

**The Effectiveness and Usability of an Application-Based Gratitude Intervention On  
Well-being and Stress among Employees in Times of COVID-19**

Emma E. Witteveen

Department of Positive Clinical Psychology & Technology, University of Twente

1st Supervisor: Dr. N. Kloos

2nd Supervisor: Drs. N. Keesmekers

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### Abstract

**Background.** The current COVID-19 pandemic potentially has caused physical and emotional harm to employees, since they are desired to work from home. Therefore, an effective, easy implementable intervention that increases employees' mental welfare seems desirable. Gratitude has achieved promising results in the field of mental well-being. Research revealed that gratitude interventions can *inter alia* increase well-being and decrease levels of stress.

**Objective.** The present study aims to investigate the effects of an application-based gratitude intervention on well-being and perceived stress among university employees. Also, the usability of this application is evaluated, looking at both quantitative- and qualitative measures.

**Method.** A quasi-experimental design was employed, using pre-post-test measures. During the course of three weeks, participants ( $n=19$ ) were expected to conduct gratitude exercises for 15 minutes every working day for three weeks. The GQ-6 and grateful mood were used to measure trait- and state gratitude, and the MHC-SF and PSS were used to measure well-being and perceived stress. All four were utilized at baseline (T0) and post-intervention (T1). A paired sample t-test was conducted to analyse whether well-being significantly increased and stress significantly decreased post-intervention. As a manipulation check, a paired sample t-test was used as well on both trait- and state gratitude.

**Results.** The manipulation check revealed that both trait- and state gratitude did not increase significantly. Well-being was significantly improved after the intervention [ $t(18)=-3,49, p<0.05$ ]. Additionally, perceived stress significantly decreased after the intervention [ $t(18)=2,163, p<0.05$ ]. Concerning usability, participants particularly seem to like the application's different features, but disliked the number of notifications they received.

**Discussion.** The current research took a first step looking into an application-based gratitude intervention in the context of mental welfare and found that it enhanced well-being and lowered stress among University of Twente employees. However, it is not certain that this effect was caused by the intervention itself. Further research is recommended.

**Keywords** Gratitude · Well-being · Stress · Employees · Application · Intervention · Usability

## **Introduction**

COVID-19 has become a pandemic affecting all aspects of human life. Not only does it affect people on a physical level, COVID-19 has resulted in “widespread emotional distress and increased risk for psychiatric illness” (Pfefferbaum and North (2020) p. 510). One group that might especially have been affected by this pandemic are employees. Employees might face a range of challenges since they are desired to work from home (Rijksoverheid, n.d.). They perhaps have little workspace available, children running around at home, or do not have direct contact with colleagues anymore. Overall, employees seem to experience less work satisfaction (Möhring et al., 2020). Research has shown that these new circumstances may have resulted in a decreased overall mental health and increased perceived occupational stress for employees (e.g., Prasad, Vaidya, & Mangipudi, 2020; Hamouche, 2020; Salari et al., 2020). For some employees, COVID-19 and its consequences may be seen as a tremendous stressor. It has been found that infectious disease epidemics and pandemics can be highly traumatic experiences for some individuals and can even lead to posttraumatic stress disorder (PTSD) and chronic psychological distress (Boyras & Legros, 2020). Thus, an easy implementable, large-scale intervention to increase employees’ overall well-being and decrease their levels of stress is desirable. The current study aims to test a gratitude intervention on university employees to reach this objective.

### **Stress and Well-being**

Stress among employees during the current pandemic consequently seems to be a problem. The HSE (Health Safety Executive UK) has defined stress as an undesirable response people have to immense pressures or other types of demands placed upon them (Bashir, 2010). Stress does not always have to have negative consequences. A division is made between stress and pressure. Pressure is of short duration and actually improves our performance. However, problems arise when the sources of pressure become too frequent without time to recover, or when just one source of pressure is too great for us to cope with (Bashir, 2010), like COVID-19 is perceived for many employees. This chronic stress may result in negative consequences for some individuals’ mental- and physical health. To illustrate, chronic stress results in an overload of cortisol in the brain, leading to either physical consequences, such as insomnia (McEwen, 2008), or psychological consequences, such as anxiety disorders or depression (Stetz et al., 2007). Thus, an opportunity to decrease stress is considerably important for better health.

