

# The relationship between emotion regulation and well-being in patients with mental disorders: A meta-analysis

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## ABSTRACT

**Background:** The importance of both specific emotion regulation strategies and overall deficits in emotion regulation in the context of psychopathology is widely recognized. Besides alleviating psychological symptoms, improving mental well-being is increasingly considered important in treatment of people with mental disorders. However, no comprehensive meta-analysis on the relationship between emotion regulation and well-being in people with mental disorders has been conducted yet.

**Objective:** The aim of the current study was to synthesize and meta-analyze evidence regarding the relationship between emotion regulation and well-being in clinical samples across studies.

**Method:** A systematic literature search was conducted in PsycINFO, PubMed and Scopus and 94 cross-sectional effect sizes from 35 studies were meta-analyzed to explore this relationship. To be eligible for the meta-analysis, studies had to include a clinical sample, assess at least one specific emotion regulation strategy or overall deficits in emotion regulation and include well-being as outcome.

**Results:** The findings showed significant small to moderate negative relationships with well-being for the strategies avoidance ( $r = -0.31$ ) and rumination ( $r = -0.19$ ) and positive relationships with reappraisal ( $r = 0.19$ ) and acceptance ( $r = 0.42$ ). Grouping together putative adaptive and maladaptive strategies revealed similar sized relationships with well-being in the expected direction. Overall deficits in emotion regulation showed a negative moderate correlation with well-being ( $r = -0.47$ ). No substantial difference in relationships was found when clustering studies into hedonic and eudaimonic well-being.

**Conclusion:** Our findings suggest that emotion regulation is not merely related with psychopathology, but also with well-being in general as well as hedonic and eudaimonic well-being. Therefore, it might also be important to improve emotion regulation when aiming to improve well-being in people with mental disorders.

## 1. Introduction

Emotion regulation is the way in which individuals modulate the intensity and duration of positive or negative affective states consciously and nonconsciously in order to achieve a certain goal [1,2]. Processes of emotion regulation have widely been recognized as transdiagnostic factor for numerous psychological disorders [3–5]. Several psychiatric disease models include emotion regulation as an important process, such as major depressive disorder [6,7], bipolar disorder [8], borderline personality disorder [9–11], generalized anxiety disorder [12] and eating disorders [13–15].

## Conceptualizing emotion regulation

Defining and conceptualizing emotion regulation remains a challenge. Especially in the field of clinical psychology, numerous definitions and conceptualizations of this multifaceted construct have been proposed [16] and several frameworks exist to conceptualize emotion regulation. One of the most influential frameworks concerns the process model of emotion regulation [17]. Within this framework, emotion regulation is defined as a set of specific strategies people may use to alter their emotional experiences. This conceptualization has been used in a wide range of empirical studies to examine the role of specific strategies in the context of psychological disorders [18–20].

In a comprehensive meta-analysis, Aldao, Nolen-Hoeksema [21] examined the relationship between different forms of psychopathology and six specific emotion regulation strategies derived from the process model of emotion regulation [17]: (1) reappraisal (i.e. cognitively reinterpreting a situation), (2) problem-solving (i.e. consciously modifying a situation), (3) acceptance (i.e. accepting thoughts, feelings and cognitions as they are), (4) suppression (i.e. inhibiting cognitions or

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mitigating emotional expressions), (5) avoidance (i.e. escaping from thoughts, sensations) and (6) rumination (i.e. repetitively focusing on cognitions or emotions). The strategies reappraisal, problem-solving and acceptance have generally been highlighted as adaptive across a variety of contexts, while the strategies suppression, avoidance and rumination are generally thought to be maladaptive strategies [21]. Aldao, Nolen-Hoeksema [21] based their a priori categorization into adaptive and maladaptive strategies especially on research on the etiology of mental disorders. This fixed classification remains debatable, however, as the impact of emotion regulation strategies always depends on the context and the strategies can have varying impact across different situations [22]. However, to provide a classification of emotion regulation strategies, we will refer to these specific strategies as adaptive and maladaptive in the current study.

The process model of emotion regulation provides a conceptualization in terms of specific strategies of emotion regulation and their putatively maladaptive and adaptive role in emotion regulation. However, emotion regulation remains a multidimensional construct and can also be conceptualized as broad construct rather than a specific set of strategies. Within this framework, emotion regulation reflects an overall ability to regulate emotions [23–25]. In this context, Gratz and Roemer [23] define emotion regulation as a multidimensional construct involving: (1) emotional awareness, (2) acceptance of emotional responses, (3) ability to engage in goal-directed behavior, (4) ability to inhibit impulsive behaviors, (5) emotional clarity and (6) access to emotion regulation strategies. According to their framework, an individual experiences difficulties in emotion regulation when showing deficiencies in one or several of these domains [23]. The widely used Difficulties with Emotion Regulation Scale [DERS; 23] was developed to assess deficits in these dimensions of emotion regulation. Several lines of research suggest that this overall deficiency in emotion regulation proposed by Gratz and Roemer [23] is related with numerous forms of psychopathology [26–28].

Although both frameworks provide a conceptualization of emotion regulation, they measure different dimensions of emotion regulation [29]. Considering both frameworks in the current study does justice to the multifaceted nature of emotion regulation. Furthermore, it allows to distinctively investigate the role of specific emotion regulation strategies derived from the framework by Gross [17] as well as the impact of more general deficits in emotion regulation [23] and their relationship with well-being.

