

ORIGINAL ARTICLE

Interventions to enhance eudaemonic psychological well-being: A meta-analytic review with Ryff's Scales of Psychological Well-being

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Abstract

This meta-analysis enhances our insight into the effectiveness of interventions aimed at improving eudaemonic well-being. The focal outcome of these interventions is Ryff's Scales of Psychological Well-being. We summarized experimental studies and concluded whether a specific intervention approach improves individual positive functioning by assessing the six dimensions of psychological well-being and the composite score of well-being. Our study confirmed that eudaemonic well-being can be improved. The strongest influence is seen in integral programs that link directly to Ryff's conceptual model. Breaking down to dimensional scores, existing interventions had the strongest influence on Environmental Mastery, Personal Growth, and Self-Acceptance. The weakest influence was on Autonomy and Positive Relations with Others. Overall, our result is an important contribution to the well-being literature in that it shows, more convincing than previous meta-analyses due to its exclusive and comprehensive focus on Ryff's model, that psychological eudaemonic well-being can be enhanced by targeted intervention programs.

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KEYWORDS

eudaemonia, intervention, positive psychology, psychological well-being

INTRODUCTION

It has been more than 30 years since Carol Ryff (1989) introduced her model of eudaemonic well-being, the state of positive human functioning, to the well-being field. This model and its accompanying instrument were developed based on an extensive literature review and integration of mental health, clinical, and life span developmental theories. This conceptualization of eudaemonic well-being can be traced back to the philosophers of the ancient Greeks; most influential hereby were the writings of Aristotle on having a life that is both good and fulfilling. Even before the advent of positive psychology in 1998 (for an overview, see Seligman, 2019), Ryff (1989) already argued that these perspectives incorporate similar and complementary criteria of positive psychological well-being. They emphasize an optimistic outlook on life, underlining the importance of personal growth and development. Within Ryff's model, the six theoretically derived dimensions of positive psychological well-being are Self-Acceptance, Positive Relations with Others, Autonomy, Environmental Mastery, Purpose in Life, and Personal Growth (Ryff, 1989). Together, these dimensions can contribute to the assessment of a person's level of positive functioning and well-being. The validity of the composite score was confirmed given that it consistently converged with other measures of eudaemonic well-being (Waterman et al., 2010). It has stimulated numerous studies that have helped enhance our insight into the determinants of eudaemonic well-being across the life span, and its relations to work and biological risk factors (for a full overview, see Ryff, 2014).

Intervention efforts to enhance positive functioning are a major source to support for Ryff's eudaemonic well-being model (Ryff & Singer, 2006). Yet to date, empirical evidence of intervention efficacy is disparate. Further, the evidence lacks synthesis based on the six conceptually driven dimensions in Ryff's model. Only some interventions explicitly aim to enhance eudaemonic psychological well-being, such as Fava's (Fava, 1999, 2016) well-being therapy, positive psychology therapy (Seligman et al., 2005), and mindfulness-based stress reduction (MBSR) (Kabat-Zinn, 1990). Ryff's scales of eudaemonic well-being have also been used to test the efficacy of related interventions, such as cognitive behavioral therapy (CBT) (Beck, 1995) and social support enhancement (du Preez & Jorgensen, 2012). Ryff's (2014) review acknowledged the potential of all these approaches. The questions that remain are as follows: to what extent does well-being therapy in one form or another improve the six dimensions of eudaemonic well-being, and how different is the efficacy of these intervention programs?

With these questions in mind, we conducted a comprehensive review that links intervention programs directly to Ryff's eudaemonic well-being model. Although some prior meta-analyses attempted to evaluate well-being outcomes of interventions (Khoury et al., 2015; Kirby et al., 2017; Kuykendall et al., 2015; Zessin et al., 2015), these reviews were limited in shedding light on how interventions improve eudaemonic well-being as described in its fullness by Ryff's (1989) model. First, some are restricted in their outcome measures, focusing on either affective, subjective well-being (e.g. Zessin et al., 2015) or clinical issues such as depression (Sin & Lyubomirsky, 2009). Second, some addressed only one type of intervention, such as compassion or leisure activities (e.g. Khoury et al., 2015; Kuykendall et al., 2015). Most importantly, a full

empirical overview of all interventions that targeted the enhancement of the full Ryff model is still missing in the literature, which may hinder the scientific understanding of enhancing the full breadth of well-being. Our overview will greatly support the development of future evidence-based programs specifically targeting eudaemonic well-being.

