limits = c(1, 6), breaks = 1:6) +
  labs(
    title = "Pre- and Post-Intervention Mean Well-Being Scores",
    x = "Timepoint",
    y = "Mean Score (1–6)",
    color = "Well-Being Domain"
  ) +
  theme_minimal(base_size = 14)
```

```
#The same but including error bars
# Calculate means and SDs
means_df <- data.frame(
  Time = rep(c("Pre", "Post"), times = 4),  # 4 domains now
  Score = c(
    mean(data1$PRE_EWB_total, na.rm = TRUE),
    mean(data1$POST_EWB_total, na.rm = TRUE),
    mean(data1$PRE_SWB_total, na.rm = TRUE),
    mean(data1$POST_SWB_total, na.rm = TRUE),
    mean(data1$PRE_PWB_total, na.rm = TRUE),
    mean(data1$POST_PWB_total, na.rm = TRUE),
    mean(data1$PRE_total_wellbeing, na.rm = TRUE),
    mean(data1$POST_total_wellbeing, na.rm = TRUE)
  ),
  SD = c(
    sd(data1$PRE_EWB_total, na.rm = TRUE),
    sd(data1$POST_EWB_total, na.rm = TRUE),
    sd(data1$PRE_SWB_total, na.rm = TRUE),
    sd(data1$POST_SWB_total, na.rm = TRUE),
    sd(data1$PRE_PWB_total, na.rm = TRUE),
    sd(data1$POST_PWB_total, na.rm = TRUE),
    sd(data1$PRE_total_wellbeing, na.rm = TRUE),
    sd(data1$POST_total_wellbeing, na.rm = TRUE)
  ),
  Domain = rep(c("Emotional", "Social", "Psychological", "Total"), each = 2)
```

```
)

# Order time levels
means_df$Time <- factor(means_df$Time, levels = c("Pre", "Post"))

# Plot with error bars
ggplot(means_df, aes(x = Time, y = Score, group = Domain, color = Domain)) +
  geom_line(size = 1.2) +  # Connect lines between pre and post
  geom_point(size = 3) +   # Show data points
  geom_errorbar(aes(ymin = Score - SD, ymax = Score + SD), width = 0.1) +  # Add ±SD
error bars
  scale_y_continuous(limits = c(1, 6), breaks = 1:6) +  # y-axis from 1 to 6 with labeled ticks
  labs(
    title = "Pre- and Post-Intervention Mean Well-Being Scores (±SD)",
    x = "Timepoint",
    y = "Mean Score (1–6)",
    color = "Well-Being Domain"
  ) +
  theme_minimal(base_size = 14)  # Clean theme with larger base font

## 7: Post hoc power analysis for non-normally distributed data: Social well-being (SW),
Total Well-Being (WB)##

# Post-hoc analysis social well-being:
# Convert r = 0.59 to dz
```

```
r <- 0.59

dz <- 2 * r / sqrt(1 - r^2)

dz

#Output: dz = 1.46

# Post hoc power for paired t-test approximation

pwr.t.test(n = 47, d = dz, sig.level = 0.05, type = "paired", alternative = "two.sided")


#Post-hoc analysis total well-being:

r <- 0.57

dz <- 2 * r / sqrt(1 - r^2)

dz

# Output: dz = 1.39

pwr.t.test(n = 47, d = dz, sig.level = 0.05, type = "paired", alternative = "two.sided")
```