



## **Universiteit Utrecht**

Thesis for Clinical and Health Psychology

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To what extent do positive psychological interventions prevent negative functioning and promote wellbeing?

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## Abstract

The prevalence rates of well-being show that only 17% of the world population is flourishing, which increases the risk in developing mental illnesses, such as depression. The use of Positive Psychology Interventions (PPIs) have been used in previous studies to increase well-being and buffer against negative functioning. The purpose of the present study is to investigate the relationship between well-being and negative functioning; it was hypothesized that there will be a negative correlation between well-being and negative functioning, that there will be an increase in well-being levels compared to the control group, a decrease in negative functioning levels compared to the control, and that exercise frequency will have a significant role in the increase and decrease of those levels compared to the control group. **Method:** An online intervention study with a between-measures design was used, consisting of three groups, one control and two experimental (gratitude and mindfulness). 203 participants ( $M = 29.65$ ;  $SD = 11.59$ ) completed the study. Participants had to fill-out a pre-test questionnaire, had eight days to practice their exercise, and a post-test questionnaire. **Results:** two Pearson's correlations was used to check between CES-D and MHC-SF during the pre-and-posttest and found statistically significant correlations (pre:  $r = -.705$ ;  $df = 201$ ;  $p = .000$ ;  $r^2 = .497$ ); (post:  $r = -.538$ ;  $df = 201$ ;  $p = .000$ ;  $r^2 = .289$ ); a GLM ANCOVA showed that gratitude and mindfulness conditions did not lead to a greater decrease in negative functioning  $F(2,178) = 0.23$ ;  $p = .17.$ , nor with exercise frequency  $F(14,178) = 1.37$ ;  $p = .18$ , and did not lead to an increase in well-being levels  $F(2,178) = 0.05$ ;  $p = .953.$ , nor with exercise frequency  $F(14,178) = 1.06$ ;  $p = .40$ . **Conclusions:** While there is a negative correlation between well-being levels and negative functioning, the study did not find that the role of positive activities and exercise frequency have a significant effect in increasing well-being and decreasing negative functioning. We did find an increase in well-being levels over time due to exercise frequency.

## **Introduction**

The prevalence rates of well-being show that only 17% of the world population is flourishing (Gallup Global Wellbeing Index, 2014). Additionally, countries where people are reported to have low levels of well-being have an increased risk in developing dysfunctional behaviors, thoughts, moods, and negative states, which could lead to a wide range of mental illnesses (Ronald & Bennet, 2014). For example, Depression is one of the most common negative functioning states, with the World Health Organization (WHO) reporting that almost one out of five people are suffering from it and that it is expected to be the largest influence on disease by 2030 (WHO, 2017; Board, 2012). To increase well-being levels, a new approach has taken a foothold in clinical psychology, the salutogenic approach. It holds the view that well-being and negative functioning are co-existing states and that interventions should aim to increase well-being levels and decrease negative functioning levels. This approach collides with the traditional pathogenic approach. It holds the view that well-being and negative functioning are separate states that exist in the absence of the other and that interventions should be focused on decreasing negative functioning levels, as it should result in high levels of well-being (Wood & Tarrier, 2010). The former, much younger approach, has been garnering interest amongst researchers, policy-makers, and psychologists (Diener et al., 2010).

In exploring the salutogenic approach, recent longitudinal, cross-sectional, and experimental studies show that well-being promotion has several benefits, such as acting as a buffer against mental illnesses like depression (Dolan, Peasgood, & White, 2008; Huppert, 2009). Positive Psychology, a field that holds the same views of the salutogenic approach, is the scientific study of human flourishing and optimal functioning, and it uses positive psychological interventions (PPIs) to improve mental health than merely treat mental illness (Chaudhary, Jyoti, & Chaudhary, 2014). Investigating the effects of PPIs on well-being and negative functioning in Positive Psychology research is promising thus far (Schrank, Brownell, Tylee, & Slade, 2014), as PPIs have been demonstrated to increase well-being levels with interventions that increase positive emotions, such as gratitude, resilience, and optimism (Schrank et al., 2014; Sin & Lyubomirsky, 2009). However, the research is still in its infancy and more empirical data is needed before recommending it as a supplementary tool in treatment. This makes an investigation on the effect of PPIs on well-being and negative functioning important.

### *Defining and Measuring Wellbeing*

Conducting well-being research can be a challenge, as well-being can be a difficult state to define; its ambiguous and multidimensional nature results in divided opinions on how to best define and therefore measure it. In Positive Psychology, for example, the definition of well-being is constantly changing, from Martin Seligman's PERMA model that attempts to deconstruct wellbeing to five elements, to Carol Ryff's

version of wellbeing that is made up of both philosophical and scientific epistemology (Kern et al., 2014; Dodge et al., 2012); consequently, we are left with a number of definitions that either attempt to explain wellbeing as a whole, which results in a definition too vague to be operational, or one that describes elements of wellbeing specifically and not holistically, which leaves us only looking at some aspects of wellbeing (La Placa, McNaught, & Knight, 2013).

As an attempt to resolve this issue and create a universal definition for well-being, Dodge and colleagues (2012) conducted a multidisciplinary review on well-being's several theories and models. The aim was to create an operational definition for well-being that can be used alongside other manuals that offer standard criteria for the classification of mental disorders. They concluded that well-being should be best defined as "a state of equilibrium" in which individuals can access psychological, social, and physical resources needed to meet a particular psychological, social, and/or physical challenge.

To apply this definition to this study, well-being is defined as a state that becomes more prominent given the amount of access to resources, such as PPIs, to maintain their well-being and/or to rely on such resources to buffer against negative functioning. According to this operational definition, if we know how to cultivate flourishing, then we should continue to experience levels of well-being. This aligns with the current study's aim, which is to investigate the extent to which positive psychology interventions increase levels of well-being and decrease negative functioning.

#### *Negative functioning and its relationship to wellbeing*

As previously noted, the pathogenic approach holds the view that the absence of mental illness results in the presence of well-being. Therefore, the traditional treatment for mental illness is to focus on alleviating dysfunctional behaviors, moods, thoughts, or feelings that increase or maintain the prominence of a negative functioning state (Huppert and So, 2013; Wood, 2009). To decrease levels of negative functioning, clinical guidelines recommend Cognitive-Behavioral Therapy (CBT) as first-line psychotherapy treatment. However, fewer than half of the patients who receive CBT will completely recover (Sin et al., 2011). For example, people who are treated for Major Depressive Disorder (MDD), which is a mental illness that causes significant impairment in important areas of functioning, e.g. negative mood and feelings of worthlessness (American Psychiatric Association, 2013), have an average of four relapses in their lifetime (Paykel, 2008). This suggests that CBT could be improved with additional tools; such tools can be found within the salutogenic approach, like a PPI, which aim to increase levels of well-being and to cultivate thoughts and behaviors that can be used to buffer against negative functioning (Csikszentmihalyi & Seligman, 2014).