Eudaemonic psychological well-being model

The goal of Ryff's (1989) model was to develop a theory-grounded approach to understanding mental health. She challenged subjective well-being indicators, including positive affect and life satisfaction, as inadequate for ignoring key components that reflect the positive functioning of mentally healthy individuals (Ryff & Singer, 2006). Specifically, these positive functioning indicators were formulated based on influential mental health, clinical, and life span developmental theories, such as the humanistic theory of self (Rogers, 1961), theory of individuation and complexes (Jung, 1969), and stages of psychosocial development (Erikson, 1959). Ryff examined the conceptual convergence of these theories and identified six dimensions that represent positive psychological functioning, namely, Self-Acceptance (a positive attitude about oneself and one's qualities), Positive Relations with Others (warm, satisfying, trusting relationships with others), Autonomy (a sense of self-determination and independence), Environmental Mastery (feeling competent to deal with the challenges that the world brings), Purpose in Life (a sense of meaning, goals, and directions in life), and Personal Growth (experiencing personal growth and development) (Ryff, 1989, 1995).

While building her overall theory and model, Ryff (1989, 1995) also aimed for a structured, self-report instrument to measure eudaemonic well-being (Ryff & Keyes, 1995). After 30 years of testing and revision, the model and instrument have consistently received support, based on five sources of evidence: factor validity, psychological correlates, cross-time dynamics, sociodemographic correlates, biological correlates, and intervention efficacy (see Ryff & Singer, 2006, for a review).

Mapping intervention effectiveness to eudaemonic psychological well-being

Previous meta-analyses provided a mixed image of the effectiveness of well-being interventions. An earlier meta-analysis, such as Sin and Lyubomirsky (2009) provided encouraging results for positive psychological interventions for both depression and well-being. However, White et al. (2019) reanalyzed the results of this and another highly cited meta-analysis (Bolier et al., 2013; Sin & Lyubomirsky, 2009) and reported lower effects sizes, which they attributed to correcting for small group bias and the influence of outliers. Koydemir et al. (2021) also reported relatively small effect sizes from a sample of 68 randomized controlled studies of nonclinical populations with an overall effect size (Cohen's *d*) of 0.23, but only 0.08 for psychological well-being and 0.22 for subjective well-being. On the other hand, Weiss et al. (2016) reported encouraging results on Ryff's eudaemonic well-being indicators among a sample of 27 randomized intervention studies with a moderate effect size of 0.44. Together, these results show some promise about our ability to enhance eudaemonic but also leave open the questions which programs will be most effective.

It should be noted that none of the previous meta-analyses targeted exclusively Ryff's measures of eudaemonic well-being. Most notably, the outcomes measures were generally

broad, ranging from affective measures such as the Positive and Negative Affect Scale (PANAS) and life satisfaction to clinical measures of depression (Bolier et al., 2013; Sin & Lyubomirsky, 2009). The interventions in these meta-analyses were also seldomly developed specifically taking into account the full and comprehensive thinking behind Ryff's (1989) original framework. Sometimes, only one technique was given to participants. It is, however, for a full test essential to explicitly include intervention programs and outcomes measures that are directly linked to and built on this framework. As a full test of the framework, we present a meta-analysis of studies that include Ryff's scales including all six dimensions as outcome measures and explicate if interventions consider the full breadth of her model.

Interventions to improve eudaemonic psychological well-being

We organized the existing well-being interventions in order of relevance to Ryff's (1989) conceptualization of eudaemonic well-being. The order is based on the extent that which interventions explicitly referred to the elements of eudaemonic well-being.

Well-being therapy

The most notable intervention based on Ryff's model is (Fava, 1999, 2016) well-being therapy. It is a short-term psychotherapeutic strategy (Fava & Ruini, 2003), consisting of about eight (bi) weekly sessions of between 30 and 50 min. Combining with cognitive behavior therapy (Beck, 1979), the intervention adopts self-observation, structured diaries, and interactions between participants and facilitators. The sessions are designed to change participants' attitudes toward well-being. Specifically, participants are introduced to the six dimensions of Ryff's model, whereby the therapists encourage participants to link the dimensions to their own experiences and take steps toward optimal well-being levels.

Positive psychology program

A variant of well-being therapy is the positive psychology intervention, which combines insights from Ryff's model and the positive psychology literature (Seligman et al., 2005). The intervention techniques include going on a gratitude visit, writing down three good things in life, doing the best-self exercise, and identifying and using signature strengths. A thorough description of the initial program can be found in the manual by Parks and Seligman (2007). More recently, integral programs build on insights gathered within the positive psychology field and included elements of CBT like cognitive restructuring, understanding and expressing emotions, communication skills, and problem-solving (e.g. Browne et al., 2017).