Next to decreasing stress, improving employees’ well-being also seem desirable, since employees’ mental well-being has declined during the COVID-19 pandemic (Prasad, Vaidya

, & Mangipudi, 2020; Kok et al., 2021). Mental well-being has a considerable influence on public health as it reduces the risk of the prevalence of mental illnesses (Lamers et al., 2015). Mental well-being is not seen as the mere absence of pathology, but consists of social-psychological and emotional well-being (Lamers et al., 2015; Huppert & So, 2013). Empirical research has suggested that in the workplace, employees' psychological well-being has a substantial influence on individual- and organisational productivity (Hadden, 2018; Wright, Russel & Bonet, 2007), job satisfaction (Wright, Russel & Bonet, 2007), and overall functioning (Kaplan et al., 2014). Therefore, it is worthwhile for this group to flourish in their mental well-being, not only in the workspace but also during their personal lives.

### **Gratitude**

One promising aid that could help overcome the negative effects of COVID-19 on one's health is gratitude (Nguyen & Hoang Le, 2021). In positive psychology, which aims at contributing to the flourishing or optimal functioning of people (Gable & Haidt, 2005), gratitude is seen as the human way of acknowledging the good things in life (Emmons & McCullough, 2012). Positive psychologists assign gratitude as one of the greatest virtues, and as a possession that enables a person to live well (Emmons & McCullough, 2012). It has been defined as a positive emotional response that we perceive on giving or receiving a benefit from someone (Emmons & McCullough, 2012).

Gratitude, like other affects, can exist as a more stable, affective trait, or as a more flexible mood or emotion. A distinction can be made between trait- and state gratitude. Trait gratitude can also be called the grateful disposition or dispositional gratitude. It is defined as a generalized likelihood to recognize and respond with grateful emotion to the roles of other people's thoughtfulness in the positive experiences and outcomes that one obtains (McCullough, Emmons, & Tsang, 2002). State gratitude, which is also called 'the grateful emotion', refers to a temporary affect with associated thought and action tendencies. This grateful emotion occurs when appraising a received benefit as a positive outcome and recognizing that the source of this positive outcome lies outside the self (Jans-Beken et al., 2019). The current study aims to focus on both forms and will be looking at the changes of both trait- and state gratitude among employees after the intervention.

### **Research on gratitude**

Research on the effects of gratitude on stress and well-being has shown promising results. First of all, it has demonstrated a negative association between overall gratitude and stress (e.g. Wood et al., 2008; Breen et al., 2010). Grateful people tend to sleep better and feel more thankful

for their living conditions and their possessions (Nguyen & Hoang Le, 2021). This makes it easier for them to cope with stress and anxiety as a result (Nguyen & Hoang Le, 2021). For employees, gratitude seemed to reduce levels of stress using general positive psychological interventions (Baek et al., 2018) or brief positive psychology interventions (Roll, van Zyl & Griep, 2021). Research on the effects of gratitude interventions on stress among employees specifically seems not to be available yet.

When looking at the effects of gratitude on well-being in general, empirical research has proved that gratitude can facilitate higher levels of well-being (Kaplan et al., 2014; Wood et al., 2010; Froh, Sefick & Emmons, 2008). Multiple meta-analyses found that gratitude led to improvements for numerous outcomes, such as an increased well-being and a reduced level of anxiety (e.g. Dickens, 2017; Davis et al., 2016; Cregg & Cheavens, 2021). Gratitude has not only been shown to increase well-being on a sample of healthy adults (Disabato et al. 2016), but also on adults who were displaying psychological pathology (Bohlmeijer et al., 2020).

Besides, research on gratitude intervention that focuses on employees in particular also seems promising. The interventions not only showed a decrease in interpersonal mistreatment in organisations by reducing incivility, gossip, and ostracism (Locklear, Taylor & Ambrose, 2020), but also an improved positive affective well-being and self-reported gratitude for employees (Kaplan et al., 2014; Otsuka, Hori & Kawahito, 2012; Neumeier, Brook, Ditchburn & Sckopke, 2016). Overall, it can be concluded that gratitude exercises offer great potential to increase employees' mental health.

### **The current study**

Even though there is substantial research on the effects of gratitude on well-being, there seems to be a gap in knowledge when looking at the effect of gratitude on the level of stress when speaking about employees. As mentioned above, research on the effects of gratitude on stress at other target groups is available, such as on students (e.g. Wood et al, 2008; Breen et al, 2010), as well as the effect of positive psychological interventions in general on employees' stress level (Roll, Ellardus, van Zyl, & Griep, 2019; Baek, Kim, Oh, Kim, & Baik, 2018). Nevertheless, knowledge on the combination of gratitude interventions on stress among employees seems not to be available. The current research therefore tries to fill this gap by combining the aspects of a gratitude intervention, stress and employees and tries to find out if existing knowledge, which focusses solely on different target groups or positive psychological interventions in general, can be expended and if the same promising effects can be found.