### The importance of well-being

Besides focusing on psychopathology, recent developments within clinical psychology also underline the importance of well-being [30–33]. Two important aspects of well-being are subjective well-being (e.g. the presence of positive emotions or satisfaction with life) and psychological well-being (e.g. environmental mastery or self-acceptance) [34–37]. Studies suggest that these two dimensions of well-being are related, but yet distinctive [35], indicating that they can be considered as different dimensions of well-being. A related distinction is made between hedonic and eudaimonic well-being. Hedonic well-being is described as the experience of happiness and positive emotions and can therefore be seen as subjective well-being. Eudaimonic well-being is conceptualized as the degree to which an individual experiences self-realization and is functioning [38,39]. Subjective well-being can thus be conceptualized as hedonic well-being, while psychological well-being can be seen as indicator of eudaimonic well-being [35].

Recent research indicates that, although they are related to each other, it is important to consider both mental illness and well-being as distinct dimensions in groups with mental disorders and integrate both into treatment of people with psychiatric disorders [40–42]. Furthermore, well-being outcomes can be seen as a vital outcome of

recovery for people with mental disorders [43–46] and several lines of research indicate that the presence of well-being protects against the recurrence of psychopathology [47–50]. This has led to the emergence of positive clinical psychology [51] and several forms of therapy aiming to increase well-being, such as positive psychotherapy [52,53] or well-being therapy [54,55].

### Emotion regulation and well-being

Several studies have examined the importance of emotion regulation strategies for well-being in general populations [56,58–60]. However, compared to research on emotion regulation in the context of psychopathology, considerably less systematic research has been conducted on the relationship between emotion regulation and well-being. Hu, Zhang [62] synthesized evidence regarding the relationship between two emotion regulation strategies (reappraisal and suppression) and mental health in various different samples. They separately investigated the link with symptom-related outcomes (e.g. depression and anxiety) and indicators of well-being (e.g. life satisfaction and positive affect). Significant negative relationships between suppression and well-being were found. Reappraisal was found to be positively related with well-being outcomes and similar inverse correlations were found with symptom-related outcomes [62]. Although results suggest that emotion regulation might also be relevant in the context of well-being, the relationship of well-being and emotion regulation in clinical samples remains relatively unknown.

#### The current study.

In sum, research indicates that emotion regulation is an important factor in the context of psychopathology [21,23] and suggests that it might also be related with well-being [62]. However, to our knowledge, no comprehensive meta-analysis about the relationship between emotion regulation and well-being in clinical samples has been conducted. Although the relationship between specific emotion regulation and psychopathology has been investigated [21], this study did not investigate the relationship of emotion regulation and well-being. Hu, Zhang [62] conducted a meta-analysis on the relationship between emotion regulation and well-being. However, they also included student and community samples and merely investigated the relationship between two specific emotion regulation strategies and mental health. Other theoretical reviews rather focused on positive emotion regulation [63] or emotion regulation as transdiagnostic factor [4] and not performed meta-analyses.

Therefore, the goal of the current study is to synthesize and meta-analyze evidence regarding the relationship between emotion regulation and well-being in clinical samples across studies. It is important to investigate this relationship specifically for psychiatric samples, because emotion regulation as well as well-being have been shown to be particularly important outcomes in psychiatric disorders and are likely to differently affected by and interrelated in mental health conditions as compared with non-clinical or somatic samples. Therefore, this study will focus on clinical samples only and not, for example, community or student samples. This provides insights about the relationship between emotion regulation and well-being in a more specific group. If broader samples (e.g. general population) would also be included in this meta-analysis, findings would be less specific to a particular group of people or could be confounded by the type of sample and therefore strong conclusions about specific groups (e.g. people with mental disorders) would be difficult to reach. Therefore, the aim of the current study is to investigate the relationship between the six specific emotion regulation strategies outlined by Aldao, Nolen-Hoeksema [21] derived from the process model of emotion regulation [17] and to investigate the relationship between well-being and overall deficits in emotion regulation proposed by Gratz and Roemer [23] in samples with mental disorders.

## 2. Method

The current study was prepared and conducted according to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines [64] and has been registered in PROSPERO (CRD42019129629).

### Search strategy

The electronic databases PsycINFO, PubMed and Scopus were searched for the period 1985 to June 13, 2018. The starting point of the search was set to 1985, as we assumed that not much research on emotion regulation and well-being was done before this point. This decision was based on an earlier systematic search, concluding that most of the work on emotion regulation has been conducted since the mid-1990s [21]. An update of the search was performed in November 27, 2019. For the systematic search, text word search terms relating to 'emotion regulation' and 'well-being' and 'mental disorders' and 'relationship' were used and combined with corresponding thesaurus terms (PsycINFO) and medical subject headings (PubMed). We decided to not include the general term 'coping' in the search, although some coping questionnaires might also assess specific emotion regulation strategies such as avoidance or problem-solving. We think that using this general term would not lead to a significantly greater number of relevant studies for the current study and rather make the search less specific. To also identify these specific emotion regulation strategies we included specific terms in our search, such as 'avoidance' or 'problem-solving'. The strategy to not include the term coping in the search was also in line with the earlier review on emotion regulation in psychopathology [21]. Detailed information on the search strategy can be found in Appendix A. Additionally, studies included in the previously published systematic reviews and meta-analyses [4,21,62,63] and the reference lists of studies included in the current study were cross-checked.

