Routledge
Taylor & Francis Group

The Journal of Positive Psychology

Dedicated to furthering research and promoting good practice

ISSN: 1743-9760 (Print) 1743-9779 (Online) Journal homepage: www.tandfonline.com/journals/rpos20

The efficacy of seven gratitude interventions for promoting subjective well-being

Annabel V. Dang, Nicholas A. Coles, Shigehiro Oishi & Michael E. McCullough

To cite this article: Annabel V. Dang, Nicholas A. Coles, Shigehiro Oishi & Michael E. McCullough (16 May 2025): The efficacy of seven gratitude interventions for promoting subjective well-being, The Journal of Positive Psychology, DOI: 10.1080/17439760.2025.2502483

To link to this article: https://doi.org/10.1080/17439760.2025.2502483

THE JOURNAL OF POSITIVE PSYCHOLOGY
https://doi.org/10.1080/17439760.2025.2502483

Routledge
Taylor & Francis Group

The efficacy of seven gratitude interventions for promoting subjective well-being

Annabel V. Dang[a], Nicholas A. Coles[b], Shigehiro Oishi[c] and Michael E. McCullough[a]

[a]Department of Psychology, University of California, San Diego, La Jolla, California, USA; [b]Department of Psychology, University of Florida, Gainesville, Florida, USA; [c]Department of Psychology, University of Chicago, Chicago, Illinois, USA

ABSTRACT

Positive psychologists regularly use gratitude interventions to study and improve subjective well-being. However, most studies have examined the efficacy of only one or two interventions at a time. Furthermore, existing studies have used disparate dependent measures and control conditions, thwarting efforts to compare the interventions meaningfully. We addressed these concerns with two experiments: an unregistered study with nine conditions and a preregistered study with eleven conditions. The gratitude interventions included intrapersonal interventions (e.g. gratitude lists), interpersonal interventions (e.g. gratitude texts and letters), and gratitude-to-God interventions (e.g. God-focused gratitude lists and letters). Relative to four control conditions, the interventions were broadly effective (albeit some more than others) at increasing positive emotion and reducing negative emotion, though less consistently effective at increasing life satisfaction. Dosage analyses indicated that the interventions' efficacy at promoting positive affect and reducing negative affect was strongly associated with their efficacy at promoting gratitude.

ARTICLE HISTORY
Received 12 February 2025
Accepted 28 April 2025

KEYWORDS
Gratitude; life satisfaction; negative emotions; positive emotions; positive psychology

Philosophers and theologians have been considering the importance of gratitude for human flourishing since before the Common Era. It took more than two millennia for psychologists even to begin to catch up with them; social scientists basically ignored gratitude until the beginning of the 21st century. However, in light of researchers' burgeoning interests in emotion and in positive psychology in the early 2000s, many became interested in gratitude, and not only as a basic emotion, but also, as a tool for increasing positive emotions, satisfaction with life, optimism, relationship satisfaction, and other indicators of subjective well-being. Not long thereafter, researchers began to develop interventions for boosting gratitude (Emmons & McCullough, 2003; Seligman et al., 2005). In the two decades between then and now, researchers have experimented with several approaches for inducing gratitude, including (a) making daily or weekly tallies of people, things, and circumstances for which one is grateful; (b) writing letters or text messages to people to whom one is grateful; (c) expressing gratitude to others in person; and even (d) drawing pictures of things for which one is grateful (Davis et al., 2016; Dickens, 2017; Diniz et al., 2023).

By 2024, researchers had conducted scores of experiments into the effects of gratitude interventions on well-being in many populations, including students, teachers, athletes, health care practitioners, medical patients, and psychotherapy clients. Systematic reviews and meta-analyses of these evaluations have generally supported the claim that gratitude-inducing activities improve subjective well-being (Boggiss et al., 2020; Carr et al., 2020; Cregg & Cheavens, 2020; Davis et al., 2016; Dickens, 2017; Meyer & Stutts, 2023; Renshaw & Olinger Steeves, 2016). This body of research has been influential, with the most prominent studies now cited hundreds and, in some cases, even thousands of times (e.g. Emmons & McCullough, 2003; Seligman et al., 2005; Sheldon & Lyubomirsky, 2006). Recent pre-registered experiments have indicated that a number of gratitude interventions (for example, expressing gratitude privately, expressing it to the benefactor via a personal text message, or expressing it to the benefactor via social media) have significant and positive effects on several measures of subjective well-being (Russell et al., 2023; Srivastava & Ghosh, 2023; Van Cappellen et al., 2023; Walsh et al., 2022). Thus, the evidence for the salutary effects of gratitude on subjective well-being cannot be attributed solely to publication bias or other factors that can create false positives.

Despite the research attention these gratitude interventions have already received, four important questions about their efficacy remain unanswered.

CONTACT Michael E. McCullough memccullough@ucsd.edu Department of Psychology, University of California, 9500 Gilman Dr, La Jolla, San Diego, CA 92093, USA

Supplemental data for this article can be accessed online at https://doi.org/10.1080/17439760.2025.2502483

First, the field lacks a systematic comparison of a large number of interventions within a single experimental protocol. Within the existing literature, most intervention studies have examined the efficacy of only one or two interventions at a time. When we look to compare various gratitude interventions, we are faced with many sources of methodological heterogeneity that are confounded across studies, which makes it difficult to derive unbiased estimates of the impact of any one methodological decision. This belies the tremendous diversity in the published interventions, as well as in the different control conditions to which those interventions are often compared (Boggiss et al., 2020; Cregg & Cheavens, 2020; Kerry et al., 2023).

Second, and relatedly, the field lacks experiments that compare gratitude interventions to a wide range of control conditions. In the past, researchers have compared gratitude interventions to (a) measurement-only control conditions; (b) conditions in which subjects write about emotionally neutral topics; (c) conditions in which subjects write about positive emotional topics; and (d) conditions in which subjects write about emotionally negative topics, among others (Dickens, 2017). A comparison of gratitude interventions to all four of these benchmarks simultaneously would help to put the efficacy of gratitude interventions into a wider perspective.

Third, a systematic examination of the effects of gratitude interventions on subjective well-being requires (according to a popular theoretical approach; Diener et al., 2002) an evaluation of their effects on (a) positive emotions, (b) negative emotions, and (c) satisfaction with life. Many intervention experiments have examined one or more of these dimensions of subjective well-being, but a more comprehensive examination of their effects on subjective well-being requires that all three be examined simultaneously.

Finally, the field needs more large-scale preregistered experiments with open protocols, open materials, and open data sets on this topic (Frank et al., 2024). Over the past decade in particular, psychologists have navigated a 'crisis in confidence' characterized by doubts about even the most foundational and face valid findings in psychology (Pashler & Wagenmakers, 2012). For example, posed expressions of emotion (i.e. facial feedback) were once considered a literal textbook method for eliciting and understanding emotion – until, that is, 17 labs failed to replicate one of its most seminal studies (Wagenmakers et al., 2016). Researchers have since spent a decade using open science methods to recalibrate confidence in the methodology (e.g. Coles et al., 2019, 2022, 2023). Given conflicting evidence of the presence and potential impact of publication bias in research on emotion inductions (Ferrer et al., 2015; Joseph et al., 2020), more open work in this domain is key to establishing a trustworthy evidence base.

Present research

In this article, we report the results of five experiments in which we examined the efficacy of seven common gratitude interventions relative to four common control conditions. The results from Experiments 1–4, which we did not pre-register, were analyzed as a single data set and summarized here as Study 1. The results from Experiment 5, which was pre-registered, are summarized here as Study 2. We chose our interventions and control conditions with an eye toward capturing the diversity of methods that researchers in this field have used.

Study 1 compared five gratitude conditions to four control conditions. Three of the gratitude interventions involved making lists of gifts or events from one's life for which one is grateful. The first of these three was similar to the list technique Emmons and McCullough (2003) used in their early work. The second was developed to better match the cultural sensibilities of people in Hong Kong (Chan, 2010) and the third has been tested in both an American and Singaporean sample (Caleon et al., 2017; Koo et al., 2008). By using cross-cultural gratitude interventions, we are able to test whether these interventions are similarly effective on a general U.S. sample.

The list-based interventions are cognitive rather than interpersonal (Berger et al., 2019): They encourage self-reflection, but do not encourage people to think specifically about or communicate with specific people from their lives who helped them in some potentially gratitude-eliciting way. Interpersonal gratitude interventions, in contrast, involve instructing the participant to pay a visit, write a letter, or send a text message to someone they are grateful to (Berger et al., 2019; Kirca et al., 2023; O'Connell et al., 2017; Seligman et al., 2005). We chose to include two interventions that were specifically interpersonal. The first of these two involves writing (but not sending) a letter to someone the subject felt grateful to, and the second involves writing and then sending a text message to someone the subject felt grateful to (Sheldon & Yu, 2021; Toepfer et al., 2011; Walsh et al., 2022).

Study 2 involved all five of the gratitude interventions used in Study 1, plus two additional ones, which addressed gratitude to God. The new gratitude to God list conditions were similar to gratitude list from Emmons and McCullough (2003) and the interpersonal gratitude letter from Seligman et al. (2005) we adapted for Study 1, but with one important change; subjects were instructed to consider God or another divine entity as the target of their gratitude (Tsang et al., 2023).

In Study 1 and Study 2, we compared the gratitude interventions to four of the most common control conditions in the gratitude intervention literature (Davis et al., 2016). The control conditions included a measurement-only condition in which subjects merely completed the dependent measures, a neutral-emotion induction – instructed subjects to describe 'events' that had recently occurred in their life, a positive-emotion control – instructed subjects to describe 'interesting events' that had recently occurred in their life, and a negative-emotion control – instructed subjects to describe 'hassles' that had recently occurred in their life.

Transparency and openness

Data, materials, and code are publicly available at the Open Science Framework (OSF) and can be accessed at https://osf.io/cpzwn/. Data were analyzed using R, version 4.3.3 (R Core Team, 2024).

The experiments conducted as part of Study 1 were not pre-registered. The experiment that constituted Study 2 was pre-registered. We submitted an amendment shortly after pre-registering Study 2 to add two additional conditions (*Gratitude to God list* and *Gratitude to God letter*) and scales measuring gratitude to God. Data collection began only after we made this amendment.

