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Gratitude and Well-Being: Who Benefits the Most from a Gratitude Intervention?

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Background: Theory and research have shown that gratitude interventions have positive outcomes on measures of well-being. Gratitude listing, behavioral expressions, and grateful contemplation are methods of inducing gratitude. While research has examined gratitude listing and behavioral expressions, no study has tested the long-term effects of a gratitude contemplation intervention on well-being. **Methods:** The present experiment examined the efficacy of a 4-week gratitude contemplation intervention program in improving well-being relative to a memorable events control condition. Pre-test measures of cardiac coherence, trait gratitude, and positive and negative affect were collected. Pre- and post-test measures assessing satisfaction with life and self-esteem were also collected. Daily positive and negative affect were completed twice a week throughout the intervention period. **Results:** Compared to those in the memorable events condition, participants in the gratitude condition reported higher satisfaction with life and self-esteem. Trait gratitude was found to moderate the effects of the gratitude intervention on satisfaction with life. **Conclusion:** Grateful contemplation can be used to enhance long-term well-being.

Keywords: cardiac physiology, gratitude intervention, positive psychology, well-being

INTRODUCTION

Recent studies have shown that trait and state levels of gratitude are positively associated with positive affect, optimism, happiness, and life satisfac-

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tion, and negatively associated with negative affect, anxiety, and depressive symptoms (Emmons & McCullough, 2003; McCullough, Emmons, & Tsang, 2002). Furthermore, attempts to instill gratitude have produced increases in well-being among those in a gratitude intervention group compared to those in the control group (see Wood, Froh, & Geraghty, 2010, for a review). However, findings from these gratitude intervention studies have not been consistent. This may be due, in part, to differences in how gratitude has been induced and the types of comparison groups employed (Froh, Kashdan, Ozimkowski, & Miller, 2009a; Wood et al., 2010). Consequently, researchers have begun to distinguish between different types of gratitude interventions and possible mediating and moderating effects associated with health outcomes. The purpose of our study was to implement a long-term gratitude contemplation intervention to determine its effects on participants' well-being. Specific variables were then tested to determine whether they moderated or mediated the effect of the intervention on participants' well-being.

Gratitude

Gratitude is considered as both a state and a trait. State gratitude is understood as a positive, social emotion experienced when an undeserved act of kindness or generosity is freely given by another person (Emmons, 2004). Roberts (2004) refers to such experiences as episodic gratitude, and describes it as an acute, intense, and brief physiological change that co-occurs with feelings of gladness. It has also been considered as a complex, higher-level emotion since it requires cognitive sophistication. For instance, experiences of gratitude require the abilities to distinguish self from others, and to construe the act of giving as intentional (by the giver) and undeserved (Weiner, 1985). Hence, the emotion of gratitude involves a physiological change and a subjective cognitive appraisal of the situation.

As a trait, gratitude is understood as a "virtue" or characteristic of people, and can vary in intensity, frequency, and span (McCullough et al., 2002): People high in gratitude feel more grateful following a positive emotion, and experience gratitude more times per day and across a wider array of life circumstances compared to those lower in gratitude. Further, some argue that people high in gratitude have a lower threshold for experiencing gratefulness (Rosenberg, 1998), and have a propensity to dwell on the favorable and to experience gladness in situations where they receive undeserved gifts (Roberts, 2004; Watkins, 2004). To explain this, Wood et al. (2010) proposed the *schematic hypothesis*, arguing that grateful people have a cognitive "lens" that biases them in how they see the world. Compared to "less grateful" people, grateful people are prone to interpret helpful actions of others as being more costly to the other, see others as being more altruistic, and to place greater value on their action.

Benefits of Being Grateful

Recent studies have identified benefits associated with being grateful. McCullough et al. (2002) found trait gratitude to be positively correlated with life satisfaction, happiness, optimism, hope, and positive affect, while being negatively related to anxiety, depression, and negative affect. Watkins, Woodward, Stone, and Kolts (2003) found that dispositional gratitude was positively correlated with life satisfaction, positive affect, and happiness, and negatively correlated with depression, negative affect, and physical aggression.

In addition, researchers have theorised about the potential societal benefits of gratitude. Like other positive emotions, gratitude is believed to reflect, motivate, and reinforce social actions in both the giver and gift recipient (Fredrickson, 2004). For the recipient, experiences of gratitude may lead to a readiness to respond to acts of kindness by acknowledging the benefit (Roberts, 2004), and expressing appreciation and thankfulness for it (Emmons, 2004). Expressions of thankfulness, which naturally flow from this sense of appreciation (Fitzgerald, 1998), can take various prosocial behavioral forms, and can be directed back to the giver, other individuals, and/or the larger community. Thus, gratitude can act as a motivator of social action that draws people into community (Roberts, 2004). In fact, some researchers consider it an "essential lubricant to social interaction" (Buck, 2004, p. 110).