### *Positive Psychology Interventions (PPIs)*

The basic assumption of a PPI is that well-being is not the absence of a mental illness, but the presence of a positive and multidimensional state (Bolier et al., 2013). PPIs are methods that promote well-being and to help people cultivate their strengths and enhance their overall experience with positive traits (Csikszentmihalyi & Seligman, 2014). Research in the field of Positive Psychology has provided support for this with evidence-based techniques that improve well-being (Chaudhary et al., 2014; Sin & Lyubomirsky, 2009). A meta-analysis of 51 studies by Sin and Lyubomirsky (2009) revealed that PPIs are not only effective in increasing well-being, but ameliorate depressive symptoms, too. Compared to CBT, PPIs have also shown to be effective in reducing clinical symptoms, as was demonstrated in a recent study that compared the effect to both treatment conditions (Chaves et al., 2016). PPIs, like CBT, can also be delivered in more than one format; for example, some of the most recent studies have shown PPIs to be effective when delivered as an online intervention (Baños et al., 2017; Proyer et al., 2016; Wellenzohn et al., 2016; Gander et al., 2016).

As Positive Psychology is still a growing field, it is important to note that only three meta-analyses on PPIs have been conducted thus far (Bolier, 2013; Sin & Lyubormisky, 2009; Schueller, 2014), which compared to the other several meta-analyses on the efficacy of CBT, for example, is futile. The small number of meta-analyses in Positive Psychology demonstrates the need for more research to be conducted in order to expand its knowledge base and to highlight the potential value of well-being resources on mental-health.

### *Gratitude and Mindfulness*

Gratitude, a cognitive-affective state associated with a person acknowledging a valuable benefit from another person or someone else (Emmons & Stern, 2013), is a component of well-being; interventions on increasing levels of gratitude is a popular PPI to use. These PPIs aim for well-being promotion and research has shown that the increase gratitude levels not only increases overall well-being, but feelings of resilience, as well (Csikszentmihalyi & Seligman, 2014); although the aim of these gratitude exercises is well-being promotion, it has been shown to also act as a buffer against negative functioning levels associated with depression, such as feelings of worthlessness (Lyubomirsky, Dickerhoof, Boehm, & Sheldon, 2011; Froh, Sefick, & Emmons, 2008). Daily exercises that increase gratitude can include a gratitude diary, counting one's blessings, writing down three things to be grateful for, and is also effective as an online intervention (Moenizadeh & Salagame, 2010; Schueller & Parks, 2012; Schueller & Parks, 2014). Daily gratitude exercises used in Positive Psychology is a useful and versatile intervention that can be employed to highlight the potential value of well-being on mental health.

Mindfulness, a state that involves voluntary focusing one's attention on the present sensory, cognitive, and emotional experience (Bernier et al., 2009), is a popular tool to use to decrease negative functioning. For example, a program aimed at reducing negative functioning and other illnesses is Mindfulness-based stress reduction (MBSR). This aim is dysfunction reduction and research has shown that an increase in present-moment awareness by practicing mindfulness while doing everyday activities can lead to a decrease in negative functioning (Herbert & Forman, 2011). A meta-analysis of 39 studies on mindfulness-based therapy on anxiety and depression by Hoffman and colleagues (2010) showed that it is an effective intervention for treating anxiety and mood disorders. Practicing everyday mindfulness is becoming a popular technique used in traditional therapy for reducing dysfunctional behaviors (Edenfield & Saeed, 2012). MBSR techniques, such as mindfulness, are becoming a more accepted form of clinical intervention; although mindfulness is associated with well-being, it has traditionally been used as an intervention for dysfunction reduction, making it part of the pathogenic approach (Keng, Smoski, & Robins, 2011; Bazarko et al., 2013; Marchand, 2012; Evans et al., 2010). This makes everyday mindfulness exercises a useful and measurable intervention that can be used to compare with a gratitude intervention, which primarily focuses on well-being promotion, not dysfunction reduction.

#### Purpose of the study

The purpose of the present study is to investigate the relationship between well-being and negative functioning by taking a PPI used primarily for well-being promotion, a gratitude exercise, and an exercise primarily used for dysfunction reduction, an everyday mindfulness exercise, to examine to what extent these interventions promote well-being and decrease negative functioning. This leads to the research question: To what extent do positive psychological interventions promote well-being and prevent negative functioning?

The researcher hypothesized that:

1. There will be a negative correlation between well-being and negative functioning;
2. Gratitude and mindfulness conditions will lead to greater decrease in negative functioning than the control group;
3. Levels of negative functioning will decrease based on exercise frequency;
4. Gratitude and mindfulness conditions will have a higher increase in well-being levels than the control group;
5. Well-being levels will increase based on exercise frequency.

## Method

### Design

The study at hand investigated the effects of an eight-day online intervention with a between-measures, pretest-posttest design consisting of three groups, two experimental and one control. One experimental group had a “gratitude” writing exercise condition, the other a “mindfulness” writing exercise condition, and the control group had a writing exercise where they had to write down three things they did every day.

### Participants

Quota sampling was used to recruit a large and diverse sample. Methods of online recruitment were by asking people to join the study via social media, by using an online recruitment website called “FindParticipants” (FindParticipants, 2017), and by an invitation to participate posted on the Utrecht University (UU) website (Appendix A). A link was provided in each recruitment text to direct them to the first phase of the study, the pre-test. To be included in the study, participants had to be between the ages of 18 to 64, speak English, have an email address, and have access to the Internet. In exchange for participation, UU students would receive research credit and the chance to win an iPad Air 2. Participants not from UU had the chance to win either 50 euros (or the equivalent in their currency) or an iPad Air 2. A power analysis (G-Power 3.1) determined that a minimum sample size of 132 participants was needed. The obtained sample size was 381, which was sufficient and it allowed for dropout over the course of the experiment.

The total sample that completed the study is 203 (M = 52; F = 137); 12 participants did not disclose their gender. The mean age of participants who completed the study was 29.65 years (SD = 11.59). At the end of the experiment the number of participants in each condition was as follows: control (n = 61; 30%), gratitude (n = 72; 45%), and mindfulness (n = 70; 34.5%). Most participants had an education level of a university Bachelor degree (Table 1).