For Study 2, we pre-registered 11 hypotheses, three of which are addressed in detail here.

Hypothesis 1: Gratitude interventions increase state gratitude compared to control interventions.

Hypothesis 2: Gratitude interventions increase state-positive affect and reduce state-negative affect compared to control interventions.

Hypothesis 3: Gratitude interventions increase life satisfaction compared to control interventions.

We also provide stylized summaries of the results for the remaining eight hypotheses. A complete list of our pre-registered hypotheses can be found in the pre-registration. Detailed descriptions of the results for all hypotheses are available in the Supplemental Materials.

The methods we used in the five experiments that constituted Study 1 and Study 2 were quite similar. Thus, in the interest of brevity, we summarize the methods and results of the two studies simultaneously rather than one at a time.

Sample size

A power analysis was conducted using the pwr package in R (Champely et al., 2017) to determine the appropriate sample size for Study 2. The analysis indicated that a total sample size of 1,573 participants, with 143 participants per condition across 11 conditions, would provide 90% power to detect an Hedge's g effect size of 0.40.

Exclusion criteria

We did not exclude any participants.

Methods

Participants

We ran five experiments with U.S. workers on the Prolific survey platform (Prolific; https://prolific.co/). We did not use any screening questions: All Prolific workers were eligible. We paid participants $3.50 for completing the study.

Experiment 1 included 221 participants (48% male, 51% female, 1% other; age: $M = 36.02$, $SD = 12.82$). Experiment 2 included 300 participants (46% male, 52% female, 12% other; age: $M = 35.69$, $SD = 12.51$). Experiment 3 included 452 participants (46% male, 52% female, 2% other; age: $M = 37.52$, $SD = 13.52$). Experiment 4 included 182 participants (41% male, 58% female, 1% non-binary; age: $M = 37.07$, $SD = 14.24$).

Study 1, comprising data from the first four experiments, included a total of 1155 participants (45% male, 53% female, 2% other; age: $M = 36.72$, $SD = 13.29$). Participants identified with a range of ethnic backgrounds (73% White, 9% Black or African American, 8% Asian, 6% identifying as multiracial or another ethnicity, and 4% declined to answer). Of the overall sample, 139 participants identified as Hispanic or Latino. A total of 556 participants indicated an identification with a religion (83% Christian or Catholic, 4% Jewish, 2% Muslim, 13% other), whereas 551 identified as either spiritual without a religion, agnostic, or atheist. Another 48 participants chose not to indicate their religious affiliation.

Study 2, which comprised a single pre-registered experiment, had 1579 participants (43% male, 55% female, 3% other; age: $M = 37.51$, $SD = 13.26$). Participants identified with a range of ethnic backgrounds (74% White, 9% Black or African American, 8% Asian, and 8% identifying as multiracial or another ethnicity, and 1% declined to answer). Of the overall sample, 183 participants identified as Hispanic or Latino. A total of 804 participants indicated an identification with a religion (79% Christian or Catholic, 4% Jewish, 2% Muslim, 15% other), whereas 725 identified as either spiritual without

a religion, agnostic, or atheist. Another 50 participants chose not to indicate their religious affiliation.

In our analyses, we included data from all participants who completed the entire study. Table 1 presents the final sample sizes for both studies.

In Study 1, 124 subjects did not finish the survey. Of those 124 subjects, 97 quit before we randomized them into conditions. Fewer than 5 participants dropped out following randomization in each condition.

Participants completed Study 1 in about 14.49 min on average, with a median completion time of 11.92 min. The range (2.52 min −299.73 min) and standard deviation (13.44 min) were very large. Although most participants began and ended the study within just a few minutes, we found that others began the study, turned their attention to other activities on one or more occasions, and then returned to the study. On average, participants spent 3.74 min on the gratitude exercise to which they had been randomly assigned, with a median of 2.71 min. Here too (and for the same reason as for the long completion times), the range (0.46 min −28.43 min) and standard deviation (3.43) were large.

In Study 2, 255 subjects did not finish the survey. Of those 255 subjects, 153 subjects quit before we randomized them into conditions. Fewer than 10 participants dropped out following randomization in each condition.

Participants completed Study 2 in about 17.58 min on average, with a median completion time of 14.62 min. As in Study 1, the range (4.23 min −244.95 min) and standard deviation (13.18 min) were large (and for the same reasons as in Study 1). On average, participants spent 3.27 min on the gratitude exercise to which they had been assigned, with a median of 2.48 min. Here too, the range (0.04 min −47.42 min) and standard deviation (2.98) were large.

Table 1. Total sample sizes in each gratitude intervention and control condition.

Gratitude Interventions	Study 1	Study 2
(1) Gratitude List	134	152
(2) Gratitude Letter	126	143
(3) Gratitude Text	117	137
(4) Naikan Gratitude List	130	143
(5) Mental Subtraction Task	129	137
(6) Gratitude to God List	Not included	146
(7) Gratitude to God Letter	Not included	140
Control Conditions	**Study 1**	**Study 2**
(1) Measurement Only	139	152
(2) Events List	126	141
(3) Interesting Events List	127	142
(4) Hassles List	127	146
N	1155	1579

Differences in *n* among conditions are due solely to our use of random assignment with replacement (rather than without).

Experimental conditions

In both Study 1 and Study 2, subjects were randomly assigned to an experimental task, which they were asked to complete 'in the next few minutes'. We used these tasks for one of two purposes: (a) to increase state gratitude; or (b) serve as control conditions against which we could compare the efficacy of the gratitude interventions.

Study 1 featured five gratitude conditions: (1) writing a list of things or circumstances you are grateful for (*Gratitude list*); (2) writing a letter to someone you are grateful to (*Gratitude letter*); (3) writing and sending a text to someone you are grateful to (*Gratitude text*); (4) Naikan-meditation-like reflection before listing things for you are grateful for (*Naikan gratitude list*); and (5) writing about how your life would be different if something you are grateful for disappeared from your life (*Mental subtraction task*). The Naikan gratitude list condition was designed specifically to improve cultural relevance in Hong Kong (Chan, 2010). The mental subtraction task has been tested on both an American and Singaporean population (Caleon et al., 2017; Koo et al., 2008).

In Study 2, we included all of the gratitude intervention conditions from Study 1, plus two additional interventions: (6) writing a list of things or circumstances for which you are grateful to God (*Gratitude to God list*); and (7) writing a letter of gratitude to God (*Gratitude to God letter*).

Study 1 and Study 2 both had four control conditions. The four control conditions were (1) a no-treatment, measurement-only control (*Measurement only)*, (2) writing about any events (with no indication that the events should be interesting) that happened to you (*Events list*), (3) writing about interesting events that happened to you (*Interesting events list*), (4) writing about hassles that bothered you (*Hassles list*).

Tables 2 and 3 provides the exact instructions given for each condition.

In the instructions for all conditions, we told participants, 'As you write, don't worry about perfect grammar and spelling, and remember that anything you write will remain strictly confidential. Should an experimenter read this entry in the future, it will be identifiable only by a participant number and not by your name'.

Dependent variables

After completing the interventions, participants are immediately directed to several self-report measures of emotional state, happiness, and well-being. In the

Table 2. Instructions to subjects for the gratitude interventions conditions.

Condition	Instructions
(1) Gratitude List (Emmons and McCullough, 2003)	There are many things in our lives, both large and small, that we might be grateful for. Think back over the past week and write down five things in your life that you are grateful for.
(2) Gratitude Letter (Walsh et al., 2022)	In our daily lives, we often thank people for both large and small things. However, it can sometimes be difficult to make time to express our gratitude more deeply. Today, we want you to write a letter of gratitude to someone who has done something for which you are extremely grateful. Please do not share your letter with this person or anyone else. Think of the people – partners, parents, siblings, relatives, friends, neighbors, mentors, and so on – who have been especially generous and thoughtful towards you. For example, you may feel grateful to a parent who has always been there for you, or to a friend who helped you through a hard time. Now we would like you to pick ONE person who helped you, and write a letter of gratitude to them. However, this letter is really for you to express your thoughts—it is not to convey your gratitude directly to the other person. In fact, we do not want you to share your letter with anyone at all. You will type this letter out on the text box provided. To give you some ideas of what to write, you could describe the kind act(s) this person did for you and how the kind act(s) affected your life. You could also describe what you are doing now and how you often remember their efforts.
(3) Gratitude Text (Walsh et al., 2022)	In our daily lives, we often thank people for both large and small things. However, it can sometimes be difficult to make time to express our gratitude more deeply. Today, we want you to use your smartphone to text someone who has done something for which you are extremely grateful, and thank them for their kind act(s). Think of the people – partners, parents, siblings, relatives, friends, neighbors, mentors, and so on – who have been especially generous and thoughtful towards you. For example, you may feel grateful to a parent who has always been there for you, or to a friend who helped you through a hard time. Now we would like you to pick ONE person who helped you, and text them to share your gratitude. Please text ONLY the person who helped you directly via a private message. That is, we do not want you to text that person in a group message where other people can see it. Please type the text in the textbox provided. To give you some ideas of what to say, you could describe the kind act(s) this person did for you and how the kind act(s) affected your life. You could also describe what you are doing now and how you often remember their efforts.
(4) Naikan Gratitude List (Chan, 2010)	There are many things, both large and small, that happen to you every week. Think back over the past week and write down up to three things you are grateful or thankful for. Think about why these good things happen to you. Specifically, reflect on each of the three good things by asking yourself three questions. What did I receive? What did I give? What more could I do? Stay with the feeling of appreciation and gratitude.
(5) Mental Subtraction Task (Caleon et al., 2017; Koo et al., 2008)	There are many things in our lives, both large and small, that we might be grateful for. Think back over the past day and write down five things in your life that you are grateful or thankful for. Next, please choose one of the entries you have written above and describe how your life would be like if that particular moment or person was not present in your life.
(6) Gratitude to God List (Tsang et al., 2023)*	We are interested in people's experiences of gratitude toward God. Please write down anything for which you are grateful or thankful to God for giving you. You may list as many or as few things as you would like.
(7) Gratitude to God Letter (Tsang et al., 2023)*	Many people are grateful to God, a higher power, or some type of spiritual being for giving them gifts. Think about how God, a higher power, or some type of spiritual being has benefited you. List how you refer to this entity here and indicate how you would best describe them. Please write a letter to this entity, thanking them for all the ways they have benefited you.