Inducing Gratefulness

In light of the benefits associated with being grateful, researchers have tried to induce gratitude to produce positive outcomes. Three general methods of gratitude induction have been identified: gratitude lists, behavioral expressions of gratitude, and grateful contemplation (see Wood et al., 2010). Gratitude lists is the most frequently used intervention, in part because of its simplicity in having people construct lists of things for which they are grateful. For example, Emmons and McCullough (2003) randomly assigned participants to one of three experimental conditions (i.e. hassles, gratitude listing, and neutral life events) and asked them to keep weekly records of various well-being measures (e.g. moods, coping behaviors, health behaviors, physical symptoms, overall life appraisals, etc.) over 9 weeks. Gratitude listing participants rated their lives more favorably, reported fewer illness symptoms, and had higher levels of gratitude and positive affect compared to other participants. However, only in experiment one of three did gratitude listing participants report fewer physical symptoms and more hours of exercise. Froh, Sefick, and Emmons (2008a) reported that middle school students in their gratitude listing condition showed an increase in gratitude and a decrease in negative affect compared to those in the hassles and control

conditions, and showed improvements in satisfaction with school experience when compared to those in the no treatment control condition. No condition effects were found on physical illness and prosocial behaviors. Finally, gratitude listings have been used in clinical settings. These clinical studies suggest that gratitude interventions are as effective as commonly used clinical therapies in treating body dissatisfaction and excessive worry (Geraghty, Wood, & Hyland, 2010a, 2010b).

A second type of gratitude induction involves behavioral expressions of gratitude. For instance, Seligman, Steen, Park, and Peterson (2005) had adults write and deliver a gratitude letter within 1 week. Compared to people who had been asked to write about their early memories, gratitude participants reported more happiness and less depression at post-test and 1 month later. Further, while large effect sizes were produced, the effects were short-lived. Similarly, Froh et al. (2009a) randomly assigned children and adolescents to a gratitude condition where they were asked to write and deliver a letter to a person they had not yet properly thanked, or a control condition where they were asked to write about some of the things they did, and how they felt while they did them. While no condition effects emerged on changes in positive affect or negative affect, Froh et al. (2009a) found that pretest positive affect had a moderating effect: Those who were low in initial positive affect and participated in the gratitude exercise showed the greatest increases in their gratitude and positive affect scores, although these effects declined over time (i.e. 1 and 2 months later).

A third type of intervention involves gratitude contemplation. Watkins et al. (2003) randomly assigned participants to one of four conditions. In the neutral condition, participants were asked to write about the layout of their living room. In the remaining three conditions, participants were asked to think about, write about, or write a letter to someone for whom they were grateful. Significant increases in positive affect were found among participants in all three grateful conditions, but not for those in the control condition. Moreover, the "thinking" gratitude condition produced the highest positive affect scores. No significant negative affect by condition effect was found. While the short-term impact of grateful contemplation is encouraging, no studies to date have investigated the long-term impact of a gratitude contemplation intervention.

In this study, we adopted a gratitude contemplation intervention. Our preference for gratitude contemplation was influenced by research suggesting that there is a physiological connection between one's emotional and physical states, and that by manipulating one's emotional state, one can produce a physiological change. For instance, Tiller, McCraty, and Atkinson (1996) demonstrated that by having people focus their thoughts on things that they appreciate produced an entrainment between their positive emotional and physiological states. This psychophysiological entrainment was observed

through respiratory, cardiac, and electroencephalographic patterns becoming momentarily frequency-locked (i.e. oscillating at a common frequency). Hence, we expected that inducing gratitude should produce similar entrainment between our participants' emotional and physiological states, and that one of the consequences would be improvement in their well-being.

Specifically, we were interested in how inducing gratitude would affect participants' satisfaction with life and self-esteem. As noted above, previous work found that inducing gratitude led to increases in students' satisfaction with school (Froh et al., 2008a) and people's favorability ratings of their life (Emmons & McCullough, 2003). We were also interested in the link between gratitude and self-esteem. Past studies with youth have found gratitude to positively predict self-esteem (Froh, Wajsblat, & Ubertini, 2008b) and self-satisfaction assessed concurrently (Froh, Yurkewicz, & Kashdan, 2009b), at 3 weeks (Froh et al., 2008a) and at 6 months (Froh et al., 2008b). Furthermore, Kashdan, Uswatte, and Julian (2006) assessed a sample of Vietnam War veterans and reported that gratitude predicted greater daily self-esteem after controlling for post-traumatic-stress severity, and dispositional positive and negative affect.