Additionally, it might be interesting to see whether the promising effects of gratitude on

well-being can be validated when using an application-based approach. Using a mobile device gives users freedom to conduct the exercise at a place of their choice. Thus, this approach might be beneficial regarding flexibility, which may be an important factor for employees. Also, the universal nature of mobile phones promised greater patient engagement (Wang, Chaovalit, & Pongnumkul, 2018). By investigating the effects the intervention can have when participants conduct the exercises every working day, one might come to the conclusion that it potentially can be implemented at the workplace. This, in turn, can lead to a happier and healthier work environment.

The application that will be used during the research is designed by Prof. Dr. Bohlmeijer, Bohlmeijer, Kraiss, Watkins, and Schotanis-Dijkstra (2020) tested the effect of gratitude on participants' (n=217) well-being. Ultimately, they found evidence that a 6-week gratitude intervention was more effective in improving mental well-being in comparison to both active and waiting list control groups, and this effect was even maintained six months later. The current study will re-investigate this effect in an application-based format for both well-being and stress with a focus on employees.

When using an application-based approach, one has to take note that applications are occasionally challenged by hardware limitations, including small screens and limited input capabilities (Kaufman & Ruland, 2014). Studies have shown that mobile health apps are not always as effective because of these limitations, and there is room for improvement (Free et al., 2013; Sama, Eapen, Weinfurt, Shah & Shulman, 2014). New platforms should ideally be evaluated to make sure the application is user-friendly, and that users can truly use the tool without limitations to ensure usability. Usability evaluation is indispensable to enhance acceptability and is mostly examined by indirect methods (Daniels et al., 2007), such as by including a questionnaire or conducting an interview afterward (Wang, Chaovalit, & Pongnumkul, 2018). Thus, evaluating the application's usability and detecting its shortcomings will highlight the potential the application has to offer.

In addition, literature on the acceptability, usability and/or feasibility of application-based gratitude interventions is scarce. Usually, only adherence rates are mentioned (e.g. Chesak et al., 2015; Sztachañska, Krejtz, & Nezlek, 2019), which are mostly quite high. Research on the usability of other positive psychological interventions for employees is available (e.g. Baek et al., 2018; Gayed et. al., 2018) and reveals a high usability score for their interventions. However, these are often not application-based or lack a holistic view of the usability, only focussing on one aspect. Also, most indirect methods only include quantitative measures. Thus, the usability evaluation in the present study should be ideally based on multiple

measures, in order to get a complete overview of the current usability.

All in all, the present study aims to re-assess the effects of the gratitude intervention by Bohlmeijer et al. (2020), on both well-being and perceived level of stress among employees of the University of Twente by using an application-based approach. Next to this, an emphasis is being put on the usability of the application, in order to find out which potential barriers and facilitators users experience, with the goal of optimizing user-friendliness. Subsequently, the following research questions and hypothesis will be considered.

**Research question 1** How does an application-based gratitude intervention affect well-being and perceived level of stress among university employees?

**Research question 3** What aspects of the “Zo Erg Nog Niet” application do participants in particular like and dislike? What difficulties do users experience, and how can these be improved?

Subsequently, the following hypothesis is proposed:

**Hypothesis 1** It is hypothesized that employees’ well-being will be increased and their stress levels will be decreased after the gratitude intervention.

Because of the fact that the application has not been tested before, no hypothesis can be formed about its usability yet.

## Method

### Design

A quasi-experimental design was employed, using pre-post-test measures. The current study is part of a longer, overlapping research, studying the effect of a gratitude application on different outcome measures among different target groups. Here, the outcome measures well-being and stress were covered among university employees. Participants completed online assessments at baseline (T0) and post-intervention (T1). The duration of the application was six weeks, however, participants in the current study finished the intervention after three weeks. This study was ethically approved by the Behavioural, Management and Social Sciences Ethics Committee of the University of Twente (210284).

### Participants

This study compromised a convenience sample of University of Twente employees who participated voluntarily. Requirements to be able to participate in the study were: having a good

command of the Dutch language, being a staff member of the University of Twente, having a smartphone or tablet with a stable internet connection and being willing to carry out gratitude exercises for three weeks. In total, 19 participants volunteered their time for the study. Most participants were female (84% female; 16% male). The age of participants ranged from 25 to 65 ( $M=41.1$ ,  $SD=13.9$ ). Additional demographic data are displayed in Table 1. As shown, participants' occupation is quite diverse, with most people working as a teacher or PhD-student. As far as living situation is concerned, most participants live together with a partner and children. Also, most participants were married or had a registered partnership. Lastly, it can be seen that the majority of participants have finished a scientific education.