The conditions marked with an asterisk (*) were implemented only in Study 2.

Table 3. Instructions to subjects for the control conditions.

Condition	Instructions
(1) Measurement Only	Please click the arrow to proceed to the next portion of the study.
(2) Events List (Cunha et al., 2019)	In life, there are events, both large and small, that end up affecting us. Think back over the past day and write down five events that somehow affected you.
(3) Interesting Events List (Cunha et al., 2019)	In life, there are events, both large and small, that end up affecting us. Think back over the past day and write down five interesting events that somehow affected you.
(4) Hassles List (Cunha et al., 2019)	In life, we sometimes encounter hassles and annoying situations that may bother and irritate us. They can occur in various realms of our lives (in personal relationships, in the workplace, at university, at home, or in relation to finances or health). Think back over the past day and write down five hassles or annoying situations you had to face.

interest of brevity, in the main text we focus on results for state gratitude, state positive affect, state negative affect, and satisfaction with life. Analyses for all state emotions and other state measures are also briefly described.

State emotions

In each experiment, subjects completed 20 emotion adjectives to describe their current affective state using a 7-point scale (1 = strongly disagree; 7 = strongly agree).

In general, we presented these state emotion items in random order, with one exception: for Experiment 1, all subjects completed the 'grateful' emotion item first. For the rest of the experiments, all emotion items were randomly shown to the viewer in four distinct blocks of five items each.

In both studies, we measured state gratitude with three emotion words ('grateful', 'appreciative', and 'thankful'), state positive affect with five items ('happy,' 'joyful', 'pleased', 'content', and 'satisfied'), and state negative affect with three items ('sad', 'depressed', and 'anxious'). We also measured state optimism with two items ('optimistic' and 'hopeful'), state indebtedness with two items ('indebted' and 'obligated'), and state guilt with one item ('guilty').

In Study 2, we added the emotion 'nervous' in addition to 'sad', 'depressed', and 'anxious' to measure state negative affect more reliably. We also added three items to measure state envy ('envious', 'bitter', and 'jealous').

Satisfaction with life

We measured subjects' momentary life satisfaction with the five-item Satisfaction with Life Scale with instructions to 'indicate the response that best fits you *at this moment*' (Diener et al., 1985). Subjects completed the five items (e.g. 'I feel that in most ways my life is close to my ideal' and 'I feel that I have gotten the important things I want in life') to indicate their current judgments on their life satisfaction on a seven-item scale that ranged from 1 (*strongly disagree*) to 7 (*strongly agree*).

Table 4 provides basic descriptive statistics for these scales: means, standard deviations, and estimates of internal consistency (calculated with McDonald's ω). Additional descriptives for the other composite state measures appear among the Supplemental Materials.

Other state measures

In addition to the state emotion matrix and satisfaction with life scale, we included measures of social connection (Social Connection Scale; Sheldon & Hiplerts, 2012), overall life evaluation (Cantril, 1965), and perceived self size (Bai et al., 2017).

Trait measures

After the state measures, subjects completed a series of other measures designed to measure individual differences. These measures included the trait gratitude (GQ-6; McCullough et al., 2002), gratitude act frequency, religious gratitude (Rosmarin et al., 2011), trait positive and negative affect (PANAS-SF; Watson et al., 1988), eight items from the York Enviousness Scale (Gold, 1996), primal world beliefs (Primal Belief Scale; Clifton & Yaden, 2021), and religious commitment (RCI-10; Worthington et al., 2003).

Analyses

To analyze the data for both Study 1 and Study 2, we used two different approaches.

Pairwise comparisons

First, we conducted *t*-tests to compare the means of each condition to all other conditions. Therefore, for each dependent variable, this approach produced 36 unique pairwise comparisons for Study 1 and 55 pairwise comparisons for Study 2.

Here we focus here on four dependent variables for both Study 1 and 2: gratitude, positive affect, negative affect, and satisfaction with life. In Study 2, we also report additional analyses for 12 additional dependent variables: state optimism, state indebtedness, state guilt, state envy, social connectedness, attitude towards life, sense of self, trait gratitude, trait envy, trait positive affect, trait negative affect, and primal world beliefs. Complete tables containing analyses for all dependent variables in Study 1 and 2 appear in the Supplemental Materials.

Dosage analyses

Our second approach to analyzing the data is perhaps more enlightening. We ordered the interventions by the mean amounts of gratitude they

Table 4. Descriptive scales for state emotion item and SWL scales across study 1 and 2.

Study 1	Measure	M	SD	McDonalds' ω
	Gratitude	5.08	1.64	0.93
	Positive Affect	4.37	1.58	0.95
	Negative Affect (without "nervous")	2.51	1.57	0.89
	Satisfaction with Life	4.00	1.63	0.94
Study 2	Measure	M	SD	McDonalds' ω
	Gratitude	5.13	1.64	0.94
	Positive Affect	4.38	1.59	0.95
	Negative Affect (with "nervous")	2.41	1.50	0.93
	Satisfaction with Life	4.08	1.66	0.94

elicited and then calculated a one-degree-of-freedom test to evaluate whether the interventions' efficacy in improving positive emotion, reducing negative emotion, and improving satisfaction with life was a linear function of their efficacy in promoting gratitude.

To do so, we first calculated the mean amount of state gratitude for each condition. Second, we subtracted each condition's mean gratitude score from the mean score for the measurement-only control condition. By doing so, we were able to express the gratitude-inducing effect of each intervention relative to whether it produced more gratitude, or less gratitude, than a condition that reflected Prolific subjects' default levels of state gratitude. These difference scores enabled us then to order the conditions on a single, meaningful metric: the amount of gratitude they elicited, using the mean of the measurement-only control condition as a reference point. We refer to these centered values for the gratitude each condition elicited as their *dosages*.

Table 5 presents the mean state gratitude for each condition, along with the corresponding gratitude dosage.

With those dosage values in hand, we then performed an analysis of variance with a one-degree-of-freedom dosage effect for each dependent variable. For this independent variable, each subject was assigned a value that corresponded to the average amount of gratitude their condition elicited. This enabled us to evaluate whether the mean scores on our dependent variables for each condition are due to the differences in the amounts of gratitude they produced.

Table 5. Conditional dosage of gratitude for Study 1 and 2.

Study 1	Condition	Mean State Gratitude	Dosage of Gratitude
	Measurement Only	4.27	0.00
	Events List	4.76	0.49
	Interesting Events List	4.72	0.45
	Hassles List	3.85	−0.42
	Gratitude List	5.41	1.14
	Gratitude Letter	6.01	1.74
	Gratitude Text	5.70	1.43
	Naikan Gratitude List	5.47	1.20
	Mental Subtraction Task	5.58	1.31
Study 2	**Condition**	**Mean State Gratitude**	**Dosage of Gratitude**
	Measurement Only	4.50	0.00
	Events List	4.67	0.17
	Interesting Events List	4.74	0.24
	Hassles List	3.87	−0.63
	Gratitude List	5.48	0.98
	Gratitude Letter	6.00	1.50
	Gratitude Text	6.00	1.50
	Naikan Gratitude List	5.53	1.03
	Mental Subtraction Task	5.55	1.05
	Gratitude to God List	4.98	0.48
	Gratitude to God Letter	5.15	0.65

Results

Main Analyses

For the data from Study 1 and, separately, for Study 2, we conducted pairwise comparisons between all conditions (9 in Study 1; 11 in Study 2). For all dependent variables listed above, the *t*-statistic, degrees of freedom, *p*-values, and Hedges' *g* for every pairwise comparison conducted are reported in Supplemental Materials. Here, we focus on only four outcomes: gratitude, positive affect, negative affect, and satisfaction with life.

Figures 1–4 graphically depict the results of these group comparisons efficiently. In each panel of the figure, we array the nine conditions (and, for Study 2, 11 conditions) along the x-axis in ascending order on the basis of their mean scores on the outcome under consideration. The leftmost bars in each panel reflect the outcome means for the conditions that elicited the lowest scores on the outcome, and the rightmost bars reflect the outcome means for the conditions that elicited the highest scores on the outcome.

Significant differences between conditions are indicated with a pair of brackets and an asterisk; conditions in any given bracket are significantly different ($p < 0.05$) from conditions in the other bracket. For example, the lowest set of brackets in Figure 1 Panel A indicate, first, that the condition under the left bracket (i.e. the hassles condition) elicited significantly less gratitude than all the conditions under the right bracket did (i.e. all other conditions in the study). With this approach, one can clearly see where the significant differences among the conditions are located.