### Selection of studies

Studies were included in the meta-analysis if they: (1) examined at least one cross-sectional relationship between a self-report measure of a specific emotion regulation strategy proposed by Aldao, Nolen-Hoeksema [21] and well-being or between the Difficulties with Emotion Regulation Scale [23] and well-being, (2) were published in a peer-reviewed journal and (3) included adults, adolescents or children with a mental disorder, defined as meeting criteria of the Diagnostic Statistical Manual of Mental Disorders [65] or International Statistical Classification of Diseases and Related Health Problems [66] or being recruited from a clinical treatment setting. With regard to the first inclusion criterion, we also included experimental designs and scale validation studies if they provided baseline data to assess the relationship between emotion regulation strategies and well-being. With regard to the third criterion, we decided to merely include studies in people with mental disorders and not somatic disorders, as we assumed that the relevance of and relation between emotion regulation and well-being would likely be different between these populations. Studies were excluded from the meta-analysis if they: (1) included participants with somatic disorders or (2) concerned master's theses, dissertations or conference presentations. Authors were contacted by email and asked to provide the correlation coefficients at baseline if they were not (all) provided in the article.

After removal of duplicates, possibly eligible studies were screened on title, abstract and full paper in the first, second and third phase, respectively. The first (JK) and second author (PK) independently screened a randomly selected sample of 500 titles and abstracts to determine the interrater reliability of study inclusion. The interrater reliability of the screened titles was high (Cohen's kappa = 0.76). The remaining titles, abstracts and full papers were screened by the first author. Uncertainties regarding the screening of abstracts and full papers were discussed with the second (PK) and fourth author (EB).

### Data extraction

For each included study, the following data was extracted by the first author: (1) study characteristics, including first author and publication year, (2) population characteristics, including age, gender, disorder and sample size and (3) methodological characteristics, including study design and outcome measures.

### Meta-analytic strategy

Meta-analyses were conducted in Comprehensive Meta-Analysis (CMA) version 2.2.064. For each study, correlation coefficients of the relation between emotion regulation and well-being were extracted. To analyze the relationship between emotion regulation and well-being, correlation coefficients from the included studies were converted into Fisher's *z* scale [67]. If a study included more than one outcome of emotion regulation or well-being, we extracted all applicable outcomes and converted them. Since multiple effect sizes from the same study are not independent from each other, average combined effect sizes were computed if the study included several emotion regulation strategies or well-being outcomes. The results of the analyses were then again transformed to *r* coefficients for the ease of interpretation. Correlation coefficients between 0.1 and 0.3 were considered as small, between 0.3 and 0.5 as moderate and larger than 0.5 as strong [68].

To explore the relationship between emotion regulation and well-being in detail, outcomes were clustered based on: (1) specific emotion regulation strategy: reappraisal, acceptance, problem-solving, avoidance, rumination, suppression and (2) type of emotion regulation: assumed adaptive strategies (reappraisal, acceptance, problem-solving grouped together), assumed maladaptive strategies (suppression, avoidance, rumination grouped together) and overall deficits in emotion regulation and (3) type of well-being: hedonic well-being and eudaimonic well-being. Subgroups for type of emotion regulation were created based on the earlier classification of specific adaptive and maladaptive strategies [21] and the framework of overall deficits in emotion regulation [23]. For studies measuring the specific strategy avoidance, we conducted a separate sensitivity analysis for studies using a different measures than the Acceptance and Action Questionnaire-II (AAQ-II). For this purpose, studies using the AAQ-II were omitted from the analyses and only studies using other avoidance measures were meta-analyzed to examine whether the correlation will be different when including the AAQ-II in the analyses. We did this because there has been recent criticism about whether the AAQ-II actually measures the process of avoidance or rather is a general measure of overall distress [69,70] and we wanted to examine whether the correlation is different when including the AAQ-II in the analysis. Due to the explorative nature of this meta-analysis, we decided to pool studies that included adolescent and adult participants. The classification into hedonic and eudaimonic well-being was based on the distinction outlined in the introduction [34,37,39]. For type of emotion regulation and type of well-being, we additionally tested whether the strengths in correlations were significantly different using *Z*-test statistics.

Heterogeneity of the effect sizes was assessed using *Q* and *I*<sup>2</sup> statistics. The *Q* statistic assesses whether effect sizes are different from each other, compared to what would be expected based on chance alone, while the *I*<sup>2</sup> statistic is an indicator for the total variance across included effect sizes. A value of 0 is indicative of true homogeneity, while values of 25, 50 and 75 or higher indicates small, moderate and high levels of heterogeneity, respectively [71]. Due to the high heterogeneity of effect sizes in the current study, we decided to use a random-effect model for all meta-analyses. This also supports generalizability of the results, since random-effect models consider diversity across studies, for example in terms of populations or outcome measures [72–74].