**Table 1**

*Additional Demographic Variables of Study Sample (n=19).*

Demographic variable	n	Percentage (%)
<b>Occupation</b>		
Management	2	11
Teaching	5	26
Marketing- and communication	1	5
Supporting personnel	2	11
Research	1	5
Postdoc	1	5
PhD-student	5	26
Technical/lab staff	1	5
Other	1	5
<b>Living Situation</b>		
Alone	2	11
Together with partner and children	11	58
Together with partner without children	5	26
Alone with children	1	5
<b>Marital status</b>		
Married/registered partnership	13	68
Divorced	2	11
Never married	4	21
<b>Highest degree</b>		
MBO/MTS/MEAO	3	16
HBO/HTS/HEAO	1	5



Scientific education	14	74
Other	1	5

## Procedure

First of all, university of Twente employees received an email from the university's secretary which invited them to participate in this research. This email showed a link to an information website where more details about the study, the inclusion criteria and a link to an information letter were displayed. This letter provided additional information for the participants, such as about the purpose of the study, voluntary participation and privacy. Participants were directed to the baseline Qualtrics questionnaire through the link on the information website. First of all, participants had to give their consent, fill out demographical information and were then directed to multiple questionnaires. These questionnaires measured multiple outcome measures, including well-being, stress, and state- and trait gratitude.

When finished with the baseline questionnaire, participants received another email from the researcher with instructions regarding downloading the gratitude application. Participants were sent a personal log-in code by the researcher, and together with their email address, they were able to log in to the app. This email address was later assigned to an ID number, to cause pseudonymization and ensure anonymous participation. Participants were expected to conduct evidence-based gratitude writing exercises five days a week, 15 minutes per day for three weeks.

After three weeks, participants received another email from the researcher with a link to the post-intervention questionnaire. This questionnaire yet again contained the same questionnaires measuring well-being, stress, and trait-and state gratitude, with additional questions regarding the usability of the application. After finishing the post-intervention questionnaire, participants were being thanked for their contributions to the research.

## Materials

### *Gratitude application 'Zo Erg Nog Niet'*

Participants made use of the online application called 'Zo Erg Nog Niet' (Translated: 'Not That Bad'). They could use this application on a smartphone, tablet or computer desktop. Every week, a different gratitude exercise to be carried out was explained by means of a text and an informative video. For instance, in week one, participants were invited to write for 10-15 minutes about gratitude they experience in their lives. Participants conducted the exercises at a medium of their choice, which might be a piece of paper or in a Word document on their laptop.

They received daily notifications via email or on their phone to remind them of the exercises. Additionally, participants received a daily quote which they could pin and were able to upload photos that reminds them of a joyful moment.

Subsequently, multiple questionnaires during T0 and T1 were used. All data were collected via the online program Qualtrics.

### *Well-being*

To measure well-being, the 14-item Mental Health Continuum Short Form (MHC-SF) was utilized (Keyes et al. 2008; Lamers et al. 2011). The MHC-SF measures overall wellbeing by means of three subscales, which comprises of emotional- (e.g. “During the past month, how often did you feel happy?”), social- (e.g. “During the past month, how often did you feel that you had something important to contribute to society?”) and psychological (e.g. “During the past month, how often did you feel that you liked most parts of your personality?”) well-being (Keyes, 2009). Each item was rated on a scale from 0 (never), to 5 (every day). High average sum scores indicate high levels of mental well-being over the past four weeks. Various studies choose to opt for a mean score, however, sum scores are also used often (Luijten, Kuppens, van de Bongardt, & Nieboer, 2019). In the current research, it is chosen to use sum scores. The MHC-SF demonstrated high internal consistency reliability ( $\alpha = .87$ ) overall (Lamers et al., 2011), and in the current study ( $\alpha = .86$ ).

### *Stress*

To measure stress level, the 10-item Perceived Stress Scale (PSS) was utilized (Cohen et al. 1983). The PSS items measure how unpredictable, uncontrollable, and overloaded respondents feel in their day-to-day lives (Lee, 2012). Also, the scale has several direct questions about current levels of experienced stress. Each item was rated on a scale from 0 (never), to 5 (very often). The PSS yields a sum score that describes overall perceived stress, whereby high average scores indicate high levels of stress over the past four weeks. An example item of the scale is: “In the last month, how often have you been upset because of something that happened unexpectedly?”. The PSS demonstrated acceptable internal consistency reliability ( $\alpha = .78$ ) overall (Baik et al., 2019), and a high internal consistency reliability in the current study ( $\alpha = .86$ ).

### *Gratitude*

The 6-item Gratitude Questionnaire (GQ-6) was used to measure trait gratitude (Jans-Beken et al. 2015), and the grateful mood questionnaire was being used to measure state gratitude (McCullough et al. 2004). The GQ-6 is a 6-item questionnaire that ranges from 1 (strongly

disagree), to 7 (strongly agree). An example item is: “If I were to list all the things that I am grateful for, it would be a very long list”. Here, higher total summed scores indicate a higher level of dispositional gratitude. The GQ-6 showed demonstrated high internal consistency reliability ( $\alpha = .82 - .87$ ) overall (McCullough, Emmons, & Tsang, 2002), and a high internal consistency reliability in the current study ( $\alpha = .81$ ).