Effects on gratitude: pairwise analyses

Panel A in Figure 1 arrays the means for the nine conditions from Study 1 ordered according to the amount of gratitude they elicited. The lowest set of brackets indicate that the hassles condition elicited significantly less gratitude than all other conditions. The second-lowest set of brackets indicate that the hassles condition and the measurement-only condition both elicited significantly less gratitude than all other conditions in the study. The third set of brackets indicate that all four control conditions – hassles, measurement-only, interesting events, events – produced significantly less gratitude than the five active gratitude interventions. The top set of brackets indicated that the gratitude letter

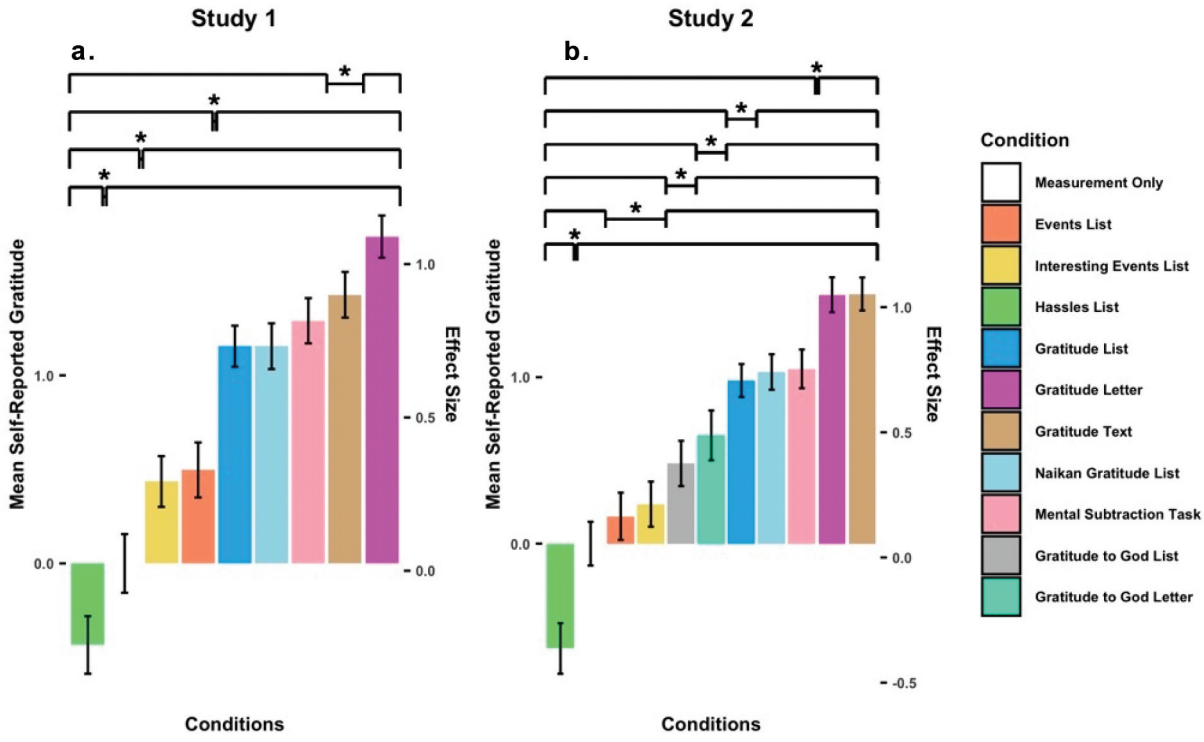

Figure 1. Mean self-reported gratitude for participants in each condition with the measurement only condition as the baseline. Brackets around conditions, separated by a line and asterisks, indicate that all conditions in the first pair brackets are significantly different from all conditions in the second pair of brackets. Conditions within a bracket are not necessarily significantly different from each other. The right y-axis is the effect size (Hedge's *g*) of the condition compared to the measurement only condition. Error bars represent ± 1 standard error.

condition elicited significantly more gratitude than all other conditions except for the gratitude text condition. The four sets of brackets exhaustively denote all significant pairwise comparisons.

Panel B in Figure 1 arrays the means for the 11 conditions in Study 2 according to the amount of gratitude they elicited. The lowest set of brackets in Figure 1 Panel B indicate, first, that the hassles condition elicited significantly less gratitude than all other conditions. The second-from-the-bottom set of brackets indicates that the hassles and measurement-only control conditions produced significantly less gratitude than all the active gratitude intervention conditions. The third-from-the-bottom set of brackets show that the four control conditions produced significantly less gratitude than all of the gratitude intervention conditions except for the gratitude to God list. The fourth-from-the-bottom set of brackets show that the four control conditions and the gratitude to God list produced significantly less gratitude than all of the gratitude intervention conditions other than the gratitude to God letter. The fifth-from-the bottom set of brackets show that the control conditions and the two gratitude to God conditions produced significantly less gratitude than the Naikan gratitude list, the mental subtraction task, the gratitude letter, and the gratitude text. The top brackets show that the gratitude letter and gratitude task produced significantly more gratitude than all other conditions.

Across the two studies, several trends stand out. First, the hassles condition and the measurement-only control consistently elicit the least gratitude, with the two other control conditions (events and positive events) as the third and fourth weakest. The gratitude letter and gratitude text produce more gratitude than any of the other conditions, with the three gratitude list conditions producing intermediate amounts of gratitude. Finally, the gratitude to God conditions produced the smallest amount of gratitude.

Effects on positive affect: pairwise analyses

Panel A in Figure 2 arrays the means for the nine conditions from Study 1 ordered according to the amount of positive affect (PA) they elicited. The lowest set of brackets indicate that the hassles condition elicited significantly less positive affect than all other conditions – including the measurement-only control. The second-from-the-bottom set of brackets show that the hassles

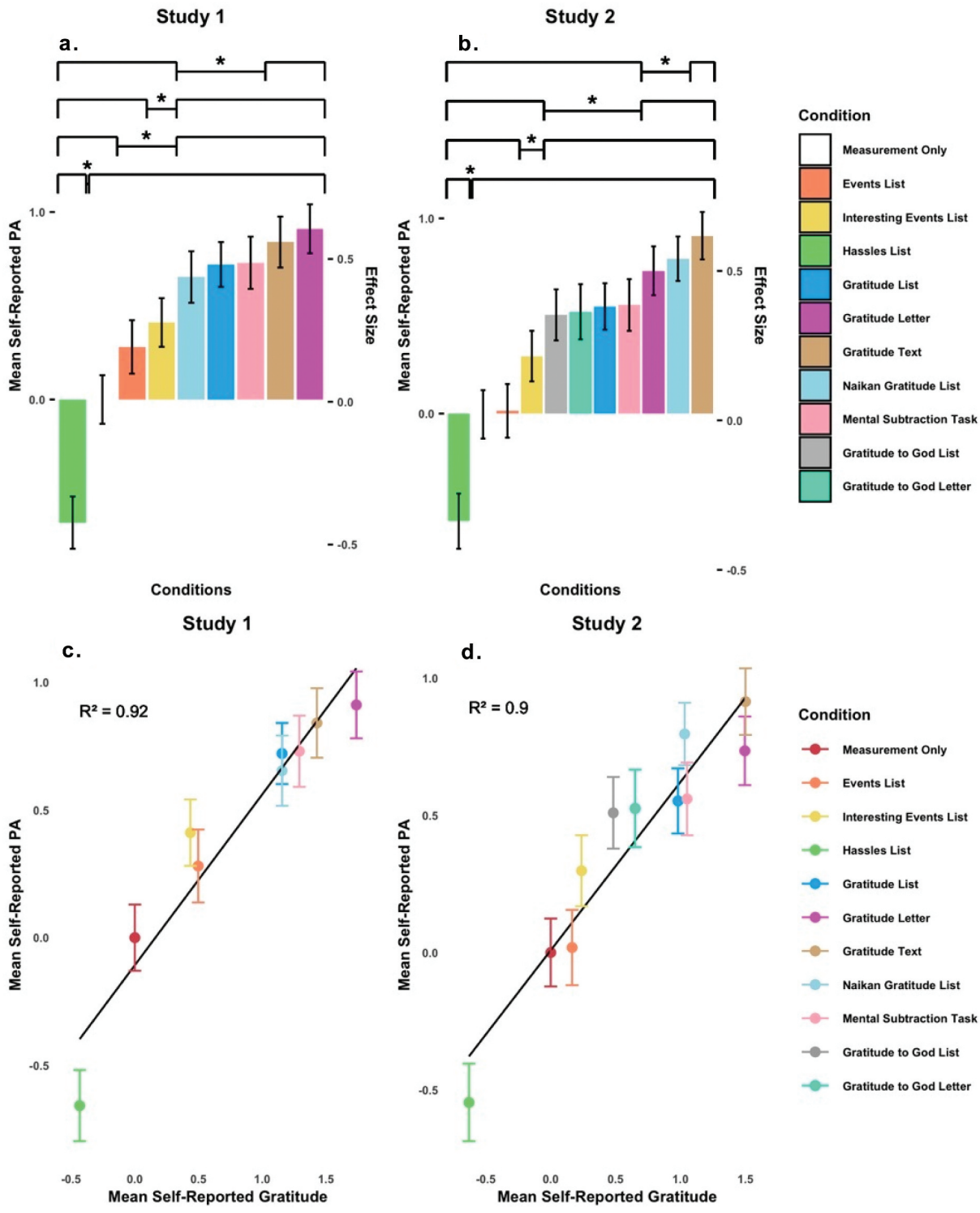

Figure 2. Mean self-reported positive affect (PA) for participants in each condition ordered by mean self-reported PA and mean self-reported gratitude with the measurement only condition as the baseline. Brackets around conditions, separated by a line and asterisks, indicate that all conditions in the first pair brackets are significantly different from all conditions in the second pair of brackets. Conditions within a bracket are not necessarily significantly different from each other. The right y-axis is the effect size (Hedge's *g*) of the condition compared to the measurement only condition. Error bars represent ± 1 standard error.

condition and measurement-only control produced significantly less positive effect than all other conditions except the events list condition. The third-from-the-bottom set of brackets show that the hassles condition, measurement-only control, and events list produced significantly less positive affect than all other conditions except the interesting events list. Finally, the top pair of brackets indicate that the four control conditions produced significantly less positive affect than the gratitude text and gratitude letter conditions.

Panel B in Figure 2 arrays the means for the 11 conditions in Study 2 according to the amount of positive affect they elicited. The lowest set of brackets indicate, first, that the hassles condition elicited significantly less positive affect than all of the 10 other conditions. The second-from-the-bottom set of brackets indicates that the hassles, measurement-only control, and events list produced significantly less positive affect than all other conditions except for the interesting events conditions. The third-from-the-bottom set of brackets show that the four control conditions produced significantly less positive affect than the gratitude letter, Naikan gratitude list, and gratitude text conditions. Finally, the top set of brackets show that the gratitude text condition produced significantly more positive affect than all other conditions except the gratitude letter and Naikan gratitude list conditions.

Effects on positive affect: dosage analyses

Panel C and D in Figure 2 arrays the conditions in terms of the amount of gratitude they elicited, centered on the mean gratitude elicited by the measurement-only control. Having done so, we then ran an analysis with a single-degree-of-freedom term, which we call dosage, to test the strength of the linear relationship between the amount of gratitude and positive affect each of the interventions elicited. In both studies, there was a significant positive relationship between average amount of elicited positive affect and dosage of gratitude (Study 1: $F(1, 7) = 81.91$, $p < 0.001$, $R^2 = 0.92$; Study 2: $F(1, 9) = 79.12$, $p < 0.001$, $R^2 = 0.90$).