**Table 1.**

**Frequency and Percentages of Education Level**

	Frequency	Percent
High School	53	26.1
Bachelor	86	42.4
Masters	46	22.7
Doctors	8	3.9
Others	10	4.9



## *Randomization*

Participants were randomly assigned to one of three conditions using a randomizer website, “Random.org” (Random.org, 2017).

## *Instruments*

### *Criteria for the Instruments*

A manual search strategy using E-books, articles, and online journals were assessed to find instruments that measure well-being and that measure negative functioning. The instruments had to be designed for general use, designed for adults, and are self-report questionnaires that did not need to be assessed by a clinician; instruments were excluded if there was no English translation, was designed for children and adolescents, can not be administered online, and can only be assessed by a trained clinician.

### *The Mental health continuum-Short form (MHC- SF)*

The MHC-SF is a 14-item questionnaire developed by Keyes (Keyes, 2002) to assess dimensions of well-being: social (5 items), psychological (6 items), and emotional (3 items). Items are scored using a 6-point Likert scale, ranging from “never to everyday”. It has been assessed in a number of studies and has been found to have excellent internal consistency and discriminant validity in adults in cross-sectional studies (Keyes et al., 2008; Lamers et al., 2011; Salama-Younes, 2011). The MHC-SF scale was found to be highly reliable with a Cronbach’s alpha of .92 for the pre and post-test compared to earlier findings, which tested the MHC long-form (Westerhof & Keyes, 2009). This questionnaire was the favorable choice to assess well-being, as it captured all elements of well-being and flourishing, as opposed to other questionnaires that investigate more specific components that only make up part of well-being. The MHC-SF ( $\alpha = .73 - .83$ ) was used to assess well-being during the pre-and-post-test.

### *Centre for Epidemiologic Studies Depression Scale (CES-D)*

The CES-D is a 20-item questionnaire that measures six components of depression: mood, feelings of guilt and worthlessness, feelings of hopelessness and helplessness, psychomotor retardation, loss of appetite and sleep disturbance. It shows to be a reliable measure across different races, genders, ages, and to have a high internal consistency (Hunter et. al, 2003). The CES-D was the favorable choice to assess negative functioning, as it has greater emphasis on the negative functioning components that comprise depression, which was what the researchers were most interested in capturing. In the present study, the CES-D scale was found to be highly reliable with a Cronbach’s alpha of .94 for the pre and post-test of 0.91 compared to

earlier findings that tested CES-D. The CES-D ( $\alpha = .85 - .90$ ) was used to assess negative functioning during the pre-and-post-test.

### Interventions

Three distinct interventions were used for each condition. Each intervention was recorded by one of the researchers as an audio file with both audio and written instructions in the email that the participant should follow (Appendix C). Our interventions were delivered via an audio file, as a study by Nortcliffe (2009) showed that students like to rely on audio recordings as a way to enhance their learning experience.

### *Gratitude*

Three Good Things is an evidence-base gratitude exercise (Gander et al., 2012) that consists of writing down three things that happened every day that the participant feels grateful for. The gratitude audio file included a definition for gratitude and an instruction to take ten minutes from the evening to practice the exercise.

### *Mindfulness*

“Mindful teeth-brushing” is an informal mindfulness exercise taken from the Positive Psychology Toolkit’s “Mindfulness in Your Morning Routine” (Positive Psychology Program, 2017). The exercise in the toolkit is a shower exercise with some evidence-base (Krusche et al., 2012). One of the researchers adapted the showering practice to a teeth-brushing exercise in order for participants to hear the audio file as they practiced their exercise. The audio file provided a definition for mindfulness and contained a one-minute guided mindfulness speech, taken from the Toolkit. We asked them to practice this exercise in the evening for two minutes, which is the recommended teeth-brushing time by Dentists (Colgate, 2017).

### *Control*

The control group was not provided a definition, as there was no concept needed to be defined, but they were instructed to write down three events that occurred each day. The audio file was emailed to the participants and the researchers recommended them to listen to it every day. We asked them to take ten minutes in the evening to do the exercise.

### Procedure

The pre-test was a 61-item online questionnaire created on Qualtrics (Qualtrics, 2017). It included a registration form, demographics information assessment, informed consent (Appendix B), MHC-SF, and CES-D. Once registered, participants were randomly assigned to one of the three conditions and a participant number. On the same day, they received an email from one of the researchers containing the intervention exercise and participants were asked to do the exercises every day for seven days. Two reminder emails were sent out on day three and six with the same instructions and audio file they received in the first email

(Appendix D). On the eighth day, participants were emailed a link to complete the post-test (Appendix E). The post-test was a 48-item questionnaire designed on Qualtrics (Qualtrics, 2017). It included a form to fill in the participant number, MHC-SF, CES-D, exercise frequency (0-7 times the exercise was practiced), and Debriefing (Appendix F). There was also an optional question to provide descriptive feedback (Appendix G). One reminder email was sent out on day nine (Appendix H). Participants were given three additional days to fill in the post-test questionnaire in order to capture the effects of the interventions or were excluded in our analysis.

### Statistical Analyses

The software used was the Statistical Packages for Social Science (SPSS, *version 24*). For the pre-test measures, a randomization test was used to investigate possible differences at baseline regarding the two instruments in the first condition: MHC-SF and CES-D. A one-way ANOVA was used to investigate those potential differences. To test hypothesis 1, which states that there is a negative correlation between negative functioning (CES-D) and well-being (MHC-SF), a Pearson's correlation was used to check the correlation between CES-D and MHC-SF. The following four hypotheses are all checked with the General Linear Model (GLM) – Analysis of Covariance (ANCOVA). Hypotheses 2 and 3, which state that gratitude and mindfulness conditions will lead to a greater decrease in negative functioning than the control group and that negative functioning will decrease based on exercise frequency, are checked with GLM ANCOVA with CES-D as dependent, group (control, gratitude, mindfulness), exercise frequency, and repeated measure of CES-D as independent. Hypothesis 2 is tested via the interaction term of the repeated measure of CES-D and group, while hypothesis 3 is tested via a three-way interaction term of repeated measure of CES-D, group (control, gratitude, and mindfulness) and, exercise frequency. Hypotheses 4 and 5, which state that gratitude and mindfulness conditions will lead to an increase in well-being than the control group and that well-being will increase based on exercise frequency, are checked with GLM ANCOVA with MHC-SF as dependent, group (control, gratitude, mindfulness), exercise frequency, and repeated measure of MHC-SF as independent. Hypothesis 4 is tested via the interaction term of the repeated measure of MHC-SF and group, while hypothesis 5 is tested via a three-way interaction term of repeated measure of MHC-SF, group (control, gratitude, and mindfulness) and, exercise frequency.