Potential publication bias was assessed using funnel plots, Begg and Mazumdar's rank correlation test and fail-safe *N*. In funnel plots, an index of sample size is plotted against the reported effect sizes. Smaller studies are usually found at the bottom of the plot and show higher

dispersion around the true mean. In contrast, larger studies are rather found at the top and gather closer around the true mean. If the scatterplot shows a symmetric distribution (i.e. shows the shape of a funnel), this is an indication for the absence of publication bias, while an asymmetric distribution is indicative for the presence of publication bias [75]. Since the funnel plot merely allows a visual and subjective decision about the presence of publication bias, we also conducted Begg and Mazumdar's rank correlation test [76] to quantitatively estimate the probability of publication bias. This test is based on the rank correlation between the standardized effect size with the variances of the effect sizes using Kendall's tau [77]. A significant rank correlation is indicative for the presence publication bias [76]. Finally, we applied fail-safe N procedures for all significant results, which estimates the number of unpublished nonsignificant studies that are required to make the results nonsignificant [78]. Findings were considered robust if the number of required studies to lower the significance is  $N \geq 5n + 10$ , where  $n$  is the number of comparisons [79].

### 3. Results

#### Study selection

The systematic search produced a total of 12,598 studies. After the exclusion of duplicates, 9744 records were screened, of which 210 remained for full-text screening. In total, 47 studies were eligible for the meta-analysis. Authors of 38 studies were contacted to provide additional data, of which 24 authors provided the requested data. As a result, 33 full-texts were included in the meta-analysis. Two of these full-texts contained two different studies, which resulted in a final number of 35 studies included for the meta-analysis, including 94 extracted effect sizes. Characteristics of the included studies are summarized in Table 1. An overview of the study selection process is shown in Fig. 1.

#### Population characteristics

In total, the included studies comprised 2901 participants with a psychiatric disorder, of which 68.2% were female and the mean age was 38.2 years. Of the included participants, 993 patients had a depressive disorder (34.2%) and 597 patients had various mental disorders (20.6%). Furthermore, 688 patients were diagnosed with anxiety disorder (23.7%), 255 with personality disorder (8.8%) and 174 with schizophrenia, psychosis or schizophreniform disorder (6.0%). Also, 113 patients (3.9%) were diagnosed with bipolar disorder, 97 with binge eating disorder (3.3%) and 35 with substance abuse disorder (1.2%). For the group of various mental disorders, no specific information regarding the exact diagnoses could be retrieved from the studies. One study [80] comprised two different clinical groups, one group with mostly schizophrenia or schizophreniform patients and another group with mood disorder patients (i.e. depression, bipolar disorder).

#### Methodological and outcome characteristics

Of the included articles, 14 studies had a cross-sectional design, while 20 studies concerned an experimental design and one study a longitudinal design. The most common instrument to assess a specific emotion regulation strategy was the Acceptance and Action Questionnaire-II (AAQ-II;  $k = 8$ ). Moreover, the Emotion Regulation Questionnaire (ERQ) was used seven times as well as the Ruminative Response Scale (RRS). No study was identified assessing problem-solving as emotion regulation strategy. Overall deficits in emotion regulation were assessed nine times with the Difficulties with Emotion Regulation questionnaire. The most common instruments to assess well-being were the Satisfaction with Life Scale (SWLS;  $k = 10$ ), the positive emotions subscale of the Positive and Negative Affect Schedule (PANAS;  $k = 8$ ), Psychological Well-being Scale (PWBS;  $k = 6$ ) and the Rosenberg Self-Esteem Scale

(RSES;  $k = 5$ ). An overview of the included outcome measures can be found in Table 1.

#### Meta-analyses

Two studies [81,82] provided both total scores of the well-being outcome and the corresponding subscores (i.e. hedonic and eudaimonic well-being). In these cases, the total scores were used for all meta-analyses, except for the subgroup analysis of hedonic and eudaimonic well-being. Here, we used the scores of the subscales, which could then be allocated to either hedonic or eudaimonic well-being. Although one longitudinal study was included, we only used the cross-sectional baseline data for this study as well, since the study had treatment in-between the measurement points. Information regarding the allocation of well-being measures to either hedonic or eudaimonic well-being can be retrieved from Table 1. Forest plots for the meta-analyses have been illustrated in Figs. 2, 3 and 4.

#### Specific emotion regulation strategies

Findings regarding specific emotion regulation strategies are summarized in Table 2. Reappraisal showed a positive significant relationship with well-being ( $r = 0.19$ , 95% CI: 0.10 to 0.27,  $p < .001$ ) and the relationship between acceptance and well-being was moderate and significant ( $r = 0.42$ , 95% CI: 0.32 to 0.52,  $p < .001$ ). Furthermore, we found a moderate negative relationship of avoidance ( $r = -0.31$ , 95% CI:  $-0.45$  to  $-0.14$ ,  $p < .001$ ) and a small negative relationship of rumination ( $r = -0.19$ , 95% CI:  $-0.28$  to  $-0.10$ ,  $p < .001$ ) with well-being. Effect sizes for avoidance revealed high heterogeneity ( $I^2 = 82.18$ ). Suppression and well-being were not significantly related ( $r = -0.02$ , 95% CI:  $-0.16$  to  $0.12$ ,  $p = .75$ ). To examine whether a different correlation for avoidance is found when omitting studies using the AAQ-II from the analyses, we conducted a sensitivity analyses in which we pooled outcomes of studies using other avoidance measures than the AAQ-II. Similarly to the correlation containing studies using the AAQ-II, we found a moderate negative relationship between avoidance and well-being ( $r = -0.34$ , 95% CI:  $-0.54$  to  $-0.12$ ,  $p < .01$ ,  $n = 472$ ). This correlation was not significant from the correlation we found when including studies using the AAQ-II ( $z = -0.60$ ,  $p = .55$ ).

