Exploring the Feasibility of Colouring Mandalas Targeting the Stress and Depression

Levels of University Students

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Abstract

University students frequently experience high levels of stress and depression, due to academic-related demands. Consequently, students' mental health and success of their academic careers are at risk. This study aimed to investigate the feasibility of an art- intervention, conducted twice a week for three weeks overall. Additionally, it was investigated, whether students perceive a significant reduction in stress and depression levels. Convenience sampling was used to recruit 10 university students (N=10, M_{age} = 21.8 years, 70% female, 20% male, and 10% nonbinary). Stress and depression levels were measured by utilizing the Patient-Health Questionnaire-9 (PHQ-9) and the Perceived Stress Scale (PSS) before and after the intervention. The post-measure further assessed feasibility aspects. A Wilcoxon signed-rank test revealed no significant changes in response to the intervention, neither on students' depression levels (z = -0.71, p = 0.47) nor their stress levels (z = -0.95, p = 0.34). However, the majority of participants perceived a relief in stress and an increase in relaxation. Overall, the intervention was labelled as feasible. The study provided insight into the interventions' benefits and areas of improvement. Recommendations for future research include implementing a control condition to account for academic stressors, exploring alternative creative activities to pre-drawn mandalas, and conducting larger-scale studies to increase the probability of obtaining effective results. Finally, the probability of achieving an effective result on certain variables in a bigger sample is higher.

Keywords: feasibility, stress, depression, university students, art intervention, mandalas, colouring

Exploring the Feasibility of Colouring Mandalas Targeting the Stress and Depression Levels of University Students

Stress presents a major issue for university students during their academic careers. Even though obtaining graduation from university is increasingly recognized as the key to success, students encounter numerous demands, such as academic pressures or financial strains (Beiter et al., 2015). Experiencing stress can thus impact students' mental health profoundly. A study by Beiter et al. (2015) revealed, that university students frequently suffer from severe psychological distress as well as heightened depression levels. Consequently, the ability to cope with daily expectations is affected and the success of the academic career is at risk (Piercall & Keim, 2007; Tavolacci et al., 2013). In order to sufficiently comply with academic-related requirements, university students need to cope with the stress they are exposed to. One opportunity to reach this goal is colouring mandalas, which is frequently incorporated into the scope of art interventions. Studies have found, that colouring mandalas significantly reduces psychological distress and depressive symptoms (Hasnida & Metuia, 2018; Kim et al., 2018). In order to reach their academic goals and prevent or reduce mental health issues, students need to cope with stressors properly. Thus, it is important to investigate the effects of art interventions, including colouring mandalas on students' stress and depression levels. Further, the feasibility of the intervention needs to be tested, to deepen the knowledge about students' perspectives and thus, expand the effectiveness of such an intervention.

Stress

A growing body of literature highlights the magnitude of experiencing stress during tertiary education. Theoretically, *Stress* is defined as psychological strain in which an external situation is perceived as exceeding the resources of the person encountering the situation, so that well-being is endangered (Lazarus & Folkman, 1984). Whereas stress is labelled as an inevitable and daily experience for everybody, primarily university students are at risk to be impacted by exacerbating stress levels (Piercall & Keim, 2007). According to Franzoi et al. (2022), the levels of distress experienced by students have been found to be significantly higher compared to the general population (Franzoi et al., 2022). A study by van den Bogerd et al. (2018) further showed that 63% of the investigated Dutch university students indicated to perceive their stress levels as high due to academic requirements. Comparative concerning results have been found in other countries. Research by Piercall & Keim (2007) examined stress levels of American

undergraduates and found, that 75% experience stress of a moderate level, whereas 12% suffer from high stress. In summary, various studies demonstrate the detrimental extent to which university students are impacted by stress during their academic careers.

Numerous triggers can be held responsible to elicit high stress levels. A literature review by Robotham (2008) distinguished between personal and academic factors. On a personal level, appearance, self-esteem, or social relationships elicit stress (Gallagher et al., 2019). In contrast, academic-related stressors, which are perceived as more demanding, include high workloads, frequent deadlines, examinations or competition (Gallagher et al., 2019; Piercall & Keim, 2007). Besides general triggers, the interpretation of stress is of crucial importance. Thus, if students acknowledge their academic challenge as useful, their learning capacity can be enhanced (Beiter et al., 2015). On the contrary, detrimental stress occurs if individuals assume, they lack sufficient resources for successful coping (Lazarus & Folkman, 1984). Hence, the mindset toward the stressful situation is decisive in the apperception of stress and whether students feel capable to manage the situation.

Stress affects students' lives in several regards. Next to short-term reactions such as feeling overwhelmed or having headaches, stress can be even more far-reaching and detrimental in the long run (Gallagher et al., 2019). Studies demonstrated that students who report high levels of psychological stress were more likely to exhibit physical inactivity and a poor diet (Gallagher et al., 2019). Given that stress interferes with the normal functioning of memory and concentration, students' academic performance is at risk and the likelihood of graduation decreases (Gallagher et al., 2019; Piercall & Keim, 2007; Robotham, 2008). In addition, severe mental health problems such as anxiety, somatization, or depression can occur (Gallagher et al., 2019; Robotham, 2008). Taking into account the underlying findings of multiple studies, stress seems to have detrimental effects on students' psychological well-being.

Depression

Students' mental well-being can be jeopardized by the development of depressive symptoms. Depression is considered to be one of the most prevalent disorders among university students and its prevalence rates are steadily rising (Ibrahim et al., 2013). According to the DSM-5, depression is a negative mood disorder accompanied by feelings of sadness, hopelessness, worthlessness, and decreased interest in daily activities (American Psychiatric Association, 2013). Triggers that have been found to underlie the development of depression among

university students are academic challenges or study/life disbalances (de Heer, 2017). Furthermore, it can be highlighted, that students who perceive their stress management as insufficient are more prone to develop depressive symptoms (Sawatzky et al., 2012). Suffering from depression during an academic career is associated with several consequences. Examples are a lack of exercise, substance (ab)use, or impaired sleep habits. Moreover, it is linked to poor academic performance, impacted relationships, or poor future career prospects (Ibrahim et al., 2013). Taken together, university students are exposed to several sources that may elicit depressive symptoms, which in turn can lead to detrimental consequences.

The magnitude of depression is noticeable when looking at recent studies focusing on the prevalence of depression among university students. A study by Fauzi and colleagues (2021) has shown, that 51.4% of the participating university students throughout all academic years suffer from depression. Another study by de Heer (2017) investigated an exclusively Dutch sample of university students and demonstrated, that 35% of the students experience minimal depression, whereas 20.2% face depression between moderate or severe levels. A systematic literature review by Ibrahim and colleagues (2013) revealed, that one-third of university students are affected by depressive disorders, which is significantly higher than the prevalence found in the general population. In light of the numerous findings, depression can be labelled as a major and common issue among university students.

Since poor mental health, caused by increased stress and depression levels, poses a risk to momentary academic performance but also to the future career of students, it is of crucial importance to promote students' well-being. Specifically, the ability of students to recognize and cope with academic stressors properly may decrease the vulnerability of being negatively impacted by external stressors (Sawatzky et al., 2012). Possibilities to support resources that enable students to relieve stress and enhance stress-management skills are called for.

Art interventions

Art interventions can be used as effective tools to approach mental health issues. They cover a range of creative activities, such as colouring, creating collages, drawing free form or still life, or modelling with clay (Kaimal et al., 2017; Sandmire et al., 2012) and can be applied in several areas, either in clinical or non-clinical settings. Notwithstanding the scope of application, several positive benefits are attributed to art interventions. A literature review by Jensen & Bonde (2018) illustrated that participation can increase general well-being, enhance

coping abilities or improve self-confidence or self-worth. Most notably, the reduction of stress or levels of depression is associated with art interventions (Hasnida & Metuia, 2018; Jensen & Bonde, 2018; Kim et al., 2018). The results demonstrate, that creativity can support the enhancement of psychological resources.

One technique that is often included in art interventions is colouring mandalas. Mandalas originally functioned as a meditative technique in various cultural contexts (Pisark & Larson, 2011). The word consists of two separate components, namely "Manda", referring to the term centre, and "La" meaning accomplishment in the Indian language (Kim et al., 2018). Besides several other forms, the most notable and prevalent usage of mandalas is the two-dimensional geometric design on paper, recognizable by the characteristic of a patterned centre with a circular boundary (Pisarik & Larson, 2011). Instead of providing a free form of paper or a plaid design, the pre-drawn mandala design is especially beneficial for improving well-being (Kaimal et al., 2017). A study conducted by Curry & Kasser (2005) demonstrated these effects. Whereas the groups colouring the plaid design or the mandala showed significantly reduced anxiety levels, the intervention for the free-form condition was not found to be effective. Studies replicating the experiments of Curry & Kasser (2005) confirm these results (Van der Vennet & Serice, 2012). The findings are prescribed to the structure that a given design provides. Creating an original artwork when faced with a free colouring task requires a big amount of creativity and particular deliberation, whereas a pre-designed mandala requires less thinking and facilitates a "trance-like state of relaxation" (Van der Vennet & Serice, 2012). Further advantages experienced when following colour sessions are the experience of accomplishment of goals, relief of emotional chaos, or the monitoring of inner thoughts and feelings (Hasnida & Metuia, 2018; Kim et al., 2018).

Numerous studies investigated the effects of colouring mandalas. Colouring mandalas can facilitate the reduction of psychological distress and symptoms of anxiety or depression (Hasnida & Metuia, 2018; Kim et al., 2018). A study by Ratnasari and colleagues (2018) for example investigated the effects of colouring mandalas on adolescents' insomnia levels, as a symptom of depression. Their results confirmed, that merely three colouring sessions significantly reduced insomnia symptoms (Ratnasari et al, 2018). Another study by Sandmire et al. (2012) investigated the effects of mandalas on anxiety levels in 57 college students, one week before final examinations took place (Sandmire et al., 2012). By utilising a pre- and post-

measure, the researchers were able to prove a significant decrease in anxiety in the experimental group, which was subjected to 30 minutes of art making, that included colouring mandalas. Likewise, a study by Kim et al., (2018) analysed the effects of mandala colouring on psychiatric inpatients. After eight sessions of mandala therapy, hope was significantly increased. As inpatients were able to monitor mental differences, they were more hopeful and motivated to recover (Kim et al., 2018). In contrast, resilience and perceived well-being have not been found to be effectively enhanced. Another study that found contradicting results was the one by Kaimal et al. (2017). They reported, that although their intervention of colouring mandalas reduced negative mood, it did not significantly increase positive mood conversely. Moreover, colouring mandalas evoked negative feelings in participants who identified as artistically talented. Whereas the majority of studies were able to demonstrate positive benefits of colouring mandalas, some researchers were not able to confirm these results or found conflicting results.

Previous Research

Even though several studies centred around the effectiveness of colouring mandalas, there are several aspects unexplored. First, the studies that were conducted primarily subjected participants to one-time or a few sessions of 30 to 60 minutes (Ratnasari et al, 2018; Sandmire et al., 2012). Thus, the effects may be observable directly after the intervention and may steadily drop to the original level. Second, the studies that are indeed executed over a longer time frame, for example, the experiment by Kim et al. (2018) focused on a clinical sample of inpatients. Thus, art therapy sessions are purposefully included in the patient's schedule and the major focus on improving mental health enables longer art interventions (Kim et al., 2018). In contrast, university students' priority is to reach academic goals, therefore, stress is already heightened (De Sanne, 2017). Given that students' stress levels also fluctuate throughout the semester, it is crucial to develop an intervention that is easy to comply with (De Sanne, 2017). Thus, investigating specific aspects of the suitability of an intervention, for example the appropriate dose is fundamental. However, the majority of studies directly focused on the underlying effects of mandalas on several variables, instead of the suitability of a mandala intervention in general (Govender et al., 2015; Kaimal et al, 2017; Kim et al., 2018). Even though it is important to test these effects, it is even more fundamental to incorporate students' perspectives, to test the suitability of an art intervention. As a response, this study assesses students' needs that enable them to continually engage in such an intervention during the semester, that in turn does not pose

additional stress to them. Rather, the intervention is supposed to reduce stress and improves depressive symptoms.

Current Study

Consequently, the main aim of this study is to capture the feasibility of an art intervention applied to university students. The acceptability of and satisfaction with the intervention, namely colouring mandalas during the specific time period of three weeks is examined. As a result, it should be possible to determine whether further investigation in a complete trial is appropriate when using this methodology. In addition, it is going to be investigated, whether students perceive a significant improvement in stress and depression levels. However, the effects are merely used as a tendency. The main interest of this study is to monitor students' acceptability of and satisfaction with the intervention. Finally, recommendations for further research that aims to investigate the effects of colouring mandalas on variables such as stress and depression in university students can be made. Following, the primary research question that is posed is:

To what extent is a three-week intervention of colouring mandalas two times a week feasible and acceptable for university students?

Additionally, as a secondary research question the effects of the intervention will be explored:

Does the intervention decrease stress and depression levels in university students?

Method

Design

This feasibility study made use of a mixed-method design. A pretest and posttest within the subjects were conducted. Whereas both measures collected quantitative data about stress and depression levels, merely the post-measure also collected qualitative data. Qualitative data were used to examine the level of the intervention's feasibility, namely colouring mandalas for a durationof three weeks. Throughout the analysis, colouring mandalas was treated as the independent variable (X), and stress as well as depressive symptoms as the dependent variables (Y).

