*The comparative efficacy of a mindfulness and gratitude intervention in alleviating depressive symptoms and the moderating role of gratitude as a trait*

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**ABSTRACT**

The efficacy of two brief positive psychology interventions (PPIs) in reducing depressive symptoms was examined in an Internet-based randomized, controlled study. The aims of the study were to: (1) determine what elements of positive psychology could be used in addition to traditional clinical interventions; (2) assess the comparative efficacy of a mindfulness and gratitude intervention in alleviating depression; and (3) investigate the moderating role of trait gratitude. Hypothesized was that both the mindfulness and gratitude intervention would alleviate depressive symptoms. The mindfulness intervention was expected to be superior over the gratitude intervention. Moreover, it was hypothesized that trait gratitude would show a negative relationship with depressive symptoms. Finally, a moderating effect of trait gratitude was expected. A total of 217 adults was allocated to a gratitude, mindfulness, or control condition, and completed an online questionnaire measuring depressive symptoms pre- and post intervention. Trait gratitude was measured pre intervention only. Hypotheses about the efficacy of the mindfulness- and gratitude interventions were confirmed, although no intervention appeared superior. Depressive symptoms substantively decreased in all groups, including the control group. A negative relationship between trait gratitude and depressive symptoms also confirmed hypotheses. The hypothesis about the moderating role of trait gratitude was rejected. Although methodological issues warrant cautious interpretation, evidence for the efficacy of PPIs was found. Practitioners are encouraged to integrate PPIs into their clinical practice. Recommendations for future research include use of a formally diagnosed depressed sample with an equal gender distribution, and a more neutral control condition.

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**INTRODUCTION**

Major Depressive Disorder (MDD) is one of the most common mental disorders with a lifetime prevalence of 16.2% (Kessler et al., 2003). According to the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5; American Psychiatric Association, 2013), main symptoms of MDD are a depressed mood and loss of interest in activities. Other symptoms include significant weight loss, insomnia, psychomotor agitation, fatigue, and recurrent thoughts about death (American Psychiatric Association, 2013). MDD is associated with substantial role impairment, loss of productivity, and medical expenses (Kessler et al., 2003; Whiteford et al., 2013; Wang, Simon & Kessler, 2003). Because of the high burden of disease and adverse consequences, it is important to treat the disorder adequately (Mathers, Vos, Stevenson & Begg, 2000).

Several interventions have been suggested for treating MDD. Some of these focus on the reduction of distress, whereas others draw on factors that support flourishing (Joseph & Wood, 2010). In research literature regarding interventions for MDD, this distinction has been formulated as the difference between clinical psychological research and positive psychological research (Wood & Tarrier, 2010). However, this distinction seems to be arbitrary as both fields investigate constructs that can either be positive or negative (Johnson & Wood, 2015). Nevertheless, an important difference does exist in that the positive psychology field is very young in comparison to clinical psychological research (Duckworth, Steen & Seligman, 2005). Traditionally, interventions for treating depressive disorder originated from clinical psychological research and include behavioral activation, pharmacotherapy, and cognitive-behavioral therapy (CBT; Hopko, Lejuez, LePage, Hopko & McNeil, 2003; Roshanaei-Moghaddam et al., 2011).

In spite of these evidence-based clinical interventions for treating MDD, many people continue to suffer from this incapacitating disorder (Sin, Porta & Lyubomirsky, 2011). This is partly explained by the large number of people who do not seek treatment (Andrews, 2001; Young, Klap, Sherbourne, & Wells, 2001). With use of a cross-sectional telephone survey among individuals possibly diagnosable with MDD, only 14.8% appeared to receive appropriate mental health care (Young et al., 2001). However, another important explanation is that empirically supported traditional interventions are not effective for everyone (Sin et al., 2011; Khin et al., 2011). For example, a meta-analysis on drug therapy for reducing depression found that 47% of the individuals receiving antidepressants did not have a greater reduction of depressive symptoms than individuals receiving a placebo (Khin et al., 2011). In addition, a systematic review found that fewer than half of individuals receiving cognitive-behavioral therapy completely remit from depression (Karwoski, Garratt & Ilardi, 2006). The same finding emerged in a 3-year prospective study measuring residual symptoms among initially depressed individuals. On average, these individuals retained two depressive symptoms present during remission (Conradi, Ormel & de Jonge, 2011). Because interventions solely originating from the clinical psychological field are sometimes ineffective, paying more attention to the positive psychological field will possibly provide more insight into effective interventions for depression.

