

EFFECTS OF GRATITUDE

Bachelor Thesis:

The effectiveness of a gratitude app on gratitude, well-being and self-esteem and adherence behaviour of university students in times of Covid-19

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Abstract

Background: The mental health of young adults has decreased during the Covid-19 pandemic crisis which can have many negative implications for their lives. Positive psychology interventions, namely the practice of gratitude, have shown to be effective in increasing the well-being and self-esteem of individuals. Despite most of these gratitude interventions being conducted paper-based, online interventions grant additional advantages. Therefore, this study aims to investigate the effectiveness of an app-based gratitude intervention on the feelings of gratitude, well-being and self-esteem of university students, assess their adherence and its relation to the outcome measures.

Methods: This study was a pilot-test with a quasi-experimental pretest-posttest design. A questionnaire measured well-being, self-esteem and gratitude of 29 university students at baseline (T0) and after following a 3-week app-based gratitude intervention (T1) from 23 university students. Participants were provided with an app containing evidence-based gratitude exercises and explanation videos, which were completed individually. A paired-sample t-test on the outcome measures of T0 and T1 was used to measure whether they differed significantly. Descriptive statistics were used to assess the adherence behaviour and feedback was inquired on the reason they were unable to finish the intervention. Further, Pearson's correlations were computed on the usage time of the intervention and change scores of the outcome measures, to examine whether there is an association between these two variables

Results: The results showed a significant difference between the means of T0 and T1 on well-being with a medium effect size, as well as for grateful mood. However, no significant difference was found between the mean on T0 and T1 for self-esteem and grateful mood. Further, three-quarters of the participants used the intervention at least five days per week. Lastly, Pearson's correlation showed no significant relationship between usage time of the intervention and change scores of the outcome measures.

Conclusion: The online-based gratitude intervention showed to be effective on the well-being and grateful mood but not on dispositional gratitude and self-esteem of the participants, while participant adherence was greater than unguided interventions seen in literature. The length of the intervention, the things people attribute gratitude and other influencing factors are discussed as possible reasons for the findings. Based on the current study a way to increase the adherence is to shorten the exercises and address participants they will not experience direct effects. Lastly, the gratitude intervention could be used by healthy students as a

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preventative resource by supporting them in gaining resilience and overcoming adverse events.

Keywords: Gratitude, Well-being, Self-esteem, Grateful mood, App

Introduction

Over the last decade, the number of young adults (ages 18-26) struggling with a poor psychological well-being have considerably increased, and this has even shown to be one of the most critical chronic health problems among this age group (Lindstrom & Mohseni, 2009; Richter Wall, 2019; Twenge & Martin, 2018). Especially the current Covid-19 pandemic, where youngsters are limited in their social- and physical freedom, had a substantial negative impact on students' overall well-being, leading to lower life expectancy, poorer physical health and life satisfaction (Fergusson et al, 2015; Cullen, Gulati, & Kelly, 2020; Shen & Sosa, 2020). This uncertain situation has raised anxiety, stress and depressive symptoms among students, leading to poorer academic achievements (Arima et al., 2020). One way to help diminish these negative health implications is the use of positive psychological interventions, aiming to enhance positive emotions and feelings within individuals, as opposed to traditional interventions, which attempt to minimize symptoms or problems (Sin & Lyubomirsky, 2009). Positive psychological intervention, such as counting one's blessings and practicing gratitude, have been shown to be effective in enhancing well-being (Lin, 2019). Another preventative factor that could enhance well-being is having high self-esteem (Arima et al., 2020; Robins, Davis, & Roberts, 2008). Therefore, this research examines the effectiveness of a gratitude application on the feelings of gratitude, well-being and self-esteem of university students.

The positive psychological intervention of the practice of gratitude can have many positive effects on one's mental health. Gratitude is defined as "the appreciation of what is valuable and meaningful to oneself and represents a general state of thankfulness and/or appreciation" (Sansone & Sansone, 2010, p. 18). The feeling of gratitude can be attributed to receiving a benefit from someone else, however, it can also be attributed to experiences (e.g. the sun or being alive) (Sansone & Sansone, 2010). Gratitude can be conceptualised as a disposition, being more stable over time or as a mood, since it can fluctuate between points in time (Nezlek, Newman, & Thrash, 2017). Following the broaden-and-build theory by Frederickson (1998), one's attention, thoughts and actions can be expanded through positive

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emotions, such as feelings of gratitude. In turn, this can help individuals build personal resources, like gaining resilience, dealing with adversity and increasing well-being (Fredrickson & Kurtz, 2011). Within a gratitude intervention, participants are usually asked to perform gratitude exercises (e.g. listing things one is grateful for) in order to increase their awareness of experiences connected to this emotion (Sztachańska, Krejtz, & Nezlek, 2019). Moreover, research has reported a positive relationship between gratitude and several other outcomes, specifically, life satisfaction, optimism, happiness, hope, well-being and self-esteem (Işık & Ergüner-Tekinalp, 2017; Lin, 2019). In this way, the practice of gratitude can help students overcome challenges and support them in enhancing their well-being.

Gratitude has also been shown to increase self-esteem. Self-esteem is defined as the evaluation an individual has of their own value or worth (Pepping, O'Donovan, & Davis, 2013). According to the moral affect theory, individuals who are high in gratitude develop a greater self-esteem and self-worth than individuals who are low in self-esteem (McCullough, Emmons, Kilpatrick, Larson, 2001). This is because individuals who are focused on receiving benefits from others will evaluate themselves more positively in contrast to individuals who are more negative about the potential evaluation others might have of them (Barlett, Valdesolo, & Arpin, 2020). Additionally, a high self-esteem may positively influence the promotion of mental well-being and protect individuals against depression and anxiety (Greenberg, et al. 1992; Lin, 2015). Therefore, gratitude could increase well-being through the development of higher self-esteem.