The grateful mood questionnaire is a 4-item questionnaire that ranges from 1 (strongly disagree), to 7 (strongly agree). An example item would be: “In the past 24 hours, ...I felt grateful”. High sum scores indicate high levels of gratitude in the past 24 hours. The grateful mood questionnaire showed high internal consistency reliability ( $\alpha = .83$ ) overall (Bohlmeijer et al., 2020), and acceptable internal consistency reliability in the current study ( $\alpha = .73$ ).

### *Usability*

The current study also places an emphasis on determining the application’s current usability. A mixed-methods approach is being used in order to test this. The quantitative analysis consists of six parts. First of all, users are asked about their overall satisfaction with the application. Then, a set of five questions about users’ rating of the overall design of the application are asked. This is measured on a five-point Likert scale ranging from “Bad” to “Very Good”. An example of such a closed question would be: “What did you think of the user-friendliness of the application?”. Again, another set of five questions are asked about participant’s rating of the applications’ features. This is measured on a four-point Likert scale ranging from “Not” to “Fully”. An example of such a closed question would be: “To what extent do the videos appeal to you?”. After this, users are questioned about the way that they have used the application; on which medium they have downloaded and utilized the application and on what medium they have conducted the exercises. Additionally, they were asked if they liked the combination that they have chosen and if they rather would have conducted the exercises on the application itself.

Moreover, the qualitative analysis allowed participants to share their experienced pros-and cons regarding usability. Here, two open-ended questions were asked, which were: “What in particular did you like about the application?” and “What in particular did you dislike about the application?”.

### **Data analysis**

The data were analysed with the statistical program IBM SPSS Statistics (Version 25). For both analyses, an alpha level of  $p < .05$  was chosen. Data from participants who did not finish either T0 or T1, or that did not give consent were excluded from the analysis.

First of all, descriptive statistics on participants’ scoring on outcome variables were

provided. To test the first hypothesis, a paired sample t-test was carried out in order to determine whether well-being scores post-intervention had significantly increased in comparison to the scores at baseline. The same analysis was performed in order to see whether participants' stress levels had significantly decreased after the intervention. Effect size, or Cohen's D was calculated as well. Here, an effect size of 0.0-0.2 is considered negligible, 0.2–0.3 is considered small, 0.5 medium, and  $\geq 0.8$  large (Cohen, 1988). After these analyses, a manipulation check will be carried out by performing a paired-samples t-test on both trait- and state gratitude.

To test usability, a mixed-method approach was taken. First of all, mean scores of items concerning overall satisfaction, participant's satisfaction with the application's overall design and features and using their medium of choice were computed. Also, user information regarding how they have used the application will be accumulated. In addition, two open-ended questions regarding pros and cons concerning usability were qualitatively analysed. This was done manually using a pen-and-paper approach. First of all, participants' answers regarding their experienced pros and cons of the application were given a specific code by the researcher. Only the answers regarding usability were taken into account, which was determined by the researcher. This resulted in a brief overview of codes concerning the assets and liabilities of the application based on participants' experience. Adherence will be determined through self-reports, by looking at how much time participants have actually spent on the intervention.

## Results

### Descriptive statistics

Table 2 gives an overview of minimum and maximum scores, alongside mean scores and standard deviations of well-being, stress and gratitude at baseline and post-intervention. Here, it can be seen that for well-being the mean score has increased at T1 respectively to T0. Additionally, the mean score for stress shows a decrease after the intervention. Both trait- and state gratitude appear to increase slightly when looking at the mean scores.

### Inferential Statistics

#### *Gratitude*

The manipulation check showed that participants' sum scores on the GQ-6 were not significantly higher post-intervention (T1) than at baseline (T0) [ $t(18)=-.67, p=.512$ ]. Cohen's D demonstrated negligible effect size ( $d=0,13$ ). Thus, trait gratitude did not differ after the three-week intervention. Additionally, when testing state gratitude, it was found that also no

**Table 2**

*Minimum and Maximum Score, Mean (M) and Standard Deviation (SD) of Well-being, Stress and Trait- and State gratitude at Baseline (T0) and Post-Intervention (T1).*

	Well-being		Stress		Trait Gratitude		State gratitude	
	T0	T1	T0	T1	T0	T1	T0	T1
Minimum	22.00	22.00	11.00	10.00	23.00	26.00	15.00	10.00
Maximum	52.00	59.00	26.00	24.00	42.00	41.00	27.00	28.00
M	35.47	40.53	18.95	16.53	33.58	34.16	21.16	22.05
SD	8.78	8.93	4.55	4.45	4.30	4.54	3.55	4.50

significant difference in sum scores was found [ $t(18)=-.68, p=.505$ ]. Cohen's D showed a small effect size ( $d=0,22$ ) Thus, the manipulation check stressed that both trait- and state gratitude did not differ significantly for participants after the three-week lasting intervention.