Mindfulness program

Kabat-Zinn (1990) developed guidelines for MBSR or mindfulness-based cognitive therapy (MBCT) to help people deal with stress, anxiety, depression, and pain by integrating Buddhist

mindfulness meditation with contemporary clinical and psychological practices. It is an 8-week program that combines weekly 2.5-h group sessions, including mindfulness meditation, body scanning, hatha yoga, and attention to thought and behavior patterns linked to communication skills, stress reactivity, and self-compassion; with a daily 45-min mindfulness practice at home (Kabat-Zinn, 1990). Key pillars of the program are the development of an on-judging, patient, and beginner's mind, as well as qualities such as trust, acceptance, kindness, and curiosity (Nehra et al., 2013). Most programs add topical lectures targeting their specific participants to the sessions.

Meditation

Like mindfulness, meditation practices usually consist of concentration on one's breathing, a virtue, a word, or an inspirational text (Innes et al., 2016). Meditation practices are, however, embedded in the religious and spiritual practices of, for example, Buddhism (Bach & Guse, 2015) or Yoga (Gebauer et al., 2018), whereas mindfulness is not bound to a specific religious or spiritual background. Additionally, these programs focus on meditation only, without including the other elements of the MBSR.

Life coaching

Life coaching focuses on bringing purpose and meaning into life (Green et al., 2005). It usually takes a holistic approach to what it means to be human. These interventions are often group-based and led by a facilitator, running for several weeks. The sessions rely on peer coaching, prescribed exercises, and self-reflection. The program usually involves goal-setting and mental imagery to enhance attention and concentration and boost one's self-confidence (Arkoff et al., 2004; Style & Boniwell, 2010).

Reminiscence therapy

A specific form of life coaching for the older adult population is the reminiscence of the past. Scholars have argued that reminiscence provides an opportunity to enhance sensemaking and give meaning to one's life (Alea et al., 2010; Gonzalez et al., 2015). The therapy is done in group sessions, during which members share life memories, with music and paintings to encourage recall and free association exercises. There is an explicit focus on lessons learned and what the experiences have brought to enhance a positive attitude to oneself, the life that has been, and the people in it. By reformulating one's life story and identity, a positive way of the past can be transferred to the present (Crawford Shearer et al., 2010; Viguer et al., 2017).

Writing

This intervention builds on the seminal work by Pennebaker, which shows that writing about important life events would have a positive influence on one's well-being (Pennebaker & Seagal, 1999). Research has shown that it can help reduce stress, alleviate traumas, place life

events into coherent mental models, and provide meaning (Hemenover, 2003; Hollis et al., 2017; Tarquini et al., 2016). The most used procedure is that participants are asked to write for about 15 to 30 min each day, usually between 3 to 6 days.

Cognitive behavioral therapy (CBT)

CBT is based on the work of Beck (1995). It clarifies how one's behavior, feelings, and thoughts are interlinked and influence one another. Sessions also focus on clarifying core beliefs of oneself, others, and the future. It is strongly behavioral and cognitive oriented to deal with current challenges and provides specific techniques to improve emotional regulation and enhance coping strategies. Therapists and participants agree on specific problems and adjust cognitive and behavioral patterns accordingly. (Borness et al., 2013; Morina et al., 2010; Müller et al., 2017).

Resilience training

These programs are designed to enhance psycho-social well-being by increasing participants' resilience, which is one's capability to respond and to recover from adversity (Burton et al., 2010). These training programs focus on teaching skills to improve work–life balance and may include goals of enhancing coping skills, self-efficacy, and knowledge about stress management (Kent et al., 2011).

Enhancing social support

Moving beyond psychological processes, these programs use a variety of approaches to help participants connect to their social resources. To create an encouraging social environment, the techniques are often diverse, including helping skills training (du Preez & Jorgensen, 2012), peer or community support groups (Hoen et al., 1997; Mohr et al., 2005), and some form of group therapy (Ban et al., 2001).

Physiological intervention

A few studies have examined the impact of pharmaceuticals, health supplements, physical activity, or cosmetic surgery on psychological well-being. Medicines include St. John's Wort, a natural product claimed to be useful for less severe depression; citalopram, an antidepressant for major depressive disorder (Rapaport et al., 2011); guarana seed extract, a stimulant claimed for a spectrum of health benefits (Silvestrini et al., 2013); and omega-3 fat supplementation, a treatment claimed for mood disorders (Mischoulon et al., 2015).