Efforts to alleviate depressive symptoms coming from the positive psychology field have yielded a series of positive psychology interventions (PPIs). These interventions aim to foster positive feelings, behaviors, or cognitions, and are often self-administered (Sin & Lyubomirsky, 2009). Examples of PPIs include recalling positive experiences, and practicing optimistic thinking. A meta-analysis of 51 studies showed that PPIs, such as happiness programs, positive writing and hope therapy, are effective in alleviating depressive symptoms with medium-sized effects in both depressed and non-depressed individuals (Sin & Lyubomirsky, 2009). Other meta-analyses, systematic reviews and RCTs have found similar effects (Bolier et al., 2013; Sin et al., 2011; Gander, Proyer & Ruch, 2013).

Although meta-analyses on the efficacy of PPIs on depression exist, they tend to look at the overall effect and conclude by stating PPIs are effective (Sin & Lyubomirsky, 2009; Bolier et al., 2013). However, it still remains unclear what PPIs work best at reducing depression and thus what the comparative efficacy of these interventions is. In addition, studies tend to offer long interventions that require much time and training before benefits are gained (Chiesa, Calati & Serreti, 2011). Therefore, the current study aims to assess the comparative efficacy of two brief PPIs.

A PPI that has received considerable evidence in ameliorating depression is mindfulness (Baer, 2003). In mindfulness, a mindful mode of awareness of the present moment is trained while retaining an attitude of not judging and accepting (Ma & Teasdale, 2004; Teasdale et al., 2000). A number of different interventions exist, such as mindfulness-based stress reduction (MBSR) and mindfulness based cognitive therapy (MBCT) (Baer & Krietemeyer, 2006). MBSR and MBCT both include elements of formal and informal mindfulness practice. Formal mindfulness stresses meditation, whereas in informal mindfulness, awareness is brought to routine daily experiences (Cramer, Lauche, Paul & Dobos, 2012). Informal mindfulness is less structured than formal mindfulness and does not require a set length of time (Hawley et al., 2014). In spite of these advantages, the isolated effect of informal mindfulness practice on depression is not well studied and meta-analyses are yet to be conducted. To find out more about the potentially beneficial effects of a brief mindfulness intervention that can be integrated into daily life easily, informal mindfulness practice will be used in the current study.

Another PPI that could effectively alleviate depression is a gratitude intervention (Gander et al., 2013; O'Leary & Dockray, 2015). Gratitude can be defined as the appreciation of what is valuable and meaningful to oneself (Sansone & Sansone, 2010). Several ways of inducing gratefulness have been used, such as writing a gratitude letter to someone you have never properly thanked or recalling things you are grateful for (Toepfer, Cichy & Peters, 2012; Watkins, Woodward, Stone & Kolts, 2003). Both correlational and experimental studies have shown positive effects of a gratitude intervention on measures of depression (McCullough, Emmons & Tsang, 2002; Emmons & McCullough, 2003; O'Leary & Dockray). However, in experimental studies like the meta-analysis by Sin and Lyubomirsky (2009), the exact nature of the gratitude interventions is often not provided. Therefore, it

remains unclear which specific gratitude interventions are effective in reducing depressive symptoms. A recent RCT by O'Leary and Dockray (2015) did clearly explain the two short novel gratitude interventions they applied. They had two gratitude conditions in which participants were either instructed to keep a diary in which they listed a number of things they were grateful for, or reflected on one thing they were grateful for (O'Leary & Dockray, 2015). Although these interventions led to a reduction in depressive symptoms, the study sample was homogenous and small. The current study aims to assess how effective these gratitude interventions are in alleviating depressive symptoms by combining them in a larger, representative sample.

In research literature regarding gratitude interventions, a difference has been pointed out between gratitude as a trait (trait gratitude), in which it is seen as a dispositional characteristic, and state gratitude, which is the more transient affect that occurs after a person has been helped. Trait gratitude has been related to a more positive and appreciative outlook towards life and has been shown to be negatively correlated with depression in observational studies (Wood, Maltby, Gillett, Linley & Joseph, 2008; McCullough, Tsang & Emmons, 2004). McCullough and colleagues (2004) found that having a high level of trait gratitude appears to be reluctant to fluctuations in gratitude-inducing events. Therefore, individuals already high in trait gratitude might experience less benefit, i.e. less reduction in depressive symptoms, from a gratitude intervention than people with lower trait gratitude. In other words, this would imply that higher trait gratitude would attenuate the relationship between the gratitude intervention and depression. The current study will test for this interaction effect by investigating the moderating role of trait gratitude in the relationship between a gratitude intervention and depressive symptoms.