#### *Well-being*

It is hypothesised that the application-based gratitude intervention would increase levels of well-being. At T1, participants scored five points higher on well-being compared to T0. A paired samples t-test revealed a significant effect between well-being at baseline (T0) and post-intervention (T1) [ $t(18)=-3,49, p<0.05$ ]. Furthermore, Cohen's D suggests that the intervention has had a medium effect on well-being ( $d=0,57$ ).

#### *Stress*

The application-based gratitude intervention was also expected to lower stress levels among University of Twente employees. It was founded that for stress, participants scored on average two points lower at T1 compared to T0. A paired samples t-test revealed a significant effect between stress at baseline (T0) and post-intervention (T1) [ $t(18)=2,16, p<0.05$ ]. Furthermore, Cohen's D demonstrated a medium effect size ( $d=0,54$ ).

#### **Usability**

As shown in Table 3, a quantitative analysis revealed that participants seemed to be satisfied with the app overall. Participants in particular liked the textual design choices: the amount of text used in the application and the use of language. Concerning the applications' features, participants seem to be satisfied with the texts and the informative videos but not with the

notifications. When looking at user information, all users used their smartphones when using the application. Concerning the writing exercises, participants mostly carried these out on a paper notebook, however, a computer desktop, smartphone or other mediums were also used. Overall, participants were only moderately satisfied with carrying out the writing exercises on the medium of their choice. However, when asking if they would have preferred to use the application itself to conduct the writing exercises, only around a quarter of participants would have liked so. Self-reported adherence revealed that on average, participants spend four days a week on the intervention, for around five minutes a day. 16 out of 19 participants have finished course one, 14 have finished course two and nine participants have finished all three courses.

**Table 3**

*Participants' Mean (M) Scores and Standard Deviation (SD) on Closed Questions Regarding the Usability of "Zo Erg Nog Niet".*

	M	SD	Scale Range
Overall satisfaction	2.68	.48	1-4
Overall design			1-5
Language use	3.84	.76	
Amount of text	3.89	.46	
Design	3.79	.71	
User-friendliness	3.53	.84	
Number of parts	3.63	.60	
Features			1-4
Texts	3.00	.58	
Videos	2.84	.96	
Exercises	2.42	.69	
Daily Citations	2.37	.83	
Notifications	1.79	.98	
Combination medium of choice /exercises	1.74	.65	1-4

For the open questions regarding experienced pros- and cons of the current usability of the application, a qualitative analysis was being employed. This analysis revealed that participants particularly enjoyed the application's variety of features. These include the ability to upload photos, pinning quotes, and the informative videos. Per contra, participants disliked

the fact that they felt like they received too many notifications. With notifications, most participants here describe that they received too many emails per day. Additionally, when looking at technical shortcomings, some participants mentioned that they had trouble uploading photos, and one participant mention that she could not checkmark previously finished exercises anymore. An exhaustive overview of the coding scheme can be seen in Appendix A.

### **Discussion**

The purpose of the present study was to determine whether an evidence-based gratitude intervention would have an effect on both well-being and perceived level of stress among employees of the University. Based on promising, previous results from gratitude studies (e.g. Bohlmeijer et al., 2020; Wood et al, 2008), it was hypothesised that the intervention would increase levels of well-being and decrease perceived stress. Next to this, the usability of the application was to be examined in the current study to identify potential barriers and find out how can these be improved in the future. Overall, well-being and stress levels were shown to be improved, however, this was not the case for trait-and state gratitude.

#### **Effects on well-being**

The findings demonstrate that employees' well-being increased after three weeks of using the intervention. These findings are in line with other previous research on the effect of gratitude interventions on well-being (Kaplan et al., 2014; Otsuka, Hori & Kawahito, 2012; Neumeier, Brook, Ditchburn & Sckopke, 2016; Bohlmeijer et al., 2020). Previous research mostly made use of a repetitive gratitude exercise that users had to perform multiple weeks in a row (Kaplan et al., 2014; Otsuka, Hori & Kawahito, 2012). The variety of exercises used in the current intervention might explain the fact that multiple aspects of well-being were stimulated by the exercises and an increase was founded already after three weeks. Also, participants' well-being score at baseline appeared to be somewhat below average (Lamers et al., 2011), leaving more room for improvement.