In sum, this meta-analysis aims to contribute to the development of intervention and prevention programs for future research and applications of Ryff's psychological well-being model. We summarize experimental studies and conclude whether a specific intervention improves individual positive functioning through assessing all six dimensions of psychological well-being as described by Ryff. Moreover, we examine potential moderators and subpopulations in which certain interventions could more likely improve eudaemonic well-being.

METHOD

Literature search and inclusion criteria

A comprehensive literature search was conducted in several ways (see supplement file for a description of the search and the studies in this meta-analysis). First, we searched Google Scholar, Scopus, and Web of Science with an iterative process of identifying articles using the Ryff and Keyes (1995) article as start point. Second, we checked the abstract and methodology sections of the articles to ensure that the included studies used Ryff's scale. We double checked in Scopus and PubMed for articles using keywords "Ryff" "Psychological Well-being" and "Intervention." The first list included 10,052 articles, of which 145 focused on the impact of well-being intervention using Ryff's scales. Each study was reviewed, with the inclusion criteria below: (a) one of the versions of Ryff's Scales of Psychological Well-being with all six dimensions reported separately and/or an overall score based on all six dimensions, (b) at least one treatment condition to enhance well-being, and (c) necessary statistics to calculate the effect sizes, either reported in the article or by contacting the author. Applying these criteria resulted in a sample of 102 independent samples published in 92 articles, until mid-2021. This included 59 studies with an experimental-control group design. The appendix provides a summary of our literature search process with a PRISMA diagram, a short description of the studies included in this article, and their references.

A codebook was developed to encode study characteristics such as sample demographics, intervention features, time lag between measurement points, and scale reliability. The authors independently coded the articles. For the comparison purpose, an intervention category needs to have been part of at least three studies to be included in our analysis. Coding discrepancies were resolved by discussion until both authors agreed.

Sample characteristics

The demographic characteristics of the samples were diverse. The average mean age was 41 years, ranging between 12 and 80 years. Gender differed between zero and 100% female, with on average 68% women. Almost half of the samples were from the USA (42 studies), the remainder from countries all over the world, with 11 from Iran, 10 from Italy, and seven from Australia. The time between the two measurement points ranged between 1 and 104 weeks, with an average of 12 weeks. The sample size of the experimental group ranged between 9 and 407 participants, with an average of 45 participants.

Analysis

The main goal of this meta-analysis was to evaluate the relative effectiveness of several interventions to enhance psychological well-being. The studies used controlled and uncontrolled evaluation setups, as well as different time frames. We calculated (a) pre-intervention to final post-intervention within-subjects effect sizes, (b) pre-intervention to final post-intervention experimental-controlled group effect sizes. If the required data were reported, seven effect sizes based on Ryff's (1989, 1995) scale were calculated: (a) overall well-being, (b) Self-Acceptance, (c) Personal Growth, (d) Purpose in Life, (e) Environmental Mastery, (f) Autonomy, and

(g) Positive Relations with Others. If the composite well-being score was not reported, it was computed by averaging the scores of the six sub-dimensions.

It should be noted that there are several versions of Ryff's scales available. The original scale consisted of 20 items for each dimension. Additionally, 14-item, 9-item, 7-item, and 3-item scale versions were developed by Ryff and her team. Within our samples, the 84-items version was used most (27), followed by the 18-items (16), 54-items (12), and the 42-items (11) version. In 12 studies, authors used their own shortened version. Twenty-two studies did not provide information on the length of the measure. Given the diversity of measures and that for a large amount of studies, information on the exact length was missing, we did not differentiate between these versions.

The Hedges' g effect size (Hedges & Olkin, 1985) was coded for each study, based on statistical information in the article: means and standard deviations, t -values, and F -values. If a study included multiple interventions, they were coded as separate effect sizes. Moderators were coded according to the descriptions. The Hedges' g effect size is a more accurate estimate than Cohen's d , especially with small samples as was the case for most studies included in this meta-analysis. The meta-analytic effect sizes were corrected for unreliability using the internal consistency of a specific (sub)scale, following the recommendation of Hunter and Schmidt (2004). If the internal consistency was not reported in a primary study, the average across all primary studies was used as a proxy. The mean reliability (Cronbach's alpha) for the full PWB scale was .87. The mean reliabilities for the subscales were .81 for Autonomy, .82 for Environmental Mastery, .79 for Personal Growth, .85 for Positive Relationships with Others, .82, for Purpose in Life, and .87 for Self-Acceptance respectively.