Across the two studies, several trends stand out regarding differences in the amounts of positive effect each intervention elicited. First, the control conditions consistently elicited the least amount of positive affect – and the hassles condition actually reduced positive affect relative to the measurement-only condition. The gratitude text, gratitude letter, and Naikan gratitude list (in Study 2) conditions elicit high amounts of positive affect. The other gratitude conditions elicit more intermediate amounts of positive affect.

Effects on negative affect: pairwise analyses

Panel A in Figure 3 arrays the means for the nine conditions from Study 1 according to the amount of negative affect (NA) they elicited. The lowest set of brackets indicate that the hassles condition elicited significantly more negative affect than all gratitude intervention conditions. The middle set of brackets indicate that the hassles condition and measurement-only control produced significantly more negative affect than all gratitude intervention conditions except the mental subtraction task. Finally, all control conditions produced significantly more negative affect than the gratitude text, gratitude list, and gratitude letter conditions.

Panel B in Figure 3 arrays the means for the 11 conditions in Study 2 according to the amount of negative affect they elicited. The lowest set of brackets indicate, first, that the hassles condition elicited significantly more negative affect than all other conditions except the measurement-only and events list conditions. The middle set of brackets indicates that the hassles and measurement-only conditions produce significantly more negative affect than all the gratitude intervention conditions. The final set of brackets show that the hassles, measurement-only, and events list conditions produced significantly more negative affect than the gratitude text, gratitude letter, gratitude list, and mental subtraction task conditions.

Effects on negative affect: dosage analyses

Panel C and D in Figure 3 arrays the conditions in terms of the amount of gratitude they elicited, centered on the mean gratitude elicited by the measurement-only control. In both studies, there was a significant positive relationship between average levels of elicited positive affect and gratitude (Study 1: $F(1, 7) = 27.81$, $p < 0.01$, $R^2 = 0.80$; Study 2: $F(1, 9) = 52.53$, $p < 0.001$, $R^2 = 0.85$).

Across the two studies, we can see several trends emerging. The hassles condition for both studies elicited more negative affect than the measurement-only condition. The gratitude text, gratitude letter, and gratitude list conditions elicit the lowest amount of negative affect and the other gratitude interventions elicited intermediate amounts of negative affect.

Effects on life satisfaction: pairwise analyses

Panel A in Figure 4 arrays the means for the nine conditions from Study 1 ordered according to the amount of

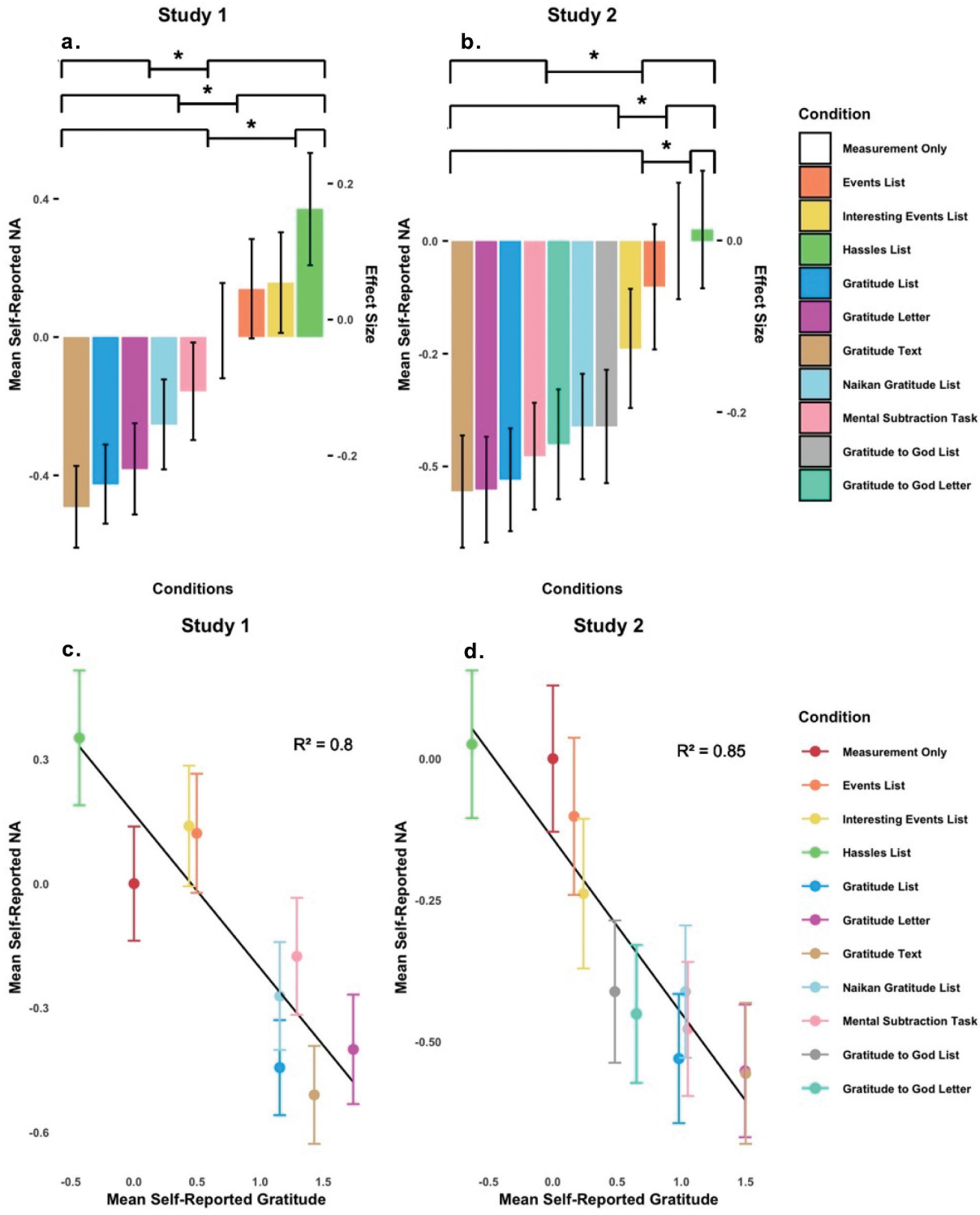

Figure 3. Mean self-reported negative affect (NA) for participants in each condition ordered by mean self-reported NA and mean self-reported gratitude with the measurement only condition as the baseline. Brackets around conditions, separated by a line and asterisks, indicate that all conditions in the first pair brackets are significantly different from all conditions in the second pair of brackets. Conditions within a bracket are not necessarily significantly different from each other. The right y-axis is the effect size (Hedge's *g*) of the condition compared to the measurement only condition. Error bars represent ± 1 standard error.

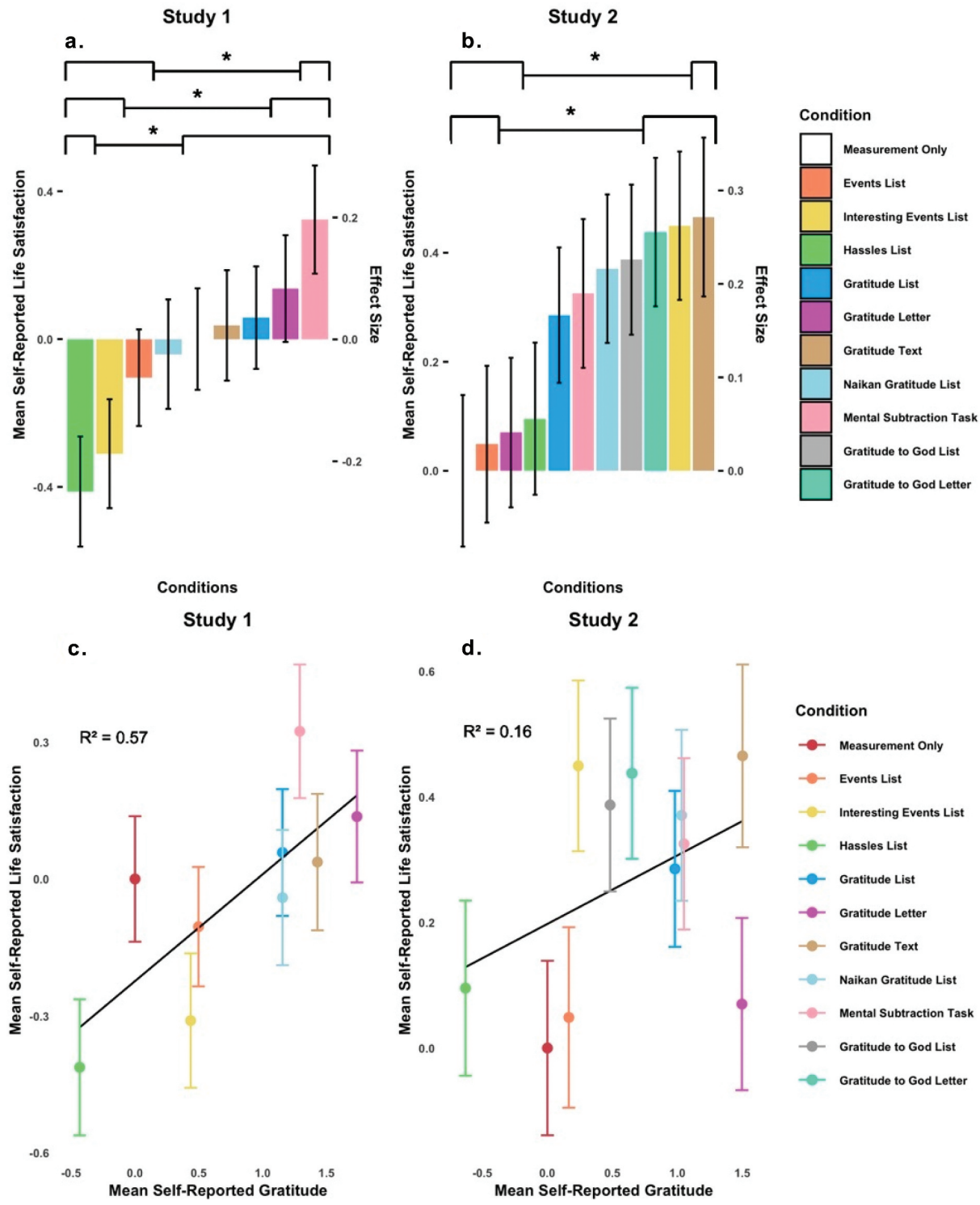

Figure 4. Mean self-reported satisfaction with life for participants in each condition ordered by mean self-reported life satisfaction and mean self-reported gratitude with the measurement only condition as the baseline. Brackets around conditions, separated by a line and asterisks, indicate that all conditions in the first pair brackets are significantly different from all conditions in the second pair of brackets. Conditions within a bracket are not necessarily significantly different from each other. The right y-axis is the effect size (Hedge's *g*) of the condition compared to the measurement only condition. Error bars represent ± 1 standard error.

satisfaction with life they elicited. The lowest set of brackets indicate that the hassles condition elicited significantly less life satisfaction than the measurement-only, gratitude text, gratitude list, gratitude letter, and mental subtraction task conditions. The middle bracket indicates that the hassles and interesting events list are producing significantly less life satisfaction than the gratitude letter and mental subtraction task. The final bracket shows that the mental subtraction task is producing significantly more life satisfaction than the events list, interesting events list, and hassles conditions.