#### Adaptive and maladaptive strategies

To investigate the overall relationship between putatively adaptive and maladaptive strategies, we grouped the six specific emotion regulation strategies in two groups of either assumed adaptive or maladaptive strategies [21]. For the subgroup of adaptive strategies, a small significant positive relationship with outcomes of well-being was found ( $r = 0.25$ , 95% CI: 0.15 to 0.35,  $p < .001$ ). Findings regarding maladaptive strategies revealed a significant negative relationship of similar effect size with well-being ( $r = -0.21$ , 95% CI:  $-0.31$  to  $-0.10$ ,  $p < .001$ ). Heterogeneity of the effect sizes for adaptive strategies was moderate ( $I^2 = 48.91$ ), while effect sizes for maladaptive strategies showed high heterogeneity ( $I^2 = 81.40$ ).

#### Overall deficits in emotion regulation

We found a moderate negative relationship between overall deficits in emotion regulation and well-being ( $r = -0.47$ , 95% CI:  $-0.56$  to  $-0.38$ ,  $p < .001$ ). Studies assessing this relationship revealed small heterogeneity ( $I^2 = 41.82$ ). The difference in the correlations with well-being between maladaptive strategies and overall deficits in emotion regulation was significant ( $z = -6.58$ ,  $p < .001$ ). Findings regarding adaptive and maladaptive emotion regulation strategies and overall deficits in emotion regulation are summarized in Table 3.

#### Hedonic and eudaimonic well-being

Our analyses stratified by hedonic and eudaimonic well-being revealed that adaptive strategies were weakly positively related with hedonic well-being ( $r = 0.23$ , 95% CI: 0.11 to 0.35,  $p < .001$ ) and