## Results

### Randomization

For the pre-test measures, a randomization test was used to investigate possible differences at baseline regarding the two instruments in the first condition: MHC-SF and CES-D. A one-way ANOVA was used to investigate those potential differences and no statistically significant differences at baseline were found for the CES-D ( $F_{(2,200)} = 0.12$ ,  $p = .884$ ) or for the MHC-SF ( $F_{(2,200)} = 1.07$ ,  $p = .346$ ), either. This means that the randomization appears to have been worked appropriately.

### Sample Description

**Table 2.**

**Pearson's correlation of variables.**

	N	Min.	Max.	Mean	SD
Age	203	18.0	65.0	29.65	11.59
1 MHCSF Pre	203	1.50	5.86	4.01	0.97
2 MHCSF Post	203	2.14	6.00	4.26	0.98
3 CESD Pre	203	0.00	2.65	0.80	0.56
4 CESD Post	203	0.00	2.50	0.65	0.49

Hypothesis 1: There will be a negative correlation between well-being and negative functioning

In investigating the correlation between well-being and negative functioning, the results of two Pearson's correlations of variables (Table 2) of pre-and-post measures of CES-D and MHC-SF found statistically significant negative correlations (pre:  $r = -.705$ ;  $df = 201$ ;  $p = .000$ ;  $r^2 = .497$ ); (post:  $r = -.538$ ;  $df = 201$ ;  $p = .000$ ;  $r^2 = .289$ ). This supports the hypothesis that there was a negative correlation between well-being and negative functioning, with close to a medium effect size for the pre-test ( $r^2 = .497$ ) and a small effect size for the post-test ( $r^2 = .289$ ).

Hypothesis 2: Gratitude and mindfulness conditions will lead to greater decrease in negative functioning &

Hypothesis 3: Levels of negative functioning will decrease based on exercise frequency

Hypotheses 2 and 3 were checked with GLM ANCOVA with CES-D as dependent, group (control, gratitude, mindfulness), exercise frequency, and repeated measure of CES-D as independent. Hypothesis 2 was tested via the interaction term of the repeated measure of CES-D and group (Table 3), the interaction term of repeated measures with group was statistically not significant;  $F(2,178) = 0.23$ ;  $p = .17$ . Hypothesis 3 was tested via a three-way interaction term of repeated measure of CES-D, group (control, gratitude, and

mindfulness) and, exercise frequency. The three-way interaction effect between repeated measures, exercise frequency, and group was statistically not significant;  $F(14,178) = 1.37$ ;  $p = .18$ . This does not confirm hypothesis 2 or 3 that positive activities will result in a decline of negative functioning symptoms; the control group had the same effect. Exercise frequency did not have an effect in decreasing negative functioning.

**Table 3.**

**Results of GLM ANCOVA of negative functioning (CES-D)**

	F	df 1/df2	p
Group	0.45	2, 178	.636
Exercise frequency	1.31	7, 178	.247
Time	20.91	1, 178	.05
Group * exercise frequency	.85	14, 178	.063
Exercise frequency * time	0.47	7, 178	.85
Group * time	0.23	2, 178	.17
Group * time * exercise frequency	1.37	14, 178	.18

Hypothesis 4: Gratitude and mindfulness conditions will have a higher increase in well-being levels than the control group & Hypothesis 5: Well-being levels will increase based on exercise frequency

Hypotheses 4 and 5 were checked with GLM ANCOVA with MHC-SF as dependent, group (control, gratitude, mindfulness), exercise frequency, and repeated measure of MHC-SF as independent. Hypothesis 4 was tested via the interaction term of the repeated measure of MHC-SF and group (Table 4), the interaction effect of repeated measures with group was statistically not significant;  $F(2,178) = 0.05$ ;  $p = .953$ .

Hypothesis 5 was tested via a three-way interaction term of repeated measure of MHC-SF, group (control, gratitude, and mindfulness) and, exercise frequency. The three-way interaction term between repeated measures, exercise frequency, and group was statistically not significant;  $F(14,178) = 1.06$ ;  $p = .40$ . This does not confirm hypothesis 4 or 5 that positive activities will result in an increase of well-being levels; the control group had the same effect. Exercise frequency did not have an effect in increasing well-being levels.

**Table 4.**

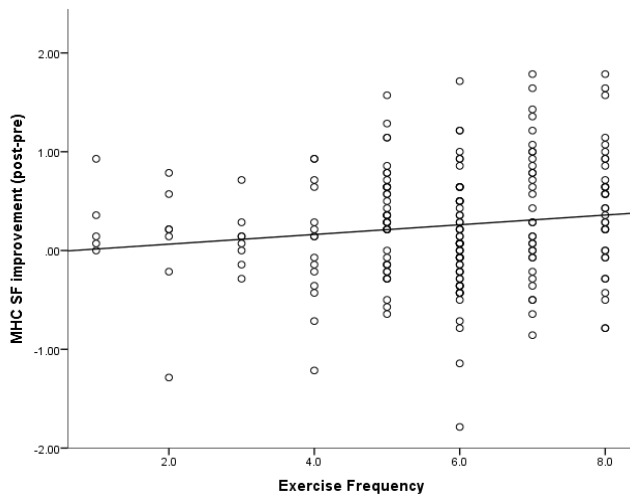
**Results of GLM ANCOVA of positive functioning (MHC-SF)**

	F	df 1/df2	p
Group	1.02	2,178	.363
Exercise frequency	0.87	7,178	.529
Time	14.54	1, 178	.000

Group * exercise frequency	0.58	14, 178	.877
Exercise frequency * time	2.09	7, 178	.047
Group * time	0.05	2, 178	.953
Group * time * exercise frequency	1.06	14, 178	.401

### Exploratory Analyses

Within the GLM ANCOVA for MHC-SF, time and the interaction term of time and exercise frequency were both statistically significant (Table 4). A Bonferroni confidence interval shows that pre-to-post changes of MHC-SF are positive (95% CI = [0.12; 0.38]). A Pearson's correlation between the difference between MHC-SF pre-and-post and exercise frequency shows that the direction of the interaction effect is positive ( $r = .14$ ,  $n = 203$ ,  $p < .05$ ) (Figure 1). This means that over time, well-being levels increase and that this increase is enhanced by exercise frequency.



**Figure 1. Scatter-plot of exercise frequency against MHC-SF improvement score**

## Discussion

The purpose of this study was to investigate the relationship between well-being and negative functioning by taking a PPI, a gratitude exercise, and an exercise primarily used for dysfunction reduction, an everyday mindfulness exercise, to answer the research question, which is “To what extent do positive psychological interventions prevent negative functioning and promote well-being?” Five hypotheses were tested; while the first hypothesis can be confirmed that there is a negative correlation between well-being and negative functioning, hypotheses two to five, which test the role of positive activities and exercise frequency between the three conditions, cannot be confirmed. We do find, however, that exercise frequency of positive activities did lead to an increase in well-being levels over time, regardless of the assigned condition the participant is in.