The statistical analyses were performed in R using the packages: meta (Balduzzi et al., 2019), metafor (Viechtbauer, 2010), and Dmetar. The syntax was based on Harrer et al. (2019). A description of the articles used in this article can be found in the appendix, including a description of the search strategy, PRISMA diagram, and key characteristics of the individual samples with Hedges's g within-sample effect size.

RESULTS

We will describe the results in five steps. First, an overview of the main overall effect is given for the effect size of studies that included an experimental group and a control group, and for the within-group effect size. Second, we tested for the potential influence of outliers and adjusted the analysis accordingly, taking out those outlier studies. Third, we analyzed the influence of sample characteristics as a potential moderator. Fourth, we report on the effect size of the different interventions. Fifth, we tested for the potential influence of file drawer or publication bias.

For the first step, Table 1 shows the overall effect sizes. For studies using an experimental design with a control group, the overall corrected effect size (Hedge's g) for PWB is 0.74. To test for heterogeneity, Cochran's Q -statistic is given that indicates the difference between the observed effect sizes and the fixed-effect model estimate. The results supported a significant difference, $Q = 727.66$, $p < .0001$. Additionally, we calculated the I^2 statistic, which is the percentage of variability in the effect sizes which is not caused by sampling error and outliers (Higgins & Thompson, 2002). This value was 92% for the experimental/control group condition; a rule of thumb states that values above 75% indicate substantial heterogeneity.

TABLE 1 Meta-analytic results: Overall

| | <i>k</i> | <i>N</i> | <i>g</i> | γ | <i>SD</i> | 95% CI | 95% PI |
|---|----------|----------|----------|----------|-----------|--------------|---------------|
| Pretest/posttest within subjects effect sizes | | | | | | | |
| PWB Composite | 102 | 4552 | 0.70 | 0.74 | 0.94 | [0.55, 0.94] | [-1.12, 2.61] |
| PWB Composite without outliers | 90 | 4039 | 0.42 | 0.45 | 0.39 | [0.36, 0.54] | [-0.33, 1.23] |
| Autonomy | 48 | 1545 | 0.42 | 0.45 | 0.52 | [0.28, 0.63] | [-0.62, 1.52] |
| Environmental Mastery | 48 | 1545 | 0.66 | 0.74 | 0.84 | [0.48, 1.01] | [-0.98, 2.47] |
| Personal Growth | 48 | 1545 | 0.60 | 0.67 | 0.85 | [0.41, 0.93] | [-1.06, 2.39] |
| Positive Relations with others | 48 | 1545 | 0.44 | 0.47 | 0.54 | [0.29, 0.65] | [-0.64, 1.27] |
| Purpose in Life | 48 | 1545 | 0.59 | 0.63 | 0.77 | [0.38, 0.87] | [-0.94, 2.19] |
| Self-Acceptance | 48 | 1545 | 0.71 | 0.75 | 1.07 | [0.43, 1.08] | [-1.38, 2.89] |
| Experimental/control group effect sizes | | | | | | | |
| PWB Composite | 59 | 4200 | 0.69 | 0.74 | 0.99 | [0.46, 1.01] | [-1.27, 2.75] |
| PWB Composite, without outliers | 51 | 3619 | 0.41 | 0.44 | 0.47 | [0.29, 0.59] | [-0.52, 1.40] |
| Autonomy | 29 | 1579 | 0.41 | 0.47 | 0.63 | [0.21, 0.73] | [-0.85, 1.79] |
| Environmental Mastery | 29 | 1579 | 0.63 | 0.71 | 1.01 | [0.31, 1.12] | [-1.41, 2.83] |
| Personal Growth | 29 | 1579 | 0.61 | 0.69 | 0.83 | [0.35, 1.02] | [-1.06, 2.43] |
| Positive Relations with Others | 29 | 1579 | 0.46 | 0.50 | 0.60 | [0.26, 0.75] | [-0.74, 1.75] |
| Purpose in Life | 29 | 1579 | 0.53 | 0.59 | 0.77 | [0.28, 0.90] | [-1.02, 2.19] |
| Self-Acceptance | 29 | 1579 | 0.61 | 0.66 | 1.28 | [0.16, 1.16] | [-2.02, 3.34] |

Note: PWB = Psychological Well-Being; *k* = number of independent studies, *N* = sample size; *g* = Hedges' *g*; γ = Hedges' *g* corrected for unreliability in the criterion; *SD* = corrected standard deviation; CI = confidence interval; PI = prediction interval.

The pooled effect size for PWB in the within studies pre-/post-corrected effect size was 0.74, the same as studies with the experimental/control group effect size. The effect size heterogeneity was also substantial ($Q = 1389.20$, $p < .0001$, $I^2 = 93\%$).