**Table 1**  
Characteristics of studies included in the meta-analysis (k = 35).

Authors (ref#)	Population (n)	% female	Mean age (SD)	Design	Well-being outcome(s)	Emotion regulation outcome(s)
Amjad and Bokharey [101]	Generalized anxiety disorder (40)	45.0	NA	Cross-sectional	SWI (E)	CSQ: avoidance
Badcock, Paulik [102]	Schizophrenia (34)	29.4	37.9 (9.4)	Cross-sectional	SISH (H)	RRS: rumination, ERQ: reappraisal, suppression
Berking, Wupperman [103]	MDD (138), adjustment disorder (63), PTSD (5)	77.0	47.0 (9.0)	Experimental: quasi-experimental	PANAS: positive affect (H)	ERSQ: acceptance
Study 1: Butler, O'Day [104]	Generalized anxiety disorder (68)	48.5	33.7 (NA)	Experimental: randomized controlled trial	SWLS: satisfaction with life (H)	ERQ: reappraisal
Study 2: Butler, O'Day [104]	Generalized anxiety disorder (100)	55.0	32.7 (NA)	Experimental: randomized controlled trial	SWLS: satisfaction with life (H)	ERQ: reappraisal
Chaves, Lopez-Gomez [105]	MDD or dysthymia (96)	100	51.6 (10.4)	Experimental: randomized controlled trial	PANAS: positive affect (H), PHI (H), PWBS (E), SWLS (H)	RRS: rumination, WBSI: suppression, DERS
Dingle, Neves [106]	Substance abuse disorder (35)	37.0	25.0 (4.48)	Experimental: two-group pretest posttest design	SWLS: satisfaction with life (H)	DERS
Eisner, Eddie [107]	Bipolar I disorder (37)	72.0	41.3 (11.2)	Experimental: one-group pretest posttest design	PWBS (E)	DERS
Study 2: Gámez, Chmielewski [109]	Various mental disorders (201)	73.0	41.6 (12.8)	Cross-sectional	PANAS: positive affect (H) (H), PWBS: purpose in life (E), SWLS (H)	BEAQ: avoidance
Geschwind, Peeters [108]	MDD (129)	75.9	43.9 (9.6)	Experimental: randomized controlled trial	ESM: positive affect (H)	RRS: rumination
Graser, Höfling [109]	Chronic depression (11)	36.3	46.5 (9.8)	Experimental: one-group pretest posttest design	RSES (E)	ASQ: acceptance, reappraisal, suppression, RSQ: rumination
Haeyen, van Hooren [81]	Various personality disorders (74) <sup>b</sup>	70.3	37.48 (10.5)	Experimental: randomized controlled trial	MHC-SF: emotional (H), social (E), psychological (E) well-being	AAQ-II: avoidance
Henry, Castellini [110]	Adolescents with various mental disorders (41)	80.0	15.4 (1)	Cross-sectional	SWLS (H)	DERS
Huffziger and Kuehner [111]	MDD (76)	50.1	47.3 (NA)	Experimental: 3 group pretest posttest design	PANAS: positive affect (H)	RSQ: rumination
Ito, Horikoshi [112]	Various: MDD (9), anxiety disorder (9)	59.0	35.2 (10.8)	Experimental: one-group pretest posttest design	PANAS: positive affect (H)	ERQ: reappraisal, suppression
Study 1: Jazaieri, Goldin [113]	Social anxiety disorder (128)	52.3	33.1 (8.5)	Cross-sectional	SWLS (H)	ERQ: reappraisal, suppression
Study 2: Jazaieri, Goldin [113]	Social anxiety disorder (72)	52.8	33.3 (8.6)	Experimental: randomized controlled trial	SWLS (H)	ERQ: reappraisal, suppression
Johnson, Tharp [114]	Bipolar I disorder (67)	54.2	35.9 (12)	Longitudinal	PWBS (E)	ERQ: reappraisal, suppression
Kladnitski, Smith [115]	Various: anxiety disorders and/or MDD (22)	90.9	36.5 (13.0)	Experimental: one-group pretest posttest design	WEMWBS	RRS: rumination, BEAQ: avoidance, DERS
Kladnitski, Smith [116]	Various: anxiety disorders and/or MDD (158)	86.1	39.2 (12.1)	Experimental: randomized controlled trial	WEMWBS	RRQ: rumination, BEAQ: avoidance, DERS
Kuehner and Bueger [117]	MDD (68), dysthymia (21)	50.6	45.1 (12.8)	Cross-sectional	RSES (E)	RSQ: rumination
Study 2: Marco, Pérez [118]	Borderline personality disorder (80)	91.2	29.2 (9.3)	Cross-sectional	PIL-10 (E)	DERS
McEvoy, Erceg-Hurn [119]	GAD (50)	60.0	38.0 (14.3)	Experimental: one-group pretest posttest design	PANAS (H)	RRS-A: brooding, reflection
McEvoy, Thibodeau [120]	MDD (168), social anxiety disorder (96), Generalized anxiety disorder (60), dysthymia (16), various (60)	63.0	35.5 (12.6)	Cross-sectional	PANAS: positive affect (H)	RRS: rumination
Pinto, Kienhuis [121]	Various: MDD (26), anxiety disorder (10), bipolar disorder (9), other disorders (10)	76.4	44.0 (11.7)	Experimental: one-group pretest posttest design	PWI-A: satisfaction with life (H)	AAQ-II: avoidance
Rueda and Valls [122]	Various: MDD (22), anxiety disorder (25), adjustment disorder (64), any of the previous disorder (36)	68.7	40.2 (12.1)	Cross-sectional	SWLS (H)	AAQ-II: avoidance
Rüsch, Hölzer [123]	Borderline personality disorder (60) Social anxiety disorder (30)	100 100	27.8 (6.9) 35.1 (11.9)	Cross-sectional	RSES (E)	AAQ-II: avoidance
Safer and Jo [124]	Binge eating disorder (97)	85.0	52.2 (10.6)	Experimental: randomized controlled trial	PANAS: positive affect (H)	DERS
Schaap, Chakhssi [82]	Various personality disorder (41)	72.3	26.9 (6.5)	Experimental: uncontrolled pre-post within-subjects design	MHC-SF: emotional (H), social (E), psychological (E) well-being	YRAL: avoidance
Tan and Martin [125]	Adolescents with various mental disorders (10)	70.0	15.7 (1.1)	Experimental: one-group pretest posttest design	RSES (E)	AFQ-Y8: avoidance
Uliaszek, Rashid [126]	Various mental disorders (54)	78.0	22.2 (5.0)	Experimental: randomized controlled trial	PPTI: pleasant life (H), engaged life (E), meaningful life (E)	DERS, KIMS: acceptance

(continued on next page)

Table 1 (continued)

Authors (ref#)	Population (n)	% female	Mean age (SD)	Design	Well-being outcome(s)	Emotion regulation outcome(s)
Valiente, Espinosa [80]	Schizophrenia (26), schizophreniform disorder (9), schizoaffective disorder (6), delusional disorder (8), psychotic disorder (3)	50.0 80.0	34.7 (11.4) 41.3 (10.6)	Cross-sectional	PWBS: self-acceptance (E)	AAQ-II: avoidance
Valiente, Espinosa [80]	Schizophrenia (26), schizophreniform disorder (9), schizoaffective disorder (6), delusional disorder (8), psychotic disorder (3)	50.0 80.0	34.7 (11.4) 41.3 (10.6)	Cross-sectional	PWBS: self-acceptance (E)	AAQ-II: avoidance
Valiente, Provencio [127]	Schizophrenia (12), schizophreniform disorder (5), schizoaffective disorder (4), delusional disorder (8), psychotic disorder (18)	42.6	31.0 (8.4)	Cross-sectional	SWLS (H), RSES (E)	AAQ-II: avoidance
Valiente, Provencio [128]	Schizophrenia (18), schizophreniform disorder (7), schizoaffective disorder (4), delusional disorder (8), psychotic disorder (4)	47.5	35.6 (12.6)	Cross-sectional	PWBS: self-acceptance (E)	AAQ-II: avoidance

