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REVIEW ARTICLE

The Effect of Expressed Gratitude Interventions on Psychological Wellbeing: A Meta-Analysis of Randomised Controlled Studies

Abdurrahman Kirca[1] · John M. Malouff[1] · Jai Meynadier[1]

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Abstract

The effectiveness of expressed gratitude interventions in enhancing psychological wellbeing has been explored in a number of studies. The present meta-analysis synthesized results from 25 randomized controlled trials, including a total of 6,745 participants, to examine the effect of expressed gratitude interventions on positive indicators of psychological wellbeing, including life satisfaction, positive affect, and happiness. The results showed that expressed gratitude interventions had a significant effect on psychological wellbeing relative to neutral comparison groups, Hedges' $g = 0.22$, 95% CI [0.11, 0.33], $p < .001$. The significant effects applied to each of the three elements of positive wellbeing. Intervention length and duration from baseline to final assessment did not significantly moderate effect sizes across studies. The present findings indicate that expressed gratitude interventions have value in improving psychological wellbeing.

Keywords Effects · Expressed gratitude · Meta-analysis · Psychological wellbeing

Gratitude has been defined as a general state of appreciation and thankfulness for the personal benefit individuals perceive that they have received from others (Emmons & Stern, 2013; Sansone & Sansone, 2010). Different forms of gratitude have been studied as psychological interventions. Interventions involving the *expression* of gratitude may help to accentuate the benefits of gratitude, thus allowing them to be fully realized (Davis et al., 2016). Expressing one's gratitude to another person may be more meaningful and impactful than experiencing gratitude without expressing it (Kumar & Epley, 2018).

Psychological wellbeing is often conceptualized as the combination of effective functioning and feeling good (Hutson et al., 2011). The mental health status of an

✉ John M. Malouff
jmalouff@une.edu.au

[1] University of New England, Armidale, NSW, Australia

individual can be determined by assessing the presence of negative and positive indicators of psychological wellbeing (Hu et al., 2015). Prior to the advent of the positive psychology movement, there was a greater emphasis on negative indicators of psychological wellbeing, such as depression, anxiety, stress and negative affect (Hendriks et al., 2017; Muusses et al., 2014). Positive psychology, on the other hand, focuses on positive indicators of psychological wellbeing (see Keyes et al., 2012).

Positive indicators of psychological wellbeing include life satisfaction, positive affect, and happiness (Maiolino & Kuiper, 2014). Life satisfaction refers to a global assessment of one's life, while positive affect refers to the frequency of a person's positive emotions at any given time (Diener, 2000; Froh et al., 2009). Happiness, sometimes referred to as hedonic or subjective wellbeing (Adler et al., 2017; Boehm et al., 2011), can be defined as an individuals' overall assessment of satisfaction with their life and the frequency of their positive emotional states (Shinde, 2017).

1 Measuring Psychological Wellbeing

Various scales have been used to measure positive indicators of psychological wellbeing. The most widely used instrument to measure life satisfaction is the five-item Satisfaction with Life Scale (SWLS; Diener et al., 1985). The SWLS has been found to be a reliable and valid measure of life satisfaction across different age groups and ethnicities (Esnaola et al., 2017; Lopez-Ortega et al., 2016). The Positive Affectivity and Negative Affectivity Schedule (PANAS; Watson et al., 1988) positive affect scale is a commonly used measure of positive affect that has shown excellent reliability and validity across diverse populations (Davis et al., 2020; Diaz-García et al., 2020). The Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999) is a widely used measure of happiness that has demonstrated good reliability and validity across different populations (Iani et al., 2013).

2 Expressed Gratitude Interventions and Psychological Wellbeing

Researchers have conducted numerous experimental studies to investigate the effects of gratitude interventions on psychological wellbeing. Some of these studies have included expressions of gratitude to another person (i.e., expressed gratitude), while others have not. The most widely used expressed gratitude intervention has been writing gratitude letters, which involves expressing one's thankfulness towards another person in writing (Wood et al., 2010). Gratitude letters are not always written with the intention to deliver. When written with an intention to deliver, gratitude letters are either mailed or delivered in-person. The study of Seligman et al. (2005) was one of the first to examine the effects of an expressed gratitude intervention on psychological wellbeing. Of the five positive psychology interventions the authors investigated, the expressed gratitude condition had the largest positive effect on happiness relative to the control group.

Several other studies have also investigated the effects of expressed gratitude interventions on happiness. Significant increases in happiness were demonstrated in

a number of these studies using a variety of expressed gratitude activities, including gratitude letters (Toepfer et al., 2012), social media posts (Yu, 2020), video calls (Sheldon & Yu, 2021) and face-to-face meetings (Gander et al., 2013). In other studies, nonsignificant increases in happiness were observed amongst participants who expressed gratitude relative to controls (Dickerhoof, 2007; Timmons & Ekas, 2018). Two other studies did not show significant effects of expressed gratitude interventions on happiness (Nelson-Coffey et al., 2021; Walsh et al., 2022b).

Similarly, studies on the effectiveness of expressed gratitude interventions for improving life satisfaction and positive affect have reported mixed findings. Significant findings were found in some studies (Boehm et al., 2011; Walsh et al., 2022c), while other studies found no significant difference between expressed gratitude and control groups in life satisfaction (Berger et al., 2019; Froh et al., 2009; Gherghel & Hashimoto, 2020; Renshaw & Hindman, 2017). The absence of significant findings in some of these studies may have been due to the frequency of gratitude expression. Renshaw and Hindman (2017) required expressed gratitude participants to express their gratitude to another person three times a day for two weeks, while Gherghel and Hashimoto (2020) required nine expressions of gratitude over three weeks. Participants in these studies may have perceived frequent expressions of gratitude as excessive, thus inhibiting the intervention's effect on life satisfaction (Renshaw & Hindman, 2017).