This study was approved by the Ethics Committee of the Faculty of Behavioral Management and Social Sciences (BMS) of the University of Twente (Protocol number: 230395).

Participants

In total, 10 participants were recruited via a convenience sampling method. The

university's SONA system, as well as the researcher's personal network, were used. The SONA system enables students to conduct their research and collect participants within the university population. Of the 10 participants, seven were female (70%), two were male (20%), and one non-binary (10%). Their age ranged from 18 to 27, with a mean age of 21.8 years (SD_{age} = 2.52). The vast majority of participants were German ($n = 9$), followed by Dutch participants ($n =1$). The sample comprises Bachelor-students (80%) as well as Master students (20%). The academic programmes the subjects are currently undertaking differ.

To participate, the subjects needed to be officially enrolled as university students and be between 18 and 35 years old. Further, they were supposed to possess sufficient reading and writing skills in the English language and have access to a printer. Participants that have a diagnosable mental disorder were excluded. Participation was voluntary and withdrawing from the study was possible at any time. Informed clear consent before participation started was needed (see Appendix A). All participants provided their consent to participate prior to the study.

Materials

Perceived Stress Scale

The stress the participant experiences was assessed by the Perceived Stress Scale (PSS). Specifically, 10 items refered to the feelings and thoughts during the last month and were answered on a 5-point Likert scale, ranging from 0 (never) to 4 (very often). Test final scores ranged from 0-40, whereby higher scores reflected higher perceived stress levels (Cohen & Williamson, 1988). The questionnaire's psychometric properties were tested in three samples, whereas two samples included college students and were considered to be good, as internal consistency is $\alpha = .84 - .86$ and test-retest reliability 0.85 (Cohen, Kamarck & Mermelstein, 1983). Cronbach's alpha of this study is acceptable ($\alpha = 0.79$).

Patient Health Questionnaire

Depressive symptoms were measured by the Patient Health Questionnaire (PHQ-9). Nine items assessed specific symptoms that are based on the DSM-5 criteria. All items refer to the time frame of the past two weeks and are answered on a 4-point Likert- scale, ranging from 0 (not at all) to 3 (nearly every day) (Kroenke & Spitzer, 2002). Final test scores can vary between 0 and 27, whereas cutoff points of 5, 10, 15, and 20 resembled the respective depression levels of mild, moderate, moderately severe, and severe (Kroenke & Spitzer, 2002). A study by Kroenke et al. (2010) including 6000 primary care patients investigated the validity and reliability of the

questionnaire. Psychometric properties were considered to be good, with test-retest reliability of .84 and internal consistency of α = .86 -.89 (Kroenke et al., 2010). In the current study, Cronbachs alpha was very good (alpha = 0.9). The questionnaire provided for the pre-measure is represented in Appendix B1.

Feasibility Questionnaire

Construction. The intervention's feasibility was investigated using a questionnaire constructed by the researchers. Specifically, feasibility was supposed to capture the participant's adherence, perceived appropriateness, satisfaction, and perception of the art-based intervention. Thus, the questionnaire's aim was, to explore the way participants perceived the intervention, and identify potential drawbacks in order to incorporate resolved remarks and create a valid and appropriate final intervention. The first idea about possible items was generated by reviewing standardised feasibility questionnaires from various studies (c.f. Carswell et al., 2020; Schmaderer et al., 2022). The collected ideas about possible questions were compared with the researcher's expectations about which domains are relevant to tap the goal of the study. By considering ideas from previous studies as well as the researcher's specifications, important domains that need to be examined in the questionnaire were obtained. The major domains included are ease of usage, appropriateness of time investment, satisfaction, possible benefits from participating, difficulty level, obstacles, or future implementation. Besides that, it was taken into account that the questions are easy to understand and merely address one concept to measure. Furthermore, the items were neutrally formulated and the answer categories were mutually exclusive.

Final Questionnaire. The final questionnaire was created and included 20 items (see Appendix B2; see Tables 3 and 4). Among these items, 11 items were closed-ended and nine are open-ended. As two of the 20 items aimed to assess mindfulness, they were not covered in the further analysis, even though all participants had to answer them. The response format of the closed-ended questions was either a binary (yes/no), ordinal (too little/ appropriate/ too many), or ratio format (1, 2, 3, 4). Responses to closed-ended questions should generate a general overview of the perception of the intervention, for example, "How many of the six mandalas did you actually do?" or "Did you perceive the intervention as stressful?". In contrast, open-ended questions are meant to encourage the participant to elaborate on a specific topic. Two example items are " Did you experience any obstacles when colouring the mandalas and why?" or "In which way did you notice a change in your mood throughout the study?".

Intervention

   Contact. The overall intervention was executed for three weeks. As all participants signed up for the study at different times and therefore started the intervention at an individual time point, they all hold different starting and end dates of the intervention. At the beginning of each week, the participant was contacted individually via SONA and received a standardised message. The message included the instructions (see Appendix C) as well as the link to the two mandalas for the week in pdf format (see Appendix D). When responses to the questionnaires were missing after the first distribution of the survey, the participants were sent an e-mail, including the appropriate link and a reminder to respond to the questionnaire.

   Instructions. The main aim of providing instructions each time the mandalas were sent was to guide the participant through the intervention in an organized manner. First, the instructions started with a headline and introduction that specified the current week of the intervention. Then, the participant was provided with an underlined link to the mandalas. As guidelines, specific steps are mentioned regarding the way the intervention should be followed. Generally, the participant is able to freely decide on their own on which days they want to colour their mandalas. This provided the participant with a certain flexibility to integrate colouring into their weekly schedule and arrange a fitting time frame.

   It was decided that the participant should spend at least 15 minutes colouring each mandala. Curry & Kasser (2005) were able to provide evidence, that a colouring session of 20 minutes is sufficient to occupy significant effects on psychological well-being. However, participants were merely supposed to follow the session once. As students in the current study were subjected to six colouring sessions, the time was reduced to a minimum of 15 minutes. Furthermore, university students already might have experienced high stress or depressive symptoms. Thus, they may have felt overwhelmed by small tasks easily or found it difficult to integrate further tasks into their schedule, so it would have been easier to start with a mandala when a low time limit is given. Consequently, the motivation to adhere to the requirements of implementing two mandala sessions each week might have been higher. It was suggested, that if participants find the task satisfying, they were given the choice to continue. After 15 minutes, it was up to the participants to decide whether they wanted to continue for more satisfaction.

   An additional aspect that was considered to prevent the subjects to feel overwhelmed is, that the general instruction was designed in an organised and clear manner. The design of the text

ensured, that participants could see every piece of information easily. Complicated wordings and sentences were avoided. The structure of the instruction's texts was repeated every week so that merely the link to the mandalas and the headings were adapted weekly. Therefore, participants did not have to adapt to new designs of instructions and were familiar with the instructions.

Every session the participant engaged in colouring should have been done in a quiet environment without distraction. The participant was also instructed to concentrate as focused as possible solely on the task. These instructions are also considered in other studies focusing on mandala colouring (Curry & Kasser, 2005; Czerwinski, 2021). Specifically, participants were encouraged to acknowledge their thoughts and feelings in a clear manner and can focus on the underlying activity of colouring. In addition, the instructions may have facilitated the effects participants may have experienced as a result of colouring, which diminished possible moderating distractors. In the last step, they were provided with the contact details of the researchers, in case they experienced any difficulties.

Mandalas. The mandalas were obtained from a publicly available website called *www.kinder-malvorlagen.com*. They were freely downloaded as A4 pdf files. The pre-drawn mandalas all displayed a circular pattern but varied in their design and complexity (see Appendix D). The mandalas were chosen based on difficulty level. Since the difficulty of the mandala patterns increased during the intervention, two easy, two medium, and two more complex mandalas were chosen. Participants started with two easy mandala designs and ended with the two most difficult ones.

Procedure

After signing up for the study on SONA, the subjects were provided with a link to the Qualitrics platform (https://www.qualitrics.com/de). Hereby, they were first presented with the informed consent form (see Appendix A), which included the purpose of the study, and important details about the study's procedure.

After consenting, participants were asked to indicate their basic demographic information, for example, age, gender, nationality, or marital status. Subjects that did not participate via SONA were asked to indicate their e-mail address to contact them throughout the intervention. Then, they were presented with the questionnaires Perceived Stress Scale (PSS), Patient Health Questionnaire (PHQ-9), and Five Facet Mindfulness Questionnaire (FFMQ) in respective order. Since this study exclusively focuses on stress as well as depression, the FFMQ was not of interest in this study and

therefore taken into account in the analysis.

After filling out the questionnaires, participants were thanked for their first responses and informed about the following procedure. Participants were assigned a starting date for the intervention and were provided with the first week of the intervention via e-mail. The same procedure was applied for the next two weeks. After finishing the third week of intervention, the participant was contacted one last time via SONA and asked to complete the final questionnaire.

As a last step, the final questionnaire was applied. First, the participants were supposed to fill out the PSS, the PHQ-9, and FFMQ again. Afterward, they were presented with the feasibility questionnaire. In the end, they were thanked for their participation. If applicable, participation was granted one SONA credit point.

Data analysis

The data analysis that assesses quantitative data was conducted in R (version 2023.03.0+386) for Windows. Before the main analysis was performed, the data were checked for missing values and errors in Excel. If missing values existed, they were excluded. Descriptive statistics to display demographic data were employed, for example, age, gender, nationality or their current study degree. Afterward, participants' levels of depression and stress before and after the intervention were obtained, by calculating the mean, standard deviation, and range of responses to each questionnaire. As one question of the PSS questionnaire was missing during the pre-measure, the questionnaire was reduced to nine items in the post-measure, to ensure comparability of stress levels. A Wilcoxon's signed-rank test was used to provide insight if differences in the paired samples between pre- and post-measures existed. Therefore, a tendency to check for the impact of colouring mandalas on participants' stress and depression levels could be established. However, these effects are merely used as an indication, rather than demonstrating significance of effectiveness. Further items of the feasibility questionnaire with nominal answer categories were also evaluated in R and frequencies were calculated.

Next to the quantitative data analysis, a qualitative content analysis of participants' narrative comments was conducted. The research software ATLAS.ti (version 9.1) was utilised. Given that key domains of interest pre-existed (adherence, obstacles, dose, facilitators, benefits, drawbacks, intention for continuation) a directed content analysis was conducted (Hsieh & Shannon, 2005). Answers were reviewed in their direct relation to the overall key domains. Hence, the underlying goal was to generate a variety of themes for each key domain of interest.

For example, if two participants mentioned the theme of stress relief when answering the question about possible *benefits*, they were taken together into one code. In the end, several relevant codes have been collected to substantiate the evaluation of each aspect of feasibility. The frequencies of how often each code was mentioned were calculated. Taken together, the qualitative responses enable a better interpretation of the retrieved quantitative data.

Results

Research Question 1: Feasibility

To assess the overall feasibility of the intervention, responses to qualitative as well as quantitative questions were taken into account. The results of the close-ended questions can be viewed in Table 1. The full transcription and the coded comments from the open-ended questions can be viewed in Appendix E.

Adherence

Of 10 participants, five (50%) succeeded to colour all six required mandalas according to the instructions. Four (40%) participants were able to colour five mandalas and one participant (10%) merely coloured four. Accordingly, 5.4 mandalas were coloured on average (SD = 0.69). Thus, it can be concluded that adherence was very high.

Dose

The aspect of the dose was investigated by posing two closed questions. First, the appropriateness of the number of mandalas per week was assessed. The majority of participants (60%) responded that the number has been appropriate, whereas four participants (40%) perceived two mandalas per week as too much.

Second, participants were able to rate their perceived correct dose of engaging in mandala colouring and the opinions varied. Whereas half of the participants (50%) suggest that two to three times a week is appropriate, four participants (40%) perceive once a week as doable. It was noticeable, that the majority of participants were satisfied with colouring mandalas two times a week. Apart from that, other participants indicated, they would prefer a reduction to colour mandalas once a week. Thus, the dose of colouring mandalas two times a week was primarily perceived as appropriate.

Obstacles

An open-ended question sought to assess, whether participants experienced any obstacles during the intervention. The only big issue that was identified by two participants (20%) in this regard was a time constraint, as they struggled to implement the task in their daily life. For example, one participant mentioned, "When I was in a hurry, it was very difficult to fully engage in the study. It was then more a task than a method for stress relief.". The other participant responded that it was difficult "making time for it, even if it was only 15 minutes". Next to that, the majority of participants did not experience obstacles. In summary, no major problems occurred during the intervention and the number of participants who were affected by stress-related problems was relatively low.

Facilitators

When asked by an open-ended question, whether possible facilitators helped the subjects in order to comply with the task, there were various aspects mentioned. Three participants (30%) pointed out that they were motivated by the relaxed feeling the colouring evokes. One participant referred to "When I knew I had enough time to do them and use that as kind of relaxation task". Another participant highlighted". Thinking of calming down deliberately and concentrate on something different than my studies". Two participants (20%) also referred to the pleasant silence during the colouring process and one participant thought about the personal growth this intervention could bring. Moreover, two participants (20%) mentioned that they enjoyed choosing colours themselves or being creative, for example by indicating "I have used beautiful and colourful pencils". The last subject stressed the positive aspect of focus, by mentioning "Taking 20 minutes and dedicating it just to that". These responses highlight the importance of silence as well as the crucial aspect of reducing distractions during the activity.