There are two main traditions used to describe well-being. The hedonic tradition describes well-being as happiness and is concerned with 'feeling good' (Diener, et al., 1999). An individual will experience this feeling when there is a balance between positive and negative affect and has a high life satisfaction. The eudaimonic tradition conceptualises well-being as 'living well', where one has the feeling of living a life of meaning and is realising his or her potential (Deci & Ryan 2000). Therefore, a complete definition of mental well-being encompasses both the hedonic ('feeling good') and eudaimonic tradition ('living well') (Keyes, 2002).

Gratitude interventions have been found to be effective on well-being, self-esteem and feelings of gratitude. For instance, a meta-analysis by Dickens (2017) found that gratitude interventions have a positive effect on well-being, dispositional gratitude and one's grateful mood. Further, a 6-week gratitude intervention which compared a gratitude intervention with adults to a control group, showed an effect on well-being, dispositional gratitude, and grateful mood as well. However, this gratitude intervention even confirmed long-term effects by

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showing that the effects lasted up to six months (Bolmeijer, Kraiss, Watkins, & Schotanus-Dijkstra 2020). Furthermore, several other studies conducting a gratitude intervention including students found a positive effect on their mental well-being, self-esteem, and dispositional gratitude while also improving their academic performance (Işık & Ergüner-Tekinalp, 2017; Lee, 2017; Lin, 2015; Nezlek et al., 2017; Rash et al., 2011).

However, there is also contrasting empirical data that does not support the effectiveness of gratitude interventions in students. For example, the meta-analysis by Dickens (2017), which did find an effect of gratitude interventions on well-being and gratitude feelings did not find such an effect on self-esteem. Additionally, another meta-analysis which included young adults, did not find an effect of gratitude interventions on well-being and gratitude feelings (Davis et al., 2016). Due to the divergent findings regarding the effectiveness of the gratitude intervention, ambiguity remains about whether these are truly beneficial for one's mental health or not. This ambiguity may be caused by the difference in duration of the interventions, with some interventions being conducted for only one or two weeks (Nezlek et al., 2015) whereas others lasted over 12 weeks (Lee, 2017). Further, the amount and content of the exercises differs across the interventions, within some interventions individuals only have to write a gratitude letter or list things they are grateful for (Davis et al., 2016; Nawa, Yamagashi, 2021), while other interventions ask individuals to journal daily or use more intensive exercises (Işık & Ergüner-Tekinalp, 2017).

Most of the above described gratitude interventions were conducted paper-based, and so, it is unclear whether the positive effects of such interventions can be yielded within an online-based intervention as well. However, online-based interventions do grant additional advantages, online interventions can be highly persuasive and engaging as they are able to remind participants of their participation (Bolier & Abello, 2014). Moreover, online-based interventions are usually cost-effective, easy to access and able to reach a broad scope of diverse participants (Beatty & Binnion, 2016). Further, young adults are familiar with technology, feel comfortable with it and, almost all, possess a smartphone, tablet or computer which will make it easy and beneficial for this group to use an online intervention (Benavides & Bono 2019). Therefore, although an online intervention seems to be beneficial, its effectiveness needs to be investigated before it can be implemented.

However, young adults find it difficult to adhere to online interventions. The exercises within the online interventions require commitment from the participants and need to be planned and conducted by the participants themselves, without direct supervision. Therefore, the adherence rate, which is the total number of participants who follow the recommended

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usage of the intervention, such as completing all exercises or using the intervention a certain amount of time per week, might be affected (Beatty & Binnion, 2016). Regarding online interventions for depression, a meta-analysis showed that the average adherence was approximately 72% when there was some guidance, in contrast to 25% when there is no guidance (Richards & Richardson, 2012). The difficulty in adherence has also been shown by several other studies, which observe that students find it difficult to adhere to a self-guided positive psychological or even gratitude intervention (Didgdon & Koble, 2011; Gutierrez et al., 2020; Neil, et al., 2009). Further research has shown that increased time spent on a health-related intervention significantly increased its outcome measures while low adherence has been found to diminish the possible effect (Carson et al. 2005; Fuhr et al., 2018; Shapiro et al., 2008;). Therefore, it is fruitful to conduct a pilot study in order to assess the feasibility of an online intervention and gain insight into the adherence behaviour of the participants. Assessing their adherence to an online intervention could potentially help identify ways to increase this, by evaluating feedback of participants regarding their difficulties with adherence, possibly improving future online intervention.

The aim of this study is to investigate the feasibility of a 6-week gratitude intervention through a pilot study. Therefore, this study will assess the effectiveness of a 3-week app-based gratitude intervention on students' mental well-being, self-esteem, dispositional gratitude, and grateful mood. Further, this study will investigate the adherence of the participants to the recommendation of using the online intervention at least five days per week. Additionally, the participants will be asked to provide feedback regarding their difficulties with adherence to the online intervention. Lastly, this study will examine whether there is a relationship with usage time of the intervention and the outcome measures. When the intervention is completed, points of improvement can be noted and used for future interventions and can be tested on a larger scale, to support students in enhancing their well-being and self-esteem by focusing on positive aspects of their lives. This leads to the following research questions: "What is the effectiveness of the daily practice of gratitude by the use of an app on university students' gratitude, well-being and self-esteem?", "How well do the participants adhere to the recommendation of using the intervention at least five days per week and what difficulties are experienced with this?" and "To what extent does a relationship between usage time of the intervention and the outcome measures exist?" It is hypothesized that:

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Hypothesis 1: A 3-week app-based gratitude intervention increases the well-being of university students.