3 Previous Reviews and Meta-Analyses

Wood et al. (2010) conducted the first systematic review investigating the efficacy of gratitude interventions on psychological wellbeing. The review included 12 studies, three of which involved an expressed gratitude intervention. Wood et al. found that gratitude interventions caused significant improvements in psychological wellbeing. However, the authors suggested that studies involving negative comparison group activities, such as hassles lists, may have exaggerated the efficacy of gratitude interventions. Wood et al. did not examine the effects of the type of gratitude intervention (i.e., expressed or non-expressed gratitude) on psychological wellbeing, nor did they differentiate between the various indicators of psychological wellbeing.

Davis et al. (2016) performed the first meta-analysis examining the efficacy of gratitude interventions on psychological wellbeing. The authors included 26 studies in their meta-analysis, five of which involved an expressed gratitude intervention. The researchers found that gratitude interventions had a modest effect overall on psychological wellbeing. Davis et al. found no discernable difference between gratitude interventions involving expressions of gratitude relative and those without an expressed component. Davis et al. grouped life satisfaction, which is a positive indicator of psychological wellbeing, with depression, which is a negative indicator of psychological wellbeing. This grouping is important, as the relationship between these two indicators of psychological wellbeing has been questioned (e.g., Gigantesco et al., 2019).

Renshaw and Olinger Steeves (2016) meta-analyzed the effects of gratitude interventions in school children. Only one included study investigated effects of

expressed gratitude. In a subsequent meta-analysis, Dickens (2017) examined the effects of gratitude interventions on a variety of psychological wellbeing outcomes across 38 studies. Dickens found that gratitude interventions increased happiness, life satisfaction and positive affect, with small to medium effect sizes. However, unlike Davis et al. (2016), Dickens (2017) did not evaluate the effects of the type of gratitude intervention on psychological wellbeing. Additionally, Dickens and colleagues included studies with quasi-random participant assignment and required a study to fulfil a minimum intervention length of one week for it to be included in their meta-analysis.

Cregg and Cheavens (2021) meta-analyzed the impact of gratitude interventions on depression and anxiety. Three of the included studies involved expressed gratitude as the sole intervention; the included outcomes were anxiety or depression, not psychological wellbeing.

The reviews and meta-analyses described above did not provide an adequate answer to a key question: Do interventions that ask participants to express gratitude to a person of their choice have positive effects on the participants' wellbeing? A meta-analysis focused on that question could fill a gap in the findings on the effects of gratitude interventions of any type. The existence at present of many published studies on expressed gratitude creates a potential for answering the question with specific meta-analytic findings – across study groups, across types of participants, and across whether the expressed gratitude is communicated to the person or not. Answering the question with meta-analytic results has potential for guiding efforts to help individuals improve positive aspects of mental health.

4 Aims of the Current Meta-Analysis

The aim of the present meta-analytic study was to synthesize the results of studies investigating the effects of expressed gratitude interventions on positive indicators of wellbeing. Comparison conditions were separated into two types: neutral and bona fide intervention conditions. Comparison groups that involved tasks not expected to enhance psychological wellbeing were coded as neutral comparison conditions. Comparison groups that used a therapeutically intended treatment aimed at enhancing psychological wellbeing were coded as bona fide comparison conditions. We hypothesized that expressed gratitude interventions would have a larger overall effect on positive indicators of psychological wellbeing than neutral comparison groups. We had no hypothesis regarding bona fide comparison groups.

The meta-analysis also examined several potential moderators of effect size. We hypothesized that studies with longer interventions would exhibit stronger effect sizes relative to those with shorter interventions. This hypothesis was based on the results of a meta-analysis by Carr et al. (2021) on the effects of positive-psychology interventions. That meta-analysis showed that studies with longer interventions tended to have greater effects on wellbeing.

Further, we hypothesized that studies with longer durations from baseline to final assessment would display smaller effect sizes relative to those with shorter baseline to final assessment durations. This hypothesis was based on findings in Magan

et al.'s (2021) meta-analysis suggesting that the beneficial effects of psychological interventions tended to fade over time. The present meta-analysis also explored whether the mean age of samples, the proportion of females in samples and expressing gratitude to the recipient prior to completing post-intervention assessment would moderate effect sizes for outcomes. We had no specific hypotheses relating to these variables.

5 Method

5.1 Protocol and Registration

The protocol of the meta-analysis was registered on PROSPERO (registration record 318755).

5.2 Eligibility Criteria

Studies were included if they: (a) had both an expressed gratitude intervention and a control or comparison group with randomization to condition (RCTs), (b) measured at least one of the following psychological wellbeing outcomes: life satisfaction, positive affect, and happiness, (c) provided the necessary statistics for effect-size calculation, and (d) had an overall attrition rate at first post-assessment that was not greater than 50%. Only RCTs were included in the study as they are the most stringent method for evaluating the efficacy of interventions (Akobeng, 2005). There were no restrictions regarding the study's language, date of publication and publication status (i.e., unpublished manuscripts were also considered).

Studies were excluded if they combined an expressed gratitude intervention with another intervention. These combined interventions were excluded as they are likely to exhibit unexplained heterogeneity (Caldwell & Welton, 2016). Combining interventions can lead to an inability to identify how much of the observed effects can be attributable to each intervention (McKenzie et al., 2019). Studies were also excluded if they measured overall affect and did not report results for positive and negative affect separately. There is ample evidence to indicate that, as constructs, positive and negative affect are mostly independent and have distinct correlates (Coffey et al., 2014).

5.3 Information Sources

Eligible studies were identified through several methods. First, we conducted a systematic search in April 2022 of the EBSCO, EBSCO Open Dissertations, ProQuest, PubMed and SCOPUS electronic databases. Second, we searched the reference lists of both included studies and previous reviews and meta-analyses on gratitude interventions (i.e., Davis et al., 2016; Dickens, 2017; Wood et al., 2010). Third, we conducted forward citation tracking on included studies using Google Scholar to identify eligible studies. Finally, where possible, we sent emails to corresponding

authors of included articles to ask for in-press or unpublished studies relevant to the current meta-analysis.