Benefits

Several other positive aspects participants liked about the intervention were mentioned in response to an open-ended question. Four participants (40%) liked the fact that the intervention was relaxing and enabled them to calm down. Subjects elaborated, that the colouring allowed them to make a break from daily responsibilities and hassles, for example, one participant addressed: "Concentrate on something different than my studies when I was stuck at one point." Another subject responded, "Some time to slow down and do something while the mind can wander as it wants". Therefore, the mandalas functioned as relaxing free time tasks. Concerning that, two participants (20%) also connected the intervention with a useful break from daily

responsibilities, by indicating "I like the fact that I could do the mandalas to have a time-out from my responsibilities". All in all, colouring mandalas is primarily associated with a relief of stress, an increase in relaxation, or the focus on oneself. These results further emphasize the positive benefits that engaging in colouring mandalas has on individuals.

Drawbacks

Despite favourable factors, the participants were given the opportunity to elaborate on the negative aspects experienced throughout the intervention. First, a closed-ended question was applied, that investigated the experience of stress. Even though six participants did not perceive the intervention as stressful, three participants (30%) perceived it as sometimes stressful and one (10%) perceived it as generally stressful. This item is followed by an open-ended question, in which participants were asked to elaborate on their previously indicated answer. Four participants (40%) argued, that the intervention posed additional stress on them. "It was stressful" or "When I was in a hurry, it was difficult to fully engage in the study. It was more a task than a method for stress relief" were example statements mentioned in this context. Another striking comment was made by one participant, saying "Colouring over the lines angers me."

Beyond the additional stress, the design was also burdensome for some participants. Three participants (30%) criticised, that "The level of difficulty was too high", "The last two mandalas were a bit too time-taking" or that "the mandalas could have been a little more different to each other". Even though some participants were not satisfied with the design of some mandalas, nine participants (90%) indicated that the difficulty level was suitable. Merely one person (10%) perceived it as too difficult. In regard to satisfaction in general (pointing to patterns, colours, fulfillment), seven participants (70%) were satisfied with the process, whereas three (30%) were merely sometimes satisfied. Even though some participants criticised the difficulty level, it can ultimately be labelled as appropriate.

Intention for Continuation

Among the various answers, different attitudes about implementing mandala painting in the future were reported. The intention for continuation was assessed by a closed-ended question about future implementation, as well as an open-ended question enabling the participants to elaborate on their indicated answer. In response to the closed-ended item, two participants (20%) expressed their interest in including mandala painting in their future life. In contrast, one person

(10%) cannot imagine implementing it in the future. The majority, namely seven participants (70%) are not sure about the implementation of mandalas.

Reasons for not being sure or not wanting to consider mandalas in the future were revealed by answers to the open-ended question. On the one hand, participants experienced positive effects on their mood as favourable. Example statements in this regard are "I felt it was a great way to distress that I would also want to make use of it in the future" or "I will definitely consider it as a method to take off my mind from stress". In contrast, three participants (30%) have too little time or rather like to follow other activities, like one participant "I enjoy other tasks in my free time, for example, exercising." Two participants (20%) mentioned, that they are nevertheless not sure yet so that they maybe want to introduce it in their future free time.

All in all, the evaluation provided insight into the intervention's feasibility. The majority of participants adhered to the instructions throughout the intervention and coloured the required six mandalas. Whilst some participants perceived the intervention as burdensome, as the incorporation of colouring two mandalas each week triggered additional stress, the majority indicated that two mandalas each week were an appropriate dose. Moreover, half of the participants even indicated that two to three mandalas are an appropriate dose to comply with. Further, the results demonstrate that the majority of participants have been satisfied with the process of colouring. The difficulty level was experienced as appropriate by the majority of students. Therefore, it can be concluded that the mandala intervention has been feasible for university students. The intervention is sufficiently perceived as appropriate, as nearly all participants adhered to the instructions, and the majority perceived the intervention as satisfying.

Table 1

Feasibility Questions assessing Feasibility - Closed-Ended (N=10)

Item	n	%
Did you perceive the intervention as stressful?		
Yes	1	10%
Sometimes	3	30%
No	6	60%
How did you experience the number of mandalas per week?		
Too little	0	0%
Appropriate	6	60%
Too many	4	40%
What is an appropriate time dose to engage in mandala painting?		
Once a week	4	40%
2- 3 times a week	5	50%
Every two weeks	1	10%
Once a month	0	0%
Have you been satisfied with the process (patterns, colours, fulfillment) of colouring your mandalas?		
No	0	0%
Sometimes	3	30%
Yes	7	70%
How did you perceive the difficulty level of the chosen mandalas?		
Too easy	0	0%

Too difficult	1	10%
Suitable	9	90%

Do you want to implement colouring mandalas in your daily life?

Yes	2	20%
Maybe	7	70%
No	1	10%

Did you like receiving the mandalas via e-mail?

Yes	8	80%
No	2	20%

Research question 2: Effectiveness

Descriptive statistics - observed effects

The descriptive statistics are summarised in Table 2, in which key measures for both depression and stress scores before and after the intervention are presented. Depression scores were assessed by utilizing the PHQ-9 as the measurement instrument. Whereas depression scores varied from 2 to 20 in the pre-measure, they ranged from 1 to 22 in the subsequent post-measure. The mean score of 7.9 (SD = 6.22) obtained before the intervention decreased to 7.2 (SD = 7.62) after the intervention. Consequently, the final depression score for the sample can be found between 5 and 9, indicating the presence of 'mild depression' (Kroenke & Spitzer, 2002). The results are further illustrated in Figure 1.

The assessment of stress levels was executed by using the PSS. Prior to the implementation of the intervention, the stress scores varied from 11 to 25, while ranging from 10 to 31 following the intervention. Notably, the pre-measure of stress exhibited a mean score of 18.9 (SD = 4.97) whereas the mean after the intervention decreased to 17.4 (SD = 6.39). By taking into account the classification of results, it is noticeable that the stress levels of this sample fall within the range between 14 and 26, considered to be 'moderate stress' (Fong et al., 2022) The changes in stress levels from post-to pre-measure are further demonstrated in Figure 2.

Table 2

Descriptive statistics of pre-measure and post-measure data and Cronbach's alpha for PHQ-9
and PSS (N=10)

Scale	Pre-measure			Post-measure			Cronbach's α
	M	*SD*	Range	*M*	*SD*	Range	
PHQ-9	7.9	6.22	2- 20	7.2	7.63	1-22	0.9
PSS	18.9	4.97	11-25	17.4	6.39	10- 31	0.79

Note. PHQ- 9= Patient-Health-Questionnaire-9, Min. = 0, Max. = 27; PSS= Perceived Stress Scale, Min. = 0, Max. = 40

Wilcoxon's signed-rank test

As the sample size was relatively small ($n = 10$) and assumptions of linear models could not have been met sufficiently, a Wilcoxon signed-rank test was computed. The test was used, to assess whether differences in the paired samples between the pre-and post-measure exist and whether test scores differ significantly from zero. The results of the statistical analysis are shown in Table 3.

The Wilcoxon signed-rank test indicated that depression levels before the intervention were not significantly different from depression levels after the intervention ($z = -0.71$, $p = 0.47$). Similarly, the intervention did not elicit a significant change in stress levels ($z = -0.95$, $p = 0.34$). This can also be observed in Figure 2.

In summary, the Wilcoxon signed-rank test did not show significant differences between pre-and post-measure, neither in depression nor in stress levels. In regard to the first research question, whether the intervention decreases stress and depression in university students, it can be concluded that there was no observed effect, whether in depression or on stress levels.
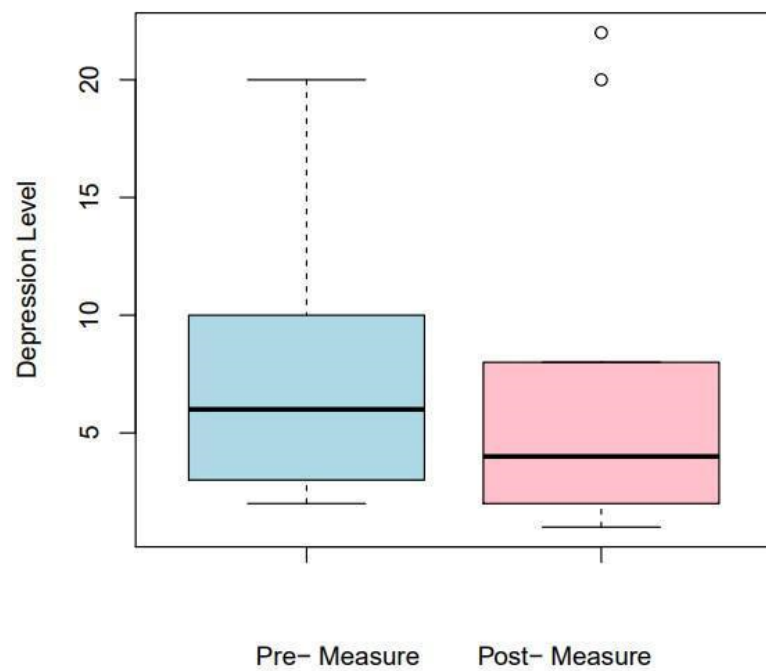
Table 3

Wilcoxon signed-rank test

Scale	*V*	*p*	z	95% CI
PHQ-9	29	0.47	-0.71	-4.0- 5.0
PSS	31	0.34	-0.95	-2.50 - 6

*Note. * V-value is significant at the 0.05 level (p < 0.05).*

Figure 1

Changes in depression levels between pre-measure and post-measure

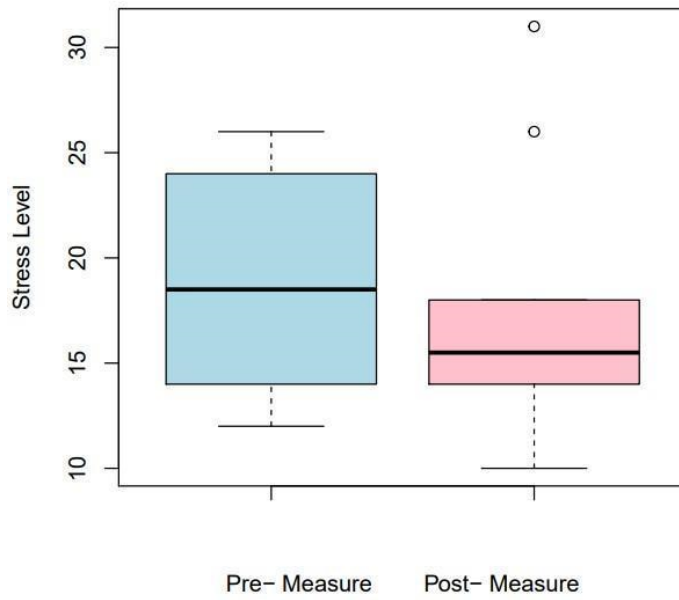*Note*. *X*-axis = Measure point, *Y*- axis = Score on PHQ-9

Figure 2

Changes in stress levels between pre-measure and post-measure

Note. *X*-axis = Measure point, *Y*- axis = Scores on PSS

Perceived effects

Despite assessing the effects between pre- and post-measures objectively, participants were asked about their subjective experienced effects. Two closed as well as two open questions were asked, in order to evaluate if participants sensed a change in mood or motivation throughout the intervention. The responses to these two closed questions are presented in Table 4.

When asked by a closed question whether an increase in motivation was experienced, the majority of participants indicated that they did not notice a clear increase in motivation. These results are consistent with the narrative comments on the respective open-ended question. Whereas half of the participants merely confirmed that they have not faced an increase, two participants referred to reduced stress as a consequence. For instance, one participant indicated "I noticed that they help me to take off my mind from daily stress". One subject highlighted experiencing increasing awareness in regard to their own feelings. Another participant gained an increase in motivation in general.

Overall, participants did not experience a clear increase in mood, as responses to the closed question represent. However, the narrative responses to the open-ended question that followed reveal underlying thoughts about participants' moods in regard to the intervention. One big advantage participants benefitted from colouring was an increase in relaxation, as mentioned by four (40%) participants. One respondent pointed out: "I was a bit more relaxed". Beyond relaxation, one participant highlighted "I felt a little bit less stressed".

Besides that, various other effects were mentioned by individual participants. One participant specified an increase in attentiveness. In line with that, another participant gained more awareness of their own feelings "I could reconnect with myself and my feelings". Two other participants mentioned an increase in positive feelings generally. For example: "I felt better right after colouring". Even though these aspects indicate that most participants experienced a slight effect in mood generally, four (40%) participants confirmed again, that they have not noticed any effect in mood. Overall, a wide range of perceived effects are noticeable. On the one hand, the closed questions revealed that participants have not experienced an explicit change in mood or motivation throughout the intervention. On the other hand, responses to the open-questions disclosed, that some participants faced slight changes in stress or mood.