Panel B in Figure 4 arrays the means for the 11 conditions in Study 2 according to the amount of life satisfaction they elicited. The lowest set of brackets indicate that the measurement-only and events list conditions elicited significantly less life satisfaction than the gratitude to God letter, interesting events list, and gratitude text. The top set of brackets indicates that the gratitude text condition produced significantly more life satisfaction than the measurement-only, events list, and gratitude letter conditions.

Effects on life satisfaction: dosage analyses

Panel C and D in Figure 4 arrays the conditions in terms of the amount of gratitude they elicited, centered on the mean gratitude elicited by the measurement-only control. In Study 1, there was a significant positive relationship between average levels of elicited positive affect and life satisfaction (Study 1: $F(1, 7) = 9.441$, $p < 0.05$, $R^2 = 0.57$). In Study 2, there was a non-significant relationship (Study 2: $F(1, 9) = 1.754$, $p = 0.22$, $R^2 = 0.16$).

Across the two studies, we do not find consistent evidence that gratitude interventions impact life satisfaction.

Additional analyses

Here, we briefly describe the results of our additional analyses from Study 2 on state optimism, state indebtedness, state guilt, and state envy. We also report analyses on state measures of social connectedness, attitude towards life, and perceived sense of self. Finally, we report results for trait measures of gratitude, envy, positive affect, negative affect, and primal world belief. See Supplemental Materials for details.

Effects on optimism: pairwise analyses

In general, our gratitude interventions increased participants' optimism, with the text and Naikan list conditions doing so most effectively.

All 10 of our conditions elicited significantly more optimism than the hassles list condition. Additionally, all seven gratitude interventions elicited more optimism than the measurement-only condition. All the gratitude interventions except the gratitude to God list produced more optimism than the events list condition. The list, text, and Naikan list conditions elicited more optimism than the interesting events list condition. Finally, both the text and Naikan list conditions produced more optimism than the gratitude to God list.

Effects on indebtedness: pairwise analyses

In general, our gratitude interventions increased participants' indebtedness, with the text and letter conditions having the most potency.

The text, letter, Naikan list, mental subtraction task, gratitude to God letter, and interesting events list conditions significantly increased indebtedness relative to the hassles list. The letter, text, and Naikan list conditions elicited more indebtedness than did the events list. The letter and text conditions elicited significantly more indebtedness than both the measurement-only control and the interesting events list.

Some gratitude interventions were more potent at generating indebtedness than others were. The letter, text, Naikan list, and mental subtraction task generated significantly more indebtedness than did the gratitude to God list. In addition, the letter and text conditions elicited more indebtedness than did the list condition. Finally, the text condition elicited more indebtedness than the gratitude to God letter.

Effects on guilt: pairwise analyses

In general, the effects of our gratitude conditions on guilt were unsystematic and difficult to characterize.

Both the gratitude to God list and gratitude to God letter significantly reduced guilt compared to the events list. The gratitude to God list also elicited significantly less guilt than the measurement-only control. No other pairwise comparisons were statistically significant.

Effects on envy: pairwise analyses

In general, the gratitude interventions reduced participants' envy, with the text, letter, and mental subtraction task conditions doing so most effectively.

All gratitude interventions significantly reduced envy compared to the measurement-only control and hassles list conditions. The letter, text, and mental subtraction task conditions also produced less envy than did the events and interesting events list conditions.

Some of our gratitude interventions were more effective at reducing envy than others. The text, letter, and mental subtraction tasks reduced envy more than did the gratitude to God list. The text and letter conditions reduced envy more than did the Naikan list. Finally, the

text condition reduced envy more than did the gratitude to God letter.

Effects on social connectedness: pairwise analyses

In general, gratitude interventions increased feelings of social connectedness with the text condition being most effective.

Every gratitude intervention (except for the letter and gratitude to God letter conditions) significantly increased social connectedness compared to the measurement-only control. The text and mental subtraction task conditions also elicited greater feelings of social connectedness than the interesting events list and hassles list conditions. Additionally, the text condition generated more social connectedness than the events list.

Effects on attitude towards life: pairwise analyses

In general, the effects of our gratitude conditions on attitude towards life was unsystematic and difficult to characterize.

The mental subtraction task significantly improved positive attitude towards life relative to both the events list and hassles list conditions. The interesting events list also elicited a more positive attitude towards life than did the events list condition.

Effects on perceived sense of self: pairwise analyses

There were no significant pairwise comparisons.

Effects on trait gratitude: pairwise analyses

The text and Naikan list conditions elicited significantly more trait gratitude than the hassles list. No other pairwise comparisons were significant.

Effects on trait envy: pairwise analyses

The gratitude to God list elicited more trait envy than the gratitude list condition. No other pairwise comparisons were significant.

Effects on trait positive affect: pairwise analyses

The Naikan list elicited more trait positive affect than the events list, hassles list, and gratitude letter. No other pairwise comparisons were significant.

Effects on trait negative affect: pairwise analyses

The gratitude list elicited more trait negative affect than did the measurement only control No other pairwise comparisons were significant.

Effects on primal world belief: pairwise analyses

The Naikan list elicited more positive primal world beliefs than did the measurement-only condition. No other pairwise comparisons were significant.

Discussion

Over the past two decades, interventions for promoting gratitude have come to be seen as one of the most useful positive-psychology approaches for improving positive affect, negative affect, and satisfaction with life. Enthusiasm for this idea has led to a proliferation of techniques for promoting gratitude. However, previous research usually compares only one or two gratitude interventions in the same study. It is difficult to compare the effectiveness of these interventions across different studies when considering how individual studies test interventions against different control conditions and measure subjective well-being with inconsistent dependent variables. Due to multiple sources of heterogeneity, it is impossible to know the 'true' relative efficacy of different gratitude interventions. Therefore, the current state of knowledge is that gratitude interventions are effective, but not whether a specific intervention is the most effective at improving well-being.

In the studies we report here, we sought a more comprehensive picture of these interventions' efficacy by randomly assigning Prolific workers to one of seven popular gratitude interventions or one of four control conditions that have previously been used as baselines for evaluating the gratitude interventions' efficacy. Our studies eliminated various sources of heterogeneity and convincingly showed that gratitude text and gratitude letters are the most efficacious methods of increasing positive affect and reducing negative affect.

In this paper, we describe four unregistered pilot experiments, which we combined into a single mega-experiment described here as Study 1, and a single pre-registered experiment described as Study 2. The results of the two studies were remarkably similar. In both, participants who completed gratitude interventions ended up with significantly more positive affect and less negative affect than people did in the four control conditions. As psychologists continue to navigate a 'crisis in confidence' (Pashler & Wagenmakers, 2012), the replication of such findings in a separate pre-registered experiment with open data and materials adds to the arsenal of well-established inductions of emotion.

When compared to a control condition in which subjects were instructed to write about daily hassles, the most efficacious of the gratitude interventions (which were, as we will address below, the gratitude letter, gratitude text, and gratitude list conditions) produced effect sizes around $g = .70$ to .90 for positive affect and around $g = .50$ to .70 for negative affect. When compared to a measurement-only control condition, the most efficacious gratitude interventions produced effect sizes around $g = .40$ to .60 for both positive and negative affect. When compared to control conditions that involved writing about life events or interesting life events specifically, effect sizes for both positive and negative affect averaged around g = .30 to .40. These results comport well with the results from Walsh et al. (2022), who found in a large pre-registered experiment that three gratitude interventions produced improvements in positive affect and reductions in negative affect with effect sizes of about $g = .30$ when compared to a condition in which people wrote about daily life events.

The gratitude text and gratitude letter interventions appeared to generate particularly high amounts of gratitude, increase positive affect, and decrease negative affect. It is likely that their efficacy is slightly better than the other gratitude interventions because they are interpersonal interventions. By requiring subjects not only to recall past gratitude-evoking events, but also to express their gratitude to a specific person, these interventions might cause participants to feel more connected to the memory of the event.

In Study 2, we also examined two gratitude interventions that were focused on encouraging people to experience gratitude to God. These two interventions generally had some of the weaker effects on affect and satisfaction with life of all of the interventions we examined here. This is perhaps not so surprising. Some Prolific workers are no doubt more religious than others, and it seems likely that an intervention designed to promote subjective well-being by getting people to experience and express gratitude toward God would be more effective for religious people than for religious people. In a future research effort, we will examine whether the interventions we studied in Study 2 have more efficacy for religious participants than for non-religious ones.

The dosage analyses revealed that the differences in the efficacy of the various conditions in producing positive affect and negative affect can be explained well by their efficacy at producing gratitude (with R^2 values ranging from .79 to .92). This leads to a fairly tidy characterization of our results: the more gratitude a gratitude intervention produces, the more positive affect and less negative affect it produces.