5.4 Search Strategy

We searched the titles and abstracts of publications in the electronic databases using the following search terms: gratitude AND (express* OR convey* OR visit* OR letter) AND (wellbeing OR "well-being" OR “life satisfaction” OR happiness OR “positive affect”) AND (control* OR comparison) AND (intervention* OR treatment* OR experiment*).

5.5 Study Selection Process

Two of us simultaneously searched each of the electronic databases using the chosen search terms. We compared the number of search results for each database to ensure the accuracy of search results. Disagreements were resolved by discussion, and a consensus was reached on the final number of search results for each database. We then screened search results by title and abstracts, followed by an assessment of full-text articles for eligibility. If an eligible study was missing effect size data needed to compute Hedges' g, we contacted the corresponding author to request the relevant data.

5.6 Data Extraction and Coding Process

One of us extracted and coded the data for each eligible study. Another of us then checked the entries of each study. A third researcher then independently coded the data of each eligible study relevant to effect size and moderator analyses. Inter-rater reliability for the independent coding was good for both nominal variables (Cohen's Kappa > 0.8) and for continuous variables (intraclass correlation coefficient > 0.7).. Disagreements on coding were resolved by consensus.

Data items coded included: (1) study author and publication year, (2) psychological wellbeing outcome variable (happiness, life satisfaction, positive affect) (3) type of comparison condition (neutral, bona fide intervention), (4) sample size, (5) mean sample age, (6) percentage female, (7) type of sample, (8) country of sample, (9) type of expressed gratitude intervention, (10) whether gratitude was actually expressed to recipient prior to post-intervention assessment, (11) outcome measure, (12) intervention length in weeks, (13) baseline to final assessment duration in weeks, and (14) attrition rate. We coded studies that did not report any indication of attrition as having zero attrition.

To compute effect sizes, we coded pre-intervention assessment (where applicable) and final assessment means and standard deviations of both treatment and comparison conditions, sample size for each condition and the effect direction. Final assessment was defined as the last assessment point in the study with an overall attrition rate not greater than 50%.

5.6.1 Moderator Selection and Coding Process

To be evaluated as a potential moderator, a study characteristic had to: (a) be present in all or almost all studies, (b) demonstrate variation among studies, and (c) be relevant to research or to interventions if found to be statistically significant.

One potential categorical moderator was investigated for the present study: whether gratitude was expressed to the recipient prior to post-intervention assessment. This variable was coded as yes, no, optional, or unknown. If the relevant information was missing from a study, the corresponding author was contacted, where possible.

Four potential continuous moderators were examined: mean sample age, female percentage of sample, intervention length, and baseline to final assessment duration. For studies that did not perform baseline assessments, the commencement of the intervention was considered to be the study's starting point. If the duration of the intervention was less than an hour, intervention length was coded as 0.001 weeks. Similarly, if the total duration of the study, including both the intervention and all assessments, was less than an hour, baseline to final assessment duration was coded as 0.001 weeks.

5.7 Quality Assessment

To assess the quality of included studies, we created a quality assessment checklist. As we included only RCTs, we did not evaluate study design. We chose the assessment criteria based on whether studies had internal validity, as suggested by the Cochrane Collaboration (2011), and were able to produce meaningful results, e.g., with reliable, valid measures (see Kimberlin & Winterstein, 2008). We used no more than 25% attrition as a criterion, as suggested by Hussain et al. (2013). The quality assessment criteria were: (1) whether there was evidence of reliability for the outcome measure used, (2) whether there was evidence of validity for the outcome measure used, (3) whether conditions were similar at baseline in terms of participant age, participant gender and wellbeing measures, (4) whether all participants recruited for the study were accounted for, and (5) whether the attrition rate at final assessment was below 25%. Criteria (1) and (2) were coded as met if we found evidence of reliability and validity in either the study or in another study. If evidence was missing, criteria (1) and (2) were coded as not found.

5.8 Statistical Methods

We conducted analyses using Comprehensive Meta-Analysis software, version 3.3.070 (Borenstein et al., 2014) and calculated two meta-analytic effect sizes using Hedges' g: one for studies with neutral comparison conditions and the other for studies with bona fide comparison conditions. We chose Hedges' g as the effect size measure as it corrects for biases in small samples (Hedges, 1982). For studies with more than one outcome variable, we computed a single g per study based on

an average of all outcome variables that were measured. Similarly, for studies with multiple neutral, bona fide or expressed gratitude conditions or multiple relevant outcome measures of any type, we averaged the effect size of each comparison to generate a single *g* per study.

We used the random effects model to aggregate each of the computed *g* values into an overall weighted *g* and reported results with 95% confidence intervals (CI). We used the random effects model over the fixed effects model because we expected effect sizes between studies to vary due to differences in samples and interventions.

We identified potential outliers by inspecting the forest plot of effect sizes of both neutral and bona fide comparison conditions. When we identified outliers, we conducted the analyses both with and without the outliers. To investigate potential moderators, we conducted sub-group analyses for the categorical moderator and multivariate meta-regression for the continuous moderators.

We assessed heterogeneity across studies using Q, I^2 and Tau^2 statistics. The Q statistic tests the null hypothesis that true homogeneity is present across all study effect sizes (Huedo-Medina et al., 2006). The I^2 statistic indicates the percentage of total variability in effect sizes across studies that is due to true heterogeneity, rather than sampling error (Huedo-Medina et al., 2006). The Tau^2 statistic provides an estimate of true between-studies heterogeneity of effects in a random effects meta-analysis (Deeks et al., 2022).

We analyzed publication bias using the following four methods: visual inspection of a funnel plot, Egger's regression test (Egger et al., 1997), Begg and Mazumdar's (1994) rank correlation test and Duval and Tweedie's (2000) trim and fill test. A funnel plot is a scatterplot that displays the relationship between the effect size and the standard error (SE) of included studies (Sterne & Egger, 2001). Symmetrical distribution of studies in the funnel plot indicates an absence of publication bias (Borenstein et al., 2009). Conversely, asymmetric distribution, commonly observed near the bottom of the plot, indicates the presence of publication bias (Sterne & Egger, 2001). Both Egger's regression test and Begg and Mazumdar's rank correlation test assess publication bias via significance testing. A significant *p*-value indicates the presence of publication bias in these tests (van Enst et al., 2014). Duval and Tweedie's trim and fill test imputes studies into an asymmetric funnel plot in order to achieve symmetry (Borenstein et al., 2009). This process corrects for publication bias, and a new adjusted effect size *g* is computed using the imputed studies (Borenstein et al., 2009).