Notes. AAQ-II = Acceptance and Action Questionnaire-II, AFQ-Y8 = Avoidance and Fusion Questionnaire for Youth, ASQ = Affective Style Questionnaire, BEAQ = Brief Experiential Avoidance Questionnaire, CR = Clinician-rated, CSQ = Coping Strategies Questionnaire, DHS = Dispositional Hope Scale, E = Eudaimonic well-being, ERSQ = Emotion Regulation Skills Questionnaire, ESM = Experience Sampling Method, GAD = Generalized Anxiety Disorder, H = Hedonic well-being, IHS = Integrative Hope Scale, KIMS = Kentucky Inventory of Mindfulness Skills, LOT = Life Orientation Test-Revised, MDD = Major Depressive Disorder, mDES = Modified Differential Emotions Scale, MHC-SF = Mental Health Continuum - Short Form, NA = Not available, PANAS = Positive and Negative Affect Schedule, PIL-10 = Purpose in Life Test, PPTI = Positive Psychotherapy Inventory, PTSD = Posttraumatic Stress Disorder, PWBS = Ryff's Psychological Well-being Scales, PWI-A = Personal Well-being Index, RRS = Ruminative Response Style Questionnaire, RRS-A = Ruminative Response Style Questionnaire adapted, RSES = Rosenberg Self-Esteem Scale, RSQ = Response Styles Questionnaire, RSS = Rumination on Sadness Scale, SBI = Savoring Beliefs Inventory, SISH = Single-item Scale of Happiness, SR = Self-rated, SWLS = Satisfaction with Life Scale, THS = Trait Hope Scale, WBSI = White Bear Suppression Inventory, WEMWBS = Warwick-Edinburgh Mental Wellbeing Scale, YRAI = Young-Rygh Avoidance Inventory.

moderately with eudaimonic well-being ( $r = 0.34$ , 95% CI: 0.18 to 0.49,  $p < .001$ ). The difference in the two correlations was, however, not significant ( $z = -1.25$ ,  $p = .21$ ). Maladaptive strategies revealed a significant weak negative relationship with hedonic well-being ( $r = -0.21$ , 95% CI:  $-0.30$  to  $-0.11$ ,  $p < .001$ ) and a nonsignificant relationship with eudaimonic well-being ( $r = -0.18$ , 95% CI:  $-0.38$  to  $0.04$ ,  $p = .10$ ). This difference in correlations was not significant either ( $z = 0.75$ ,  $p = .45$ ). Finally, we found a moderate negative relationship of overall deficits in emotion regulation and hedonic well-being ( $r = -0.40$ , 95% CI:  $-0.51$  to  $-0.28$ ,  $p < .001$ ) and a strong negative relationship with eudaimonic well-being ( $r = -0.50$ , 95% CI:  $-0.62$  to  $-0.35$ ,  $p < .001$ ). However, the difference in the two correlations was, again, not significant ( $z = -1.51$ ,  $p = .13$ ). Findings regarding hedonic and eudaimonic well-being are summarized in Table 4.

#### Publication bias

Inspection of the funnel plot (Fig. 5) revealed no visual indication of skewedness of the included effect sizes. To quantitatively test for publication bias, we conducted Begg and Mazumdar's rank correlation tests. Findings revealed no significant correlation between standard error and effect sizes ( $\tau = 0.05$ ,  $p = .49$ ), supporting the conclusions made about the visual inspection of the funnel plot. In addition, we applied fail-safe N procedures to test for publication bias and robustness of all significant findings. For the emotion regulation strategies acceptance and avoidance, the estimated fail-safe N was higher (26 and 352, respectively) than required (25 and 80, respectively). Similarly, for the strategy rumination the estimated fail-safe N (77) was also higher than required (60). For the strategy reappraisal the fail-safe N was lower (23) than required (50). Findings for the groups of adaptive and maladaptive strategies appeared robust, with a higher fail-safe N (101 and 622, respectively) than required (60 and 145, respectively). Similar, for overall deficits in emotion regulation, the fail-safe N was also higher (334) than required (55).

#### 4. Discussion

The goal of the current study was to synthesize studies assessing the relationship of specific emotion regulation strategies and overall deficits in emotion regulation with well-being in clinical samples and to meta-analyze these findings. We found that several strategies derived from the process model of emotion regulation [17] were related with well-being. Our findings also indicate that both putatively adaptive and maladaptive emotion regulation strategies [21] were related with well-being. Moreover, the concept of overall deficits in emotion regulation [23] was significantly related with well-being as well. Based on fail-safe N, most of the significant findings appeared robust.

#### Main findings

We found that the specific strategy avoidance was negatively related with well-being, which complements literature on the important role of this strategy [83,84] and notions of third wave cognitive behavioral therapies [10,85,86]. In this context, avoidance has been described as key mechanism for the development and maintenance of psychological problems [87]. In line with this, we also found a positive relationship between well-being and acceptance, which might be an adaptive strategy to improve well-being in most contexts by reducing avoidance. Avoidance might thus serve as a particularly maladaptive strategy, as it hinders people from taking a non-judgmental and accepting position towards their cognitions and emotions. This often leads to worse psychological functioning in the long term [88]. However, it should be noted that the AAQ-II has been criticized for being a measure of general distress and neuroticism rather than avoidance [69,70], so it remains questionable whether it truly measures the process of avoidance. Notwithstanding, we decided to include it as an avoidance measure in line with the earlier meta-analysis by Aldao, Nolen-Hoeksema [21]