Comparing mindfulness and gratitude interventions with each other in the meta-analysis by Sin and Lyubomirsky (2009), mindfulness interventions generally show higher effect sizes than gratitude interventions in lowering depression. Therefore, a higher efficacy of a mindfulness intervention in reducing depression is to be expected. However, calculations of effect sizes of these interventions are based on different samples, which does not allow for objective comparison. In order to draw unbiased conclusions, current research will include both interventions in one sample.

Taken together, the current study aims to answer several questions and hypotheses. The overarching question is what elements of positive psychology may be used in supplement to clinical interventions to enhance their efficacy in reducing depressive symptoms. The second question is what the comparative efficacy of a mindfulness intervention and a gratitude intervention is in alleviating depressive symptoms. Third, this study aims to answer the question if trait gratitude acts as a moderator between the gratitude intervention and depressive symptoms. To answer the research questions, four hypotheses are postulated:

1. A mindfulness intervention will alleviate depressive symptoms.

2. A gratitude intervention will alleviate depressive symptoms.

3. A mindfulness intervention will alleviate depressive symptoms more effectively than a gratitude

intervention.

4. The level of trait gratitude will show a negative relationship with the level of depressive symptoms.

5. Trait gratitude moderates the relationship between the gratitude intervention and depressive symptoms.

## METHOD

### Study design

An Internet-based, single blind, controlled, mixed 3 x 2 design was used to answer the research questions. Age and gender matching and a randomizer (https://www.random.org/lists/) were used to allocate participants to one of three conditions, in which participants practiced differential exercises for a week. Depressive symptoms were measured pre- and post intervention, whereas trait gratitude was only measured pre intervention. Condition and time were independent variables and the level of depressive symptoms was the dependent variable.

### Participants

In this study, 379 people registered for participation, who were recruited through an advertisement at the Utrecht University research credit website, acquaintances, social media, and the website findparticipants.com. Of these people, 217 completed all questionnaires. In exchange for participation, students from Utrecht University received research credits necessary to graduate, and had the chance of winning a new 32GB iPad Air. Non-students also had a chance of winning the iPad and could additionally win 50 euros (or the equivalent in their country). To ensure a diverse research population, an excel sheet with fixed categories matching age (18-39 and 40-60 years old) and gender was used. The distribution of age and gender is shown in Table 1. Most participants were from Europe (66.8%), although other continents of residence were North America (27.6%), Asia (1.8%), Africa (1.8%), Australia (1.4%), and South America (0.5%).

Table 1
*Age and gender distribution*

|  | *N* | *M  (years)* | *SD* |
|---|---|---|---|
| Men | 71 | 31.79 | 1.40 |
| Women | 146 | 29.06 | .96 |
| Total | 217 | 29.95 | 11.70 |

(at least 70% of the participants were highly educated as rated by bachelors degree or higher)

**Instruments**

After completing an informed consent and registration form, the Time 1 (T1) Questionnaire was administered. This questionnaire consisted of the Center for Epidemiological Studies Depression Scale (CES-D), the Gratitude Questionnaire-6 (GQ-6), the Mental Health Continuum Short Form (MHC-SF), and the Toronto Mindfulness Scale (TMS). Responses to two of those scales (CES-D and GQ-6) were analyzed to answer the research questions. All instruments were offered online, as this is an anonymous way of obtaining data and therefore is likely to obtain accurate responses (Ong & Weiss, 2000; Van Selm & Jankowski, 2006). Previous studies using an online implementation of PPIs have been successful in reducing depression (Sergeant & Mongrain, 2014; Proyer, Gander, Wellenzohn & Ruch, 2014).

*CES-D*

The Center for Epidemiological Studies Depression Scale (CES-D) was used to measure depressive symptoms. This self-report questionnaire is not meant to diagnose a depressive disorder, but to determine if depressive complaints were present over the past week (Bouma, Ranchor, Sanderman & Sonderen, 1995). The items of the CES-D can be divided into four subscales, namely 'Somatic-Retarded Activity' (SR), 'Depressed Affect' (DA), 'Positive Affect' (PA), and 'Interpersonal Affect' (IA). Examples of items for each subscale are "I felt that everything I did was an effort" (SR), "I felt depressed" (DA), "I was happy" (PA), and "People were unfriendly" (IA). The total scale consists of 20 items. The CES-D has four possible response categories: '0 = seldom or never; less than a day', '1 = sometimes or rarely; 1-2 days', '2 = regularly; 3-4 days' and '3 = most of the time or always; 5-7 days'. A higher score on the CES-D indicates a higher degree of depressive symptoms. Individuals scoring 16 or higher possibly suffer from depressive disorder (Bouma et al., 1995).