Control Condition

Overall, gratitude intervention studies, independent of the type, report positive outcomes on measures of well-being compared to a variety of control conditions. However, Wood et al. (2010) have cautioned that the promotion of gratitude interventions may be premature. They note that few gratitude intervention studies have used a "true" control group. For instance, most studies have participants list daily hassles, or write about psychologically neutral topics such as the layout of a room or what happened during the day as their control condition(s). In these cases, it is unclear that these conditions produce the same psychological expectancy of change as a gratitude intervention in clinical settings. Further, interventions such as listing daily hassles are thought to produce a negative psychological state (Froh et al., 2009a) and consequently may exaggerate outcome differences more than if more psychologically neutral control conditions were used. In our study, we used gratitude contemplation as our experimental condition due to previous findings showing its psychological and physiological benefits. Asking participants to remember a memorable event in the recent past was used in an effort to produce a more psychologically neutral control condition.

Personality Traits as Moderators

Previous research suggests that there may be certain types of people who are better able to benefit from gratitude induction interventions than others

(Froh et al., 2009a; Froh et al., 2008a; McCullough, Tsang, & Emmons, 2004). As previously mentioned, Wood et al. (2010) offered the schematic hypothesis proposing that grateful people have a cognitive lens enabling them to view the world in a more positive, altruistic manner. Similarly, McCullough and colleagues (2004) proposed a *conductance hypothesis* suggesting that people who have a proclivity towards gratefulness are particularly responsive to the effects of gratitude relevant daily-events. According to both hypotheses, grateful people are "primed" to experience and benefit from positive experiences. In contrast, McCullough et al. (2004) proposed a resistance hypothesis theorising that those who are predisposed to being grateful may already experience the world in a positive light such that no additional positive experiences (e.g. experiencing a gratitude intervention) could lead to further benefits above and beyond what they normally experience. Preliminary support has been found for the resistance hypothesis. In a behavioral expressions experiment on gratitude, Froh et al. (2009a) instructed youths to write and deliver a gratitude letter and found that youth low in positive affect at baseline reported greater gratitude and positive affect at post-test. To explore these issues, we considered the moderating effects of gratitude disposition along with positive and negative affect.

Finally, in understanding gratitude intervention effects, few studies have explored the kinds of items participants generate when asked to think about or write down those things for which they are grateful. It could be that some activities or people may produce different outcomes from others. Most gratitude studies are indifferent to the kinds of experiences used to generate gratitude assuming they all will have the same effect. We wished to explore this assumption in more detail in order to determine whether it is warranted.

Predictions

In summary, research shows that gratitude interventions have a positive outcome on well-being; however, less is known about the mechanisms underlying these relationships. Based on the theoretical and empirical work reviewed, we made the following predictions:

1. Gratitude contemplation would result in a higher degree of physiological entrainment relative to baseline or memorable events recall.
2. Participants in the gratitude condition would score higher on satisfaction of life and self-esteem compared to participants in the control condition at post-test.

We also explored whether trait gratitude moderated the effects of gratitude intervention on well-being. The schematic/conductance hypothesis would predict that participants who score higher in gratitude and positive affect

would benefit more from the intervention than participants lower in gratitude on measures of well-being at post-test. In contrast, the resistance hypothesis would predict that those who score lower in gratitude and positive affect would benefit more from a gratitude intervention compared to those who scored higher.

We also content analysed the grateful moments and memorable events participants listed to identify common themes. Given that this was exploratory, no specific hypotheses were made regarding thematic differences between the two groups. Rather, we hoped that exploring thematic differences between groups might help us to better interpret our quantitative results.

METHOD

Participants

Fifty-six adults (30 males) were recruited from a small urban area in British Columbia, Canada. The average age of the predominantly white (81%) sample was 22.5 years (SD = 3 years), with over 75 per cent having some years at university. Participants were recruited through advertisements on the radio broadcasting to a small city, and through posters distributed to people walking through a university concourse area, and at the entrance to a sports complex servicing the city. This experiment was advertised as "The HEW Study: Health, Emotions, and Well-Being" with the purpose of examining the impact that emotions associated with past events have on physical and psychological health and well-being. Potential recruits were given contact information, and told that they would receive $25 for their participation.