For step two, given the high heterogeneity of the effect sizes, we checked the full database for studies with extreme values that may have overproportioned the population means of the within studies effect size either in a positive or negative direction (Viechtbauer & Cheung, 2010). We relied on three indicators: the DFFITS value, the Cook's distance, and the Baujat Plot. The DFFITS value indicates in terms of standard deviations the extent to which the predicted pooled effect changes after excluding a particular study; this is similar to the Cook's distance which is commonly used in conventional regression statistics (Viechtbauer & Cheung, 2010). Additionally, we generated a Baujat Plot (Baujat et al., 2002) which shows the contribution of each study to the overall heterogeneity as measured by Cochran's *Q* on the horizontal axis, and its influence on the pooled effect size on the vertical axis.

For the remainder of this article, we want to provide generalizable insights. Studies with extreme scores may lead to erroneous and non-replicable conclusions, given the specific nature of those studies, and were therefore taken out. The combined insights of the three tests indicated that to calculate a more reliable overall population mean population, we should take out 10 articles, which included 12 intervention samples. We checked the characteristics of these studies to see if there was a consistent pattern that could explain the relatively high effect sizes.

The interventions were all different, the demographics of the samples undergoing the interventions were different, and the sample sizes ranged from 25 to 50. The only overlap found was that Iran was the country where four of the 10 studies were conducted.

The adjusted database for studies using a control group gave an overall corrected effect size (Hedge's g) of 0.44 for PWB. The Cochran's Q -statistic dropped considerably for the full sample but was still significant ($Q = 124.00, p < .001$). I^2 dropped to 60%, indicating far less heterogeneity. The pooled corrected effect size for PWB for the within studies pre-/post-effect size was 0.45 ($Q = 207.02, p < .001$), similar to the average experimental/control group effect size.

We used the adjusted database to analyze the potential differentiated influence of the interventions on the six dimensions of the Psychological Well-being Scales (see Table 1). The meta-analytic results showed that the strongest influence was on Personal Growth ($g = 0.61$), Environmental Mastery ($g = 0.63$), and Self-Acceptance ($g = 0.61$). The weakest influence of the interventions was on Positive Relations with Others ($g = 0.46$) and Autonomy ($g = 0.41$). The general pattern of effect size strengths was the same for both the experimental/control-group effect size and the within-group effect size.

For the moderator analysis in the third step, we needed to have enough power to potentially find significant results. The analysis hereafter is done with the outlier adjusted database of 90 samples, focusing only on the within pre-/post-effect sizes. We tested the influence of the demographic variables of the participants as a potential moderator on the PWB effect size with the mixed-effects regression model provided by the *dmetar* package (Harrer et al., 2019). With respect to the potential influence of the age of the participants, the moderator test was not significant (estimate = .001, SE = .003; $F[1,88] = .07, p = .79$) For gender, operationalized as the percentage male versus female participants, the test also was not significant (estimate = $-.003$, SE = .002; $F[1,88] = 1.54, p = .22$). Additionally, we tested the potential influence of the year of publication (i.e. whether earlier or later studies would report stronger effect sizes); this was also not significant (estimate = .004, SE = .008; $F[1,88] = .27, p = .60$). Same for sample size (estimate = $-.001$, SE = .001; $F[1,88] = 2.89, p = .09$), although there was a clear tendency that large samples were related to a smaller effect size. Together, we can conclude that the variance in the mean effect size across all samples was unlikely to be due to the sample's demographic characteristics. We, therefore, proceeded with testing the differential influence of the intervention programs themselves.

For the fourth step in our analysis, we first tested if the time between the two measurement points influenced the effect sizes. This time lag also provides a proxy for the intervention duration given that the pre- and post-measurement points usually were shortly before starting and ending a program. As with the participants variables, this estimate was not significantly related to effect size (estimate = .001, SE = .003; $F[1,87] = .13, p = .71$).

Next, we tested the differences between interventions, again using the 90 samples with the within-study effect size to be able to include most interventions and increase the power of the analyses. Only interventions with at least three separate samples were included. This gave a subsample of 80 studies. Table 2 shows the results of the comparison of the within-group pre-/post-effect size for the specific interventions. The overall corrected mean pre-/post-effect size is 0.49, which slightly higher compared to the full sample.