Table 3

Feasibility Questions assessing Perceived Effects - Closed-Ended (N=10)

Item	*n*	%
Did you notice an increase in motivation throughout the study?		
Definitely not	0	0%
Probably not	5	50%
Might or might not	1	10%
Probably yes	4	40%
Definitely yes	0	0%
Did you notice an increase in mood throughout the study?		
Definitely not	0	0%
Probably not	2	20%
Might or might not	2	20%
Probably yes	6	60%
Definitely yes	0	0%

Integrating Results of Both Analyses

Results of the qualitative and quantitative analysis were taken into account, to integrate the findings. On the one hand, the first research question addressed particular feasibility aspects and was evaluated by posing quantitative as well as qualitative questions during the post-measure. The quantitative questions provided a general tendency of the participant's perspectives, whereas the qualitative questions could add explanational value. Specifically, details about which specific obstacles participants encountered during the intervention were revealed. Further, participants could elaborate on facilitators, that helped them in order to adhere to the intervention. Lastly, it was evaluated why exactly participants (do not) want to implement colouring sessions in the future. Taken together, prompting participants to elaborate on specific aspects provided additional insight into their perception of the interventions, that quantitative questions could not have covered sufficiently.

On the other hand, the second research question covered the effects of colouring on stress and depression levels. Specifically, the PSS and PHQ-9 questionnaires prior to and after the intervention contribute to the understanding of whether the intervention was objectively effective. Furthermore, the perceived effectiveness was evaluated, in terms of combined qualitative and quantitative questions. The understanding of the responses to the qualitative questions was again enhanced by answers to qualitative questions. For example, participants were asked to indicate whether they perceived a change in mood first and subsequently prompted in which way they did or did not experience a change. The combination of qualitative and quantitative questions enhanced the interpretation of effects. It is noticeable that even though no significant effects were observed, participants still perceived slight changes in their mood and motivation, for example in terms of relaxation or stress relief.

Taken together, the interpretation of findings in terms of quantitative data could be enhanced by the elaboration of answers to qualitative questions. So, it is possible to integrate and connect all findings, so that a broadened understanding of effectiveness as well as feasibility is created. In summary, the mixed-method approach helped to draw sufficient conclusions for future research.

Discussion

This mixed-method study aimed to capture the feasibility and acceptability of a three-week art-based intervention of colouring mandalas and assess the extent to which stress and depression levels in university students decreased after being subjected to this intervention. The findings do not illustrate significant observable effects of the intervention, neither on stress nor depression levels in university students. In contrast to the observed effects, the perceived effects of participants vary. Correspondingly, half of the participants indicated not having noticed an increase in motivation throughout the intervention. Conversely, the slight majority of participants indicated that they have probably experienced an increase in mood. Thus, it can be concluded that the perceived effects were slightly noticeable. Even though some participants faced additional stress when subjected to the weekly tasks, the majority of participants experienced positive benefits.

Although the effects have been non-significant, the overall intervention has proven to be feasible for university students. On average, 5.4 out of six mandalas have been coloured, so adherence was very high. The majority of participants perceived the dose of mandalas as well as the difficulty level as appropriate. They were satisfied with the general intervention and even though some participants were not satisfied with the design, the difficulty level of the mandalas was considered appropriate by almost all participants. In response to the second research question, it can be concluded that the intervention was feasible for the participating university students.

Research Question 1: Feasibility

The first research question addressing the feasibility of a three-week art-based intervention was confirmed and is thus, in line with the expectations. Several studies confirm these results in different samples, for example by Carswell et al. (2020).

Adherence

One explanatory reason for the high adherence as well as high satisfaction is the interventions' creative nature. Cheung et al. (2003) found, that creativity levels steadily decline with the semesters spent studying at a university. The underlying reasons for this are attributed to the complexity of problems faced during the academic career, which require time and effort to be solved. Thus, creative assets are maybe outperformed by academic performances and cannot be facilitated (Cheung et al., 2003). As confirmed by previous research of Kaimal & Ray (2016), adult participants often refer to missing opportunities during their daily life to spend on visual

self-expression or being creative since middle school. Certainly, several participants mentioned that they primarily favoured the interventions' aspect of being creative the most. Moreover, one participant mentioned that it has been a long time ago since he or she coloured. Not only creativity was facilitated by the intervention, but also the ability to rest, calm down or take a break from daily responsibilities was valued. Kaimal et al. (2017) even argue, that "colouring might be considered as a potential self-care practice" and a way to express oneself visually.

Obstacles

The majority of participants did not encounter any obstacles. Nevertheless, some participants claimed that they have struggled with time constraints. These findings are in line with evidence in other studies. Next to the general academic stressors, such as exams, other assessments, or interpersonal relationships, Pitt et al (2018) highlight the poor financial condition of university students. Due to financial issues, the number of students who undertake paid work next to their studies increases (Pitt et al., 2018). Hence, a study-life balance is difficult to create and making time for an extra task as colouring mandalas two times a week for 15 minutes might be additionally stressful for some participants. Another research by Takács & Pogatsnik (2022) confirms these claims and states that rising amounts of work and difficulty levels of academic requirements decrease the free time students have. The study by de Sanne (2017) further emphasises the numerous demands students have to meet in order to achieve their academic goals. Hence, it is no surprise that students are not able to incorporate an additional weekly task into their schedule.

Dose

Overall, the dose of colouring mandalas was perceived as appropriate. Previous studies covered different periods of colouring sessions, ranging from 20 minutes to 100 minutes of colouring sessions, either conducted one time or over a time span of eight weeks (Curry & Kasser, 2005; Fong et al., 2022; Kim et al, 2018). However, the studies focused on different samples, for instance, participants working full-time or being treated in psychiatric hospitals (Czerwinski, 2021; Fong et al., 2022; Kim et al. 2018). Considering these aspects, the time period of the whole intervention as well as the time limit of each colouring session needs to be tailored to the sample. As university students are generally constrained in their time and the current study found that the dose of two mandalas each week is appropriate, this dose can be utilised when conducting future studies.

Facilitators

Facilitators that supported the participants to comply with the colouring sessions have also been found in previous studies. Participants perceived the quiet environment as well as the possibility to act creatively as supporting factors for complying with the task. A study by Gallagher et al. (2019) even labelled spending time in a quiet environment as a coping strategy applied by university students frequently. Consequently, the quiet space a participant was supposed to look for before the task started can be seen as an additional aspect that had calming effects. Furthermore, it has been found that reducing distractions facilitates mindfulness (Czerwinski et al., 2021). In turn, the mind can focus on the underlying task, and the effects of relaxation are enhanced.

Evidence indeed supports, that colouring mandalas have a positive effect on mindfulness. According to a study by Curry & Kasser (2005), colouring mandalas enables the user to get into a meditative state. Kaimal et al. (2017) substantiate the findings, that colouring mandalas reduced anxiety with the explanation, that mandalas created a meditative-like condition. They argue, however, that this was only the case for the pre-drawn mandala condition, whereas no similar findings were found in participants who were supposed to paint on a blank page (Kaimal et al. (2017).

Another study by Czerwinski and colleagues (2021) employed the influence of mandalas on mindfulness in a sample of teachers. In addition to the mandalas, participants were exposed to a video explaining the way to colour mindfully. The video included acknowledgements that resemble the instructions of the current study, for example, that attention should be explicitly paid to the colouring task itself and distractions should be minimised. In contrast to the current intervention, the study by Czerwinski et al. (2021) further highlighted, that the mind is allowed to wander and participants should acknowledge their feelings during the colouring process. In the end, colouring mandalas significantly increased mindfulness levels. The researchers ascribed the findings to the video shown before the intervention started, but also to the fact, that simultaneously burnout and psychological distress levels were improved. Given that the video incorporated in the study by Czerwisnki et al. (2021) resembles the instructions given prior to the current intervention, the findings that have been found in terms of mindfulness are in line with each other. However, the video might have facilitated these effects even further, compared to a written instruction. Taken together, the findings of this study are in line with previous findings.

Benefits

Numerous participants mentioned that the intervention was relaxing and calming. Carl Jung, who introduced the colouring of mandalas into the therapeutic context originally claimed that colouring has calming and relaxing effects (Jung, C.,1973 as cited in Pisarik & Larson, 2011). According to him, colouring triggers a certain conscientiousness, in which self-understanding is enhanced. Studies that investigated Jung's assertion were able to confirm the results. For example, the study by Ratnasari et al. (2018) verified calming and relaxing effects in their participants, even though their task was to create the mandala in a given circle, instead of merely colouring a pre-drawn design. Likewise, Jung enabled his patients to create the mandala on their own, which functioned as the symbolic representation of their mental health. A study by Slelegis (Slegelis, 1987, as cited in Pisarik & Larson, 2011) holds, that the increased positive affect of their participants is related to the colouring inside of a circle, instead of a square.

Mandalas also functioned as a free time task, that created a purposeful moment to take a break from demanding responsibilities and hassles during the day. De Sanne (year) argues, that students frequently encounter daily stressors, or minor hassles that accumulate, which in turn leads to heightened stress and depression levels. As a response, Curry & Kasser (2005) suggest, that colouring a mandala before and after stressful activity, for example prior to a flight or a test, could reduce stress levels. The study by Pisarik & Larson (2011) examined the association between authenticity, mental well-being, and creating and interpreting mandalas in first-year university students. Specifically, the participants were given a blank piece of paper on which they were supposed to trace a circle. Subsequently, they could fill it with drawings that represent their momentary affect or emotions, using any symbol, pattern or colour of interest. Afterward, participants were instructed to interpret their drawings. Pisarik & Larson (2011) have found that participants in the experimental demonstrated higher levels of authenticity, which for example includes self-awareness or unbiased processing and personal development and growth. (Pisarik & larson, 2011). In contrast to the experimental group, students in the control condition scored significantly lower on self-awareness, which is associated with the initial, developmental changes during the transition to university. In light of these results, it can be concluded that mandala drawing is an effective tool to increase self-awareness.

A study by Rith-Najarian and colleagues (2014) highlighted the fact, that low self-awareness presents a deficit in interpreting stress and related physiological reactivity. This

means, that people are not able to determine their stress perception or their physiological reactions adequately. Conversely, individuals' high self-awareness facilitates appropriate coping possibilities (Rith-Najarian et al., 2014). Taken together, colouring mandalas can increase self-awareness and in turn, lead to an enhanced ability to perceive stress and evaluate possible reactions.

Drawbacks

The findings of the present study in terms of the interventions' drawbacks are versatile. The majority did not find the overall intervention as stressful. Nevertheless, some participants stressed that they (sometimes) felt overwhelmed, which is contradictory to evidence in the majority of previous studies. Primarily, colouring mandalas has been demonstrated to reduce stress levels significantly and can trigger an increase in relaxation, instead of increasing stress (Hasnida & Meutia, 2018; Fong et al., 2022). The study by Fong et al. (2022) was able to prove, that colouring mandalas for at least five days or 100 minutes in total resulted in significant stress reduction for participating nurses. However, they also stressed that the differences between the experimental group compared to the control group were rather small. In light of these findings, it can be concluded that the instructions provided to the participants might be of crucial importance in regard to the significance of the effects.

Furthermore, the different effects on stress between previous studies and the current one can be related to the varying time periods, in which intervention is applied to participants. The experiment by Fong et al. (2022) was conducted over a short period of 10 days, in which the participants were supposed to colour for at least five days, which is a shorter time frame than the current study focused on. Conversely, Kim and colleagues (2018) applied their intervention including colouring mandalas for eight weeks, in which inpatients of a neuropsychiatric hospital in South Korea were supposed to attend art therapy twice per week for an hour. Specifically, they examined the effects of mandala art therapy and found that hope was significantly boosted by colouring mandalas. In contrast to this sample, the current study focused on university students who follow a different weekly schedule, so that including an additional task next to academic demands might be more difficult, than for inpatients. Inpatients focus on their mental health instead of academic demands first, so that therapy is a priority and can be primarily focused on during the day. In summary, it can be concluded that the time the intervention is conducted needs to be specifically tailored to the characteristics and needs of the underlying samples.

Another finding resulting from the evaluation of feasibility was, that almost all participants perceived the difficulty level of the mandalas as suitable. However, some participants criticised the difficulty level of the mandalas, as they could have been easier or less complex. On the one hand, it can be considered to include mandalas that are simple or merely slightly vary in difficulty level. On the other hand, providing participants with several opportunities they can choose is possible. As shown in previous studies, colouring mandalas as well as merely drawing a self-created pattern in the boundaries of a circle have similar effects (Pisarik & Larson, 2011). Thus, opportunities such as colouring a mandala or drawing a self-created pattern into a circle can be offered to participants.

Intention for Continuation

The big majority of participants are not sure about the implementation or do not want to include colouring sessions in the future. Merely some participants expressed their interest in including mandalas in their future. Mentioned reasons for these indications were other activities, such as sports, or the preference for another method to relieve stress during their daily life. Others have too little time to follow colouring sessions. In light of these results, the interests in stress-relieving tasks in their free time vary. Whereas some participants prefer creative tasks, other students might prefer sports activities. Findings also highlight, that sports activities might potentially add factors, that this intervention did not consider, such as the fitness aspect or the possibility to contact with others. Thus, some students might prefer a pleasurable sport-related activity over a creative silent activity (Diehl et al., 2018).

All in all, the mixed-method approach used to assess the interventions' feasibility provides relevant and considerable insight to substantiate the improvement of a final large-scale study. Important positive as well as negative aspects of the current study were explored and determined. The initial examination of feasibility and the consideration of individual responses serves as a profound foundation to identify potential barriers and drawbacks of the intervention. This approach enables the mitigation of obstacles and facilitates the positively evaluated aspects of the intervention. By incorporating these elements, several crucial factors of the overall art intervention can be substantially improved, thereby increasing the probability of the intervention's effectiveness. The examination and inclusion of participants' perspectives, therefore, contributes to future research, for example, a pilot study or a study including more participants.