6 Results

6.1 Search Results

Figure 1 displays a flow diagram of the study selection process. The database search yielded a total of 219 records for possible inclusion. Following both the removal of duplicate records and initial screening of titles and abstracts, 37 full-text articles were assessed for eligibility. Fifteen studies met the inclusion criteria. Of the 22 excluded articles, 10 combined an expressed gratitude intervention with another

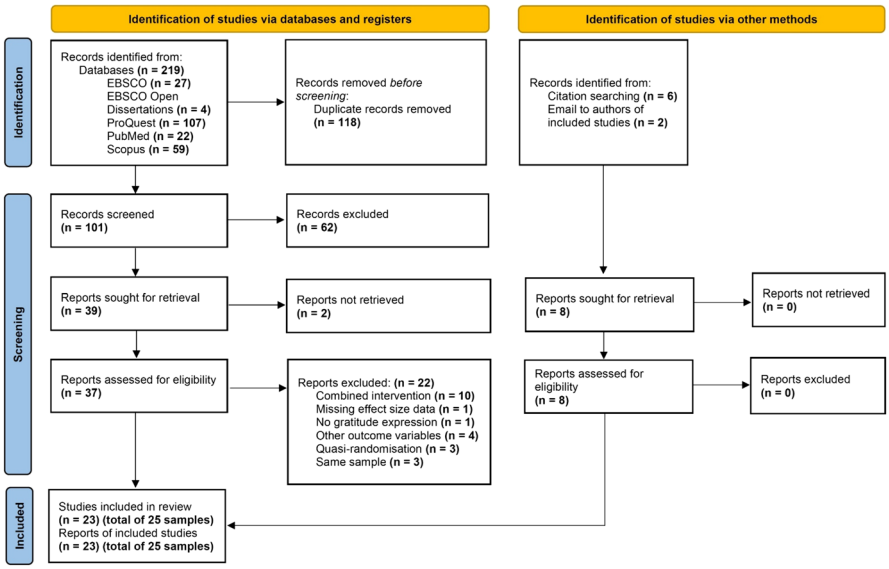

Fig. 1 PRISMA Flow Diagram of Study Selection Process

intervention (e.g., Armenta et al., 2022; Bono et al., 2020), four did not measure the target outcome variables of the present meta-analysis (e.g., Gunaydin et al., 2021; Heekerens et al, 2022). Three other excluded studies used quasi-randomisation (e.g., Khanna & Singh, 2019), three included the same participants as another study (e.g., Lyubomirsky et al., 2011) and one study was missing effect-size data (O'Connell et al., 2017). In addition to identification of studies via database searching, a further six studies were found via citation searching, and another two studies were found by contacting corresponding authors of included studies. Figure 1 shows the study selection process.

6.2 Study Characteristics

Table 1 shows the key characteristics of included studies. There were a total of 6,475 participants across included studies. Positive affect was the most common outcome variable assessed (60%), followed by life satisfaction (44%) and happiness (36%). Of the 45 comparison conditions across studies, 27 were neutral conditions and 18 were bona fide conditions. Intervention length across studies varied from very brief sessions to sessions lasting eight weeks. The data file is available at https://osf.io/tg65k/.

6.3 Quality Assessment

We identified evidence of reliability for 35 of the 36 outcome measures used in the included studies. We identified evidence of validity for 27 of the 36 outcome

Table 1 Key Characteristics of Included Studies

Study author (Year)	Outcome variable	Comparison group	N	Mean age	% female	Gratitude expressed	Intervention length (weeks)	Baseline to final (weeks)
Berger et al. (2019)[a, b, c]	LS, PA	GL Non-Interpersonal[d]; GL Interpersonal[d]; Emotions Diary[e]	165	27	72	No	3	15
Boehm et al. (2011)[a, f, g]	LS	BPS[d]; WA[e]	212	36	53	Optional	6	10
Dickerhoof (2007)	Happ, LS, PA	BPS[d]; DA[e]	332	20	69	Optional	8	20
Froh et al. (2009)	PA	Daily Activities and Feelings[e]	89	13	51	Yes	2	10
Gander et al. (2013)[h]	Happ	USS[d]; TGT[d]; EM[e]	741	45	95	Yes	1	1
Gherghel and Hashimoto (2020)[f]	LS, PA	TKA[d]; Memorable Events[e]	58	19	64	Yes	3	3
Hosaka and Shiraiwa (2021)	LS	Gratitude Essay[d]; Gratitude Contemplation[d]; Room Layout[e]	84	22	44	No	0.001	1
Kanagawa (2020)	PA	Goal Setting/Planning[d]; Food Diary[e]	78	NP	NP	Unknown	3	4
Shin et al., (2020a, b), *India*	PA	GLS[d]; WA[e]	431	20	76	No	0.001	0.001
L. J. Shin et al., (2020a, b), *Taiwan*	PA	GLS[d]; WA[e]	111	41	98	No	0.001	0.001
Shin et al., (2020a, b), *U.S*	PA	GLS[d]; WA[e]	307	34	49	No	0.001	0.001
Layous et al. (2013)[a, i]	LS, PA	TKA[d]; DA[e]	123	NP	61	Optional	6	6
Layous et al. (2017), *Study 1*	PA	Gratitude Experience[d]; Relief Experience[e]	137	32	46	No	0.001	0.001
Shin et al., (2020a, b)[a]	PA	Parent Details[e]	581	20	80	Optional	0.001	2
Nelson-Coffey et al. (2021)[j]	Happ, PA	WA[e]	419	36	70	No	0.001	0.001
Proyer et al. (2014)[k]	Happ	USS[d]; TGT[d]; EM[e]	110	56	100	Yes	1	5
Renshaw and Hindman (2017)[f]	LS	College Message[e]; College Journal[e]	115	21	83	Yes	2	2
Sheldon and Yu (2021), *Study 3*[f]	Happ	Celebrity Admiration[e]	219	NP	70	Yes	2	2
Timmons and Ekas (2018)	Happ, LS	WA[e]	64	40	100	No/ Unknown[m]	8	12
Titova et al. (2017)[b]	PA	BPS[d]; DA[e]	369	34	55	No	0.001	0.001
Toepfer et al. (2012)	Happ, LS	NA[e]	183	26	86	Yes	3	4
Walsh et al. (2022a), *Study 1*[f]	LS, PA	DA -Shared[e]; DA—Not-Shared[e]	369	20	79	Yes/ No[m]	0.001 or 1[n]	2
Walsh et al. (2022b), *Study 1*[b]	Happ, LS	WA[e]	220	37	71	No	0.001	0.001