The effects of the gratitude interventions on satisfaction with life aren't as easy to characterize. Although several gratitude interventions were more effective than several of the control conditions, the effect sizes were much smaller and less systematic. In Study 1, the most potent gratitude interventions were the mental subtraction task and the gratitude letter, but the most potent gratitude interventions in Study 2 were the gratitude to God letter and the gratitude text, and the interesting-events control condition was about as efficacious as they were. The dosage effects for satisfaction with life were less clear as well. In Study 1 and Study 2, the amounts of gratitude the conditions elicited was less strongly related to their effects on satisfaction with life ($R^2 = .57$ and .16, respectively) than their effects on positive affect and negative affect (with R^2 values ranging from .79 to .92). Thus, it appears difficult to conclude that gratitude interventions, on average, produce significant increases in satisfaction with life – with one exception: across Study 1 and Study 2, all of the gratitude conditions could be counted on to produce higher satisfaction with life than the hassles control condition.

Indeed, what stands out most clearly about the control conditions is how markedly the hassles condition differs from the other three. Although many researchers have used an intervention in which people write about daily hassles as a control condition (e.g. Cunha et al., 2019; Emmons & McCullough, 2003; Froh et al., 2008), the hassles condition we used here consistently led to less positive affect, more negative affect, and less satisfaction with life than the measurement-only control. Thus, the hassles condition should not be thought of as an active control condition; instead, it should be thought of as a technique for reducing subjective well-being (Davis et al., 2016; Dickens, 2017). Thus, we do not recommend its use as a control group in future intervention work – that is, unless the goal of that work is to study how to reduce subjective well-being. We can, however, recommend the measurement-only control condition as a benchmark for absolute effectiveness, the events list as an active control condition with only minimal emotional content, and the interesting events list as an active control condition that creates a small but significant amount of positive emotion.

Our additional analyses for Study 2 revealed several interesting trends with other state emotion items. Specifically, gratitude interventions significantly increased optimism compared to control conditions, with effect sizes ranging from g = 0.21 to 0.78. This increase in optimism is similar to what we observed for

state positive affect. We also found that gratitude interventions, particularly the letter and text conditions, significantly increased feelings of indebtedness compared to the control condition, with effect sizes ranging from g = 0.24 to 0.51. These two conditions, which focus on interpersonal relationships, may lead participants to consider their obligations to repay the kindness they have received from others. Additionally, all gratitude interventions reduced envy compared to the measurement-only control condition, with effect sizes ranging from g = 0.18 to 0.60. This suggests that thinking about things for which one is grateful can reduce the tendency to compare oneself to others who seem better off than oneself. However, we did not observe any noticeable trends when examining state guilt.

Analyses of social connectedness revealed that the text condition was the only gratitude intervention that consistently elicited greater feelings of connectedness compared to control conditions. This may be due to the fact that this condition is the only one in which participants are asked to actively reach out to someone in their life. No trends emerged for attitudes toward life or perceived sense of self.

Finally, although we observed clear trends with state emotions, we did not see any significant effects on trait measures of emotions. It is likely that the shorter gratitude interventions have little impact on how participants generally perceive the world, but instead yield only short-term increases in positive affect and reductions in negative affect.

Limitations

The chief limitations of our work can be understood as limitations on generalizability. To evaluate whether gratitude interventions promote subjective well-being, we sampled broadly from the range of interventions that researchers have evaluated in previous work, and we evaluated those interventions by comparing their efficacy to four of the most common control groups to which gratitude interventions have been compared in previous work. However, there are certainly other interventions, such as drawing pictures of things one is grateful for (e.g. Diniz et al., 2023), which we could have included, but many of them were not easily administered by computer. Additionally, researchers have used alternative wordings of instructions and presentation formats for the interventions we studied here, and we did not test those alternatives.

Additionally, our findings generalize only to U.S. workers on the Prolific online platform. We do not know whether these results would generalize to subjects on other platforms, or subjects who completed the tasks in other formats (e.g. via instructions on paper and handwritten responses). And of course, we do not know how our experiments would have turned out if we had run them with participants from different countries.

Finally, our conclusions generalize only to short one-time gratitude inductions, and to measurements of subjective well-being that occur immediately after the intervention. It seems unlikely that the effects of our interventions lasted more than a few minutes, and yet many researchers' interests in gratitude come from its potentially salutary effects on well-being over longer time horizons (Rash et al., 2011; Wong, 2022). Longer-term effects will no doubt require more elaborate interventions – or perhaps a series of short interventions, presented as an ensemble of exercises that participants complete over the course of several days or weeks (e.g. Bohlmeijer et al., 2021). Researchers interested in multi-component interventions of this nature might find value in our documentation showing that (a) some gratitude interventions (e.g. gratitude texts, gratitude lists, and gratitude letters) were particularly effective relative to control conditions, while at the same time (b) virtually all of them were at least a little bit more effective than control conditions (even if not significantly so). In the interest of generating variety that helps participants to stay engaged with a multi-day or multi-week intervention, interventions that combine several of the short exercises we studied here – and perhaps not only the most effective ones, but also the less effective ones – may lead to precisely the sort of powerful long-term effects that many researchers desire. The addition of the gratitude-to-God interventions in particular might provide unique benefits to religious believers that are not available to non-believers (Tsang et al., 2023).

Concluding remarks

Writers have long speculated that gratitude promotes subjective well-being. However, pre-registered tests of this idea using experimental methods have been limited, and the results from those tests somewhat mixed (Folk & Dunn, 2023). We provide some of the first comprehensive tests of this premise in high-powered, pre-registered experiments, and think they show definitively that the gratitude interventions that are most potent at inducing gratitude are also the most potent at inducing positive affect and reducing negative affect, though their effects on satisfaction with life are more modest and harder to interpret.

We look forward to future work that can address the limitations of the work we have conducted here, which we hope will enhance our understanding not only of when these interventions work, and for whom they work, but also how they can be extended and improved to create more durable changes in subjective well-being.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research was supported by the John Templeton Foundation Grant [#62295].

Open Scholarship

This article has earned the Center for Open Science badges for Open Data, Open Materials and Preregistered. The data and materials are openly accessible at https://osf.io/cpzwn/.

References

Bai, Y., Maruskin, L. A., Chen, S., Gordon, A. M., Stellar, J. E., McNeil, G. D., Peng, K., & Keltner, D. (2017). Awe, the diminished self, and collective engagement: Universals and cultural variations in the small self. *Journal of Personality and Social Psychology*, *113*(2), 185–209. https://doi.org/10.1037/pspa0000087

Berger, P., Bachner-Melman, R., & Lev-Ari, L. (2019). Thankful for what? the efficacy of interventions targeting interpersonal versus noninterpersonal gratitude. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, *51*(1), 27–36. https://doi.org/10.1037/cbs0000114

Boggiss, A. L., Consedine, N. S., Brenton-Peters, J. M., Hofman, P. L., & Serlachius, A. S. (2020). A systematic review of gratitude interventions: Effects on physical health and health behaviors. *Journal of Psychosomatic Research*, *135*, 110165. https://doi.org/10.1016/j.jpsychores.2020.110165

Bohlmeijer, E. T., Kraiss, J. T., Watkins, P., & Schotanus-Dijkstra, M. (2021). Promoting gratitude as a resource for sustainable mental health: Results of a 3-armed randomized controlled trial up to 6 months follow-up. *Journal of Happiness Studies*, *22*(3), 1011–1032. https://doi.org/10.1007/s10902-020-00261-5

Caleon, I. S., King, R. B., Tan, J. P.-L., Low, M., Tan, C. S., & Liem, G. A. (2017). Nurturing grateful and connected twenty-first century learners: Development and evaluation of a socially oriented gratitude intervention. *Asia Pacific Journal of Education*, *37*(4), 567–581. https://doi.org/10.1080/02188791.2017.1386091

Cantril, H. (1965). *The pattern of human concerns*. Rutgers University Press.

Carr, A., Cullen, K., Keeney, C., Canning, C., Mooney, O., Chinseallaigh, E., & O'Dowd, A. (2020). Effectiveness of positive psychology interventions: A systematic review and meta-analysis. *The Journal of Positive Psychology*, *16*(6), 749–769. https://doi.org/10.1080/17439760.2020.1818807

Champely, S., Ekstrom, C., Dalgaard, P., Gill, J., Weibelzahl, S., Anandkumar, A., Ford, C., Volcic, R., & De Rosario, H. (2017). *pwr: Basic functions for power analysis*. Software. https://cran.r-project.org/web/packages/pwr/

Chan, D. W. (2010). Gratitude, gratitude intervention and subjective well-being among Chinese school teachers in Hong Kong. *Educational Psychology*, *30*(2), 139–153. https://doi.org/10.1080/01443410903493934

Clifton, J. D. W., & Yaden, D. B. (2021). Brief measures of the four highest-order primal world beliefs. *Psychological Assessment*, *33*(12), 1267–1273. https://doi.org/10.1037/pas0001055

Coles, N. A., Gaertner, L., Frohlich, B., Larsen, J. T., & Basnight-Brown, D. M. (2023). Fact or artifact? Demand characteristics and participants' beliefs can moderate, but do not fully account for, the effects of facial feedback on emotional experience. *Journal of Personality and Social Psychology*, *124*(2), 287–310. https://doi.org/10.1037/pspa0000316

Coles, N. A., Larsen, J. T., & Lench, H. C. (2019). A meta-analysis of the facial feedback literature: Effects of facial feedback on emotional experience are small and variable. *Psychological Bulletin*, *145*(6), 610–651. https://doi.org/10.1037/bul0000194

Coles, N. A., March, D. S., Marmolejo-Ramos, F., Larsen, J. T., Arinze, N. C., Ndukaihe, I. L. G., Willis, M. L., Foroni, F., Reggev, N., Mokady, A., Forscher, P. S., Hunter, J. F., Kaminski, G., Yüvrük, E., Kapucu, A., Nagy, T., Hajdu, N., Tejada, J., & Marozzi, M. (2022). A multi-lab test of the facial feedback hypothesis by the many smiles collaboration. *Nature Human Behaviour*, *6*(12), 1731–1742. https://doi.org/10.1038/s41562-022-01458-9

Cregg, D. R., & Cheavens, J. S. (2020). Gratitude interventions: Effective self-help? A meta-analysis of the impact on symptoms of depression and anxiety. *Journal of Happiness Studies*, *22*(1), 413–445. https://doi.org/10.1007/s10902-020-00236-6