Hypothesis 2: A 3-week app-based gratitude intervention increases the self-esteem of university students.

Hypothesis 3: 25% of the participants adhere to the recommendation of using the intervention at least five days per week.

Hypothesis 4: There is a positive relationship between usage time of the intervention and the outcome measures.

Method

Design

The study conducted a pilot-test using a quasi-experimental pretest-posttest design, by conducting two online questionnaires amongst one group of university students who performed a 3-week app-based gratitude intervention. Assessment took place before the participants started with the intervention (T0) and approximately three weeks later when the participants completed the intervention (T1), to measure the effectiveness of the gratitude intervention on the students' mental well-being, self-esteem, dispositional gratitude and gratitude mood. The research was approved by the BMS faculty of the university of Twente with request number 210214.

Participants

In order to take part in the intervention the participants had to meet several inclusion criteria, they needed to be students from the university of Twente and be able to understand the Dutch language. Further, participants needed to possess a smartphone or tablet to download the app, a valid email address, and sufficient access to the internet. Lastly, participants needed to be willing and motivated to work with the intervention for three weeks.

This study comprised a convenience sample of 29 undergraduate students from the university of Twente. There were four individuals who did fill out T1 and two individuals who started but did not complete T1. Therefore, the final sample consisted out of 23 participants with an age range between 18 and 27 (see Table 1). The mean age of the participants was higher for T0 (M=21.5, SD=2.6) than for T1 (M=20.8, SD=2.2). Further, the majority of the participants were female, finished their preparatory academic education, and studied psychology. Lastly,, more than half of the participants were in the first year of their bachelor, lived with their parents or with others and have never been married.

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Table 1*Demographics of T0 and T1*

	T0	T1
Number of participants (n)	29	23
Age, M (SD)	21.5(2.6)	20.8(2.2)
Gender, n(%)		
Male	7(24.1)	5(21.7)
Female	22(75.9)	18(78.3)
Educational level, n (%)		
General secondary education	2(6.9)	1(4.3)
Preparatory academic education	16(55.2)	16(69.6)
Higher professional education	6(20.7)	4(17.4)
University	5(17.2)	2(8.7)
Study Course (%)		
Psychology	21(72.4)	19(82.6)
Health Sciences	5(17.2)	1(4.3)
Other	3(10.4)	3(13.0)
Study year, n(%)		
First year bachelor	13(44.8)	13(56.5)
Second year bachelor	2(6.9)	2(8.7)
Third year bachelor	5(17.2)	4(17.4)
First year master	9(31.0)	4(17.4)
Living situation, n (%)		
Alone	1(3.4)	1(4.3)
Living with partner	2(6.9)	0(0)
With parents	13(44.8)	11(47.8)
With others	13(44.8)	11(47.8)
Marital Status, n (%)		
Never been married	29(100)	23(100)

Procedure

An information website from the University of Twente and Sona systems was used in order to advertise the study and recruit participants. After the participants read what was expected from them on the information platform, they chose to participate voluntarily and were provided with the link to access the online baseline questionnaire. They were asked to fill in their name and email address and gave consent through an opt-in method in order to participate. Next, the survey showed seven demographic questions and asked the participants

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about their mental wellbeing, self-esteem and gratitude feelings. The survey took around 15 minutes to complete and the data of the participants were pseudonymized and safely stored.

Shortly after the participants finished the questionnaire they were sent an online letter, containing the manual on how to download the app, a personal code to login into the app and make an account and information needed to start with the intervention. Participants were asked to download the app as soon as possible after they received the email and with a maximum of three days and were encouraged to explore the app and start with the first gratitude exercise. The participants only covered half of the intervention, since this is a pilot study for the original six-week gratitude intervention.

After the participants finished the 3-week intervention they were sent the post-test questionnaire via email. The participants filled in the final questionnaire which included questions about the respondents' mental wellbeing, self-esteem, gratitude feelings and five questions about the adherence of the participants to the intervention. Since this research is part of a bigger study, the questionnaire included additional questions about the usability, self-reported effectiveness and satisfaction with the app and potential feedback. This survey took around 15 minutes to complete.

Materials

Intervention

The exercises of the gratitude app “Zo erg nog niet” (ZENN) were developed out of evidence-based exercises from research of Bohlmeijer et al. (2020), who after their research created the application which could be used on a smartphone or tablet. The app consisted of six modules, which each cover different themes such as appreciating simple everyday things and a focus on the meaning other people have in one's life. The app keeps track of the participants' progress by colouring a petal of a sunflower each time an exercise was completed. The modules started with an introductory video, a written explanation and was followed by the exercise to be completed. An example of an exercise is: “Where are you grateful for? What exactly happened that made you feel grateful? and “Why do you feel grateful? What does this mean to you?” The participants were asked to keep an online or written diary. The exercises needed to be completed five days a week over a period of three weeks and were estimated to take around 10-15 minutes to complete. People could receive tips on the exercises and on their experience with it. Further, the users received a quote each day they opened the app for the first time in order to inspire them, they could pin the quote and save it or go discard the quote and go to the exercises. Lastly, the participants could

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upload photos of things they felt grateful for and were sent a notification every day to remind them to complete the exercises.