Table 1 (continued)

Study author (Year)	Outcome variable	Comparison group	N	Mean age	% female	Gratitude expressed	Intervention length (weeks)	Baseline to final (weeks)
Walsh et al. (2022c)[f, g]	LS, PA	DA[e]	881	19	68	Yes/No[m]	1	1
Yu (2020)[l]	Happ	NA[e]	77	NP	75	Yes	2	6

N = sample size; % female = percentage of females in sample; Gratitude expressed = gratitude expressed to recipient prior to post-intervention assessment; Baseline to final (weeks) = baseline to final assessment duration in weeks.

Happ Happiness, *LS* Life Satisfaction, *PA* Positive Affect, *BPS* Best Possible Selves, *DA* Daily Activities, *EM* Early Memories, *GL* Gratitude List, *GLS* Gratitude Letter to Self, *NA* No Activity, *NP* Not Provided, *TGT* Three Good Things, *TKA* Three Kind Acts, *USS* Using Signature Strengths, *WA* Weekly Activities.

[a] Missing information regarding expression of gratitude to recipient provided by author.

[b] Missing effect size statistics computed using raw data file provided by author.

[c] 'Interpersonal list and interpersonal letter' condition excluded due to combination of expressed gratitude and other activity.

[d] Bona fide comparison condition.

[e] Neutral comparison condition.

[f] Missing effect size statistics provided by author.

[g] Different *n* values at pre-intervention and relevant post-assessment for each condition. Smaller *n* used to compute effect size.

[h] Attrition greater than 50% at all follow-up assessments. Post-intervention data provided by author used instead. Six conditions, comprised of only female participants, excluded.

[i] South Korea sample excluded due to attrition over 50% at all post-assessments. U.S. sample attrition greater than 50% at follow-up. Post-intervention data provided by author used instead. Gratitude/kindness and kindness/gratitude conditions excluded because of combination of expressed gratitude and other activity.

[j] SD values computed using standard error values. 'Safe haven gratitude' condition excluded because of restricted scope of gratitude.

[k] Similar study to Gander et al. (2013). Only unique participants included in effect size calculations. Attrition greater than 50% at two follow-up assessments. 1-month follow-up data provided by author used instead.

[l] 'Photo diary' condition excluded as effect size data missing. Missing sample sizes of remaining two conditions computed using df values of ANCOVA statistic. Since SD values were missing, t-value computed by square rooting F statistic at 1-month follow-up.

[m] Gratitude expression to recipient varied between conditions.

[n] Intervention length varied between conditions.

measures. Information regarding differences in demographic characteristics between conditions were not reported in most studies (gender = 68% missing and age = 72% missing). Of the 18 studies with baseline measures, 11 had an attrition rate below 25%. See Table 2 for further quality assessment details of included studies.

The hypothesis that expressed gratitude interventions would cause a significant overall increase in positive indicators of psychological wellbeing relative to neutral comparison conditions was supported, $g = 0.22$, 95% CI [0.11, 0.33], $k = 25$, $p < 0.001$. Heterogeneity statistics were as follows: $Q(24) = 64.85$ ($p < 0.001$), $I^2 = 62.99$ and $\text{Tau}^2 = 0.04$. These results indicate significant heterogeneity among effect sizes, with 63% of the observed variability due to true heterogeneity of effect sizes rather than sampling error. Figure 2 presents a forest plot of effect sizes for neutral comparison conditions. Visual inspection of the forest plot shows one study as an outlier due to its very large effect size (Hosaka & Shiraiwa, 2021). After removal of the outlier, the overall treatment effect remained significant, with a marginal reduction in overall effect size, $g = 0.19$, 95% CI [0.11, 0.26], $k = 24$, $p < 0.001$.

Significant outcomes on each of the positive indicators of psychological wellbeing were also found in expressed gratitude conditions relative to neutral comparison groups. The effect sizes for each of the three positive indicators were as follows: happiness ($g = 0.16$, CI [0.06, 0.26], $k = 9$, $p = 0.002$), life satisfaction ($g = 0.22$, CI [0.01, 0.44], $k = 12$, $p = 0.044$) and positive affect ($g = 0.21$, CI [0.09, 0.33], $k = 15$, $p = 0.001$).

Expressed gratitude interventions had a small but nonsignificant effect on positive indicators of psychological wellbeing relative to bona fide comparison conditions, $g = 0.12$, 95% CI [-0.02, 0.26], $k = 14$, $p = 0.081$. Figure 3 presents a forest plot of effect sizes for bona fide comparison conditions. Visual inspection of the forest plot identified one study as an outlier due to its very large effect size (Hosaka & Shiraiwa, 2021). After removal of the outlier, the overall treatment effect remained nonsignificant, with a slight reduction in overall effect size, $g = 0.06$, 95% CI [-0.03, 0.15], $k = 13$, $p = 0.185$. As the overall effect size for bona fide comparison conditions was nonsignificant, we did not test whether this effect size may have been influenced by publication bias or effects of potential moderators.