Between the pre-and-post tests, participants showed an increase in well-being levels and a decrease in negative functioning within eight days, which confirms that there is a negative correlation between well-being and negative functioning. This is aligned with the study by Wood & Tarrier (2010) arguing for the existing relationship between the two states. This correlation demonstrates a relationship between two states, which differs from the pathogenic approach that both states are separate and do not coexist. If a person has high levels of negative functioning, for example, there is still a presence of well-being levels, albeit low. Wood and Joseph (2010) argue that well-being levels being present, but low, may be due to a negligence of resources that cultivate that state. This highlights the importance of giving an equally weighted focus on both states.

While we assigned two interventions and one control writing exercise, participants showed an increase in well-being levels and a decrease in negative functioning in all three conditions, which demonstrates that well-being and negative functioning levels did not differ significantly in the post-test between all three groups. While there is a correlation between negative functioning and well-being, we were unable to confirm that an increase in well-being levels and a decrease in negative functioning were due to the PPIs. While these results differ from others that showed a significant effect using PPIs compared to control groups (cf. Sin & Lyubomirsky, 2009), there have been previous studies on PPIs that have shown participants experiencing significant improvement in the control condition, as well. For example, Mongrain and Anselmo-Mathews (2012) conducted a replication study of Seligman’s (2005) study, which was an online PPI intervention study and found that all conditions, including the control, improved over the course of seven days. The aim of the replication study was not to only replicate but to improve the control condition, as they believed that participants in the control experience a “manipulation of belief in positive change”, which altered the results since the participants had “high hopes”; they added an additional control exercise and found that the original control condition, which was a writing exercise on positive memories, may have

been an accidental creation of a PPI and that it also had the same therapeutic effect shared with other PPIs. This may have occurred in the current study's control condition, as well. A follow-up study could determine if the unexpected results may be explained by an influence of a belief in positive change, specifically in the control condition, known as the Hawthorne effect, or if like Seligman's (2005) study, the researchers created an exercise that has therapeutic effects on well-being and negative functioning levels.

### *The Hawthorne effect*

The Hawthorne effect is a change in participants' behavior or outcomes that is not due to the condition that they are assigned to, but by being aware that they are part of a research study (Sedgwick, 2011; McCambridge et al., 2014), and for this study specifically, that the participants were aware that we were studying the role of positive activities. We advertised our study as a research on the influence of positive activities on well-being, which may have given participants expectations of what the interventions' goals were, creating a response bias. A recent systematic review of the Hawthorne effect in 19 articles by Cambridge and colleagues (2014) found that there is a strong likelihood for such an effect to occur because of unknown and uncontrolled biases, but that the strength of the effect is determined by how aware they are of what is expected of them. Since the study was advertised as research on "the influence of positive activities", it is likely that participants' knowledge determined the study's outcomes.

### *The impact of reflective writing*

In the audio file containing instructions for the control condition, we introduced participants to the exercise by referring to their writing exercise as a "reflection". While this is not a PPI, it is possible that the participants in this condition interpreted it as a form of journal writing. Some of the written feedback from the control group shows this possibility:

- ❖ "It was very interesting to see what stood out during the day that could be written down, and choosing between different events or thoughts."
- ❖ "I liked to take a moment every day to do the exercise because it gave me a quiet moment "for myself" that I didn't need to share with others."
- ❖ "I liked to always be aware of what was happening during the day or the week. The days did not just pass by without being aware of it."
- ❖ "It was a very interesting experiment and helped me to self-reflect on a daily basis. I experience that my observations helped to interpret situations better and to learn many things about myself. Great stuff."

The feedback given from a number of participants in the control group provides useful insights as to how the task of "write down three things that happened every day" could be interpreted. Since they were told beforehand in the recruitment text that these activities were "positive", it is possible that some participants



filtered their days and chose events that had some personal and significant meaning to them. This is a common issue with unguided online interventions, as participants have a different understanding of what is to be expected (Baumeister et al., 2014). There was an attempt to control for that by explicitly stating in the audio file instructions to write down events that could or could not be significant to them; but, if participants had already assumed the exercise is positive, it could explain why the written responses were positive and why the control group had experienced significant improvement from the pre-to-posttest.

Reflective writing is not a PPI, however it could lead to increases of well-being, with some arguing that journaling daily activities, thoughts, and emotions, may allow for cognitive and emotional processing (Borkin, 2014). Furthermore, self-writing on experiences may help shape relations to others, which, as stated by Theresa Sauter (2014), has been a form of catharsis since the Ancient Greeks via letter writing. For example, Levine and colleagues (2008)'s study on thirty-two interns participating in "narrative writing" resulted in cathartic reflection, self-awareness, and it encouraged interns to reconsider their core values and priorities. In hindsight, it appears that all three conditions involved some form of reflection. If participants in the control condition filtered the events of their day to those that had personal meaning to them, then it could be argued that they followed the same procedure that participants in the gratitude condition did, for example, where they had to filter events that made them feel grateful. Also, all participants were instructed to practice their exercise at the end of their day upon reflection of the day's events, which may have promoted some form of cognitive process that involved increasing awareness. A follow-up study would have to be done to determine the likelihood of this possibility.

### *The impact of exercise frequency*

While the increase in well-being and decrease in negative functioning was not influenced between all three conditions, we did find that exercise frequency did increase levels of well-being over time. This means with practice, well-being levels can become strengthened and take on a more prominent role. This, alongside the confirmation that there is a negative correlation between well-being and negative functioning, supports the argument that positive activities help buffer against negative functioning while promoting well-being (Dolan, Peasgood, & White, 2008; Huppert, 2009). It also is in alignment with Cohn and Fredrickson's (2010) study on long-term outcomes of Loving-Kindness meditation, a PPI, which showed all participants maintaining their well-being levels and that they expressed more positive emotions in a 15-month follow up; it is important to note that participants had 9 weeks to practice their intervention, in contrast to ours. The extent in which exercise frequency promotes well-being in our study is unclear, as we only gathered results after eight days. A follow-up study could determine if well-being levels were maintained, increased, or decreased.