Cunha, L. F., Pellanda, L. C., & Reppold, C. T. (2019). Positive psychology and gratitude interventions: A randomized clinical trial. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00584

Davis, D. E., Choe, E., Meyers, J., Wade, N., Varjas, K., Gifford, A., Quinn, A., Hook, J. N., Van Tongeren, D. R., Griffin, B. J., & Worthington, E. L. (2016). Thankful for the little things: A meta-analysis of gratitude interventions. *Journal of Counseling Psychology*, *63*(1), 20–31. https://doi.org/10.1037/cou0000107

Dickens, L. R. (2017). Using gratitude to promote positive change: A series of meta-analyses investigating the effectiveness of gratitude interventions. *Basic and Applied Social Psychology*, *39*(4), 193–208. https://doi.org/10.1080/01973533.2017.1323638

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Diener, E., Oishi, S., & Lucas, R. E. (2002). Subjective well-being: The science of happiness and life satisfaction. *Handbook of*

Positive Psychology, 463–473. https://doi.org/10.1093/oxfordhb/9780195187243.013.0017

Diniz, G., Korkes, L., Tristão, L. S., Pelegrini, R., Bellodi, P. L., & Bernardo, W. M. (2023). The effects of gratitude interventions: A systematic review and meta-analysis. *Einstein (São Paulo)*, *21*, 21. https://doi.org/10.31744/einstein_journal/2023rw0371

Emmons, R. A., & McCullough, M. E. (2003). Counting blessings versus burdens: An experimental investigation of gratitude and subjective well-being in daily life. *Journal of Personality & Social Psychology*, *84*(2), 377–389. https://doi.org/10.1037/0022-3514.84.2.377

Ferrer, R. A., Grenen, E. G., & Taber, J. M. (2015). Effectiveness of internet-based affect induction procedures: A systematic review and meta-analysis. *Emotion*, *15*(6), 752–762. https://doi.org/10.1037/emo0000035

Folk, D., & Dunn, E. (2023, October). A systematic review of the strength of evidence for the most commonly recommended happiness strategies in mainstream media. *Nature Human Behaviour*, *7*(10), 1697–1707. https://doi.org/10.1038/s41562-023-01651-4

Frank, M. C., Braginsky, M., Cachia, J., Coles, N., Hardwicke, T. E., Hawkins, R. D., Mathur, M. B., & Williams, R. (2024). *Experimentology: An open science approach to experimental psychology methods*. MIT Press. https://doi.org/10.7551/mitpress/14810.001.0001

Froh, J. J., Sefick, W. J., & Emmons, R. A. (2008). Counting blessings in early adolescents: An experimental study of gratitude and subjective well-being. *Journal of School Psychology*, *46*(2), 213–233. https://doi.org/10.1016/j.jsp.2007.03.005

Gold, B. T. (1996). Enviousness and its relationship to maladjustment and psychopathology. *Personality and Individual Differences*, *21*(3), 311–321. https://doi.org/10.1016/0191-8869(96)00081-5

Joseph, D. L., Chan, M. Y., Heintzelman, S. J., Tay, L., Diener, E., & Scotney, V. S. (2020). The manipulation of affect: A meta-analysis of affect induction procedures. *Psychological Bulletin*, *146*(4), 355–375. https://doi.org/10.1037/bul0000224

Kerry, N., Chhabra, R., & Clifton, J. (2023). Being thankful for what you have: A systematic review of evidence for the effect of gratitude on life satisfaction. *Psychology Research and Behavior Management*, *16*, 4799–4816. https://doi.org/10.2147/prbm.s372432

Kirca, A., Malouff, M. J., & Meynadier, J. (2023). The effect of expressed gratitude interventions on psychological well-being: A meta-analysis of randomised controlled studies. *International Journal of Applied Positive Psychology*. https://doi.org/10.1007/s41042-023-00086-6

Koo, M., Algoe, S. B., Wilson, T. D., & Gilbert, D. T. (2008). It's a wonderful life: Mentally subtracting positive events improves people's affective states, contrary to their affective forecasts. *Journal of Personality and Social Psychology*, *95*(5), 1217–1224. https://doi.org/10.1037/a0013316

McCullough, M. E., Emmons, R. A., & Tsang, J.-A. (2002). The grateful disposition: A conceptual and empirical topography. *Journal of Personality and Social Psychology*, *82*(1), 112–127. https://doi.org/10.1037/0022-3514.82.1.112

Meyer, H. H., & Stutts, L. A. (2023). The impact of single-session gratitude interventions on stress and affect. *The Journal of Positive Psychology*, *19*(2), 315–322. https://doi.org/10.1080/17439760.2023.2170823

O'Connell, B. H., O'Shea, D., & Gallagher, S. (2017). Feeling thanks and saying thanks: A randomized controlled trial examining if and how socially oriented gratitude journals work. *Journal of Clinical Psychology*, *73*(10), 1280–1300. https://doi.org/10.1002/jclp.22469

Pashler, H., & Wagenmakers, E. J. (2012). Editors' introduction to the special section on replicability in psychological science: A crisis of confidence? *Perspectives on Psychological Science*, *7*(6), 528–530. https://doi.org/10.1177/1745691612465253

Rash, J. A., Matsuba, M. K., & Prkachin, K. M. (2011). Gratitude and well-being: Who benefits the most from a gratitude intervention? *Applied Psychology: Health and Well-Being*, *3*(3), 350–369. https://doi.org/10.1111/j.1758-0854.2011.01058.x

R Core Team. (2024). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org

Renshaw, T., & Olinger Steeves, R. (2016). What good is gratitude in youth and schools? A systematic review and meta-analysis of correlates and intervention outcomes. *Psychology in the Schools*, *53*(3), 286–305. https://doi.org/10.1002/pits.21903

Rosmarin, D. H., Pirutinsky, S., Cohen, A. B., Galler, Y., & Krumrei, E. J. (2011). Grateful to god or just plain grateful? A comparison of religious and general gratitude. *The Journal of Positive Psychology*, *6*(5), 389–396. https://doi.org/10.1080/17439760.2011.596557

Russell, P. S., Frackowiak, M., Cohen-Chen, S., Rusconi, P., & Fasoli, F. (2023). Induced gratitude and hope, and experienced fear, but not experienced disgust, facilitate COVID-19 prevention. *Cognition and Emotion*, *37*(2), 196–219. https://doi.org/10.1080/02699931.2022.2157377

Seligman, M. E., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist*, *60*(5), 410–421. https://doi.org/10.1037/0003-066x.60.5.410

Sheldon, K. M., & Hilpert, J. C. (2012). The balanced measure of psychological needs (BMPN) scale: An alternative domain general measure of need satisfaction. *Motivation and Emotion*, *36*(4), 439–451. https://doi.org/10.1007/s11031-012-9279-4

Sheldon, K. M., & Lyubomirsky, S. (2006). How to increase and sustain positive emotion: The effects of expressing gratitude and visualizing best possible selves. *The Journal of Positive Psychology*, *1*(2), 73–82. https://doi.org/10.1080/17439760500510676

Sheldon, K. M., & Yu, S. (2021). Methods of gratitude expression and their effects upon well-being: Texting may be just as rewarding as and less risky than face-to-face. *The Journal of Positive Psychology*, *17*(5), 690–700. https://doi.org/10.1080/17439760.2021.1913639

Srivastava, M., & Ghosh, A. (2023). Online gratitude interventions during COVID-19 pandemic on youth: Randomized trial. *Journal of Evidence-Based Social Work*, *20*(2), 272–298. https://doi.org/10.1080/26408066.2022.2157691

Toepfer, S. M., Cichy, K., & Peters, P. (2011). Letters of gratitude: Further evidence for author benefits. *Journal of Happiness Studies*, *13*(1), 187–201. https://doi.org/10.1007/s10902-011-9257-7

Tsang, J.-A., Medenwaldt, J. M., Alwood, H. N., Nelson, J. M., & Schnitker, S. A. (2023). Writing about gratitude toward god produces differential content and outcomes compared to gratitude toward other benefactors among U.S. adults. *The International Journal for the Psychology of Religion*, *33*(3), 169–197. https://doi.org/10.1080/10508619.2023.2192106

Van Cappellen, P., Clapp, A. R., & Algoe, S. B. (2023). God of the good gaps: Prevalence, eliciting situations, and demonstrations of gratitude to god as compared to interpersonal gratitude. *The Journal of Positive Psychology*, *19*(1), 66–82. https://doi.org/10.1080/17439760.2023.2190928

Wagenmakers, E. J., Beek, T., Dijkhoff, L., Gronau, Q. F., Acosta, A., Adams, R. B., Albohn, D. N., Allard, E. S., Benning, S. D., Blouin-Hudon, E.-M., Bulnes, L. C., Caldwell, T. L., Calin-Jageman, R. J., Capaldi, C. A., Carfagno, N. S., Chasten, K. T., Cleeremans, A., Connell, L., DeCicco, J. M., & Zetzer, E. E., & Zwaan, R. A. (2016). Registered replication report: Strack, Martin, stepper (1988). *Perspectives on Psychological Science*, *11*(6), 917–928. https://doi.org/10.1177/1745691616674458

Walsh, L. C., Regan, A., Twenge, J. M., & Lyubomirsky, S. (2022). What is the optimal way to give thanks? comparing the effects of gratitude expressed privately, one-to-one via text, or publicly on social media. *Affective Science*, *4*(1), 82–91. https://doi.org/10.1007/s42761-022-00150-5

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. https://doi.org/10.1037/0022-3514.54.6.1063

Wong, Y. J. (2022). The catalyst model of change: Gratitude interventions with positive long-term effects. *Affective Science*, *4*(1), 152–162. https://doi.org/10.1007/s42761-022-00136-3

Worthington, E. L., Jr., Wade, N. G., Hight, T. L., Ripley, J. S., McCullough, M. E., Berry, J. W., Schmitt, M. M., Berry, J. T., Bursley, K. H., & O'Connor, L. (2003). The religious commitment inventory-10: Development, refinement, and validation of a brief scale for research and counseling. *Journal of Counseling Psychology*, *50*(1), 84–96. https://doi.org/10.1037/0022-0167.50.1.84