The CES-D appears to have psychometric characteristics of sufficient quality. The internal consistency was reviewed as good with a Cronbach's Alpha ranging between .79 and .92 (Hanewald, 1987). Furthermore, the test-retest reliability was found to be stable (Hanewald, 1987). Construct validity was found to be good with strong correlations between related scales, showing the highest correlations with the Profile Of Mood States ($r = .83$) and the State Trait Anxiety Inventory ($r = .73$) (Bouma et al., 1995).

*GQ-6*

The Gratitude Questionnaire-6 (GQ-6) was used to measure trait gratitude. The self-report items measure how frequently people feel gratitude, the intensity of the gratitude felt, and the range of experiences that elicit gratitude (Wood et al., 2008). The GQ-6 consists of 6 items. Examples of items are "I have so much in life to be thankful for" and "I am grateful to a wide variety of people". The GQ-6 has seven possible response categories ranging from '1 = strongly disagree' to '7 = strongly agree'. A higher score on the GQ-6 indicates a higher degree of trait gratitude.

The GQ-6 was shown to have good internal consistency with a Cronbach's Alpha of .82 and a robust one-factor solution was previously found (Wood et al., 2008). Good convergent validity has been shown with well-being, with correlations ranging from $r = .31$ to $r = .67$ when self-reported and from $r = .18$ to $r = .34$ when peer-reported (McCullough et al., 2002).

**Procedure**

*Pretest*

Prior to starting the actual experiment, a pretest was conducted in which a few people were recruited for each condition. These trial participants were emailed and handled just as the researchers intended to do in the actual experiment. The pretest revealed some errors that were adapted for the actual experiment and allowed the researchers to familiarize with the procedure.

To ensure the circumstances were equal for all participants, all three researchers followed a composed protocol. Participants were allocated to one of three conditions: Mindfulness, Gratitude, or Control.

- *Mindfulness*. Participants in this condition received an informal mindfulness exercise, namely an instruction on how to focus their awareness on the present experience while brushing their teeth in the evening. This exercise was written by the researchers of the current study, but inspired by the informal mindfulness practice of the Positive Psychology Program (https://positivepsychologyprogram.com/informal-mindfulness-practice/).

- *Gratitude.* Participants in this condition were asked to daily privately write down three things they were grateful for and why. This exercise was based on two novel gratitude exercises introduced by O'Leary and Dockray (2015).

- *Control*. Participants in the control condition were instructed to daily write down three things that happened during their day. No instruction was given on whether they should write about positive or negative events. Researchers of the current study constructed this exercise.

After allocation to a condition, the researchers contacted participants through email. In this email, participants were introduced to their exercise with an audio file, which varied depending on condition. Participants were asked to practice their exercise for seven consecutive days with use of the audio file. To prevent high participant attrition, two emails were sent on day three and day six reminding participants of their exercise and incentives for completing the study. The decision to send two reminders was based on an experimental study investigating the perceived burden of participating in web surveys (Crawford, Couper & Lamias, 2001). In this experiment, sending two reminder emails with two days in between increased response rates best. Participant attrition was further avoided by including motivational quotes in the emails.