7 Publication Bias

We assessed publication bias for studies that included neutral comparison groups. Visual inspection of the funnel plot in Fig. 4 indicated symmetry, suggesting the absence of publication bias. Similarly, nonsignificant p-values (two-tailed) for the Begg and Mazumdar's rank correlation test ($p = 0.98$) and the Egger's regression test ($p = 0.42$), intercept = 0.71 [95% CI -1.71, 2.48], provided further evidence for the lack of publication bias. Duval and Tweedie's trim and fill test did not suggest adjusting the meta-analytic effect size by imputing additional studies.

Table 2 Quality Assessment of Included Studies

Study author (Year)	Outcome measure	Evidence of reliability for measure (Alpha)	Evidence of validity for measure	Conditions similar at baseline			All participants accounted for	Attrition below 25%
				Gender	Age	Wellbeing measure		
Berger et al. (2019)	SWLS; PANAS	+(α = 0.86);	+	-	+	+	+	-
		+(α = 0.83)	+					
Boehm et al. (2011)	SWLS	+(α = 0.91—0.94)	+	Unknown	Unknown	+	+	-
Dickerhoof (2007)	SHS; SWLS; FBR	+(α = 0.79—0.94);	+	Unknown	Unknown	+	+	+
		+(α = 0.87);	+					
		-	Not found					
Froh et al. (2009)	PANAS-C	+(α = 0.84—0.91)	+	+	+	Unknown	+	+
Gander et al. (2013)	AHI	+(α = 0.93)	+	+	+	+	+	-
Gherghel and Hashimoto (2020)	SWLS; PANAS	+(α = 0.87);	+	-	Unknown	+	+	-
		+(α = 0.76)	+					
Hosaka and Shiraiwa (2021)	SWLS	+(α = 0.84—0.90)	+	Unknown	Unknown	+	+	-
Kanagawa (2020)	BMSWBI	+(α = 0.93)	+	Unknown	Unknown	Unknown	+	+
Shin et al., (2020a, b), *India*	AAS	+(α = 0.77)	Not found	Unknown	Unknown	Not applicable[a]	+	+
Shin et al., (2020a, b), *Taiwan*	AAS	+(α = 0.94)	Not found	Unknown	Unknown	Not applicable[a]	-	+
Shin et al., (2020a, b), *U.S*	AAS	+(α = 0.94)	Not found	Unknown	Unknown	Not applicable[a]	+	+
Layous et al. (2013)	SWLS; mDES	+(α = 0.87);	+	Unknown	Unknown	+	+	+
		+(α = not found)	+					
Layous et al. (2017), *Study 1*	PECI	+(α = 0.88)	Not found	+	+	Not applicable[a]	+	+
Shin et al., (2020a, b)	PANAS	+(α = 0.89)	+	Unknown	Unknown	+	+	+
Nelson-Coffey et al. (2021)	SHS;	+(α = 0.90);	+;	+	+	Not applicable[a]	+	+
	mAAS	+(α = 0.92)	Not found					

Table 2 (continued)

Study author (Year)	Outcome measure	Evidence of reliability for measure (Alpha)	Evidence of validity for measure	Conditions similar at baseline			All participants accounted for	Attrition below 25%
				Gender	Age	Wellbeing measure		
Proyer et al. (2014)	AHI	+(α = 0.93)	+	+	Unknown	Unknown	+	-
Renshaw and Hindman (2017)	SWLS	+(α = 0.91)	+	+	+	Unknown	+	+
Sheldon and Yu (2021), *Study 3*	OHQ	+(α = 0.91, α = 0.55—0.63)	+	Unknown	Unknown	Unknown	+	+
Timmons and Ekas (2018)	SHS; SWLS	+(α = 0.72—0.80); +(α = 0.81—0.88)	+;+	+	+	+	+	+
Titova et al. (2017)	PANAS-X	+(α = 0.92)	+	Unknown	Unknown	Unknown	+	-
Toepfer et al. (2012)	SHS; SWLS	+(α = 0.85—0.95); +(α = 0.87)	+;+	Unknown	Unknown	Unknown	-	+
Walsh et al. (2022a), *Study 1*	SWLS; mAAS	+(ω = 0.85—0.87); +(ω = 0.92—0.93)	+; Not found	Unknown	Unknown	Unknown	+	+
Walsh et al. (2022b), *Study 1*	SHS; SWLS	+(α = 0.81—0.94); +(α = 0.87)	+;+	Unknown	Unknown	Not applicable[a]	+	+
Walsh et al. (2022c)	CIT; mAAS	+(α = 0.83—0.88); +(α = 0.90—0.93)	+; Not found	Unknown	Unknown	Unknown	+	+
Yu (2020)	GHS	+(α = 0.80—0.87)	+	Unknown	Unknown	Not applicable[a]	+	+

AAS Affect-Adjective Scale, *AHI* Authentic Happiness Inventory, *BMSWBI* Body-Mind-Spirit Well-being Inventory, *CIT* Comprehensive Inventory of Thriving, *FBR* Based on Feldman Barrett and Russell (1998), *GHS* General Happiness Scale, *mAAS* modified Affect-Adjective Scale, *mDES* modified Differential Emotions Scale, *OHQ* Oxford Happiness Questionnaire, *PANAS* Positive and Negative Affect Schedule, *PANAS- C* Positive and Negative Affect Scale for Children, *PANAS-X* Positive and Negative Affect Schedule – Expanded Form, *PECI* Positive Emotion Composite Items derived from other scales, *SHS* Subjective Happiness Scale, *SWLS* Satisfaction With Life Scale, *ω* McDonald's omega.

+means criterion met;—means criterion not met.

[a] No baseline measures in study. Post-intervention assessment only.