## *Strengths*

The Mindfulness and Gratitude online interventions were easily administered by the researchers, understood by the participants, and could be followed as an online intervention via audio files. The “three good things” gratitude exercise was effective, which is consistent with Seligman and colleagues (2005) study that also used the same exercise for one week via an online study. The “teeth-brushing” mindfulness exercise was an Informal Mindfulness practice, and was the best intervention to use, as it allowed for participants to listen to the audio file while practicing mindfulness. An Informal Mindfulness exercise was also convenient to use for this eight-day study, as Formal Mindfulness exercises generally ask participants to practice these exercises for a longer period of time before testing for its potential effects (Carmody & Baer, 2009).

With the risks of miscommunication and misinterpretation in delivering an intervention online, an Internet-based PPI intervention was the best method of delivery. Firstly, it was easier to recruit a large sample than in a face-to-face on-site study. We successfully recruited a large sample of people in thirty days, mainly due to FindParticipants, which makes our results more generalizable. Secondly, it is more affordable and accessible to people (Masselink, 2013), making it a convenient and attractive study to participate in; participants could practice their exercise at their own pace and in any location they choose to. Online interventions are a good method in delivering interventions for people living in remote areas, who have physical limitations, and who are looking for more convenient self-help strategies (Bennet-Levy & Perry, 2009). The study at hand was able to show that PPIs are simple and effective as a self-help evidence-based intervention.

The use of audio files was also successful, as it helped provide guidance without direct involvement. Like the Nortcliffe (2009) study, our sample was mostly of students, and the efficacy of the audio files allowed a way to enhance their learning experience. Another strength was also the utilization of reminder emails to our participants, since it was another way for researchers to guide their participants through the study without direct involvement.

## *Limitations*

While the gratitude and mindfulness interventions were easily administered and understood, our mindfulness exercise was much shorter in terms of the duration of the experiment and how long participants were to practice it for (e.g. two minutes versus one hour in other studies) (Cavanagh et al., 2013; Hindman et al., 2015; Krusche et al., 2012). Furthermore, we also instructed participants in the gratitude and control condition to take ten minutes of their time in the evening to practice their exercise, while we only gave the participants in the mindfulness exercise two minutes. Even though a two-minute tooth brushing is in alignment with the recommendation of Colgate (Colgate, 2017) and Gallagher and colleagues (2009), it does not allow enough time to cultivate mindfulness. There are inconsistencies in literature as to how long one

should practice mindfulness for, with some arguing for thirty-second mindfulness exercise to forty minutes a day (Davidson, 2010; Moore et al., 2012; Lanius, 2011; Slagter et al., 2011). Although participants in the mindfulness condition did improve in well-being levels, more time should have been allotted for them, but perhaps by using a different Informal Mindfulness exercise that still allowed them to listen to the audio file. It remains unclear if participants improved due to a response bias alone or if the intervention created for the control group allowed for self-reflection and perspective shifting, which mindfulness and gratitude interventions also aimed to achieve.

Although online interventions and recruitment allowed for a larger sample size, it leaves several gaps in our research. Firstly, it is impossible to determine how participants interpreted their exercise, for example, or if they displayed more adherence than the other groups. While reminder emails were a good choice in terms of indirect guidance, it is unclear if their use helped maintain adherence since there was a 47% drop-out rate. Treatment adherence could have had a role in the differing results. For instance, the control group may have been more motivated than the other groups, leading to significant results. Although there was an attempt control for that by allowing participants to email researchers with questions or concerns, it still did not prevent one of the drawbacks of online studies, which is that participants do not have as much access to researchers the way that an interactive on-site experiment does (Christensen et al., 2009). Secondly, it is possible that the sample was the wrong target group, as several studies prior targeted groups of depressed people, while this study's only requirements were that participants to be between the ages of 18-64 and to be able to speak English. While participants did have high levels of negative functioning, it was not a clinically depressed sample. Targeting a depressed sample group could have yielded the results expected, as it would have been more similar to previous studies. Thirdly, it is possible that an inappropriate measure for negative functioning was used, the CES-D, as it assesses depression specifically. Another questionnaire, such as the Negative Mood Questionnaire (NRM), could have been more appropriate, as it assesses behavioral or cognitive constructs that influence negative mood states. The NRM could have provided more useful insights on several aspects of negative functioning, whereas CES-D may have been too limiting in terms of assessing negative functioning. Finally, reliance of self-reports were another limitation, as it increased the risk of biases, such as response bias.

In order to prevent a bias, the researchers did not provide a conceptual introduction on gratitude, mindfulness, or self-writing. While the term "reflection" in the control condition may have had an effect on the participants' behaviors, a definition of these concepts could have decreased the likelihood of misunderstandings. Keeping in mind that doing so would have increased risks of the Hawthorne effect significantly, however, some of the written feedback provided at the end of the study showed that it may have been necessary to include definitions for participants. For example, the received feedback from the

Mindfulness Questionnaire included participants finding mindfulness to be “abstract” and “hard to understand”. Another limitation is that the experiment only lasted eight days, which may not have been enough time for participants to be introduced to the interventions conceptually and may not have practiced their exercises each day. There was an attempt to control for that by having them report the number of times they practiced their exercise in order to see if it did have a significant effect on well-being levels, negative functioning, and if it differed between all three conditions.

### *Recommendations*

First, a follow-up study should be conducted to determine the long-term effects of the exercises and to assess if participants’ changes or maintenance were due to a Hawthorne effect or some other effect, such as the control condition have a beneficial exercise. Second, to replicate the study, it is recommended for future researchers to create an additional control group, like in Mongrain and Anselmo-Mathews’s (2012) study that controlled for “control expectancy”. One way to limit a change in behavior could be by having them practice an activity that does not rely on reflection, such as taking ten minutes every day to write down three things they have read that day. Third, it is recommended to change the mindfulness exercise from a teeth-brushing practice, to “Washing Dishes to Wash Dishes” practice, which is an Informal Mindfulness exercise where participants engage in a contemplative practice, and it is an exercise that has been demonstrated in a previous study to be efficacious in decreasing negative functioning (Hanley et al., 2014). Fourth, it could be worth considering changing the CES-D to NMR, for example, which varies in its assessment of negative functioning, as CES-D primarily looks at negative functioning symptoms that lead to MDD. NMR, on the other hand, is a scale that assesses one’s belief on how likely they are to alleviate their negative mood, with participants having strong or weak expectancies based on the level of negative affect they are experiencing (Catanzaro & Mearns, 2011). Since this study defined well-being as a state in which people have access to resources that could increase their well-being levels, an NMR scale defines negative functioning similarly. It is important to note that NMR is primarily used in psychotherapy to track progress (California State University, Fullerton, 2016) and CES-D has been a more popular choice in previous studies. The final recommendation is to neutralize terms in the recruitment and instruction messages that may lead to a response bias, such as changing “positive activities” in the recruitment message to “activities”. It is also recommended that future researchers should allot for a longer time to allow participants to grasp the principles of these interventions and to give them longer than a week to practice these exercises. Given the lack of clarity as to why the control group improved, it is difficult to recommend another writing exercise or more explicit instructions in the audio file.