Apparatus

Physiological data were collected using a Dell Optiplex GX620 computer system with Biopac physiological recording hardware running AcqKnowledge 3.7.3 software. For electrocardiogram recordings, an electrical recording of heart rate, Vermed disposable ECG electrodes were attached to each wrist and the right shin, and connected to leads. An electrical recording of blood flow through the heart (cardiac impedance) was made using four paired dual snap disposable impedance electrodes, two attached to each side of the rib cage and two attached to each side of the neck in a standard cardiac impedance montage. Measures of blood pressure and arterial pulse were obtained through a Finapres device attached to participants' left middle finger. Blood pressure measures were processed with MindWare BP 2.14 blood pressure analysis software.

Pre-Test Measures

Gratitude Questionnaire-Six Item Form (GQ-6) (McCullough, Emmons, & Tsang, 2001). The GQ-6 measures trait gratitude, and includes items such as "I have so much in life to be thankful for" and "I am grateful to a wide variety of people". Participants rate their level of agreement on each item ranging from 1 (strongly disagree) to 7 (strongly agree). McCullough et al. (2001) reported that the GQ-6 has good inter-item reliability and construct validity. We found the GQ-6 to have high internal consistency. Cronbach's alphas were .77.

Positive and Negative Affect Scale (PANAS) (Watson, Clark, & Tellegen, 1988). The PANAS comprises 10 positive affect words (e.g. excited, proud) and 10 negative affect words (e.g. distressed, upset). Participants are asked whether they generally feel this way using a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely). Watson et al. found the PANAS to be reliable and possess both convergent and discriminant validity. In this study, the PANAS was found to also have high internal consistency. Cronbach's alphas ranged from .84 to .88.

During Intervention Measures

Daily Positive and Negative Affect Scale (Daily-PANAS) (Watson et al., 1988). The Daily-PANAS includes the same 20 affective words as the general PANAS (described above). The only difference is that with the Daily-PANAS, people are asked how they feel "today" as opposed to "in general". In our study, Chronbach's alpha ranged from .77 to .90.

Pre- and Post-Test Measures

Satisfaction with Life Scale (SWLS) (Diener, Emmons, Larsen, & Griffin, 1985). The SWLS is a five-item scale that measures general life satisfaction. It includes items such as "In most ways my life is close to my ideals". Participants respond to these items using a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). Diener et al. (1985) found the SWLS to have good reliability and validity. We also found it to have good reliability with the pretest alpha being .88 and the post-test alpha being .80.

Rosenberg Self-Esteem Scale (RSE) (Rosenberg, 1965). The RSE is a 10-item questionnaire that measures global self-esteem. Examples of items include "I feel that I have a number of good qualities". Participants are asked to respond using a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). The RSE has been shown to have good reliability and

validity (e.g. Rosenberg, 1965; Silber & Tippett, 1965). We found the RSE to have good internal consistency. Pretest alpha was .86 and post-test alpha was .78.

Procedures

Participants were invited to a laboratory where they completed the informed consent form, provided demographic information, and were asked to disclose any prior or current medical conditions or diagnoses that may affect physiological recording. No participants were excluded on these grounds. Participants then completed questionnaires followed by the recording of physiological measures. These recordings entailed a series of 5-minute phases: baseline, gratitude induction, return to baseline, and memorable events induction. The order of gratitude and memorable events induction was randomised and counterbalanced. In the gratitude induction, participants were asked to bring to mind people for whom, or items or moments for which they were grateful this past week, and to sustain the feelings of gratitude associated with these people, items, or moments. During the memorable events induction, participants were asked to bring to mind a memorable event from the past week, and to sustain the emotions associated with that event.

To collect physiological data, participants were fitted with ECG electrodes and a Finapres cuff, and then seated in a comfortable, reclining chair that minimised postural changes. Prior to recording, participants were instructed to refrain from talking, falling asleep, performing exaggerated bodily movements, or intentionally altering their respiratory patterns.

Following the pretest physiological recording, participants were randomly assigned to one of two intervention conditions (i.e. gratitude vs. memorable events) by an experimenter blind to the purpose of the study. For each condition, participants were given a journal package along with specific condition instructions. In the gratitude condition, participants were asked to begin by thinking "about items, people or events for which you are particularly grateful," and trying "to experience and maintain the sincere heart-felt feelings of gratitude associated with that thought". This reflection process was to be completed twice a week over the next 4 weeks for a total of 8 days. Participants were instructed that they could perform this reflection on any day and time that was convenient for them so long as the period between each reflection process was 2 or more days. In addition, instructions were given for each of the 8 days, asking participants to generate people, items, or events for which they were grateful and then they were asked to reflect on one of them for 5 minutes. Following the 5 minutes, participants were asked to write down their grateful experiences in the journal provided. In the memorable events condition, a similar procedure occurred, this time asking participants to begin by "recalling a memorable event" and trying "to experience and

maintain the feelings associated with [the] one event". For each condition, after experiencing a grateful or memorable experience, participants were asked to report their mood during the last couple of days. Finally, the journals were designed to be user-friendly to enhance compliance and decrease the burden participants may feel, which are two primary concerns with journal-keeping studies (Green, Eshkol, Bolger, Shrout, & Reis, 2006).