On the eighth day, participants were sent a final email with a link to fill out the final Time 2 (T2) Questionnaire consisting of the CES-D, MHC-SF, and TMS. At the end of this questionnaire, participants were asked for optional feedback on the study, student number, and student email (if applicable). They were also asked how many days of the week they had managed to complete the exercise. In doing this, it was stressed that their answer would not affect their chancing of winning of the prizes. Moreover, participants were debriefed about the nature and purposes of the experiment. Participants interested in receiving the abstract or access to all exercises at the end of the study were asked to send an email. Two reminder emails were sent on day nine and day ten if participants failed to complete the T2 Questionnaire. Data of participants completing the T2 Questionnaire too late were excluded from further analyses because intervention effects were likely to have vanished. For an illustration of the workflow of the experiment, see Figure 1.
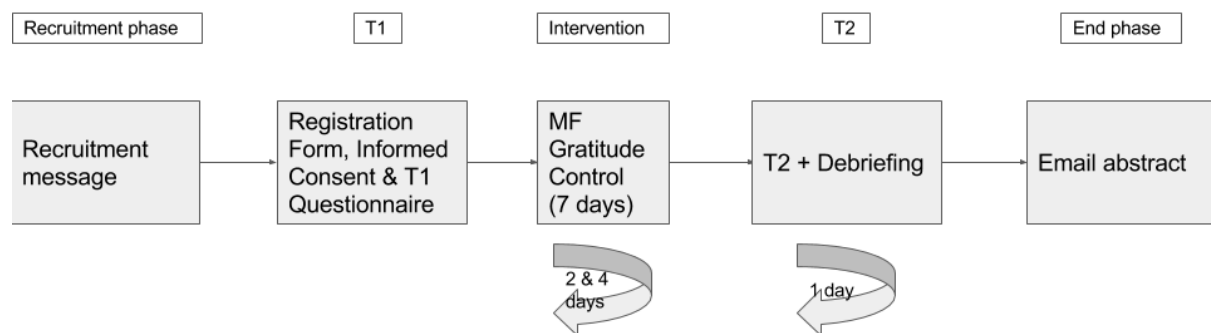


*Figure 1.* Workflow of the experiment

**Statistical analyses and software**

To ensure a large enough sample, a power analysis was conducted prior to recruitment of participants with use of G*Power. This showed a minimum of 132 participants (43 per condition) necessary in order to find meaningful significant effects.

Statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS), version 24. All analyses were conducted with $\alpha = .05$.

To determine the efficacy of the interventions in ameliorating depression, a mixed ANOVA was conducted for CES-D scores at T1 and T2 in all intervention groups. To assess the moderating role of trait gratitude in the relationship between the gratitude intervention and the CES-D, an ANCOVA was conducted with trait gratitude as a covariate. Furthermore, reliability analyses were conducted for all instruments and correlations between trait gratitude and the CES-D at T1 and T2 were computed.

**RESULTS**

**Dropout rate**

The dropout rate was 42.74%. Participants that completed the study were generally younger ($M$ = 29.95, $SD$ = 11.70) than those that dropped out ($M$ = 33.28, $SD$ = 12.74). Among the dropouts, a higher percentage was female (75.30%), than among participants that stayed in the study (67.30%). Most people that dropped out had been allocated to the control condition (37.70%).

**Descriptive statistics**

Descriptive statistics for the CES-D, subscales of the CES-D and GQ-6 are shown in Table 2. On average, participants in all conditions managed to complete the exercise five days of the week.

Table 2

*Means and standard deviations for the CES-D and its subscales, and for the GQ-6 at Time 1 (T1) and Time 2 (T2)*

| | T1 | | T2 | |
|---|---|---|---|---|
| | $M$ | $SD$ | $M$ | $SD$ |
| CES-D sum | 16.23 | 11.35 | 13.03 | 9.76 |
| CES-DsubSR | 6.10 | 4.20 | 4.98 | 3.92 |
| CES-DsubDA | 3.58 | 3.52 | 2.69 | 3.03 |
| CES-DsubPA | 4.43 | 2.99 | 3.65 | 2.80 |
| CES-DsubIA | .90 | 1.27 | .78 | 1.12 |
| GQ-6 sum | 33.70 | 5.68 | | |

(subSR=Somatic Retarded Activity, subDA=Depressed Affect, subPA=Positive Affect, and subIA=Interpersonal Affect)

**Guidelines**

In analyses of internal consistency, magnitude was classified according to guidelines set by Nunnally and Bernstein (1994) for less important decisions on an individual level: low $\alpha < .70$, moderate $.70 \leq \alpha < .80$, good $\alpha \geq .80$. For correlations, guidelines set by Reynolds and Livingston (2012) were used: weak $r < .30$, moderate $.30 \leq r \leq .70$ and strong $r > .70$. In analyses of variance, the magnitude of $\eta^2$ was classified according to guidelines set by Cohen (1988): small $\eta^2 = .010$, moderate $\eta^2 = .059$, and large $\eta^2 = .138$.

**Reliability analyses**

*Internal consistency*

Internal consistency was determined for all instruments. Most alpha values reflected good or moderate reliability. One subscale of the CES-D, Interpersonal Affect (IA) showed low reliability at both measurements. However, this subscale being part of the CES-D still led to a good overall reliability. See Table 3 for Cronbach's alpha values for all instruments.