Testing the science of flourishing, Positive Psychology, only helps to expand our knowledge base on how to improve the quality of life. Given recent events, political tension, and the dismal well-being levels of the

world population, it is imperative to continue researching on short and effective exercises that will help people become more resilient, flourish, and self-reliant.

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## **Appendix A. Recruitment texts**

*“Dear reader,*

*We are three students of the masters program of Clinical Psychology at Utrecht University (The Netherlands). We are currently conducting research on the influence of positive activities on wellbeing. We are looking for people from 18-65 years old willing to participate. Participation means that you fill out a short online questionnaire twice and practice a short exercise for seven days.*

*We offer you the chance of winning a new iPad air 2 (32 GB) or 50 euros or the equivalent in your country’s currency. If you are currently studying at Utrecht University, you will receive 3 research credits and have the chance of winning an iPad air. If you are not a UU student, you have the chance of winning an iPad air or 50 euros.*

*Would you like to participate in this study? Click this link: <http://tinyurl.com/h4d9ph6> to register for participation. Thank you in advance!*

*Kind regards,*

*Reham Al Taher, Etienne Andree and Fanny Hakstege*

### **Recruitment Text for UU Students**

*“Dear UU student,*

*We are three students of the masters program of Clinical Psychology at Utrecht University (The Netherlands). We are currently conducting research on the influence of positive activities on wellbeing. We are looking for people from 18-65 years old willing to participate. Participation means that you fill out a short online questionnaire twice and practice a short exercise for seven days.*

*We offer you the chance of winning a new iPad air 2 (32 GB) and you will also receive 3 research credits (PPUs).*

*Would you like to participate in this study? Click this link: <http://tinyurl.com/h4d9ph6> to register for participation. Thank you in advance!*

*Kind regards,*

*Reham Al Taher, Etienne Andree and Fanny Hakstege*

## **Appendix B. Informed consent**

Dear participant,

We are interested in looking at the impact of positive activities on well-being. For the next seven days you will be asked to do a short exercise during the evening. Prior to and after the exercise, you will be asked to fill out a short questionnaire.

### **What does participation in this research entail?**

Your participation in this study is completely voluntary and you have the opportunity to discontinue participation at any point in time. This study will consist of three parts:

Part 1: A questionnaire will be sent out that assesses your emotions and well-being (approx. 10 minutes to complete)

Part 2: You will be sent a link of a short exercise to do for the next

Part 3: A final questionnaire will be sent out assessing the same components as part one (approx. 5 minutes to complete).

Afterwards we will ask you to evaluate the study.

### **Confidentiality and anonymity**

All the information we ask for is only used in the present study. We will need your email solely to send the questionnaires and to provide instructions about the exercise. Your details will be handled with confidentiality and anonymity. We will discard your email address after the study.

After completing the study, we will contact you one more time with an overview of the entire experiment. You will have the chance to contact us if you would like to receive an abstract of the study. We will discard your email address after we have sent you the abstract.

You also have the option to contact us through [researchuu16@gmail.com](mailto:researchuu16@gmail.com) if you have any questions during the study and we will help guide you along as best as we can.

### **Benefits of participation**

If you are currently an Utrecht University student, you will receive 3 research credits (PPU) for participating and you will have the chance of winning an iPad air 2 (32GB). If you are not an Utrecht University student, you will also have the chance of winning an iPad air 2 or 50 euros (or the equivalent in your country's currency).

### **Possible risks of participation**

Some of the questions on positive and negative emotions may evoke unpleasant experiences. If you have this and you want to talk about this, please contact our thesis supervisor Dr. Sibe Doosje at [s.doosje@uu.nl](mailto:s.doosje@uu.nl) or +31 30 2534906 and he can help resolve any issue you may have.

By clicking 'accept', you give us your informed consent. This means that you agree that you are participating out of free choice and willingness. You also have the right to withdraw during any time of the experiment without giving a reason why. Your data will be anonymized. They will not be used for purposes other than the present research.

Kindest regards,

Reham, Etienne, and Fanny

## Appendix C. Transcript of interventions

Once participants have completed the first questionnaire, they will be invited to the intervention part by the following e-mail, varying depending on the condition. They will be asked to open the attached audio file to listen to the instructions given:

### MINDFULNESS EXERCISE

Dear reader,

Thank you for filling out the questionnaire. In this part, you will receive your exercise to practice daily for seven days.

“The moment one gives close attention to anything, even a blade of grass, it becomes a mysterious, awesome, indescribably magnificent world in itself.” - H. M.

In this practice, we want to ask you to focus on your sensations and your experiences.

Your exercise

Open the audio file attached to this email and listen to it for the following seven days before brushing your teeth in the evening.

Transcript

This audio file contains an explanation to mindfully brush your teeth. First, I will give you a short explanation of how the exercise works. After the gong you will start the exercise.

For the next 7 days you will brush your teeth in a mindful way every evening before going to sleep.

Get ready to brush your teeth.

Be aware of how the floor feels that you stand on. Notice the sound of the water coming out of the tap.

What are the sensations you experience? What do you see when you put the toothpaste on your toothbrush? How does the toothpaste smell and taste?

Notice the movements of your arms from side-to side when brushing your teeth.

If thoughts arise during this time, acknowledge them and then, let them go. Thoughts come and move on like clouds.

Gently bring your attention back to the sensations that the teeth-brushing provides, after acknowledging what distracted you.

Please do this exercise for about 2 minutes. The sound of the gong tells you when to start and stop.

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### GRATITUDE EXERCISE

“Gratitude makes sense of our past, brings peace for today, and brings a vision for tomorrow” - Melody Beattie

Your exercise

Open the audio file attached to this email and listen to it for the following seven days before going to sleep. We recommend taking ten minutes every day to write down three things you're grateful for and why.

Transcript

This audio file contains an introduction to an exercise on gratitude.

Can you recall moments in your life you wished you showed more appreciation of good things happening? As the famous saying goes, we only know what we have when it's gone. It's much easier to focus on what's going wrong than right.

For this week, you will be asked to write down three things everyday you're grateful for and why.

These three things can have a small or large meaning for you.

We recommend taking 10 minutes of your time before you sleep to write in a journal or on your mobile device.

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## CONTROL EXERCISE

“Self-reflection is the school of wisdom”- Baltasar Gracian

### Your exercise

Open the audio file attached to this email and listen to it for the following seven days before going to sleep. We recommend taking ten minutes every day to write down three things you're grateful for and why.