The experimenter contacted participants 2 weeks into the intervention to assess progress, answer questions, and schedule post-test visits. No participants reported problems or concerns with the intervention and all participants appeared to be complying with the procedure.

After completing the 4-week intervention component of the study, participants returned to the lab to deliver their journal package, and complete the same battery of questionnaires as in the pretest. Out of the initial 56 participants, 47 returned the journal package and completed the post-test measures. There were no significant differences in gender, age, years of education, or pretest measures between those who remained in and those who exited the study. Differential mortality between conditions could not be evaluated among the nine subjects who failed to return their questionnaire packages due to the double-blind group randomisation procedure. Finally, there were no significant differences in gender, age, or years of education between the participants in the two conditions (i.e. gratitude and memorable events).

Journals submitted by the 47 participants were examined for compliance. Three of the 47 participants were missing one or more of the 8 days of recordings. In total 6 days (1.6%) were missed. No participants were excluded on the basis of non-compliance. Positive and negative affect scores for participants' missing days were determined using mean imputation.

Content Analysis of Participants' Experiences

We explored participants' descriptions of their memorable events or grateful experiences to determine if there were differences in the kinds of experiences participants generated. Participants' experiences were open-coded looking for common themes. Twelve categories were generated based on these themes, including people, activities, major concerns, surroundings, positive and negative emotions/experiences, character, objects, work, school, self, and events/occasions (see Table 1 for examples). There was good interrater reliability, Kappa = 0.81.

RESULTS

Gratitude Intervention

To determine whether our intervention was having its intended effect in creating physiological entrainment, we compared pretest cardiac coherence

TABLE 1
Thematic Categories of Participants' Experiences

Categories	*Subcategories*	*Examples*
People	Family/Relatives	Daughter, Grandmother, Parents
	Partner/Girl or Boyfriend	Wife
	Peers/Friends	Teammates, Girl from class
	Other/Community	Attractive man
Activities	Sports/Hobbies	Ping pong, Playing basketball
	Leisure/Social Life	Party last night
	Daily/Domestic	Cleaning the house
Major Concerns	Health	My alcoholism
	Finances	Money
	Time	Free time to travel
Surroundings	Place	Home
	Travel	Trip to Nova Scotia
Positive Emotions/Experiences		Happy
Negative Emotions/Experiences		Stress
Character		Careful, Trust
Objects		TV, Cell phone, Beer
Work		Spent all day applying for jobs
School		Cramming for midterm
Self		All of my opportunities, my life
Events/Occasions		Old sister got engaged

scores between the gratitude induction condition, the memorable events condition, and baseline. Cardiac coherence is a measure of entrainment and is represented by a stable, ordered sine-wave-like pattern in the heart rate variability (HRV) waveform. To calculate cardiac coherence, the HRV time series is first converted into its spectral components by applying a mathematical Fast-Fourier transformation to the data. The resultant power spectrum reduces the heart rhythm into its constituent frequency components that can be divided into three main frequency ranges. The very low frequency range (VLF; 0.0033–.04 Hz) is primarily an index of sympathetic activity while power in the high frequency range (HF; 0.15–0.4 Hz) is primarily due to parasympathetic activity and represents more rapid beat-to-beat changes in heart rate. The low frequency region (LF; 0.04–0.15 Hz) reflects activity in the feedback loops that regulate short-term blood pressure changes and other regulatory processes (McCraty, Atkinson, Tomasino, & Bradley, 2006).

Heart rhythm coherence approximates the LF/(VLF+HF) ratio of the HRV power spectrum and is quantified by the formula (peak power/(total power—peak power))^2. Peak power represents the power associated with the highest peak found in the LF range of the HRV's power spectrum (see McCraty et al., 2006; Tiller et al., 1996). Due to the positive skew to the

TABLE 2
Group Raw Mean (*SD*) Scores by Condition

	Gratitude Condition		*Memorable Events*	
Pre- & Post Measures	Pre	Post	Pre	Post
Satisfaction with Life*	25.36 (6.48)	27.27 (4.47)	27.84 (4.28)	26.92 (4.79)
Self-Esteem*	3.34 (.49)	3.45 (.36)	3.31 (.40)	3.26 (.32)

	Gratitude Condition	*Memorable Events*
Daily Mood Measures		
Positive Daily Mood	3.30 (.12)	3.22 (.11)
Negative Daily Mood**	1.64 (.40)	1.99 (.37)
Thematic Category Scores		
People**	7.43 (4.70)	2.75 (3.21)
Negative Emotions/Experiences**	0.14 (0.36)	2.98 (2.98)
School**	1.05 (1.53)	4.17 (3.19)
Events/Occasions*	0.19 (0.68)	0.71 (0.95)

Note: ** $p < .01$; * $p < .05$.

data, the coherence scores were log transformed and reported in units of (ln ms^2/Hz).