The comparison showed different mean effect sizes between the interventions. According to the results depicted in Table 2, comprehensive interventions that are based on a comprehensive approach directly linked to eudaimonic well-being seem to be more effective (i.e. Well-being therapy, Mindfulness) than interventions that only used a single technique (e.g. enhancing

TABLE 2 Meta-analytic results for psychological well-being: Intervention comparison of within-group pre-/post-effect size

| | <i>k</i> | <i>N</i> | <i>g</i> | γ | <i>SD</i> | 95% CI |
|----------------------------------|----------|----------|----------|----------|-----------|---------------|
| Well-being therapy | 7 | 267 | 0.84 | 0.89 | 1.05 | [−0.13, 1.92] |
| Mindfulness program | 19 | 720 | 0.56 | 0.60 | 0.36 | [0.40, 0.81] |
| Resilience training | 6 | 529 | 0.53 | 0.56 | 0.38 | [0.08, 1.03] |
| Physiological intervention | 8 | 306 | 0.51 | 0.53 | 0.35 | [0.18, 0.89] |
| Positive psychology intervention | 5 | 514 | 0.48 | 0.52 | 0.36 | [−0.01, 1.04] |
| Reminiscence therapy | 3 | 138 | 0.44 | 0.48 | 0.41 | [−0.71, 1.66] |
| Writing | 3 | 98 | 0.43 | 0.46 | 0.09 | [−0.00, 0.91] |
| Life coaching | 8 | 284 | 0.39 | 0.43 | 0.21 | [−0.09, 1.58] |
| Cognitive behavior therapy | 11 | 408 | 0.28 | 0.31 | 0.18 | [0.14, 0.72] |
| Meditation | 3 | 302 | 0.28 | 0.30 | 0.10 | [0.08, 0.69] |
| Enhancing social support | 7 | 327 | 0.20 | 0.22 | 0.26 | [−0.09, 0.54] |
| PWB, combined effect | 80 | 3,561 | 0.45 | 0.49 | 0.39 | [0.39, 0.59] |

Note: Only interventions included with at least three studies in the full sample. PWB = Psychological Well-Being; *k* = number of independent studies, *N* = sample size; *g* = Hedges' *g*; γ = Hedges' *g* corrected for unreliability in the criterion; *SD* = corrected standard deviation; CI = confidence interval.

social support, meditation). The between-group difference was, however, not significant ($Q = 12.70$, $df = 10$, $p = .24$, corrected effect size).

For the fifth step, we checked the potential effects of file-drawer or publication bias. In this case, it is more likely that a study with a positive effect gets published than one with a non-significant effect, which may lead to an overestimation of the true effect size. This may especially be the case for studies with relatively small sample sizes. Small study bias can be checked with a funnel plot and Egger's test (Egger et al., 1997). The funnel plot shows three studies clearly outside the funnel, and several other studies just outside the funnel on both sides. The test was significant with an intercept of 1.22 (CI = [0.49, 1.96], $t = 3.25$, $p = .002$). Next, we used the trim-and-fill procedure (Schwarzer et al., 2015). This procedure suggests the addition of 23 studies (to a total of 113), with a resulting estimated effect size of 0.28 ($SD = 0.56$, CI = [0.16, 0.39], PI = [−0.84, 1.40]). However, this lower estimate was due to the algorithm suggesting several imputed studies with a strong negative effect on well-being. Given the nature of the interventions, that is highly unlikely.

Recently, the trim-and-fill procedure has been criticized and the so-called *p*-curve was suggested as an alternative to estimate the true effect with less bias (Simonsohn et al., 2014). The results of the *p*-curve estimate gave a power estimate of 82% (69%–90% CI), evidential value = yes and absent = no. Therefore, the algorithms behind the *p*-curve estimate confirm that there is indeed a “true” effect size and that the results are not purely the result of publication bias. Surprisingly, the *p*-curve estimate of this true effect size is .74, which is higher than the empirical value. However, it came with the warning that the variance in effect sizes in terms of the I^2 is higher than 50%, which makes the estimated effect size untrustworthy. Taking the results of the different tests together, it seems that the real effect is probably close to the reported value.

DISCUSSION

Our study shows that psychological intervention programs can improve eudaemonic well-being as described in Ryff's (1989) model of psychological well-being. This overall result is an important contribution to the field in that it shows, more convincing than previous meta-analyses, that eudaemonic psychological well-being can be enhanced by targeted intervention programs. The strongest influence is seen with integral programs that link directly to the theoretical model underlying her measure. We observe the strongest effect sizes for the Environmental Mastery, Personal Growth, and Self-Acceptance dimensions, and the weakest influence was seen for the Autonomy and Positive Relations with Others dimensions.