Mental Wellbeing

In order to measure the mental well-being of the participants, the 14-item Dutch version of the Mental Health Continuum-Short Form (MHC-SF) was used (Keyes, 2009). The questionnaire comprised the dimensions of emotional well-being (3 items, e.g., ‘During the past month, how often did you feel happy?’), social well-being (5 items, e.g., ‘During the past month, how often did you feel that you had something important to contribute to society?’) and psychological well-being (6 items, e.g., ‘During the past month, how often did you feel that you liked most parts of your personality?’). Participants rated each item on a 6-point Likert scale from 0 (never) to 5 (everyday). The mean score on the scale was computed, with higher mean scores indicating a higher level of well-being (Keyes, 2009). The scale reported a high internal reliability ($\alpha = 0.89$) and a good convergent and discriminant validity (Lamers et al., 2010). In the current sample the scale has a good reliability of 0.81.

Self-esteem

Self-esteem was measured using the 10-item Rosenberg Self-esteem Scale (RSE; Rosenberg, 1965). The scale assessed the self-worth of the participants by incorporating both negative (5 items, e.g., ‘At times I think I am no good at all’) and positive (5 items, e.g., ‘On the whole, I am satisfied with myself’) questions about the participants’ feelings about themselves. Participants rated each item on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The mean score on the scale was computed, with higher scores indicating higher self-esteem (Rosenberg 1965). The Scale showed a high reliability ($\alpha=0.92$) and good construct validity (Rosenberg, 1965). In the current sample the scale has a good reliability of 0.88.

Gratitude

Gratitude was measured using the 6-item gratitude questionnaire (GQ-6) which measured the participants’ inclination to experience gratitude in their daily lives (McCullough, Emmons, & Tsang, 2001). The scale measured four facets, namely, intensity (e.g. ‘I have so much in life to be thankful for’), frequency (e.g. ‘Long amounts of time can go by before I feel grateful to something or someone’), span (e.g. ‘As I get older, I find myself more able to appreciate the people, events and situations that have been part of my life history’) and density or the

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number of people an individual feels grateful for (e.g. ‘I am grateful to a wide variety of people’). Participants rated each item on a 7-point likert scale from 1 (strongly disagree) to 7 (strongly agree). The mean score on the scale was computed, with higher scores indicating higher levels of gratitude (McCullough, Emmons, & Tsang, 2001). The scores could range from 6 to 42, with higher scores indicating greater dispositional gratitude. The scale showed a good reliability ($\alpha = 0.82$) (McCullough & Emmons, 2002). In the current sample the scale has a good reliability of 0.82.

Grateful mood

To measure the grateful mood of the participants, four questions (e.g. ‘In the past 24 hours I felt grateful’) were used (Bohlmeijer et al., 2020). The questions were answered on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The mean scores on the scale were calculated, with higher scores demonstrating greater levels of grateful mood. A Cronbach’s alpha of 0.83 was reported, indicating good reliability (Bohlmeijer et al., 2020). In the current sample the scale has a good reliability of 0.81.

Adherence

To measure the adherence of the participants towards the performance of the gratitude exercises participants were asked about their weekly and daily adherence to the app. The participants received four questions and were asked to select how many days, on average, per week they used the app (0 days to 7 days per week), how many minutes, on average, per day they spent on the app (less than 5 minutes to 20 or more minutes), whether they forgot one or more times during the intervention to perform the (an) exercise(s) and which parts of the intervention they finished (no parts to six parts). When the participants finished only one or two parts of the intervention they were asked an additional question: “You indicated you were not able to finish all the parts, could you elaborate on what limited you to do this?” The five questions were assessed separately and ultimately adherence was defined as using the app at least 5 days per week over the three weeks of the intervention. Using the app five days a week was recommended to the participants, since this might be enough to measure the desired effect. The time individuals spent on the exercises was not included in the assessment of adherence, since the prescribed time of 10 to 15 minutes was an estimated time. Some participants might take less time to finish the exercises in comparison to other participants, making it less of an indication about their adherence, since participants who are quicker would have been considered as ‘non-adherent’.

Data Analysis

All analyses were performed in SPSS 24.0 (IBM SPSS statistics), and the alpha level was set at .05. The data of six participants were missing on one or more individual items on the measurement of well-being and self-esteem on T1 and were excluded from the analysis.

The descriptive statistics on the outcome measurements of well-being, self-esteem, dispositional gratitude and grateful mood were provided for both T0 and T1. Further, the assumptions were tested (Normality) to see whether valid inferences from the population can be drawn. Next, the descriptive statistics on the questions regarding the adherence of the respondents to the intervention were described. However, the mean and standard deviation of the minutes spent on the app per day were not computed, since these were measured on a continuous scale. This was not done for parts finished either, since the participants could choose multiple answers on this question. Adherence was defined as reporting using the app at least five days a week. Lastly, the feedback of six participants on why they were unable to finish the three parts of the intervention were analysed. The analysis was done on six feedback quotes from the participants and were transcribed to Excel. An inductive approach was used in order to create the codes based upon the feedback quotes. A coding scheme was created by analyzing each quote separately and each quote was compared to previously generated codes in order to identify similarities and differences. After analysing all the feedback quotes, codes that were similar were grouped into a category and key themes were identified. Ultimately, five codes were identified (see Appendix).