Ideally, we would expect the gratitude induction to produce a high coherence score relative to baseline and memorable events condition. Using a within-subject ANOVA, we found a main effect for intervention, $F(2, 54) = 4.22$, $p < .05$, $\eta^2 = .14$. Post-hoc *t*-tests indicated that coherence during the gratitude condition ($M = .30$, $SD = .20$) was significantly higher than during the memorable events ($M = .26$, $SD = .18$) ($p < .05$), which was marginally higher than during the baseline conditions ($M = .23$, $SD = .23$) ($p = .08$). Hence, our intervention seems to have had the predicted physiological effect with respect to cardiac coherence.

We then conducted ANCOVAs on our psychological well-being measures at post-test, controlling for the respective pretest measure. We found general support for our predictions. There was a significant intervention effect on Satisfaction with Life, $F(1, 43) = 4.53$, $p < .05$, $\eta^2 = .10$, and self-esteem, $F(1, 43) = 5.00$, $p < .05$, $\eta^2 = .10$ (see Table 2). Participants in the gratitude intervention scored significantly higher on life satisfaction and self-esteem compared to participants in the memorable events condition as predicted.

Moderating Effects

To probe for trait gratitude by intervention interactions on our outcome measures, we used the Johnson-Neyman (J-N) technique recommended

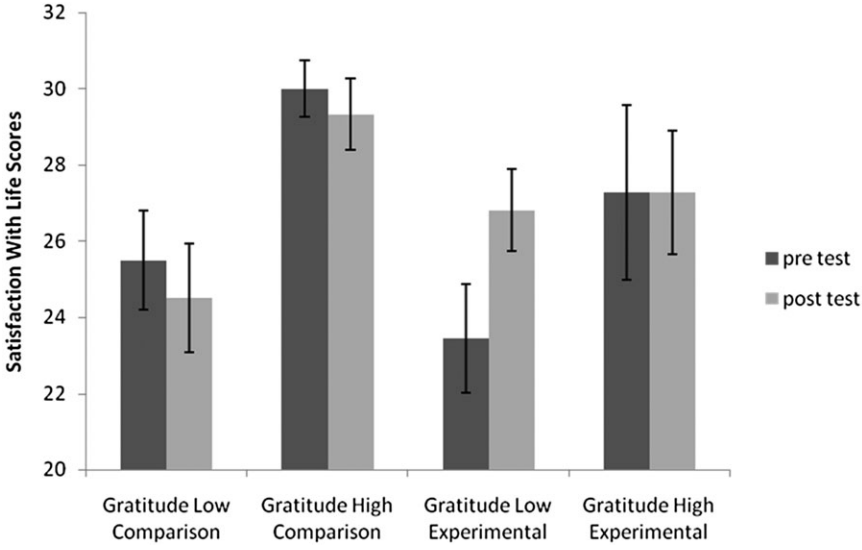

FIGURE 1. Mean Satisfaction with Life Scale scores and associated error as a function of gratitude trait grouping (high vs. low) and intervention condition (memorable events comparison vs. gratitude experimental).

by Hayes and Matthes (2009), which is a more rigorous method than the separate regressions approach often used to test interactions. Using the MODPROBE macro for SPSS (see Hayes & Matthes, 2009), we found an interaction effect, $\beta = 3.18$, $t(42) = 2.34$, $p = .02$, for Satisfaction with Life (see Figure 1). Further examination of the results revealed that for gratitude values above 38.28 the treatment effect was nonsignificant. But below 38.28 the treatment effect is significant and negative. That is, those who were lower in trait gratitude appeared to benefit from the gratitude intervention relative to those who were higher on trait gratitude on the Satisfaction with Life Scale. No interaction effect was found on self-esteem.