Furthermore, previous studies have focussed on a more traditional approach when using gratitude exercises. The current study opted to find out if these effects can be generalized when using a different medium, namely, an application. Results show that indeed the same effects can be found when using an application-based approach, and therefore can offer a great benefit for employees, since this specific intervention enables flexibility and therefore can be quite easily implemented into the workplace (Otsuka, Hori & Kawahito, 2012).

### **Effects on stress**

This study has taken a first step in looking into the effects of gratitude on levels of stress for employees. Results showed that perceived levels of stress declined post-intervention compared to T0. Negative associations between stress and gratitude have been found before, only here looking at a general target group (Wood et al, 2008; Breen et al, 2010) or positive psychological interventions on employees in general (Roll, Ellardus, van Zyl, & Griep, 2019; Baek, Kim, Oh, Kim, & Baik, 2018). The gratitude exercises of the intervention may have caused participants to shift their perspective and take a more positive stance on life (Lambert, Graham, Fincham, & Stillman, 2009), which may be rather demanding for employees at the moment. Also, the exercises may have facilitated certain coping styles for participants, which are consequently associated with reduced levels of stress (e.g. Wood et al. 2007; Lambert et al. 2011). This could explain the positive effects experienced by employees as well.

### **Manipulation check**

The manipulation check revealed that there was no considerable change in scores on both trait- and state gratitude post-intervention compared to before the intervention started. Substantially, a negligible effect size was founded for trait gratitude and a small effect size was found for trait gratitude. This suggests that it cannot be concluded with certainty that the favourable effects of an increasing well-being and decreasing stress level were caused by the intervention itself. This result was not to be expected, since the exercises were evidence-based and gratitude was practiced every working day. Even though it would seem quite plausible that trait gratitude did not significantly differ; the intervention only lasted for three weeks and this would seem too short for one's more stable personality characteristics to change (Stieger et al., 2021), it was certainly to be expected that state gratitude would have increased, since this measures one's gratitude level in the past 24 hours. A possible explanation for the fact that state gratitude did not increase is that half of the participants did not finish the last course, and some participants did not fill out the questionnaire directly after the intervention. Thus, there was intervening time whereby the effect of state gratitude might have been diminished.

### **Usability**

The current study has looked at the current usability of the gratitude application "Zo Erg Nog Niet". The aim was to find out what aspects of the application participants in particular liked and disliked and what difficulties they experienced, with the goal of optimizing user-friendliness in the future. Participants were overall satisfied with the application. enjoyed the design of the app, in particular the textual parts, but disliked the notifications. The features of



the app, like the ability to upload photos or pin quotes were appreciated. Tailoring one's experience and making the environment 'their own' might have facilitated their subjective experience with the app (Levin, Haeger, & Cruz, 2018). Per contra, participants mainly disliked the number of notifications they received via email every day. Even though these could have been turned off, this apparently was not well enough communicated for most participants. This is recommended to be improved in the future.

When looking at previous research, a meta-analysis revealed a statistically significant increase in adherence rates when participants received reminders compared to a control group (Fenerty et al., 2012). However, apparently, too many reminders seem to work aversively. It is therefore recommended to lower the amount of notifications participants receive every day, and to make it more apparent that notifications can be turned off. Also, some failing technical functions were mentioned, like the ability to upload photos or to checkmark previously finished exercises. These disliked functions might explain the lower (self-reported) adherence rates than expected. When looking at previous usability studies (e.g. Chesak et al., 2015; Sztachañska, Krejtz, & Nezlek, 2019), the adherence rates are substantially higher than found in the current research. By implementing the constructive criticism of this usability study and adjusting the technical shortcomings, an increase in adherence rates is to be expected. Hence, a follow up-study using an improved version of the "Zo Erg Nog Niet" application would be recommended, in order to explore its full potential.

### **Implications**

The current study has taken a first step into looking for possibilities to make an effective and easy implementable psychological intervention available for employees. The intervention offers great potential, since this study did not filter on low levels of well-being a priori (Bohlmeijer et al., 2020), and made use of a healthy population. Thus, one does not have to display pathological symptoms to benefit from this gratitude intervention. The app therefore shows its potential amongst a wide population of employees. The exercises may be implemented in for instance lunch breaks for employees, potentially resulting in a decreased work absence and positively influence individual mental welfare by creating a more positive and less stressful workplace. Additionally, lower levels of well-being are correlated with higher burn-out levels (Sonnetag, 2015), therefore the intervention may limit burnout complaints and thereby prevent burnouts or help during a re-integration process for employees since it appears to increase well-being.