A dependent sample t-test was performed on the mean scores of well-being, self-esteem, dispositional gratitude and grateful mood of T0 and T1 to see whether there is a significant difference between the scores before and after the intervention of the same sample group. Further, Cohen's d was computed on significant findings of the outcome measures to assess the effect sizes, with Cohen's d .20 as small, .50 as medium and .80 as large (Cohen, 1969). Lastly, eight bivariate Pearson's correlations were performed to assess the strength of the linear relationship between the independent variable of adherence to the intervention and the dependent variable of change scores between T0 and T1 on the outcome measures of wellbeing, self-esteem, dispositional gratitude and gratitude mood. Correlations were defined as 0 - .10 a negligible correlation, .10 - .39 a weak correlation, .40 - .69 a moderate correlation .70 - .89 a strong correlation and .90 to 1 a very strong correlation (Schober, Boer, & Schwarte, 2018).

Results

Descriptive statistics

The descriptive statistics of the total scores on the outcome measurements of well-being, self-esteem, dispositional gratitude and grateful mood on T0 and T1 are presented in Table 2.

When looking at the mean total scores, the respondents showed greater than moderate levels of self-esteem, dispositional gratitude and grateful mood. Only the mean scores on well-being are less than moderate. Further, from Table 2 it can be seen that the average score on self-esteem between T0 and T1 has decreased whereas the levels of the participants' well-being, dispositional gratitude and grateful mood have increased.

Table 2

Scale, means(M), Standard deviation (SD), and raw change scores of the mean score for well-being, self-esteem, dispositional gratitude and grateful mood outcomes of the respondents (N= 23)

		T0	T1	
	Scale	M(SD)	M(SD)	Raw change scores
Wellbeing	0-5	2.42(.56)	3.25(.82)	.83
Self-esteem	1-4	2.71(.16)	2.69(2.30)	-.02
Dispositional Gratitude	1-7	4.76(.40)	4.99(.53)	.23
Grateful mood	1-7	4.68(1.28)	5.53(1.13)	.85

Main analyses

Firstly, it was hypothesized that the gratitude intervention would increase the well-being of university students. A dependent t-test revealed that there was a statistically significant difference in mean scores of the participants' well-being in T0 (M = 2.42, SD = .56) and T1 (M=3.25, SD = .82), $t(22) = -3.83$, $p = 0.001$. Further, a large effect size was found $d = -0.78$ (95% CI = -1.26 - -.38). This result suggests that the scores between T0 and T1 did

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significantly improve and that the gratitude intervention did have an effect on the well-being of the participants, meaning that the hypothesis is supported.

Secondly, it was hypothesized that the gratitude intervention would increase the self-esteem of university students. A dependent t-test revealed that there was no statistically significant difference in mean scores of the participants' self-esteem in T0 and T1, $t(22) = -.45$, $p = 0.660$. This result suggests that the scores between T0 and T1 did not significantly improve and that the gratitude intervention did not have an effect on the self-esteem of the participants, meaning that the hypothesis is rejected.

Effects on gratitude

Regarding the effect of the gratitude intervention on the respondents' experience of gratitude, a dependent t-test revealed that there was no statistically significant difference in mean scores of the participants' dispositional gratitude in T0 ($M = 4.76$, $SD = .40$) and T1 ($M = 4.99$, $SD = .53$), $t(22) = -1.47$, $p = 0.155$. This result suggests that the scores between T0 and T1 did not significantly improve and that the gratitude intervention did not have an effect on the well-being of the participants, meaning that the hypothesis is rejected.

Regarding the effect of the gratitude intervention on the respondents' grateful mood, a dependent t-test revealed that there was a statistically significant difference in mean scores of the participant's grateful mood in T0 ($M = 4.68$, $SD = 1.28$) and T1 ($M = 5.53$, $SD = 1.13$), $t(22) = -2.64$, $p = 0.015$. Further a medium effect size was found $d = .55$ (95% CI = $-1.51 - .18$). This result suggests that the scores between T0 and T1 did significantly improve and that the gratitude intervention did have an effect on the well-being of the participants, meaning that the hypothesis is supported.

Adherence

It was hypothesized that 25% of the participants would adhere to the recommended guideline of using the intervention at least five days per week. The descriptive statistics regarding the adherence of the participants to the intervention can be seen in Table 3. Around three-quarters of the participants reported using the intervention, on average, at least more than five or more days a week as was requested. Further, more than half of the participants reported using the intervention at least 10-15 minutes a day, which was the estimated time of use. However, approximately three-quarters of the participants had forgotten to perform one or more exercises during the time of the intervention. These results suggest that the hypothesis is

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supported since more than 25% of the participants used the intervention at least five days per week.

A total of six participants provided feedback regarding the reason that impeded them to finish the intervention. Five codes were derived: forgotten, busy, suggestion, not completed, no effect and. 'Forgotten' indicated that the participant forgot to perform the intervention more than once, so they were unable to finish the whole intervention. 'Suggestion' meant that the participant gave a suggestion on what could be improved regarding the intervention, such as being able to move more freely between the exercises when he or she wanted and not when this was finished. This could have motivated him or her to continue. Further, the code 'not completed' implied that the participant described simply not having completed all the exercises yet. Lastly, 'no effect' indicated that the participant did not feel an effect of the exercises and so, did not feel the urge to continue these, an example quote:

“The advantage was not as big as I had hoped.”