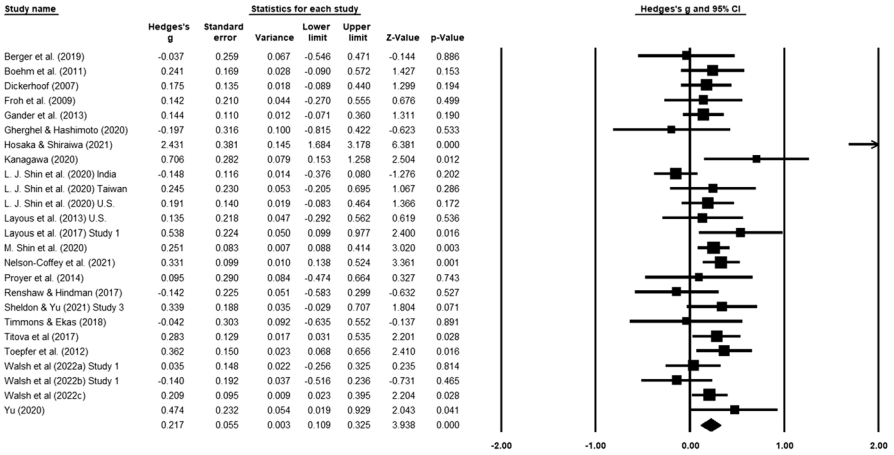

Fig. 2 Forest Plot of Effect Sizes for Neutral Comparison Conditions

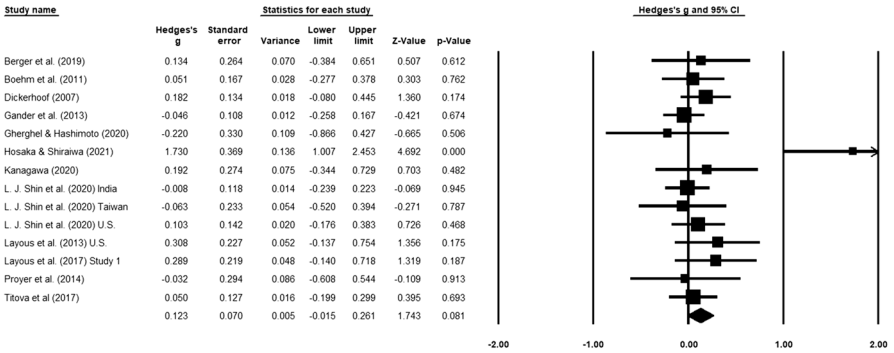

Fig. 3 Forest Plot of Effect Sizes for Bona Fide Comparison Conditions

7.1 Moderator Results

We conducted moderator analyses for studies that included neutral comparison conditions. The subgroup analyses for whether study participants expressed gratitude to the recipient prior to post-assessment was nonsignificant, $Q(2) = 0.30$, $p = 0.86$. Three studies were excluded from this analysis because expression of gratitude to recipient was either unknown or varied between study conditions. Table 3 displays results of the categorical moderator analyses.

Table 4 shows results of the multivariate meta-regression model we used to evaluate whether effect size was associated with four continuous variables: intervention length, baseline to final assessment duration, mean sample age and female percentage of participants. Five studies were excluded from this analysis because they did not report a value for one or more of the continuous variables. In contrast to what

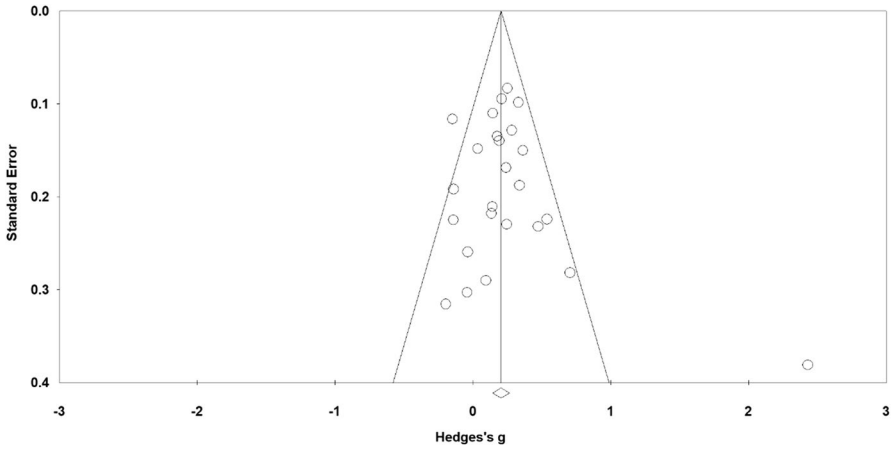

Fig. 4 Funnel Plot of Standard Error Versus Hedges' g

Table 3 Categorical Moderator Subgroup Analysis for Neutral Comparison Conditions: Gratitude Expressed to the Person

Category	*k*	Hedges' *g*	SE	95% CI	*p*
Yes	8	0.19	0.07	0.06, 0.33	0.005
No	10	0.27	0.13	0.01, 0.53	0.044
Optional	4	0.22	0.004	0.10, 0.35	< 0.001

Table 4 Continuous Moderator Analysis for Neutral Comparison Conditions

Covariate	Coefficient	SE	95% CI	*p* (two-tailed)
Mean sample age	0.003	0.01	-0.01, 0.02	0.655
Baseline to final assessment	-0.002	0.03	-0.05, 0.05	0.933
Female percentage	-0.01	0.01	-0.02, 0.00	0.055
Intervention length	-0.01	0.06	-0.13, 0.11	0.848

Number of studies included in the analysis = 20

was hypothesized, both intervention length and baseline to final assessment duration were not significantly associated with the effect size of expressed gratitude interventions across studies. Similarly, age and female percentage were not significantly associated with effect size.

8 Discussion

The current meta-analysis investigated the efficacy of expressed gratitude interventions on positive indicators of psychological wellbeing across 23 studies involving 25 samples, including a total of 6,745 participants. The main hypothesis that

expressed gratitude interventions would have a larger overall effect on positive indicators of psychological wellbeing than neutral comparison groups was supported, $g = 0.22$, $p < 0.001$.

There was only a nonsignificant trend toward expressed gratitude interventions having a greater effect on positive indicators of psychological wellbeing than *bona fide comparison* conditions.