We also tested whether there was a positive affect by intervention effect and a negative affect by intervention effect on well-being. However, no interaction effects were found on pretest measures of positive and negative affect. Positive and negative daily mood was then considered over the 4-week period. Following Froh et al. (2008a), we aggregated the eight positive daily mood scores and eight negative daily mood scores to create a positive daily affect composite score and a negative daily affect composite score. While no intervention effect was found on the positive daily affect score, $F(1, 43) = 0.16$, $p = .75$, observed power = .06, an intervention effect was found on the negative daily affect score, $F(1, 43) = 11.17$, $p < .01$, $\eta^2 = .21$. Those in the gratitude condi-

tion scored significantly lower in their negative daily affect compared to those in the memorable events condition (see Table 2).

Using SEM in AMOS, we compared groups on their latent trajectories for positive and negative daily mood by treating group as a dummy variable (see Singer & Willett, 2003). No group effects were found for either the intercept or the slope for positive mood. Nor was there a group effect on the slope for negative mood. However, a group effect was found for the intercept for negative mood, with $\beta = -.49$, $p = .015$. Overall model fit for negative mood was adequate, $\chi^2(31) = 40.8$, $p = .11$, IFI = .90, RMSEA = .075. These findings demonstrate that those in the gratitude condition were in a less negative mood than comparison individuals at the beginning of the study, and this difference was maintained through the duration of the intervention.

Qualitative Analysis of Participants' Experiences

Our intervention groups were compared in the frequency of experiences listed for each of the 12 categories. Significant group differences were found for: People, $t = 3.85$, $p < .01$; School, $t = -4.27$, p <. 001; and Events, $t = -2.11$, $p < .05$; and for Negative Emotions/Experiences, $t = -3.23$, $p < .01$ (see Table 2). Participants in the grateful condition described more people-related experiences compared to those in the memorable events condition. Participants in the memorable events condition described more school, events, and negative emotions-related experiences relative to grateful participants. To determine if these differences in content categories were mediating the intervention effects on well-being, we used a nonparametric bootstrapping procedure recommended by Preacher and Hayes (2004). This is a more powerful approach to testing mediations than the approach recommended by Baron and Kenny (1986), especially with small samples. No significant effects were found.

DISCUSSION

First, our results led us to conclude that asking participants to undergo grateful contemplation in the laboratory produces a positive physiological response as demonstrated in a more ordered heart rate ECG waveform and greater physiological coherence. Physiological coherence occurs during positive experiences and is thought to be the result of increased parasympathetic activation and reduced sympathetic activation where the net result is equivalent levels of activation among the two branches of the autonomic nervous system (see McCraty et al., 2006). When the parasympathetic and sympathetic nervous system reach this harmonious balance there is an increase in total power of the ECG power spectral density plot. Among other things, physiological coherence has been hypothesised to reduce stress, naturally

increase the body's regenerative processes, correlate with a general sense of well-being, and improve cognition and social performance (McCraty & Childre, 2010). In the present experiment, contemplating grateful thoughts appears to have resulted in increased physiological coherence presumably reducing stress and boosting well-being. This is an encouraging result given that participants were not trained in emotion induction before experimentation; however, it should be noted that these are preliminary findings and additional research is needed to replicate these findings and ensure there are not other confounding influences such as history or maturation. Further, future work can explore possible accompanying health benefits of coherence during a gratitude contemplation intervention.

Second, our results led us to conclude that a gratitude intervention has an effect on well-being. First, the gratitude contemplation intervention had an effect of increasing self-esteem. This suggests that gratitude may be a self-acceptance-related emotion, with gratitude interventions having the effect of improving one's self-concept, a finding which is best conceptualised using the sociometer theory of self-esteem (Leary & Baumeister, 2000). Sociometer theory offers an interpersonal explanation of self-esteem, suggesting that the self-esteem system evolved to monitor degree of acceptance versus rejection in the social environment (Leary & Baumeister, 2000). According to sociometer theory, the self-esteem system monitors the social environment for cues indicating change in acceptance. Such changes are then registered by corresponding changes in self-esteem, with lowered self-esteem indicating a declining relational evaluation and vice versa. According to this theory then, grateful contemplation may lead to increases in participants' perceived relational value and social acceptance, suggesting that it may function as an acceptance-related emotion. Hence, simply contemplating items, moments, or events for which one is grateful may lead to greater perceived social acceptance; an interesting possibility considering that gratitude and social integration have been found to serially enhance one another (Froh, Bono, & Emmons, 2010). However, this is one possible interpretation of our findings. Exactly how gratitude and self-esteem are linked awaits further investigation.