Research Question 2: Effectiveness

The main findings in terms of the interventions' effectiveness are contrary to the expectations. No significant evidence, that colouring mandalas decrease stress or depression levels in university students has been found. Contrary to these results, previous studies have found a significant effect on both variables. A study by Ratnasari et al. (2018) for instance, tested the effects of a mandala therapy programme and was able to capture a significant relationship between three sessions of colouring and a diminution of depression. Moreover, a study by Yan Fong and colleagues (2022) examined the effectiveness of colouring mandalas on stress levels. They demonstrated a significant decrease in stress levels as a response to colouring pre-drawn mandalas (Fong et al., 2022).

Differences in results between the previous findings and the current study may be ascribed to several factors. On the one hand, the time participants were supposed to colour the mandalas differed. Participants of the study by Ratnasari et al. (2018) were subjected to three sessions of colouring sessions for 60 minutes. Fong et al. (2022) instructed their participants to colour for at least five days or 100 minutes in total. On the other hand, both studies predominantly focused on participants with a high baseline level in the variable of interest, namely depression or anxiety. In order to participate in the study of Ratnasari et al (2018), depression scores were supposed to be above 31. Likewise, the study by Fong et al. (2022) recruited nurses from a hospital in Hong Kong, and data collection was conducted during the fourth wave of COVID-19. Hence, 79.2% of the participants scored moderate to high in on stress, so after the intervention the mean stress level was 18.4 (Fong et al., 2022). It can be concluded, that the effects in other studies could have been observed more quickly and on a significant level, as participants with higher baseline levels are more likely to be sensitive to interventions that may reduce their symptoms.

Nevertheless, there are also studies that are in line with the results of the current research. A study by Henderson et al. (2007) for instance was not able to confirm a significant relationship between colouring mandalas and the diminution of depression. They investigated the effects of mandala colouring in patients suffering from Post-Traumatic Stress Disorder and discovered, that even though trauma symptoms decreased, no significant decreases in depression were observable (Henderson et al., 2007). Another study by Kaimal et al. (2017) demonstrated, that colouring mandalas indeed reduced negative mood generally, but was not able to considerably facilitate an

increase in a positive mood. Several factors are specified by Kaimal et al. (2017) that may have contributed to these results, for example, that colouring might decrease distress but does not significantly enhance positive affect or that an increase in sessions would have enhanced positive emotions.

In contrast, other factors might have played a crucial role in the occurrence of the current findings. On the one hand, the intervention might have been affected by the appearance of the *Hawthorne effect* (Merrett, 2006). The Hawthorne effect describes the underlying reason for unexpected outcomes, namely that participants have been aware of the fact that they are part of a study. Indeed, some participants in the current study mentioned, that the submission of the mandalas at a certain point triggered additional stress. Despite the fact that the submission of mandalas has not been requested in the instructions, some participants were convinced that the researchers will control the resulting mandalas. Other participants also highlighted that the motivation behind colouring is external, as they knew they are supposed to engage in the task (for example to obtain the required SONA credits). Thus, the thought of being part of an official intervention might have provoked more stress in some participants, instead of reducing it as supposed to.

On the other hand, the mood of students might have been negatively affected by the colouring process itself. Kaimal et al. (2017) stressed, that participants who consider themselves talented or artists, in general, were more likely to experience negative reactions from the colouring process. Even though not explicitly asked during the questionnaires, responses to open-ended questions make clear, that the participants like colouring activities. Several participants acknowledged their interest in using different colours and the activity of colouring in general. These responses can be connected to the findings of Cheung et al. (2019) who claims that university students' creativity levels might differ depending on their study programmes. Empirical evidence suggests that especially students following arts, humanities, or social sciences display a higher creativity level than students studying natural or technological sciences (Cheung et al., 2019). As the majority of participants followed either Psychology or educational programmes, the sample could be labelled as high in creativity and thus being impacted by the monotonous design of the mandalas or colouring process itself. Indeed, one participant mentioned that it is perceived as annoying when he or she colours over the lines. As the mandala designs got more difficult over time, this effect might have been increased throughout the study

and triggered negative experiences. Also, the designs of the mandalas could have been more different to each other, as suggested by some respondents.

A last explanation for the non-significant findings considers the time of the semester. Data collection for the current study started at the beginning of April 2023 and ended at the beginning of May 2023. Thus, the respondents found themselves in the middle of the semester. Even though stress levels may fluctuate throughout the semester, Pitt et al. (2018) determine the start as well as the end of a semester as the most stressful period that are simultaneously associated with the highest levels of stress among university students (Pitt et al., 2018). Therefore, the demands of the current time of the semester might not have been high enough and in turn, stress levels not high enough, so colouring mandalas frequently could not have reached a significant impact on students' stress levels.

The evaluation of the observed as well as perceived effects provides considerable aspects that can be improved when scaling up the study. First, it needs to be emphasised to the respondents, that the coloured mandalas do not have to be submitted nor are they controlled by the researchers. Second, the requirements for the participation could be changed. The feeling of being urged to comply with the task can be reduced by voluntary participation instead of recruiting participants who need to obtain credits through participation. Third, the pre-drawn design of the mandalas should be more simple, to avoid that the design of the triggers additional stress.

Strengths and Limitations

The current study encompassed numerous strengths. First, the assessment of feasibility enables the researchers to detect possible risks and drawbacks that may be included in the study. A re-evaluation of several factors is thus possible, to improve the final study. Second, the participants were able freely chose at which time point during the week they wanted to comply with the tasks of colouring mandalas. Certain flexibility and spontaneity were therefore provided so that adherence might have been enhanced. Third, the study was conducted online, which provides the participants with a certain freedom of engaging in colouring. Participants were able to choose when a colouring session would fit their weekly schedule and could engage in the activity at home. As a result, participants did not have to meet on campus with the researchers and could colour in an atmosphere they are familiar with and feel comfortable in.

Several limitations of the general study, as well as the intervention itself, are worth mentioning. The first limitation considers the overall first questionnaire provided to the participants. Since the researchers missed including the PSS questionnaire sufficiently, the final questionnaire lacked the 10th and final question. Even though the calculated Cronbach's alpha was labelled as good, the questionnaire was not complete. For comparison and similarity purposes, the tenth question was also eliminated in the statistical analysis of the second questionnaire. Therefore, final quality of statistical analysis could have been ensured.

Another limitation can be pinpointed in the feasibility questionnaire. Even though the closed-questions were formulated neutrally and answer categories were mutually exclusive, almost all closed-questions entailed different answer categories. Consequently, the comparison of different aspects of feasibility was difficult. Similar and standardized answer categories for each question would also have facilitated the comprehensibility of the questionnaire and thus, participants responding behaviour.

Practical Implications and Future Research

By considering the major strengths and weaknesses of the current study, several implications for a future study can be made. These can be distinguished between methodological implications and practical implications. Practical implications specifically centre around the underlying objectives of achieving effectiveness and the goal of capturing feasibility.

Certain methodological implications can be considered in future research. First, the usability of the feasibility questionnaire can be strengthened. Answer categories to each question should be made similar so that it is easier for the respondent to answer, as well as for the researchers to interpret the results. Second, a question should be added to the feasibility questionnaire, namely whether participants have regular experience with creative activities. The addition of the question can contribute to the possibility, to draw final conclusions about differences in effectiveness after the intervention. Third, volunteering sampling can be used, in order to enhance participants' motivation for involvement and complementation.

In terms of the practical implications, the following suggestions need to be considered in future research. First, implementing a randomised control condition as well as a condition is useful. The addition of a control group facilitates an unbiased measurement of the intervention's effectiveness. Given that several factors throughout the semester may impact the well-being of students, possible moderating or mediating effects can occur that influence the findings. To

control for such effects in future studies, a control group that does not engage in a creative task is suggested.

Second, another experimental group could be included, that is provided with another creative task. It can be investigated, whether drawing a self-created pattern into a given circle or colouring a plaid design is equally effective or whether effectiveness can be merely found in the condition that coloured a pre-drawn mandala.

Third, the intervention could be conducted at a different time point during the semester than the current study. Given that stress levels are especially high at the beginning and the end of the semester, it can be considered to conduct the study during these time periods (Pitt et al., 2018). In the current study, students' average stress level was moderate. By implementing the study at a stressful time period during the semester, stress levels might be generally higher and effectiveness might be more likely, as students are more sensitive to changes in stress scores. Consequently, a clear tendency of effects might be possible.

Fourth, the participants can be subjected to a video that instructs them how to create an appropriate atmosphere and focus sufficiently and be mindful of the task itself. This might increase the effectiveness of the colouring sessions.

Lastly, future research should improve the included mandalas, given that some participants criticised the design or difficulty level of the mandalas. The mandalas differ more from one another without resemblance to each other, to ensure variety that in turn may facilitate creativity. Moreover, it can be considered to provide participants with different designs, which they could choose from in each colouring session. Even though the big majority of participants concluded that the difficulty level of the mandalas was appropriate, some criticised the complex design. Adding another mandala and further implementing a certain freedom of choice might increase overall satisfaction with the variety of mandalas. Finally, participants might be more satisfied with the final result when they were able to pay more attention to colour the small fields conscientiously, instead of hurrying to colour all the fields at the given time.

Conclusion

Taken together, this study tested the feasibility as well as the effects of a three weeks art-based intervention on stress and depression levels of university students. Even though effects are merely used as an indication, there were no significant effects, neither on stress nor on depression levels observable. Conversely, perceived effects existed. More than half of the

participants probably noticed an increase in mood throughout the study, have not felt stressed by the intervention, and reported further beneficial effects such as stress relief or a time-out from daily hassles. An increase in motivation appears to be unlikely. In contrast, the intervention can be labelled as feasible for university students. In line with the expectations, the majority of participants adhered to the number of mandalas to colour, and perceived the dose as well as the difficulty level as appropriate. Finally, the majority of participants were satisfied with the intervention. Ultimately, the study provides a substantial foundation for other studies, that investigate the effects of mandalas on university students. A crucial step future research should consider are recruiting participants by volunteer sampling, including a control group as well as another experimental condition to compare the effectiveness of mandalas with other creative activities. Conducting the study at a different time point during the semester and including a video as instruction are recommended. Apart from that, improving the feasibility questionnaire as well as aspects of the mandalas is important.

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Appendix A

Informed Consent

Informed Consent

The purpose of this study is to investigate the feasibility of coloring mandalas and its effects on stress, mindfulness and depression.

 In the following, you are supposed to answer several questionnaires, which will take approximately 20 minutes. Afterwards, the intervention will be explained to you. Then, you will get a notification, including instructions and the mandalas for the first week. You get this notification every week on the same day.

 Participation is voluntary and can be stopped at any time, without mentioning a reason. If you feel uncomfortable with answering questions, then leave the questions open. Negative consequences from withdrawing of this study or refusing to answer some questions do not exist.

 The results of this data collection is only for educational purposes and to report the results of the feasibility. Personal data that can lead back to the participant will not be collected. Data is going to be handled anonymously and stored for one year.

 Minimal risks are associated with participation in this study, which may include mental distress resulting from the questionnaires or the weekly tasks. Participants suffering from symptoms of high stress and depressive symptoms might be at risk for experiencing mental burden.

 The study has been reviewed and approved by the BMS Ethics Committee (Humanities & Social Sciences).
 In an case of any severe impact, please contact:

 The researchers
 - v.michalski@student.utwente.nl

- l.warda@student.utwente.nl

The supervisor

- l.reiter@utwente.nl

The study advisors

- studyadvisor-psy@utwente.nl

    o I hereby confirm that I am 18 years old or older and have read and understood the information. My participation in this study is voluntary.

Appendix B

B1. Questionnaire Pre-measure

E-mail) If you are not participating via SONA, please indicate your e-mail adress (It will be used to send you the instructions for the intervention. Afterwards, it will be deleted)

_____

Age) Please indicate your age

_____

Gender) Please indicate your gender

- o Male
- o Female
- o Non-binary / third gender
- o Prefer not to say

Nationality) Please indicate your nationality

_____

Education) Please indicate if you are Bachelor or Master student

- o Bachelor student
- o Master student

Study program) What is your study programme?

_____

Marital status) What is your current marital status?

- o Married
- o Widowed
- o Divorced
- o Single (never married)
- o Other (please specify) _____

Stress (PSS) How often have you been bothered by any of the following problems in the last month?

	never	almost never	sometimes	fairly often	very often
In the last month, how often have you been upset because of something that happened unexpectedly?	o	o	o	o	o
In the last month, how often have you felt that you were unable to control the important things in your life?	o	o	o	o	o
In the last month, how often have you felt nervous and stressed?	o	o	o	o	o
In the last month, how often have you felt confident about your ability to handle your personal problems?	o	o	o	o	o
In the last month, how often have you felt that things were going your way?	o	o	o	o	o

In the last month, how often have you found that you could not cope with all the things that you had to do?	o	o	o	o	o
In the last month, how often have you been able to control irritations in your life?	o	o	o	o	o
In the last month, how often have you felt that you were on top of things?	o	o	o	o	o
In the last month, how often have you been angered because of things that happened that were outside of your control?	o	o	o	o	o

Depression (PHQ) In the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly everyday

Little interest or pleasure in doing things	o	o	o	o
Feeling down, depressed, or hopeless	o	o	o	o
Trouble falling or staying asleep, or sleeping too much	o	o	o	o
Feeling tired or having little energy	o	o	o	o
Poor appetite or overeating	o	o	o	o
Feeling bad about yourself or that you are a failure or have let yourself or your family down	o	o	o	o
Trouble concentrating on things, such as reading the newspaper or watching television	o	o	o	o

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
Moving or speaking so slowly that other people could have noticed. Or the opposite being so figety or restless that you have been moving around a lot more than usual	o	o	o	o	
Thoughts that you would be better off dead, or of hurting yourself	o	o	o	o	

Q25 Please rate each of the following statements with the answer that best describes your own opinion of what is generally true for you.

	Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
When I'm walking, I deliberately notice the sensations of my body moving.	o	o	o	o	o
I'm good at finding words to describe my feelings.	o	o	o	o	o

I criticize myself for having irrational or inappropriate emotions.	o	o	o	o	o
I perceive my feelings and emotions without having to react to them.	o	o	o	o	o
When I do things, my mind wanders off and I'm easily distracted.	o	o	o	o	o
When I take a shower or bath, I stay alert to the sensations of water on my body.	o	o	o	o	o
I can easily put my beliefs, opinions, and expectations into words.	o	o	o	o	o
I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	o	o	o	o	o

I watch my feelings without getting lost in them.	o	o	o	o	o
I tell myself I shouldn't be feeling the way I'm feeling.	o	o	o	o	o
I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	o	o	o	o	o
It's hard for me to find the words to describe what I'm thinking.	o	o	o	o	o
I am easily distracted.	o	o	o	o	o
I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	o	o	o	o	o
I pay attention to sensations, such as the wind in my hair or sun on my face.	o	o	o	o	o

	o	o	o	o	o
I have trouble thinking of the right words to express how I feel about things.	o	o	o	o	o
I make judgments about whether my thoughts are good or bad.	o	o	o	o	o
I find it difficult to stay focused on what's happening in the present.	o	o	o	o	o
When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	o	o	o	o	o
I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	o	o	o	o	o

In difficult situations, I can pause without immediately reacting.	o	o	o	o	o
When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.	o	o	o	o	o
It seems I am "running on automatic" without much awareness of what I'm doing.	o	o	o	o	o
When I have distressing thoughts or images, I feel calm soon after.	o	o	o	o	o
I tell myself that I shouldn't be thinking the way I'm thinking.	o	o	o	o	o
I notice the smells and aromas of things.	o	o	o	o	o

Even when I'm feeling terribly upset, I can find a way to put it into words.	o	o	o	o	o
I rush through activities without being really attentive to them.	o	o	o	o	o
When I have distressing thoughts or images, I am able just to notice them without reacting.	o	o	o	o	o
I think some of my emotions are bad or inappropriate and I shouldn't feel them.	o	o	o	o	o
I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.	o	o	o	o	o
My natural tendency is to put my experiences into words.	o	o	o	o	o

When I have distressing thoughts or images I just notice them or let them go.	o	o	o	o	o
I do jobs or tasks automatically without being aware of what I'm doing.	o	o	o	o	o
When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about.	o	o	o	o	o
I pay attention to how my emotions affect my thoughts and behavior.	o	o	o	o	o
I can usually describe how I feel at the moment in considerable detail.	o	o	o	o	o
I find myself doing things without paying attention.	o	o	o	o	o

I disapprove of myself when I have irrational ideas.	o	o	o	o	o

The end

Thank you for your participation. Part 1 is done!

Now, we can procede with part 2. You will get a notification with instructions and the first two mandalas you are supposed to color for the first week. Print them and start coloring! You can choose on your own, at which days during the week you want to take time for this task. You can paint until you are satisfied with the result, but at least you should spend 15 minutes on it. After the first week, you will get a second notification with the next mandalas for the second week. The same procedure will be applied in the third week.

Good luck!

B2. Post-measure

Q1 Welcome to the second part of the study. Hopefully, you enjoyed the intervention.

In the following, you are supposed to answer several questionnaires, which will take approximately 20-30 minutes. First, you are asked to answer some questions you already know from the first part of the study. Afterward, you are asked to give feedback regarding the feasibility of the study.

The purpose of this is to investigate whether the intervention had an effect on your well-being and how feasible it has been for you to implement the tasks in your daily life.

Participation is still voluntary and can be stopped at any time, without mentioning a reason. If you feel uncomfortable with answering questions, then leave the questions open. Negative consequences from withdrawing of this study or refusing to answer some questions do not exist.

o I hereby confirm that I participated in the intervention as good as possible and that I understand that participation in this questionnaire is still voluntary and can be stopped at any time.

Q2 Please indicate your ID Code, if you participated via Sona. Otherwise, indicate your initials.

_____

Stress (PSS) How often have you been bothered by any of the following problems in the last month?

	never	almost never	sometimes	fairly often	very often
In the last month, how often have you been upset because of something that happened unexpectedly?	o	o	o	o	o

In the last month, how often have you felt that you were unable to control the important things in your life?	o	o	o	o	o
In the last month, how often have you felt nervous and stressed?	o	o	o	o	o
In the last month, how often have you felt confident about your ability to handle your personal problems?	o	o	o	o	o
In the last month, how often have you felt that things were going your way?	o	o	o	o	o
In the last month, how often have you found that you could not cope with all the things that you had to do?	o	o	o	o	o

In the last month, how often have you been able to control irritations in your life?	o	o	o	o	o
In the last month, how often have you felt that you were on top of things?	o	o	o	o	o
In the last month, how often have you been angered because of things that happened that were outside of your control?	o	o	o	o	o
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	o	o	o	o	o

Depression (PHQ) In the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly everyday
Little interest or pleasure in doing things	o	o	o	o
Feeling down, depressed, or hopeless	o	o	o	o
Trouble falling or staying asleep, or sleeping too much	o	o	o	o
Feeling tired or having little energy	o	o	o	o
Poor appetite or overeating	o	o	o	o
Feeling bad about yourself or that you are a failure or have let yourself or your family down	o	o	o	o
Trouble concentrating on things, such as reading the newspaper or watching television	o	o	o	o

Moving or speaking so slowly that other people could have noticed. Or the opposite being so figety or restless that you have been moving around a lot more than usual	o	o	o	o
Thoughts that you would be better off dead, or of hurting yourself	o	o	o	o

Mindfulness FFMQ Please rate each of the following statements with the number that best describes your own opinion of what is generally true for you.

	Never or very rarely true (1)	Rarely true (2)	Sometimes true (3)	Often true (4)	Very often or always true (5)
When I'm walking, I deliberately notice the sensations of my body moving.	o	o	o	o	o
I'm good at finding words to describe my feelings.	o	o	o	o	o

I criticize myself for having irrational or inappropriate emotions.	o	o	o	o	o
I perceive my feelings and emotions without having to react to them.	o	o	o	o	o
When I do things, my mind wanders off and I'm easily distracted.	o	o	o	o	o
When I take a shower or bath, I stay alert to the sensations of water on my body.	o	o	o	o	o
I can easily put my beliefs, opinions, and expectations into words.	o	o	o	o	o
I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.	o	o	o	o	o

I watch my feelings without getting lost in them.	o	o	o	o	o
I tell myself I shouldn't be feeling the way I'm feeling.	o	o	o	o	o
I notice how foods and drinks affect my thoughts, bodily sensations, and emotions.	o	o	o	o	o
It's hard for me to find the words to describe what I'm thinking.	o	o	o	o	o
I am easily distracted.	o	o	o	o	o
I believe some of my thoughts are abnormal or bad and I shouldn't think that way.	o	o	o	o	o
I pay attention to sensations, such as the wind in my hair or sun on my face.	o	o	o	o	o

I have trouble thinking of the right words to express how I feel about things.	o	o	o	o	o
I make judgments about whether my thoughts are good or bad.	o	o	o	o	o
I find it difficult to stay focused on what's happening in the present.	o	o	o	o	o
When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it.	o	o	o	o	o
I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.	o	o	o	o	o

In difficult situations, I can pause without immediately reacting.	o	o	o	o	o
When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.	o	o	o	o	o
It seems I am "running on automatic" without much awareness of what I'm doing.	o	o	o	o	o
When I have distressing thoughts or images, I feel calm soon after.	o	o	o	o	o
I tell myself that I shouldn't be thinking the way I'm thinking.	o	o	o	o	o
I notice the smells and aromas of things.	o	o	o	o	o

Even when I'm feeling terribly upset, I can find a way to put it into words.	o	o	o	o	o
I rush through activities without being really attentive to them.	o	o	o	o	o
When I have distressing thoughts or images, I am able just to notice them without reacting.	o	o	o	o	o
I think some of my emotions are bad or inappropriate and I shouldn't feel them.	o	o	o	o	o
I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow.	o	o	o	o	o

My natural tendency is to put my experiences into words.	o	o	o	o	o
When I have distressing thoughts or images I just notice them or let them go.	o	o	o	o	o
I do jobs or tasks automatically without being aware of what I'm doing.	o	o	o	o	o
When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about.	o	o	o	o	o
I pay attention to how my emotions affect my thoughts and behavior.	o	o	o	o	o

I can usually describe how I feel at the moment in considerable detail.	o	o	o	o	o
I find myself doing things without paying attention.	o	o	o	o	o
I disapprove of myself when I have irrational ideas. (	o	o	o	o	o

Q3 How many of the 6 mandalas did you actually do?
  o 1
  o 2
  o 3
  o 4
  o 5
  o 6

Q4 Did you experience any obstacles when coloring the mandalas and why?

_____

Q5 What helped you in order to do the mandalas?

_____
_____
_____
_____
_____

Q6 Did you perceive the intervention as stressful?
    o Yes
    o Sometimes
    o No

Q7 How did you experience the number of mandalas per week?
    o Too little
    o Appropriate
    o Too many

Q8 What is an appropriate time dose to engage in mandala painting?
    o once a week
    o 2-3 times a week
    o every two weeks
    o once a month

Q9 Please indicate what you liked about the intervention

_____

Q10 Please indicate what you did not like about the intervention

_____

Q11 Have you been satisfied with the process (patterns, colors, fulfillment) of coloring your mandalas?
    o No
    o Sometimes
    o Yes

Q12 How did you perceive the difficulty level of the chosen mandala pattern?
    o too easy
    o too difficult
    o suitable

Q13 Did you notice an increase in motivation throughout the study as a consequence of coloring the mandalas regularly?
    o Definitely not
    o Probably not
    o might or might not
    o Probably yes
    o Definitely yes

Q14 In which way did you notice a change in your motivation throughout the study?

_____

Q15 Did you notice an increase in mood throughout the study as a consequence of coloring the mandalas regularly?
    o Definitely not
    o Probably not
    o might or might not
    o Probably yes
    o Definitely yes

Q16 In which way did you notice a change in your mood throughout the study?

_____

Q17 Do you want to implement coloring mandalas in your daily life in the future?
    o Yes
    o Maybe
    o No

Q18 Why would you or would you not implement coloring mandalas in your daily life in the future?

_____

Q19 If you were asked to perform a breathing exercise in the instructions, how often did you perform the breathing exercise actually?

o 1
o 2
o 3
o 4
o 5
o 6
o Never

Q20 If you were instructed to perform the breathing exercise did it help you to be more mindful

_____

Q21 Do you have any additional notes about the intervention?

_____

Q31 Did you like receiving the mandalas via e-mail?
o Yes
o No

Appendix C

Instructions

C1. Week 1

+++ Week 1 +++

Dear Participant,

You agreed to participate in the study 'Does coloring mandalas increase your well-being?'. You also finished the first part of the study, well done! Now, the intervention starts. You will get two mandalas each week for three weeks overall. It is your decision, at which days you take time for doing this task.

Hereby, you get the the mandalas for week number 1.

You can find them by using the following link:

https://drive.google.com/file/d/1eWna4NYVccKHzIvSDQ0HO6rUqII5wAhC/view?usp=share_link

Print it, look for a quiet environment without distractions and start coloring! Try to focus as good as possible on the task, without interruptions. At least, you should spend 15 minutes with coloring the mandala on paper. However, you can continue for sure until you are satisfied with the result. Next week, you will get two mandalas again for the second week.

If you face any difficulties, please contact the researchers:

l.warda@student.utwente.nl

v.michalski@student.utwente.nl

Good luck and enjoy the task!

C2. Week 2

+++ Week 2 +++

Dear Participant,

We hope you are doing fine. Week 1 of participating in the study 'Does coloring mandala increases the well- being of students' is done. Now, week 2 follows!

Hereby, you get the the mandalas for week number 2.

You can find them by using the following link:

https://drive.google.com/file/d/1bz2Mmom7klM2ecP6mj56gwKrSUqv_EGj/view?usp=sharing

Print it, look for a quiet environment without distractions and start coloring!

Again:Try to focus as good as possible on the task, without interruptions. At least, you should spend 15 minutes with coloring the mandala on paper. However, you can continue for sure until you are satisfied with the result. Next week, you will get two mandalas again for the second week.

If you face any difficulties, please contact the researchers:

l.warda@student.utwente.nl

v.michalski@student.utwente.nl

Good luck and enjoy the task!

C3. Week 3

+++ Week 3 +++

Dear Participant,

The last week of participating in our study 'Does coloring mandalas increase your well-being' is due!