### Transcript

This audio file contains an introduction to an exercise to follow for the next seven days.

Can you recall when was the last time you slowed down and reflected on three things that happened that day?

For this week, you will be asked to write down three things that happened to you today.

These three things could be a small or large event.

We recommend taking 10 minutes of your time before going to sleep to write in a journal or on your mobile device.



## Appendix D. Reminder emails for interventions

During the intervention week, participants will be e-mailed two days after giving the instruction and four days after the instruction asking for their experiences and reminding them of the incentives:

Day 3 (Gratitude)

*“Gratitude and attitude are not challenges; they are choice” - Robert Braathe*

*Dear participant,*

*You're almost halfway there! We hope you are enjoying your exercise so far.*

*In case you have forgotten, you have been asked to write down three things you are grateful for every day, and why you are grateful for them. If you have not been able to do the exercise yet, there are still a few days left for you to do them!*

*You can possibly win an iPad, 50 euros, or research credits (only applicable to Utrecht University students).*

*If you have any questions, you can ask them by replying to this email.*

Day 3 (Mindfulness)

*“The best way to capture moments is to pay attention. This is how we cultivate mindfulness. Mindfulness means being awake. It means knowing what you are doing” - Jon Kabat-Zinn*

*Dear participant,*

*You're almost halfway there! We hope you are enjoying your mindfulness exercise so far.*

*In case you have forgotten, you have been asked to practice mindful tooth-brushing for at least 2 minutes a day. If you have not been able to do the exercise yet, there are still a few days left for you to do them!*

*You can possibly win an iPad, 50 euros, or research credits (only applicable to Utrecht University students).*

*If you have any questions, you can ask them by replying to this email.*

Day 3 (Control)

*“Pause for a moment and reflect” - Oprah*

*Dear participant,*

*You're almost halfway there! We hope you are enjoying your exercise so far.*

*In case you have forgotten, you have been asked to write three things that happened to you every day. If you have not been able to do the exercise yet, there are still a few days left for you to do them!*

*You can possibly win an iPad, 50 euros, or research credits (only applicable to Utrecht University students).*

*If you have any questions, you can ask them by replying to this email.*

Day 6 (Gratitude):

*“Gratitude and attitude are not challenges; they are choices” - Robert Braathe*

*Dear participant,*

*Only a few days left and you're done! We hope you have been enjoying writing down three things you're grateful for the past week.*

*When you have finished, we will determine if you win one of the rewards via a lottery. Utrecht University students will get research credits for their participation and still have a chance of winning an iPad.*

*In case you have forgotten, you have been asked to write three things down everyday you are grateful for and why.*

*If you have any questions, you can ask by replying back to this email.*

Day 6 (Mindfulness):

*“The best way to capture moments is to pay attention. This is how we cultivate mindfulness. Mindfulness means being awake. It means knowing what you are doing”- Jon Kabat-Zinn*

*Dear participant,*

*Only a few days left and you're done! We hope you have been enjoying your mindful tooth-brushing.*

*When you have finished, we will determine if you win one of the rewards via a lottery. Utrecht University students will get research credits for their participation and still have a chance of winning an iPad.*

*In case you have forgotten, you have been asked to practice mindful tooth-brushing for at least two minutes a day.*

*If you have any questions, you can ask by replying back to this email.*

Day 6 (Control):

*“Pause for a moment and reflect” - Oprah*

*Dear participant,*

*Only a few days left and you're done! We hope you have been enjoying reflecting on things that happened to you everyday.*

*When you have finished, we will determine if you win one of the rewards via a lottery. Utrecht University students will get research credits for their participation and still have a chance of winning an iPad.*

*In case you have forgotten, you have been asked to write three things that happened to you every day.*

*If you have any questions, you can ask by replying back to this email.*

## **Appendix E.** Link to post-test questionnaires

On the eighth day:

*“Dear participant,*

*Thank you for sticking with us! We hope you have enjoyed your exercise. You have reached the last part of the study, in which we ask you to fill out a final short questionnaire. As this will only take about 5 minutes to complete, we want to ask you to complete it today.*

*To be able to fill out the questionnaire, we give you a participant number. Keep this and use it when we ask for it to ensure that your anonymity is guaranteed.*

*Your participant number is (...) You will need the participant number for the questionnaire!*

*The link to the questionnaire is <http://tinyurl.com/zguwwm5>*

*Don't forget - participating in this study means you can win an iPad, 50 euros, or get research credits (if you are a student at Utrecht University).*

*Kind regards,*

*Etienne, Fanny, and Reham”*

## **Appendix F. Debriefing**

After completing the questionnaire for the second time, all participants will be presented with a debriefing in which the aims of the study will be explained.

*“Dear participant,*

*Thank you for participating in our study!*

*Your help is very much appreciated and we are glad you made it through until end of the week. Now that you’ve finished, we guess you are pretty curious on what the study was about.*

*We were testing to see what effect an exercise on gratitude or mindfulness had on your levels of positive and negative emotions. The questionnaire was used to monitor how well these exercises improve your well-being.*

*In the questionnaire, we were measuring your levels of depression, gratitude, well-being and mindfulness. Within our study, we had three different groups and you were assigned to one of them. One group was asked to write about things they were grateful for everyday. The second group was asked to participate in a mindfulness training. The third group had to write down how their day was every day.*

*To determine who won one of the prizes, we will randomly draw two participant numbers and notify winners through email. If you would like to access the exercises after we have finished our study, please send us an email via [reseachuu16@gmail.com](mailto:reseachuu16@gmail.com). Also, information about the results can be obtained via this email.*

*Regards,*

*Reham, Etienne, and Fanny”*

## **Appendix G. Feedback**

In T2, the second measurement, participants will be asked to provide feedback about the exercises:

*Feel free to share your experience with the exercise during the last week. Feedback is very important to us and the development of the exercises we provided. What did you like or not like about it? (Optional)*

*Did you experience any difficulties while filling out the questionnaires or doing the exercises?*

## **Appendix H.** Reminder emails for post-test questionnaires

On the ninth day:

*“Dear participant,*

*This email is a kind reminder for you to fill out the questionnaire for our study. We would like to ask you to complete the questionnaire today.*

*If you are experiencing issues with accessing the questionnaire or for any other concern, let us know by replying to this email.*

*Your participant number is [...]*

*The link to the questionnaire is <http://tinyurl.com/zguwwm5>*

*Don't forget - participating in this study means you can win an iPad, 50 euros, or get research credits (if you are a student at Utrecht University).*

*Kind regards,*

*Reham Al Taher, Etienne Andree and Fanny Hakstege*