Table 3

*Internal consistency (α) values for the CES-D and its subscales and the GQ-6*

|  | T1 | T2 |
|---|---|---|
|  | Cronbach's α | Cronbach's α |
| CES-D sum | .93 | .91 |
| CES-DsubSR | .80 | .81 |
| CES-DsubDA | .86 | .85 |
| CES-DsubPA | .79 | .77 |
| CES-DsubIA | .65 | .69 |
| GQ-6 sum | .79 | |

(subSR=Somatic Retarded Activity, subDA=Depressed Affect, subPA=Positive Affect, and subIA=Interpersonal Affect)

*Test-retest reliability*

To assess reliability of the CES-D over time, test-retest reliability was investigated by conducting a correlation between CES-D scores at T1 and T2.

To check the assumption of normality, Shapiro-Wilk tests were conducted between the CES-D at T1 and T2. For both time points, the Shapiro-Wilk test was significant, and therefore a Spearman correlation was conducted.

A strong Spearman correlation between the CES at T1 and T2 was found, $r$ (215) = .75, $p <$ .001, two-tailed. This reflects stability of reliability over time.

**Correlations**

Before examining the correlation between trait gratitude and depressive symptoms, one extreme outlier ($N = 216$) was excluded because of a trait gratitude sum score more than three standard deviations below the mean. Of the remaining participants, 43.52% reached the cut-off score of 16 on the CES-D at T1 and therefore possibly suffered from depression. At T2, this percentage had dropped to 31.94%. The existence of depressive symptoms in the sample renders the study relevant for people presenting with depressive complaints.

To test the assumption of normality, Shapiro-Wilk tests were conducted between the CES-D at T1 and T2, and trait gratitude. For all questionnaires, the Shapiro-Wilk test was significant, and therefore Spearman correlations were conducted.

The correlation between the GQ-6 and the CES-D at T1 emerged as $r$ (214) = -.47, $p < .001$, two-tailed. Second, the correlation between the GQ-6 and the CES-D at T2 emerged as $r$ (214) = -.38, $p < .001$, two-tailed. Thus, the CES-D demonstrated moderately high negative correlations with the GQ-6. Therefore, the hypothesis that the level of trait gratitude would show a negative relationship with the level of depressive symptoms was confirmed.

**Analyses of variance**

*ANOVA*

To check the assumption of homogeneity of variances, Levene's test was conducted. Levene's Statistic was not significant at both T1, $F$ (2, 214) = .74, $p = .477$ and T2, $F$ (2, 214) = 1.12, $p = .328$. Therefore the assumption was met.

A mixed ANOVA was conducted and it was found that there was a large significant main effect of time on the level of depressive symptoms, $F$ (1, 214) = 37.39, $p < .001$, $\eta^2 = .149$. The score on the CES-D was significantly lower at T2 ($M = 13.03$, $SD = 9.76$), than at T1 ($M = 16.23$, $SD = 11.35$). See Figure 2 for a visual representation. Because all conditions led to a reduction in CES-D score, the hypotheses postulating that both a gratitude and mindfulness intervention would alleviate depressive symptoms were confirmed.
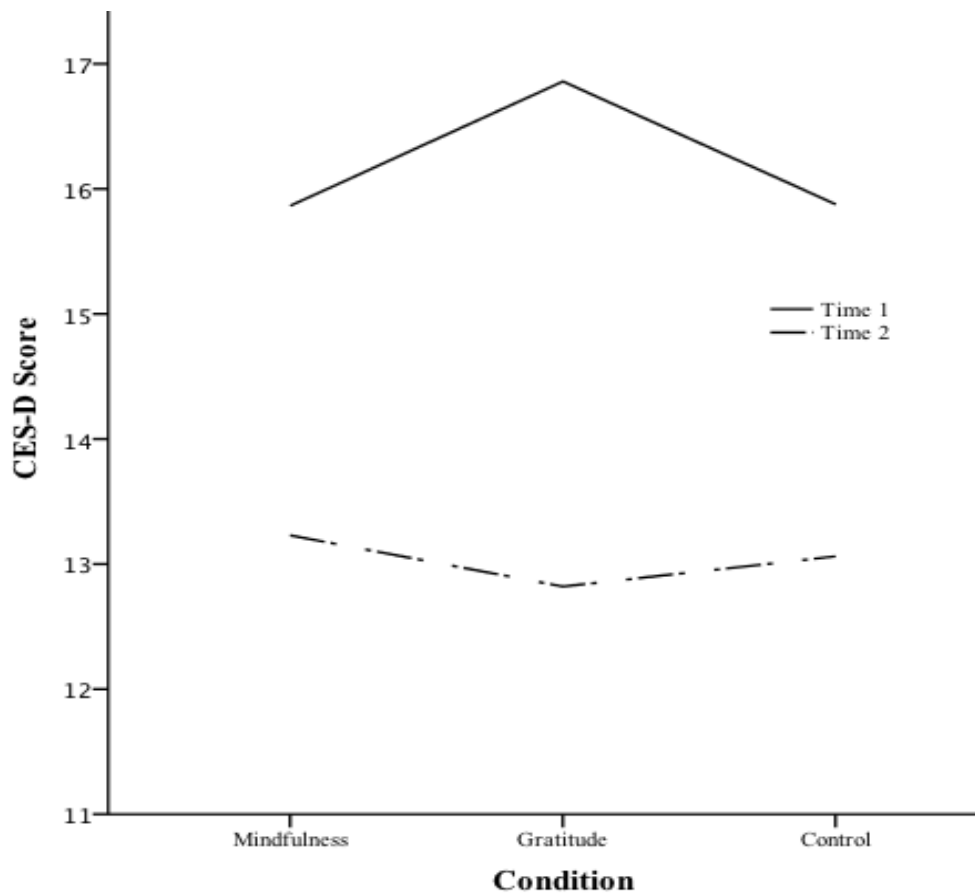
*Figure 2.* Plot of the effects of time and condition on CES-D score