Hereby, you get the the mandalas for week number 3.

You can find them by using the following link:

https://drive.google.com/file/d/1PtQWQrpUGq92oVIiFRBWQkF7F_glpzvy/view?usp=share_link

Print it, look for a quiet environment without distractions and start coloring!

Again:Try to focus as good as possible on the task, without interruptions. At least, you should spend 15 minutes with coloring the mandala on paper. However, you can continue for sure until you are satisfied with the result. Next week, you will get two mandalas again for the second week.

At the end of this week, you will get the final Questionnaire about the study, that you have to fill in. Afterwards, we will assign you the credits!

 If you face any difficulties, please contact the researchers:

l.warda@student.utwente.nl

v.michalski@student.utwente.nl

Good luck and enjoy the task!
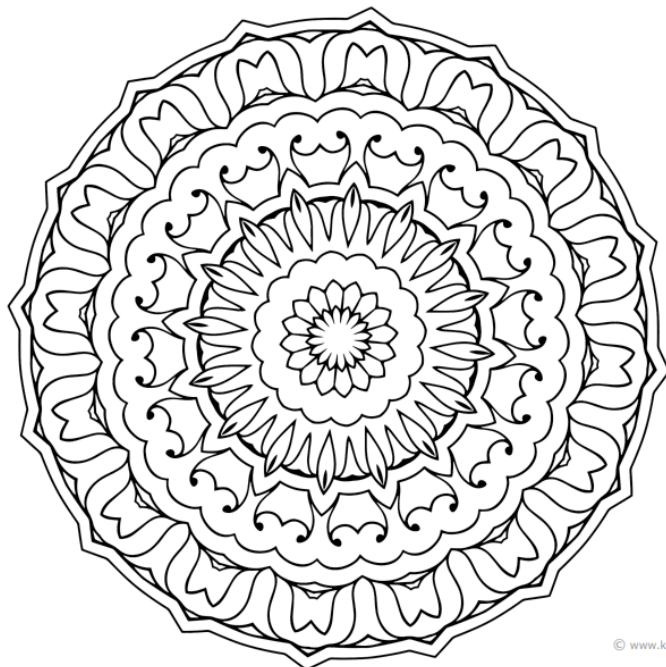
Appendix D

Mandalas

D1. Week 1
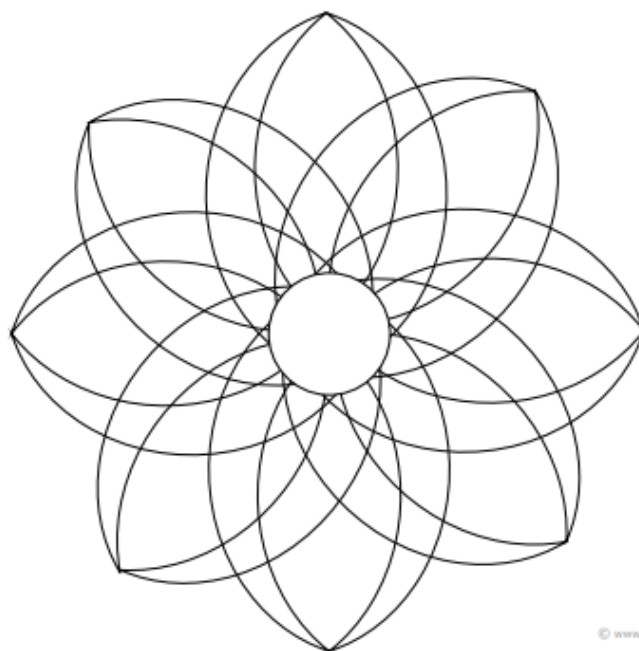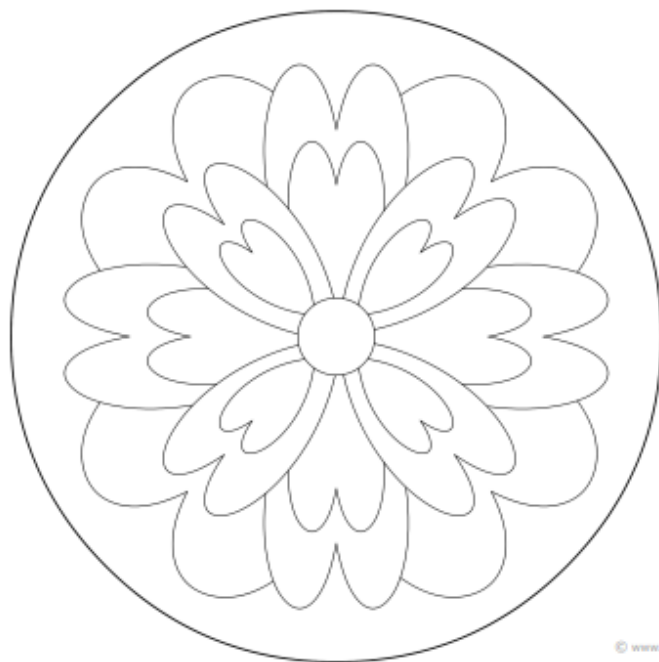
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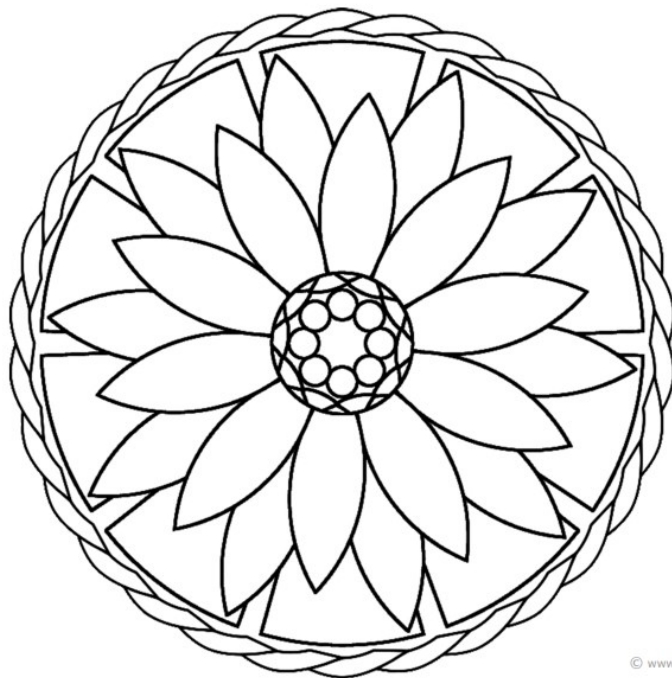
© www.kinder-malvorlagen.com
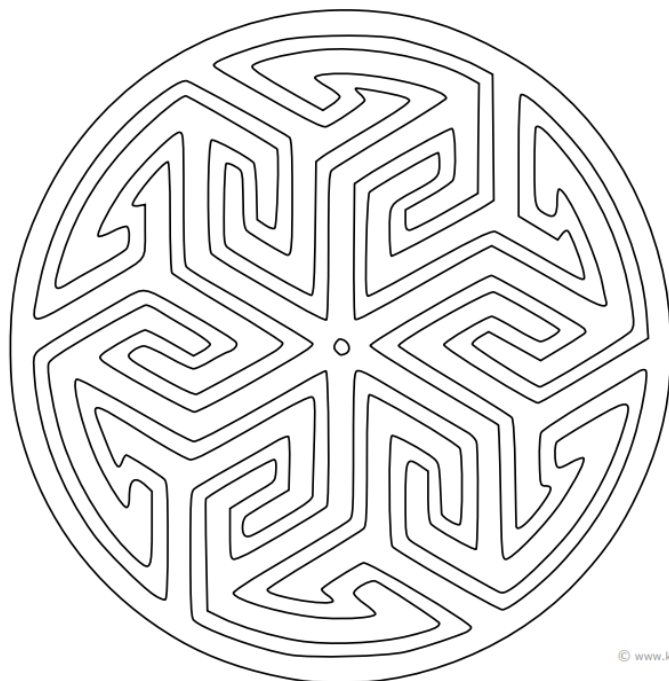
© www.kinder-malvorlagen.com

D3. Week 3
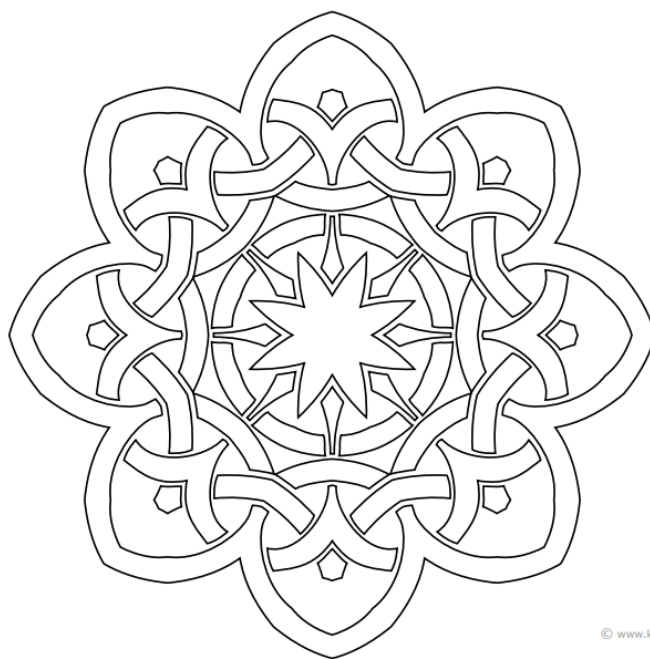
Appendix E

Transcription

Open_Questions

Textdokument, 68 Zitate

Q4: Did you experience any obstacles when coloring the mandalas and why?

1) No I didn't

2) No

3) Not really.

4) When I was in a hurry, it was very difficult to fully engage into the study. It was then more a task than a method for stress relief.

5) No

6) I had problems with my pencil

7) No

8) making time for it even if it was only 15 minutes. I can spend 15 min on Instagram as well without thinking if I can make time for it

9) No

10) no

Q5: What helped you in order to do the mandalas?

1) The thought that it would be an useful exercise for me to achieve personal growth

2) Used my iPad

3) I took time out of my week when I knew I had enough time to do them and use that as kind of a relaxation task.

4) I listened to music, found a quite environment, took myself enough time to color without having stress

5) The e-mail reminder

6) Silence

7) Taking 20 minutes and dedicating it to just that

8) Thinking of calming down deliberately and concentrate on something different than my studies when I was stucked at a point

9) I have used beautiful and colourful pencils

10) having enough pens

Q9: Please indicate what you liked about the intervention

1) Being able to perform it whenever I felt like it.

2) Colouring mandalas has something meditative.

3) I liked the fact that I could the mandelas to have a time-out from my responsibilities.

4) I enjoyed the process of coloring when I had enough time for the task. Then it was a way to calm down and to take a break of everyday life. I enjoyed choosing colors for the mandalas.

5) some time to slow down and do something while the mind can wander as it wants but still has a task in the background

6) Calm down

7) it was fun

8) Spending time without a screen and being creative. It's been a while since I have colored sth.

9) It was a challenge and I Love challenges

10) very calming for me - took way longer than expected each time but really helped me calm down

Q10: Please indicate what you did not like about the intervention

1) The mandalas could have been a little more different to eachother

2) Colouring over the lines angers me.

3) The last two mandelas were a bit too time-taxing.

4) the motivation behind coloring was because of the study and not because I want to color the mandalas. While coloring it was ok, but before it provoked stress because I had to color two mandalas in a week.

5) Nothing

6) That I knew I had to give them up at a certain point

7) nothing i can think off

8) Difficult to make time for it.

9) It was stressful and the level of difficulty was to high, the easy ones were More Stress-free

10) Nothing

Q14: In which way did you notice a change in your motivation throughout the study?

1) I felt more and more excited to start painting the mandalas

2) No change of motivation

3) That I noticed that they help me to take off my mind from daily stress.

4) I would not say there was a change of my motivation throughout the process. Rather when I was stressed, it was hard for me to engage in the task but when I had enough time planned for the activity, I enjoy it and could benefit from coloring.

5) it made me more aware of my feelings

6) I felt comfortable

7) /

8) I dont know

9) /

10) to take a break and do something stimulating

Q16: In which way did you notice a change in your mood throughout the study?

1) I felt a little bit less stressed

2) No change in mood because of mandalas

3) More motivation and relaxation.

4) I was a bit more relaxed and could reconnect with myself and my feelings.

5) calming and more attentive

6) Calm down

7) felt maybe more positive for 5 minutes after finishing the mandalas

8) Maybe that I felt better right after coloring

9) /

10) calmed means for me more energy

Q18: Why would you or would you not implement coloring mandalas in your daily life in the future?

1) I felt it was a great way to distress that I would also want to make use of in the future

2) I would like to implement it if I hadn't any other creative/meditative outlets for myself.

3) /

4) To little time and I enjoy others tasks in my free time for example exercising

5) it's easy and brings pleasure

6) It calms me

7) its fun but can be time consuming or I would forget about it

8) Actually I enjoyed coloring with different colors. I should do that more often

9) Maybe it is an option for Stressful weeks but I would choose easy ones

10) maybe not as much, but will definitely consider it as a method to take off my mind from stress

Q21: Do you have any additional notes about the intervention?

1) No I do not

4) I belief the study would benefit as part of a therapy. Then it would not have the character of a duty but as a fun activity.