Notably, our meta-analytic results show effect size that is at least similar to that reported in than previous studies. The overall effect size of 0.44 (0.41 without correcting for unreliability) for studies with a control group is higher than, for example, the 0.26 reported by Sin and Lyubomirsky (2009) and like the 0.44 reported by Weiss et al. (2016). Not only does it confirm that eudaemonic well-being can be enhanced with existing intervention programs, but it also shows that Ryff's measure is a strong instrument to capture this change. Alignment between the content of the intervention and the measure testing its impact is essential and recommended for future studies.

The most effective program used several wellbeing-oriented techniques and combined them with the core elements CBT. It should also be noted that the official Mindfulness programs include a variety of techniques. This suggests that it is the integrated and explicit focus on enhancing well-being with several matching techniques that makes the difference. It confirms a basic premise of positive psychology that enhancing eudaemonic well-being takes more than alleviating negative feelings (Lyubomirsky et al., 2005). Our review found that common elements across interventions are: (diary) writing, a consistent, structured approach, homework with self-reflection, and self-awareness of cognitive and behavioral patterns. These elements are recommended for inclusion in practical applications.

Our results suggest that specific social support interventions require further improvement, as seen in the lower relative effectiveness of these interventions and the relatively low effect size on Positive Relations with Others. Despite criticism by Waterman (2008) that this dimension is not core to eudaemonic well-being, the importance of connectedness as a core human need has been explicitly described in belongingness theory (Baumeister & Leary, 1995) and self-determination theory (Deci & Ryan, 2012). The lack of attention to social relationships within eudaemonic well-being was addressed by Keyes (1998) who developed a full-fledged model and measure allowing for a more in-depth and differentiated understanding. Social well-being is described by Keyes in five subdimensions: social integration, social contribution, social coherence, social actualization, and social acceptance. To explicitly target social well-being, current interventions might benefit from including elements from interventions based on conservation of resources theory (Freedy & Hobfoll, 1994) or strengthening the component of regulating maladaptive thoughts about social relationships (Masi et al., 2011).

Another aspect that could be improved is Autonomy, this feeling of empowerment and having a choice in the direction that one's life takes. Suggestions for improvement can be found in the area of health behavior improvement. A recent meta-analysis by Gillison et al. (2019) showed how a broad range of self-determination-based interventions was successful in enhancing autonomy.

Building on these encouraging results, we would also recommend broadening the type and context of interventions in future studies. For example, physical exercise has been shown to have clear psychological benefits (Wicks et al., 2022). Mapping these benefits onto the six dimensions of Ryff's model would help unpack the black box of how physical exercise promotes individual positive functioning. Further, as a response to the COVID-19 pandemic, online psychological interventions are increasingly common and show generally encouraging results (Heekerens et al., 2022). However, in the virtual environment, it remains unclear if, for example, Positive Relations with Others would be undermined.

We want to acknowledge that taking out studies from a meta-analysis is not without consequences (and is controversial), as it may lead to missing critical information. The lack of a clear pattern of the outlier studies, except for country, makes it likely the strong effect size was situation or sample specific. The removal of these studies was the conservative choice, given that it led to a lower overall population estimate. The additional analysis on the influence of publication bias confirmed our conclusion on the effectiveness of well-being interventions. However, the actual true effect size remains unclear. The empirically derived within study corrected pre/post-effect size is 0.45 (the experimental-control group effect size was 0.44), the trim-and-fill procedure gave a suggestion that goes below that with 0.28, whereas the *p*-curve estimate goes above it with a value of .74. Therefore, one cannot conclude if the reported effect sizes are an underestimation or overestimation. The current estimate may be relatively accurate for the population value.

An additional limitation was that the number of studies within most intervention categories was low, several included only three studies. This means that a singly study will have a relatively strong influence. We invite future studies with larger samples for a more accurate insight into the true effect size. A point of attention is the different versions of Ryff's measure that are being used. Checking the differences in effect sizes between these versions did not result in a clear pattern. The overall PWB effect size was 0.45 for the 18-item version, 0.97 for the 42-item version, 0.33 for the 54-item version, and 0.67 for the 84-item version.

In conclusion, drawing on Ryff's six-dimensional model of psychological well-being as criteria for effectiveness, our meta-analysis provides empirical support that existing interventions boost overall positive human functioning, which adds to previous knowledge on positive affect and subjective satisfaction. All in all, this meta-analytic review helps focus future research and practice on psychological well-being interventions.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICS STATEMENT

Ethical review and approval was not required because the present study did not involve any human or animal participants.

DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study with respect to the composite score of psychological well-being are available within the article and its supporting information. More detailed information can be received from the first author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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