Analyses also explored potential moderators of effect size. The hypothesis that studies with longer interventions would have stronger effect sizes relative to shorter interventions was not supported. Similarly, the hypothesis that studies with longer baseline to final assessment durations would show smaller effect sizes relative to those with shorter baseline to final assessment durations was not supported. Exploratory moderator analyses on mean age of samples, proportion of women in samples, and expression of gratitude to the recipient prior to completing post-intervention assessment were all nonsignificant.

The quality assessment of included studies produced mixed results, with most studies using valid and reliable measures for outcome variables; however, most studies did not report on whether participant age, participant gender and wellbeing measures were similar across conditions at baseline. However, random assignment to condition would usually lead to similarities between conditions at baseline.

The main finding demonstrates that expressing gratitude to another person can significantly improve psychological wellbeing, including happiness, life satisfaction, and positive affect. These findings were consistent with previous meta-analyses that examined the effects of various types of gratitude interventions on psychological wellbeing (Davis et al., 2016; Dickens, 2017). Similar to Davis et al. (2016) and Dickens (2017), the current meta-analysis separated comparison groups into those that involved a therapeutically intended activity and those that did not. However, the present meta-analysis included a much larger number of studies involving expressed gratitude interventions (i.e., 23 studies involving 25 samples) relative to the meta-analyses of Davis et al., (2016; 5 studies involving 7 samples), Dickens (2017; 4 studies), and Renshaw and Olinger Steeves (2016; 1 relevant study). The overall effect size in the present meta-analysis for neutral comparison groups ($g = 0.22$) was higher than the corresponding effect sizes in Dickens et al. for neutral control conditions ($g = 0.17$ to 0.25), and higher than the corresponding effect size reported in Davis et al. ($g = 0.14$). Because the present meta-analysis included many more relevant studies than the prior ones, it provides more support for generalizing the results. The present results suggest that gratitude directed toward a specific individual has similar positive effects regardless of whether the recipient of the gratitude receives the expressed statement of gratitude.

The moderator analyses produced only nonsignificant results, suggesting that expressing gratitude toward an individual has positive immediate effects and positive effects that last weeks, that the length of the intervention does not matter much, and that both men and women tend to benefit from the interventions. Of relevance to the finding about intervention length is that Dickens' (2017) excluded studies with intervention lengths that were less than one week long. It appears that the exclusion of these studies was unnecessary, as short studies may also produce significant results. The results regarding duration from baseline to final assessment as a

possible moderator suggest that the positive effects of expressed gratitude interventions on psychological wellbeing may persist following an intervention. This finding was consistent with that of Dickens, who found that the duration of the follow-up period did not appear to relate to effect size for happiness and positive affect. However, most of the included studies in the current meta-analysis either had no follow-up assessments or involved one-week post-intervention assessments.

The findings of the present meta-analysis make three specific contributions to those of prior meta-analyses. First, the present meta-analysis included enough study samples to warrant generalization of the results regarding expressed gratitude and to allow moderator analyses. Second, the present meta-analysis provided an overall effect size for positive indicators of psychological wellbeing. In contrast, previous meta-analyses either reported individual effect sizes for each outcome variable or provided an effect size that combined both positive and negative indicators of psychological wellbeing. Hence, the current findings provide substantial evidence for the usefulness of expressed gratitude interventions in enhancing positive psychological wellbeing as a whole.

Third, the results of the current meta-analysis indicate that expressing gratitude directly to a recipient does not appear to provide additional benefits to psychological wellbeing relative to expressions of gratitude that do not involve recipient awareness. This finding may be useful given that some people can feel awkward (Sheldon & Yu, 2021) or stressed (Killen & Macaskill, 2015) when expressing gratitude directly to another person. Moreover, there may be situations where expressing one's gratitude to a recipient is not possible. It appears that the benefits of expressing gratitude may be realized even when individuals are unwilling or unable to directly express their gratitude to the recipient.

9 Strengths and Limitations

One of the strengths of this meta-analysis was that it only included RCTs. Including only RCTs is important, since relative to other research designs, RCTs are considered to provide the highest level of evidence for evaluating the effectiveness of interventions (Akobeng, 2005). Another strength of this meta-analysis was that it included a relatively large number of studies. A further strength of the present meta-analysis was that it was the first to assess intervention length as a possible moderator of the effects of gratitude interventions. The finding that intervention length is not related to effect size provides some support for the use of brief expressed gratitude interventions to bolster psychological wellbeing.

One of the limitations of this meta-analysis is that the meta-analytic effects are biased downward because of measurement error. Another limitation relates to the type of samples used across included studies. All of the included studies, except one, involved adult samples. Moreover, none of the studies included clinical samples. Thus, the utility of expressed gratitude interventions with relation to children and clinical samples remains unknown. An additional limitation of the current meta-analysis involves the cross-cultural applicability of the study findings. Most participants in the included studies were from the United States, with few studies from

elsewhere. Thus, it is unclear to what extent the findings generalize to other countries. Further, the meta-analysis does not address *how* the gratitude-expression interventions produced positive effects.

10 Future Research

Future research could explore the effects of expressed gratitude interventions on psychological wellbeing across diverse populations, including children, clinical samples and people from different cultural backgrounds. Sound RCTs would use measures that have good, proven levels of reliability and validity. Studies could also examine the effects of gratitude interventions beyond several weeks and could examine how gratitude interventions produced positive effects. For instance, mediation analyses could assess the role of cognitive, emotional, and social variables on wellbeing outcome. The potentially mediating variables could include degree of (a) liking of the gratitude target individual, (b) felt autonomy in expressing gratitude, (c) attitude toward expressing gratitude, and (d) positive reaction of the target.

11 Conclusion

The present meta-analysis investigated the effects of expressed gratitude interventions on positive indicators of psychological wellbeing. As hypothesized, expressed gratitude interventions produced a significant effect on positive indicators of psychological wellbeing relative to neutral comparison groups. Significant effects occurred regardless of intervention length.

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Data Availability The meta-analysis data are available at the site mentioned in section 6.2 above.

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