10) very nice study

68 Zitate:

1:2 ¶ 3 in Open_Questions

1) No I didn't

1:3 ¶ 4 in Open_Questions

2) No

1:4 ¶ 5 in Open_Questions

3) Not really.

1:5 ¶ 7 in Open_Questions

5) No

1:6 ¶ 9 in Open_Questions

7) No

1:7 ¶ 11 in Open_Questions

9) No

1:8 ¶ 12 in Open_Questions

10) no

1:9 ¶ 6 in Open_Questions

4) When I was in a hurry, it was very difficult to fully engage into the study. It was then more a task than a method for stress relief.

1:10 ¶ 10 in Open_Questions

8) making time for it even if it was only 15 minutes. I can spend 15 min on Instagram as well without thinking if I can make time for it

1:11 ¶ 24 in Open_Questions

10) having enough pens

1:12 ¶ 23 in Open_Questions

9) I have used beautiful and colourful pencils

1:13 ¶ 36 in Open_Questions

10) very calming for me - took way longer than expected each time but really helped me calm down

1:14 ¶ 32 in Open_Questions

6) Calm down

1:15 ¶ 28 in Open_Questions

2) Colouring mandalas has something meditative.

1:16 ¶ 30 in Open_Questions

4) I enjoyed the process of coloring when I had enough time for the task. Then it was a way to calm down

1:17 ¶ 29 in Open_Questions

3) I liked the fact that I could the mandelas to have a time-out from my responsibilities.

1:18 ¶ 30 in Open_Questions

take a break of everyday life.

1:19 ¶ 34 in Open_Questions

8) Spending time without a screen and being creative. It's been a while since I have colored sth.

1:20 ¶ 30 in Open_Questions

I enjoyed choosing colors for the mandalas.

1:21 ¶ 31 in Open_Questions

5) some time to slow down and do something while the mind can wander as it wants but still has a task in the background

1:22 ¶ 27 in Open_Questions

1) Being able to perform it whenever I felt like it.

1:23 ¶ 43 in Open_Questions

5) Nothing

1:24 ¶ 45 in Open_Questions

7) nothing i can think off

1:26 ¶ 48 in Open_Questions

10) Nothing

1:27 ¶ 46 in Open_Questions

8) Difficult to make time for it.

1:28 ¶ 41 in Open_Questions

3) The last two mandelas were a bit too time-taxing.

1:30 ¶ 42 in Open_Questions

While coloring it was ok, but before it provoked stress because I had to color two mandalas in a week.

1:31 ¶ 39 in Open_Questions

1) The mandalas could have been a little more different to eachother

1:32 ¶ 42 in Open_Questions

the motivation behind coloring was because of the study and not because I want to color the mandalas

1:33 ¶ 47 in Open_Questions

9) It was stressful

1:35 ¶ 47 in Open_Questions

the level of difficulty was to high, the easy ones were More Stress-free

1:36 ¶ 59 in Open_Questions

9) /

1:37 ¶ 58 in Open_Questions

8) I dont know

1:38 ¶ 57 in Open_Questions

7) /

1:39 ¶ 52 in Open_Questions

2) No change of motivation

1:40 ¶ 54 in Open_Questions

4) I would not say there was a change of my motivation throughout the process.

1:41 ¶ 53 in Open_Questions

3) That I noticed that they help me to take off my mind from daily stress.

1:42 ¶ 55 in Open_Questions

5) it made me more aware of my feelings

1:43 ¶ 51 in Open_Questions

1) I felt more and more excited to start painting the mandalas

1:44 ¶ 60 in Open_Questions

10) to take a break and do something stimulating

1:46 ¶ 64 in Open_Questions

2) No change in mood because of mandalas

1:47 ¶ 71 in Open_Questions

9) /

1:50 ¶ 66 in Open_Questions

could reconnect with myself and my feelings

1:51 ¶ 65 in Open_Questions

3) More motivation

1:52 ¶ 65 in Open_Questions

relaxation.

1:53 ¶ 66 in Open_Questions

4) I was a bit more relaxed

1:54 ¶ 68 in Open_Questions

6) Calm down

1:55 ¶ 67 in Open_Questions

calming

1:56 ¶ 67 in Open_Questions

more attentive

1:57 ¶ 63 in Open_Questions

1) I felt a little bit less stressed

1:58 ¶ 69 in Open_Questions

7) felt maybe more positive for 5 minutes after finishing the mandalas

1:59 ¶ 70 in Open_Questions

8) Maybe that I felt better right after coloring

1:60 ¶ 75 in Open_Questions

1) I felt it was a great way to distress that I would also want to make use of in the future

1:62 ¶ 82 in Open_Questions

8) Actually I enjoyed coloring with different colors. I should do that more often

1:63 ¶ 78 in Open_Questions

4) To little time and I enjoy others tasks in my free time for example exercising

1:64 ¶ 81 in Open_Questions

7) its fun but can be time consuming or I would forget about it

1:65 ¶ 80 in Open_Questions

6) It calms me

1:66 ¶ 76 in Open_Questions

2) I would like to implement it if I hadn't any other creative/meditative outlets for myself.

1:67 ¶ 79 in Open_Questions

5) it's easy and brings pleasure

1:68 ¶ 83 in Open_Questions

9) Maybe it is an option for Stressful weeks but I would choose easy ones

1:69 ¶ 84 in Open_Questions

10) maybe not as much, but will definitely consider it as a method to take off my mind from stress

1:70 ¶ 17 in Open_Questions

3) I took time out of my week when I knew I had enough time to do them and use that as kind of a relaxation task.

1:71 ¶ 18 in Open_Questions

4) I listened to music, found a quite environment, took myself enough time to color without having stress

1:72 ¶ 20 in Open_Questions

6) Silence

1:73 ¶ 18 in Open_Questions

found a quite environmen

1:74 ¶ 22 in Open_Questions

8) Thinking of calming down deliberately and concentrate on something different than my studies when I was stucked at a point

1:75 ¶ 21 in Open_Questions

7) Taking 20 minutes and dedicating it to just that

1:76 ¶ 15 in Open_Questions

1) The thought that it would be an useful exercise for me to achieve personal growth

33 Kodes:

- **being creative**

  2 Zitate:

  1:19 ¶ 34, 8) Spending time without a screen and being creative. It's been a whil… in Open_Questions / 1:20 ¶ 30, I enjoyed choosing colors for the mandalas. in Open_Questions

- **break from daily responsibilities**

  2 Zitate:

  1:17 ¶ 29, 3) I liked the fact that I could the mandelas to have a time-out from… in Open_Questions / 1:18 ¶ 30, take a break of everyday life. in Open_Questions

- **calming down**

  5 Zitate:

  1:13 ¶ 36, 10) very calming for me - took way longer than expected each time but… in Open_Questions / 1:14 ¶ 32, 6) Calm down in Open_Questions / 1:15 ¶ 28, 2) Colouring mandalas has something meditative. in Open_Questions / 1:16 ¶ 30, 4) I enjoyed the process of coloring when I had enough time for the ta… in Open_Questions / 1:21 ¶ 31, 5) some time to slow down and do something while the mind can wander a… in Open_Questions

- **creativity**

  2 Zitate:

  1:11 ¶ 24, 10) having enough pens in Open_Questions / 1:12 ¶ 23, 9) I have used beautiful and colourful pencils in Open_Questions

- **decrease in stress**

  1 Zitate:

1:57 ¶ 63, 1) I felt a little bit less stressed in Open_Questions

● **design**

  3 Zitate:

1:28 ¶ 41, 3) The last two mandelas were a bit too time-taxing. in Open_Questions / 1:31 ¶ 39, 1) The mandalas could have been a little more different to eachother in Open_Questions / 1:35 ¶ 47, the level of difficulty was to high, the easy ones were More Stress-fr… in Open_Questions

● **external motivation**

  1 Zitate:

1:32 ¶ 42, the motivation behind coloring was because of the study and not becaus… in Open_Questions

● **focus**

  1 Zitate:

1:75 ¶ 21, 7) Taking 20 minutes and dedicating it to just that in Open_Questions

● **freedom of choice**

  1 Zitate:

1:22 ¶ 27, 1) Being able to perform it whenever I felt like it. in Open_Questions

● **increase in motivation**

  1 Zitate:

1:43 ¶ 51, 1) I felt more and more excited to start painting the mandalas in Open_Questions

● **increased attentiveness**

  1 Zitate:

1:56 ¶ 67, more attentive in Open_Questions

● **increased awareness of feelings**

  1 Zitate:

1:50 ¶ 66, could reconnect with myself and my feelings in Open_Questions

● **increased motivation Q16**

  1 Zitate:

1:51 ¶ 65, 3) More motivation in Open_Questions

● **increased positive feeling**

2 Zitate:

1:58 ¶ 69, 7) felt maybe more positive for 5 minutes after finishing the mandalas in Open_Questions / 1:59 ¶ 70, 8) Maybe that I felt better right after coloring in Open_Questions

● **increased relaxation**

4 Zitate:

1:52 ¶ 65, relaxation. in Open_Questions / 1:53 ¶ 66, 4) I was a bit more relaxed in Open_Questions / 1:54 ¶ 68, 6) Calm down in Open_Questions / 1:55 ¶ 67, calming in Open_Questions

● **MAYBE**

2 Zitate:

1:68 ¶ 83, 9) Maybe it is an option for Stressful weeks but I would choose easy o… in Open_Questions / 1:69 ¶ 84, 10) maybe not as much, but will definitely consider it as a method to… in Open_Questions

● **more aware of feelings**

1 Zitate:

1:42 ¶ 55, 5) it made me more aware of my feelings in Open_Questions

● **NO**

1 Zitate:

1:64 ¶ 81, 7) its fun but can be time consuming or I would forget about it in Open_Questions

● **no change**

5 Zitate:

1:36 ¶ 59, 9) / in Open_Questions / 1:37 ¶ 58, 8) I dont know in Open_Questions / 1:38 ¶ 57, 7) / in Open_Questions / 1:39 ¶ 52, 2) No change of motivation in Open_Questions / 1:40 ¶ 54, 4) I would not say there was a change of my motivation throughout the… in Open_Questions

● **no change Q16**

2 Zitate:

1:46 ¶ 64, 2) No change in mood because of mandalas in Open_Questions / 1:47 ¶ 71, 9) / in Open_Questions

- **no dislike**

  3 Zitate:

  1:23 ¶ 43, 5) Nothing in Open_Questions / 1:24 ¶ 45, 7) nothing i can think off in Open_Questions / 1:26 ¶ 48, 10) Nothing in Open_Questions

- **no problems**

  7 Zitate:

  1:2 ¶ 3, 1) No I didn't in Open_Questions / 1:3 ¶ 4, 2) No in Open_Questions / 1:4 ¶ 5, 3) Not really. in Open_Questions / 1:5 ¶ 7, 5) No in Open_Questions / 1:6 ¶ 9, 7) No in Open_Questions / 1:7 ¶ 11, 9) No in Open_Questions / 1:8 ¶ 12, 10) no in Open_Questions

- **NO: other activities**

  2 Zitate:

  1:63 ¶ 78, 4) To little time and I enjoy others tasks in my free time for example… in Open_Questions / 1:66 ¶ 76, 2) I would like to implement it if I hadn't any other creative/meditat… in Open_Questions

- **personal growth**

  1 Zitate:

  1:76 ¶ 15, 1) The thought that it would be an useful exercise for me to achieve p… in Open_Questions

- **reduced stress**

  2 Zitate:

  1:41 ¶ 53, 3) That I noticed that they help me to take off my mind from daily str… in Open_Questions / 1:44 ¶ 60, 10) to take a break and do something stimulating in Open_Questions

- **relaxation**

  3 Zitate:

  1:70 ¶ 17, 3) I took time out of my week when I knew I had enough time to do them… in Open_Questions / 1:71 ¶ 18, 4) I listened to music, found a quite environment, took myself enough… in Open_Questions / 1:74 ¶ 22, 8) Thinking of calming down deliberately and concentrate on something… in Open_Questions

- **silence**

2 Zitate:

1:72 ¶ 20, 6) Silence in Open_Questions / 1:73 ¶ 18, found a quite environmen in Open_Questions

● **time-constrains Q10**

4 Zitate:

1:27 ¶ 46, 8) Difficult to make time for it. in Open_Questions / 1:28 ¶ 41, 3) The last two mandelas were a bit too time-taxing. in Open_Questions / 1:30 ¶ 42, While coloring it was ok, but before it provoked stress because I had… in Open_Questions / 1:33 ¶ 47, 9) It was stressful in Open_Questions

● **time-constraints**

2 Zitate:

1:9 ¶ 6, 4) When I was in a hurry, it was very difficult to fully engage into t… in Open_Questions / 1:10 ¶ 10, 8) making time for it even if it was only 15 minutes. I can spend 15 m… in Open_Questions

● **yes**

1 Zitate:

1:67 ¶ 79, 5) it's easy and brings pleasure in Open_Questions

● **YES: creativity**

1 Zitate:

1:62 ¶ 82, 8) Actually I enjoyed coloring with different colors. I should do that… in Open_Questions

● **YES: decreased stress**

1 Zitate:

1:60 ¶ 75, 1) I felt it was a great way to distress that I would also want to mak… in Open_Questions

● **YES: relaxation**

1 Zitate:

1:65 ¶ 80, 6) It calms me in Open_Questions