Our results also indicate that a gratitude contemplation intervention increases life satisfaction. Gratitude has a unique and direct relationship with satisfaction with life (Wood, Joseph, & Maltby, 2008). Life satisfaction refers to the cognitive portion of well-being in which quality of life is assessed on the basis of an individual's own unique set of criteria (Pavot & Diener, 1993). When an individual assesses life satisfaction, they are assessing the positive side of an experience rather than focusing on unpleasant emotions (Pavot & Diener, 1993). Research demonstrates that people who attend to and recall the pleasant aspects of life more easily are happier and more satisfied with their lives (Tamir & Robinson, 2007). The mechanism whereby our gratitude intervention promoted increased life satisfaction may be through the acces-

sibility and recollection of pleasant life events in memory (Watkins, 2004). A grateful predisposition and the practice of gratitude may increase the access to and the enhancement of positive information regarding one's life. Lyubomirsky, Sheldon, and Schkade (2005) argue that gratitude increases life satisfaction by offering an alternative to the "hedonic treadmill" where the focus is on increasing one's possessions in order to maintain one's short-term gains in happiness. In support of such an interpretation, Lambert, Fincham, Stillman, and Dean (2009) found that satisfaction with life mediated the relationship between high gratitude and low materialism.

Third, we found that trait gratitude moderated the intervention condition effect on satisfaction with life. Consistent with McCullough et al.'s (2004) resistance hypothesis, the intervention was most effective in raising people's satisfaction with life when they were low on dispositional gratitude. In contrast, people who rated themselves high on gratitude were already high on life satisfaction, and the gratitude intervention did not lead to greater satisfaction. Thus, gratitude-type interventions employing grateful contemplation as their methods of emotion induction may be most beneficial to those who are low in trait gratitude. This finding implies that there may be a ceiling effect to the increase in accessibility and recollection of positive life events that arises due to the practice of gratitude. Future work is needed to better understand the breadth of the resistance hypothesis as it relates to other psychological outcomes, and the underlying mechanisms. If evidence in support of the resistance hypothesis becomes robust in the literature, one implication of such a finding would be that interventions employing grateful contemplation should focus on people who are lower in dispositional gratitude.

However, positive and negative affect did not moderate the effects of the intervention on well-being. This was surprising considering past research demonstrating the moderating effect of positive affect (Froh et al., 2009a). Part of the reason for our anomalous findings could be related to the more negative daily mood our control participants were in at the start of the intervention, compared to our gratitude participants, and which was maintained throughout the intervention. Hence, there may have been an unidentified confound affecting our control participants' daily mood. Nevertheless, no differences emerged on the daily positive affect trajectory between our two groups. This could be the result of a small sample and lack of power and/or insufficient time duration for the intervention to have an effect on our measures of well-being.

Finally, participants in the gratitude contemplation condition recalled different thematic information than did participants in the memorable events control. In the present experiment, gratitude contemplation was accompanied by the recall of fewer negative emotions compared to memorable events. Grateful thoughts also carried a more social tone involving more people themes than did memorable events, which centered around events, occasions,

and negative emotions. The strong social intonation of gratitude contemplation was not surprising given that gratitude has been conceptualised as an inherently social emotion that promotes the formation and maintenance of relationships. Previous research examining the role of naturally occurring gratitude in college sororities during a week of gift giving found that gratitude predicted the formation and maintenance of relationships 1 month later (Algoe, Haidt, & Gable, 2008).

Arguably one of the most significant findings in our exploration of thematic differences between the two conditions is that none of these differences mediated the effects of our intervention on well-being. This suggests that it may not be important what people specifically think about in the gratitude intervention, but that whatever they choose seems to have the same general effect. Methodologically speaking, simply asking people to think about things for which they are grateful is sufficient versus asking them to think about specific people or events. Given the small sample of our study, further examination of this issue is warranted in future research.

In summary, our intervention produced significant main effects focused on well-being. Like other intervention studies that have attempted to induce gratitude, the results were mixed. One explanation for this could be that the intervention period was not sufficiently long or intense, a common problem with intervention studies. Having people reflect on experiences once a day, twice a week for 4 weeks may not be sufficient to produce immediate post-test effects on all facets of well-being. Second, our sample size was small, and hence, our effects were modest. Future work should employ larger samples over longer periods.

CONCLUSION

The purpose of this study was to explore the effects of a gratitude intervention on well-being. We found that participants in the gratitude condition displayed higher levels of self-esteem and satisfaction with life compared to those in the memorable events condition. Furthermore, some of the psychological benefits of a gratitude contemplation intervention may be more marked for those low in trait gratitude. Given the small sample size, our results ought to be replicated with a larger sample, additional comparison conditions, and long-term post-intervention assessments. If our results are found to be robust, they can have significant clinical implications in terms of providing an alternative means by which to improve one's well-being.

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