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Table 3

Mean (M), Standard deviation (SD), Minimum (Min) and Maximum (Max) regarding the adherence of the participants to the gratitude intervention exercises (N= 23)

	Frequency				
	(Percentage)	M	SD	Min	Max
Days per week using the app		5.2	1.9	0.0	7.0
Less than 1 day per week	1(4.3)				
1 day per week	0(0)				
2 days per week	2(8.7)				
3 days per week	0(0)				
4 days per week	4(17.4)				
5 days per week	4(17.4)				
6 days per week	4(17.4)				
7 days per week	8(34.8)				
Forgot to perform the exercise	15(65.2)	1.3	0.5	0	1
Yes	8(34.8)				
No					
Amount of minutes spent per day on the app					
Less than 5 minutes	0(0)				
Around 5 minutes	11(47.8)				
Around 10 minutes	7(30.4)				
Around 15 minutes	5(21.7)				
Around 20 minutes	0(0)				
More	0(0)				
Parts finished					
Part 1	21(91.3)				
Part 2	20(87.0)				
Part 3	17(73.9)				
Part 4	11(47.8.0)				
Part 5	3(13.0)				
Part 6	2(8.7)				
No parts	0(0)				

Correlational analyses between usage time of the intervention and the outcome measures

Lastly, it was hypothesized that there would be a positive relationship between usage time of the intervention and the outcome measures. Eight bivariate Pearson correlational analyses were performed on the independent variable of the respondents' amount of time using the gratitude intervention and the dependent variable of the change scores on the outcome measures of wellbeing, self-esteem, dispositional gratitude and grateful mood between T0 and T1 (see Table 5). The analysis showed no significant correlations between the variables of amount of time using the intervention and the change scores of the outcome measures. These results indicated that the mean scores of the participants did not improve as they spent more time on the gratitude intervention, meaning that the hypothesis is rejected.

Table 5

Outcomes of the Pearson Correlational Analysis between the Independent Variable of Adherence Behaviour and Dependent Variable well-being, self-esteem, dispositional gratitude and grateful mood outcomes of the respondents, (N=23)

		Change scores			
		well-being	Self-esteem	Dispositional gratitude	Grateful mood
Days per week using the app	Correlation	.23	-.28	-.40	-.04
	Sig. (2-tailed)	.29	.19	.06	.85
Minutes per day using the app	Pearson Correlation	-.17	-.18	-.05	.01
	Sig. (2-tailed)	.44	.42	.81	.96

Discussion

This research aimed to investigate the effectiveness of a 3-week app-based gratitude intervention on university students' feelings of gratitude, mental well-being and self-esteem and investigate how well the participants adhered to the intervention. The results showed that the practice of gratitude was effective in improving mental wellbeing, but not in improving the self-esteem of the participants. Further, the gratitude intervention showed to be effective on the grateful mood of the participants, but not on their dispositional gratitude. Regarding the adherence, it was found that the participants, on average, adhered to the recommended guideline of using the intervention at least five days per week.

The finding of the effectiveness of the gratitude intervention on the mental well-being of the participants was expected and is in line with other research, which found a similar effect of gratitude on well-being and effect size (Bohlmeijer, et al., 2020; Dickens, 2017; Işık & Ergüner-Tekinalp, 2017; Rash et al., 2011). The aforementioned studies, which found an effect of gratitude on well-being, were conducted over a longer period of time (exceeding 3 weeks). However, three weeks seems long enough for the practice of gratitude to cultivate its positive effects, since the desired effects on well-being have been observed. Indicating that the creation of efficient thinking patterns within the participant as well as the building of resilience might have been achieved, allowing the participants to better deal with adverse events (Nelson, 2009). Another possible explanation for the finding could be the below moderate levels of well-being on the baseline questionnaire, which might leave more room for improvement. Many previous studies have investigated the effects of gratitude within a healthy sample with optimal levels of well-being (Davis et al, 2016), meaning that the potential advantages of the gratitude intervention might be limited, due to the high proportion of individuals with an already high score on well-being. Lastly, the Covid-19 regulations which were maintained within the Netherlands were eased during the time of the intervention (RIVM, 2021), people were allowed to go out again and meet with friends which may have increased the feelings of happiness and mental well-being of the participants. Consequently, this could have affected the results as the increase in well-being may not have been caused by the gratitude intervention but other factors. Therefore, although a 3-week intervention seems to have an effect on well-being, the findings should be interpreted with caution.

The finding of the ineffectiveness of the gratitude intervention on the self-esteem of the participants was unexpected and is in line with the meta-analyses from Dickens (2017). A possible explanation could be that a longer intervention is needed in order to obtain the

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desired effects on self-esteem, since studies which conducted a gratitude intervention longer than three weeks did find an effect of the practice of gratitude on self-esteem (Işık & Ergüner-Tekinalp, 2017; Lee, 2017; Rash et al., 2011). This ineffectiveness can also be explained by whom or what participants attribute their feelings of gratitude to. Individuals who might have been more focused on receiving benefits from others (e.g., a gift or a compliment) might evaluate themselves more positively and develop a greater self-worth. However, individuals who might be more focused on feeling gratitude for more general things or experiences (e.g. the weather or art) might not have the effect of evaluating themselves more positively and so, this may not contribute to more feelings of self-worth. Thus, individuals within the sample might have also been less focused on feelings of gratitude from others and more towards other experiences, which could explain why the self-esteem of the participants did not improve.