The participants in the present study practiced gratitude with hardly any guidance,

suggesting the intervention would be easy implementable and can be administered at low costs. Also, well-being showed to have a significant increase after the three weeks lasting intervention. Studies have found the same effects for a longer-lasting gratitude intervention (e.g. O’Leary & Dockray, 2015), however, this research proved that the same effect can be reached in a shorter duration. Also, it became apparent that only half of the users finished all three modules. Thus, they most likely spend less than three weeks on the gratitude exercises. This insinuates that the positive effects can also be reached by an intervention with a duration shorter than three weeks. It might be valuable to investigate this relationship further in the future.

### **Strengths and Limitations**

This study is one of the first that investigates the relationship between an application-based gratitude intervention on stress among employees. Furthermore, the current research has taken a step into looking if the same, promising effects of gratitude on well-being could be replicated when using an application, which appeared to be the case. Also, reliability scores of the sample were high and the effect sizes of well-being and stress were satisfactory.

Nonetheless, some important limitations of the study need to be stressed. First of all, the intervention was to be carried out at home, which means that there was no supervision available. Self-reports show that only half of the participants finish all three modules, and no one spent the a priori determined time and days using the intervention. Subsequently, it could not be ensured that the participants have read all information, watched the videos and carried out the exercises correctly. This may explain the lack of increase in gratitude levels. Therefore, the effects might have been caused by other factors. Differences in the participant’s environment, such as a reduction of the COVID-19 restrictions or changing weather conditions may explain the findings. Nevertheless, since the current study did not make use of a waitlist control group, it limited the possibility to convincingly answer the first research question. For future research, therefore, it is recommended to include a waitlist control group to ensure that no circumstantial factors could have interrupted the research results.

Second, some important notions regarding the sample need to be made. First of all, the sample size in the current study only consisted of 19 participants. This small sample size might also explain the non-significant effect regarding gratitude. When increasing the small sample size, the insignificant effect may shift towards significance (Button et al., 2013), thus, it is recommended to increase this in a future follow-up study. Additionally, the sample size mostly included highly educated women. This sample group of university employees is not a correct

representation of the population of employees overall, thus, findings cannot be generalized to the general population of employees.

Third, Cronbach's Alpha for state gratitude appeared to be much lower in the current study than was founded before (Bohlmeijer et al., 2020), which might have influenced the reliability of the results. Also, even though the effect size here appeared to be small, a slight increase in mean scores was founded. By tackling the small sample size in a follow-up study, there is a possibility that effect size will increase.

### **Future directions**

As mentioned before, a follow-up study would be recommended. By adding a waitlist control group, the influence of environmental factors on the results would be minimalized, and a more firm conclusion about the effect of the intervention can be formed. Also, it is proposed that the follow-up study will make use of a more diverse and larger sample group. Furthermore, a shorter time frame can be chosen to determine where the borderline of effectiveness lays in terms of duration of the intervention.

### **Conclusion**

All in all, the current research described that among employees, well-being was increased and stress was decreased after the three-week lasting gratitude intervention. However, it is not certain that these effects were caused by the intervention itself. Thus, the intervention may potentially promote a self-guided, grateful perspective on life that may become a foundation for living a healthy and joyful life, however, more future research is necessary to explore the effect of this gratitude intervention further.

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## Appendix A

## Coding scheme of pros and cons regarding usability of the app

<b>Code</b>	<b>Pro</b>	<b>Con</b>	<b>Code</b>
<b>NOTIFICATIONS</b>	"The emails"	"The amount of emails"	<b>NOTIFICATIONS</b>
<b>FEATURES DESIGN</b>	"The citations and photo's one could upload every day. Also, the design"	"Receiving email notifications instead of through the app itself"	<b>NOTIFICATIONS</b>
<b>FEATURES</b>	"The pictures you can add"	"Unable to checkmark a previous done exercise"	<b>DESIGN</b>
<b>FEATURES</b>	"The flower"	"I sometimes forgot to click on a flower petal, which made it look like I did not finish it and could not restore it"	<b>DESIGN</b>
<b>DESIGN</b>	"I liked the design, it looks nice, clear and simple"	"Could not upload photos at one time"	<b>DESIGN MISTAKE</b>
<b>FEATURES</b>	"The video's"	"Uploading photos was almost impossible, so I stopped with it"	<b>DESIGN MISTAKE</b>
<b>FEATURES</b>	"Pinning quotes and uploading photo's"	"Too many reminders"	<b>NOTIFICATIONS</b>
<b>FEATURES</b>	"I liked the introduction video's"	"For me personally there was too much mail"	<b>NOTIFICATIONS</b>
<b>DESIGN</b>	"The provided theoretical information and the feedback"	"I thought it was inconvenient to not be able to perform the exercises in the app itself, but on paper. Also, clicking on the push notifications did not bring me to the app, I had to do it myself"	<b>DESIGN</b>
<b>FEATURES</b>	"Different possibilities of the app; such as the photos or writing"		