There was no significant main effect of condition, indicating that reductions in CES-D scores were similar for all conditions, $F(2, 214) = .03$, $p = .972$. Therefore, the hypothesis that a mindfulness intervention would alleviate depressive symptoms more effectively than a gratitude intervention was not confirmed.

*ANCOVA*

The assumption of homogeneity of variances was met because Levene's test was not significant at both T1, $F(2, 214) = .07$ and T2, $F(2, 214) = .62$.

An ANCOVA was conducted and it was found that trait gratitude had a large significant effect on the level of depressive symptoms, $F(1, 213) = 51.427$, $p < .001$, $\eta^2 = .194$. However, even after controlling for trait gratitude, the effect of condition on CES-D score was still non-significant, $F(2, 213) = .31$, $p = .734$. Therefore, the hypothesis that trait gratitude moderates the relationship between the gratitude intervention and depressive symptoms was not confirmed.

**DISCUSSION**

The purpose of the current study was to investigate the comparative efficacy of a mindfulness intervention and a gratitude intervention in alleviating depressive symptoms. By assessing which intervention would work best, the study aimed to determine what elements of positive psychology could be used adjunctive to traditional clinical interventions such as CBT. Moreover, the study aimed to assess the moderating role of trait gratitude. It was hypothesized that both the mindfulness and gratitude interventions would alleviate depressive symptoms. These hypotheses were confirmed, as both interventions led to a reduction in depressive symptoms. It was further hypothesized that the mindfulness intervention would be most effective. However, all three conditions - including the control condition -, led to similar reductions in depression and therefore this hypothesis was not confirmed. To replicate a finding found in observational studies, it was hypothesized that trait gratitude would show a negative relationship with depression. This hypothesis was confirmed, as a moderately high negative relationship emerged. Finally, it was hypothesized that trait gratitude would moderate the relationship between the gratitude intervention and depressive symptoms. As trait gratitude was not found to attenuate this relationship, this hypothesis was not confirmed.

The results indicate that all interventions led to a reduction in depressive symptoms. No intervention appeared superior over others. For the gratitude and mindfulness interventions, their efficacy is in line with meta-analytic findings (Sin & Lyubomirsky, 2009; Bolier et al., 2013). Likewise, the negative relationship found between trait gratitude and depressive symptoms confirmed previous findings (Wood et al., 2008; McCullough et al., 2004). However, the finding that the control group benefited just as much from their intervention as the positive psychology intervention (PPI) groups was rather surprising. The lack of a moderator effect of trait gratitude also contradicted the hypotheses (McCullough et al., 2004).

The finding that the conditions were equally successful in alleviating depression can be explained in several ways. First, the reduction of depression in the control condition could be due to the Hawthorne effect. The Hawthorne effect is a behavioral effect of an intervention on a participant, caused solely because this participant is aware of participation (McCambridge, Witton & Elbourne, 2013). A systematic review investigated this effect and found that the Hawthorne effect does exist, although much still remains unknown about the conditions under which it operates, the mechanisms, and the magnitude of the effects (McCambridge et al., 2013). A Hawthorne effect could possibly have been present in the current study because of the attention that was given to the participants. In all emails that participants received, the study was formulated as investigating the effect of positive interventions. This could have created an expectation that the intervention would cause positive changes in their behavior. In addition, participants of all conditions received reminder emails for their exercises, which included inspirational quotes. Although the quotes of the control condition did not say much (e.g. "Pause for a moment and reflect"), they could have still fueled motivation for change.