Further, the finding regarding the ineffectiveness of the gratitude intervention on dispositional gratitude was unexpected and is in line with the meta-analysis from Davis et al. (2016), which did not find an effect of a gratitude intervention on dispositional gratitude. An explanation for these findings could be due to the length of the gratitude intervention as well. The meta-analysis of Davis et al. (2016), mostly, did not include interventions longer than the current study. Whereas studies which did find an effect on dispositional gratitude conducted interventions longer than three weeks (Bolmeijer et al., 2020; Lee 2017). It may be more difficult to change dispositional gratitude since it represents a stable trait and, therefore, is harder to change over a shorter period of time. In this view, the effectiveness of the current intervention on grateful mood, could be explained by the way moods are more easily influenced by events or individual differences and fluctuate throughout the day, in contrast to dispositions or traits (McCullough et al. 2004). This result was expected and is in line with research from Bohlmeijer et al. (2020) and Dickens (2010). As a result, since dispositions are more difficult to change than moods, an effect on dispositional gratitude could not be observed within the scope of this study, while an effect on grateful moods could be observed.

The findings regarding the adherence of the participant to the intervention is not in line with the meta-analysis from Richards and Richardson (2012) who stated that the adherence to a non-guided intervention would be approximately a quarter of the participants. In contrast, the current study showed the adherence to be higher, since three-quarters of the participants adhered to the recommendation of using the intervention at least five days per week, which was unexpected. Other research found that students had difficulty with adhering to a non-guided intervention as well, and approximately half of the participants were able to perform the required exercises (Gutierrez et al., 2020). A possible explanation for the greater

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adherence in the current study could be that this particular online intervention was engaging for the participant. The feature of receiving notifications, reminding the participants to perform the exercises could have worked better in contrast to interventions without this feature. Further, the participants' feedback on the reason they could not finish the intervention showed to be useful. For instance, the motivation of some participants decreased, since they did not experience any effects of the intervention and did not feel the urge to continue anymore. The participants may expect to experience a direct effect of the intervention on their well-being, whereas this effect may only be experienced at the end of the intervention. Furthermore, a participant suggested that it would be more motivating to be able to move more freely between the exercises and not wait until the previous one is finished, which is a helpful feedback point for future research to improve the application. Lastly, participants noted that they did not have enough time in their daily lives to finish the intervention. The gratitude exercises could be shortened or an option for a short or lengthy exercise could be given to participants with less time allowing them to finish the intervention and so, increase the adherence. Thus, the online intervention seems to be effective in increasing adherence when compared to other unmonitored interventions, however, adherence could be further improved through allowing participants to move between exercises more freely, shortening exercises and ensuring they do not get discouraged if the intervention does not have a direct effect.

Finally, the finding that there does not exist a relationship between the time spent using the intervention and the outcome measures was unexpected. This is not in line with other research which found that spending more time on a positive psychological intervention had a positive effect on the outcome measures (Carson et al. 2005; Fuhr et al., 2018; Shapiro et al., 2008;). A possible explanation could be that the recommended time use is just enough for the participant to observe an effect or that the exercises are optimal in inducing feelings of gratitude within the participants. Further, as stated previously, the study was conducted during a period where Covid-restrictions in the Netherlands were relaxed. As a result, this could have been the primary reason for the observed effect on well-being, meaning that no difference could have been observed between participants that used the intervention more days per week when compared to those who used it less, since this effect would not have been as a result of the intervention.

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Strengths, Limitations and Recommendations

A strength of this study is that the participants of the gratitude intervention, on average, used the gratitude app at least five days a week, as the research recommended, making the intervention more effective and the findings more reliable. Furthermore, all of the scales showed a high reliability within the current sample, increasing the trustworthiness of the outcomes. Another strength is that this study is one of the first to use an application as a gratitude intervention which could increase adherence to the intervention, since the provided feedback could be evaluated and implemented (Didgdon & Koble, 2011; Gutierrez et al., 2020; Neil, et al., 2009; Richards & Richardson, 2012). Further, the gratitude exercises were easily accessible, since the participants were able to download the app on their mobile phones and notifications could remind the participants to perform the exercises. Lastly, the app incorporated instruction videos for the exercises, supporting the participants, making sure they understood the exercises and were performed correctly.

However, this research has some limitations that must be considered when interpreting the findings of the study. To begin with, this research had no control condition alongside the gratitude intervention, making it difficult to assess whether the outcomes were influenced by other factors, such as the relaxation of the Covid-19 restrictions in the Netherlands, which could affect the outcome measures of this result and made them less reliable. Therefore, a recommendation for future research is to use a waitlist control group which will show an untreated comparison to the intervention group, to see whether the gratitude intervention had an effect or whether it was influenced by other factors (Bohlmeijer et al. 2020).

Another limitation is that the participants were not monitored regarding their adherence during the intervention and self-reports were used in order to assess their adherence. Therefore, it cannot be claimed with certainty that the participants truly performed the exercises at least five days a week, resulting in less accuracy regarding the adherence behaviour of the participants. Thus, it is recommended for future research to monitor the adherence of the participants to the intervention, such as the study by Gilek (2010) who asked their participants to write down their answers to the exercises online each day, resulting in the researcher being able to closely monitor their adherence.

Besides, the motivation of the participants may have been less than studies in which individuals participated out of their own interest (Donkin & Glozier, 2012RE), since some of the participants could complete the intervention in return for education credits. Consequently, extrinsically motivated participants may take less time to understand the exercises and perform them faster in comparison to participants who would have been intrinsically

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motivated to complete the intervention. This limitation may have resulted in more drop-out rates, a decreased adherence to the intervention and may have caused less effectiveness due to inadequate performance of the exercises.