A second possible explanation for the success of the control condition is that participants appeared to have interpreted the exercise in a positive way. Therefore, the control intervention could actually have served as a PPI too. This is shown by the evaluative responses that participants in the control condition provided. Many people, including people in the control condition, gave the response that they enjoyed writing about positive things. Examples of feedback remarks of people from the control condition are "I liked reflecting on nice events that happened" and "I like the recalling of positive experiences". This suggests that, although participants in the control condition were asked to write about three things that happened that day, many participants only wrote about positive events. Writing about positive events has been shown to have a positive effect on depression (Sin & Lyubomirsky, 2009). When interpreted in a positive way, the exercise would then have been equivalent to the 'three good things' exercise, which is an acknowledged PPI known to reduce depression (Seligman, Steen, Park & Peterson, 2005). Further adding to the power of the control condition, Seligman and colleagues (2005) found that the majority of participants answered "yes" to the question whether they were continuing the three good things exercise on their own. The self-reinforcing nature of this exercise also appeared in the current study, with several control participants stating they would continue doing the exercise after the study had ended.

The absence of a moderator effect could mean trait gratitude may not act as a moderator in the relationship between the gratitude intervention and depressive symptoms. Although an RCT by McCullough and colleagues (2004) found that people high in trait gratitude are reluctant to the effects of gratitude-inducing events, other studies have found support for the opposite; namely that people high in trait gratitude are particularly responsive to gratitude-inducing events (Larsen & Ketelaar, 1991; Suls, Martin & David, 1998). The inconsistency of these findings may reflect absence of a true moderator effect of trait gratitude.

Although the study provided evidence for the efficacy of PPIs, caution has to be taken when interpreting the results due to some methodological shortcomings. The first shortcoming is a gender argument, as almost 70% of study participants was female. This predominance of females is possibly due to the large number of participants recruited through the website "FindParticipants". Presumably, many individuals registered on this website and reading the recruitment message of the current study were already interested in receiving help. As women have been found to show more help seeking behavior than men (Möller-Leimkühler, 2002), this could explain the relatively high number of female participants. An explanation for this effect is that depressive symptoms are much more common in women than in men (Sullivan, Neale & Kendler, 2000). This may promote help seeking behavior in women more than in men. As a result of the predominance of female participants in the sample, generalization of the results to men may be limited. Second, the possibility that the control condition may have manifested as an experimental PPI limits the ability of objective comparison. Third, the dropout rate was quite high, which may have biased the results. For example, dropouts may have differed from study-completers in terms of depression status. This is of interest because the level of

depression has been shown to moderate the relationship between PPIs and depression, such that a higher degree of initial depression has been associated with greater reductions in depression (Sin & Lyubomirsky, 2009). In contrast, it has also been suggested that the cognitive, affective, and motivational deficits characteristic of depression can restrict or even reverse the positive effects of PPIs (Sin et al., 2011). In the sample of the current study, the percentage of individuals scoring above the CES-D cut-off score was two to four times as high as in Dutch healthy participants and randomly drawn samples (Bouma et al., 1995). This elevated degree of depression is possibly explained by the high number of female, help-seeking individuals. Because of the high degree of depressive symptoms, the sample seems comparable to a clinically depressed sample and results may therefore apply to high-depression groups. However, although depressive symptoms were present in the sample used in the current study, it is not possible to diagnose individuals according to their score on the CES-D without further assessment (Bouma et al., 1995).

For future research, it would be interesting if a similar experiment would be conducted with participants formally diagnosed with a depressive disorder. This would enable to investigate whether brief PPIs are also efficacious in a clinical sample, if moderating effects of depression status would appear, and what the nature of these effects would be. In addition to using a clinical sample, future research is recommended to use a sample with a more equal gender distribution, and a more neutrally formulated exercise for the control condition.

In spite of a few shortcomings, this study usefully contributed to existing research, by showing that implementing brief interventions that draw on positivity and are integrated into daily life easily, are able to substantively alleviate depressive symptoms. Psychological practitioners could improve the mental health of their patients by offering them brief PPIs in addition to clinical interventions. These interventions do not require lengthy training and may be embedded readily in daily life through their self-reinforcing nature.

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