Another limitation is the absence of a follow-up measurement, hence, only short-term effects of the intervention could be measured instead of long-term effects, as found by Bohlmeijer et al. (2020) and Nawa & Yamagishi (2021) who scheduled another measurement after three or six months with the same outcome measures within a questionnaire. For this study it is not certain whether the effects are only short-term and would reduce after a few days or whether the effects of the gratitude intervention are more sustainable. Thus, it is recommended to schedule a follow-up measurement after three or six months when conducting such an intervention, to measure potential long-term effects.

Further, the length of the intervention is a restriction on being able to fully encompass the effective potential of the gratitude intervention, since studies conducting a longer intervention found an effect of gratitude intervention on dispositional gratitude and self-esteem (Bolmeijer et al., 2020; Işık & Ergüner-Tekinalp, 2017; Lee, 2017; Rash et al., 2011). Therefore, it is advised to conduct an intervention longer than three weeks since within the current study only an effect on well-being and a grateful mood was found. Conducting an intervention exceeding three weeks, including the outcome measures of dispositional gratitude and self-esteem, will give more knowledge on whether the duration of the intervention restricts the positive effect, or whether they are simply not affected by the gratitude intervention. Besides, future research could also conduct multiple gratitude interventions, with different lengths to assess the optimal length of such an intervention to instigate changes within the outcome measures.

Lastly, the sample size of this research is rather limited, leading to more variability within the sample and therefore affecting the reliability of the findings. There is no equality in gender since more than three-quarters of the participants were female and the diversity within the sample could not be assessed considering that the demographic questions did not inquire the participants' ethnicity. These three points may limit the generalizability of the findings to the general population, therefore, it is recommended to address these points in future research and make sure there is equality and diversity within the sample.

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Implications

The findings of this study suggest that gratitude intervention in the form of an app could be used among healthy students with, approximately, moderate levels of well-being. Students or young adults who are looking for a way to enhance their well-being or feel the need to focus on positive aspects of their lives could use a gratitude application to support them in their daily lives. The gratitude intervention will support them in building resilience, overcome challenges when needed, and prevent them from negative health implications. The gratitude intervention could be used as a preventative method since practicing gratitude buffers a person against negative events and helps them to overcome challenges (Fredrickson & Kurtz, 2011), anticipating future mental health problems.

Although ambiguity regarding the effects of a gratitude intervention could not be resolved given the limitations of the study, information was obtained regarding the effectiveness of an online-based gratitude intervention. The similar effects on well-being and grateful mood to paper-based interventions (Işık & Ergüner-Tekinalp, 2017; Lee, 2017; Lin, 2015; Nezlek et al., 2017; Rash et al., 2011), indicate that the app could be used to increase the psychological well-being of students. However, since self-esteem and dispositional gratitude were not affected, questions could be raised on whether the online-based intervention is less effective than paper-based interventions. Yet, due to the increased adherence observed among participants when compared to other unguided interventions (Didgdon & Koble, 2011; Gutierrez et al., 2020; Neil, et al., 2009; Richards & Richardson, 2012), the online-based intervention could reach greater portion of potential users, not only due to its accessibility, but also through its enhanced engagement.

Lastly, this research is a first step in applying the findings to a large-scale investigation. This study conducted a pilot-test to assess the feasibility of the intervention and gain information about the effectiveness of the gratitude intervention's effectiveness, adherence behaviour and its relationship to the outcome measures. The findings regarding the adherence behaviour, possible limitations, and recommendations could be taken into account when conducting a larger-scale intervention to enhance its effectiveness.

Conclusion

The findings of this study show that a 3-week online-based gratitude intervention has an effect on university students' well-being and gratitude mood but not on self-esteem and dispositional gratitude. Furthermore, three-quarters of the participants adhered to the recommendation of using the app at least five days a week and no relationship was found

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between the amount of time using the intervention and outcome measures. Further, the adherence being higher than other non-guided interventions suggest that it is an effective way of engaging the participants. The feedback of the participants suggested that the exercises could be shortened, so individuals having less time in their daily lives can still perform the exercises in order to further increase the adherence. However, the intervention might not have been long enough to assess all effects such as self-esteem and dispositional gratitude. In addition, participants attributing their feelings of gratitude to general experiences rather than to someone else, might have had an impact on self-esteem not being affected. Further, the relaxation of the Covid-19 restrictions may have impacted the intervention's observed effect on well-being as well as its relationship with usage time. Lastly, the study being conducted on healthy students, the intervention could be used by young adults who are looking for a way to increase their well-being.

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Appendix

Codes and quotes of the participants

Table 1.

Frequency of Codes on the Feedback of the Participants (N = 6)

Codes	Frequencies
Forgotten	2
Busy	2
No experienced effects	2
Not finished	1
Skip exercise	1

Table 2

Feedback Quotes of the Participants

Participant	Quote
1	“Het lukte me niet om tijd voor mezelf vrij te maken om elke dag stil te staan bij de opdracht.”
2	“Ik ben daar nog niet.”
3	“De app werkte niet op mijn smartphone, dus moest ik het op mijn laptop doen. die gebruik ik niet zo vaak dus ben ik het soms gewoon vergeten te doen.”
4	“Ik ben het meest actief bezig geweest met de oefeningen tijdens de tentamenweek. Daarna merkte ik er minder energie en ook minder behoefte voor om de oefeningen te doen. Het was misschien wel fijn geweest om dan ook alvast naar de volgende oefening te kunnen gaan.”
5	“Het voordeel was niet zo groot als gehoopt.”
6	“Ik vergat het, en niet genoeg tijd.”