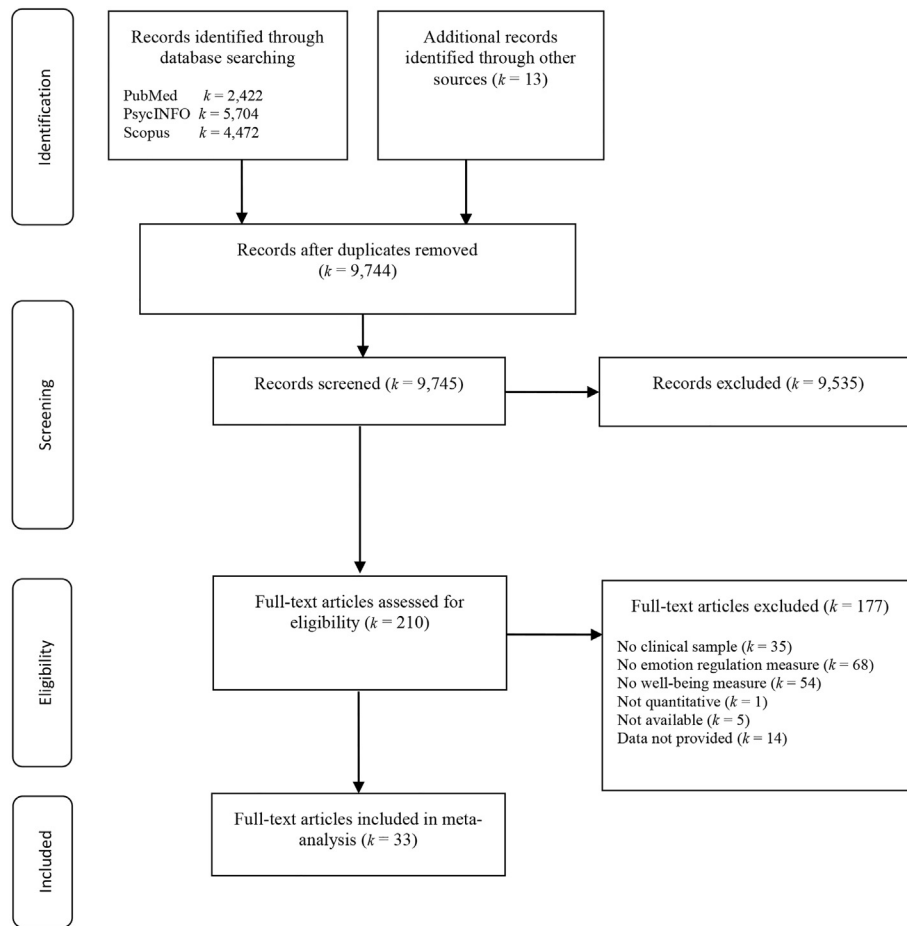


Fig. 1. Flowchart of the study selection process.

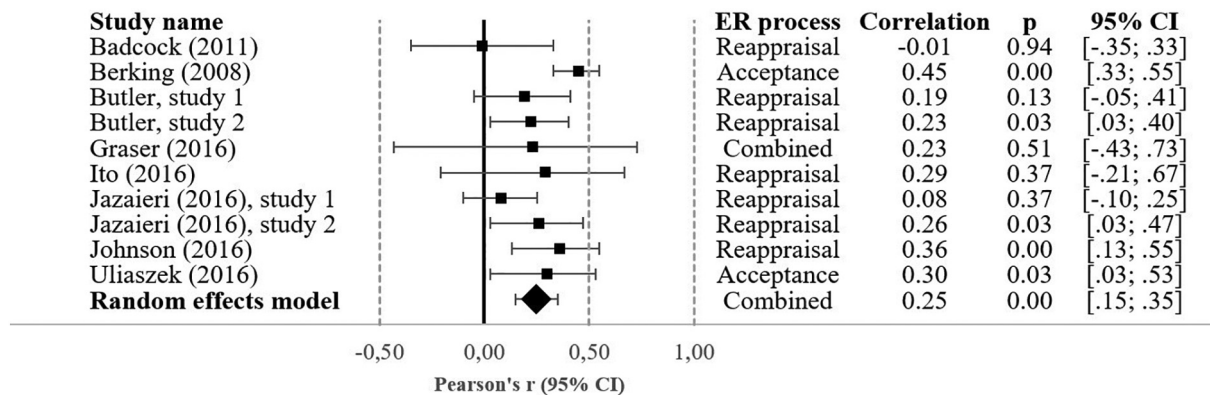


Fig. 2. Forest plot of the relationship between adaptive emotion regulation strategies and well-being.

and because our sensitivity analyses indicated that the correlation does not significantly change when including the AAQ-II in the analyses.

Furthermore, rumination was found to be negatively related with well-being as well. Prior studies have ascribed rumination a transdiagnostic role [12,89] and emphasized the importance of this strategy for psychopathology [6,90]. In addition, we found a positive relationship between reappraisal and well-being. The ability to cognitively reframe situations has already been found to be negatively related with psychopathology [21,62] and positively with well-being outcomes in mixed populations [62]. In this context, it should be noted though that the fail-safe N was lower than required for the two

strategies of rumination and reappraisal, suggesting that the results might not be robust and should be interpreted with caution. Nevertheless, our findings suggest that these specific strategies might not solely be relevant in the context of psychopathology, but also when aiming for the improvement of well-being in clinical populations.

Interestingly, suppression was found to be not related with well-being, suggesting that it might not be relevant in the context of well-being. This is not in line with prior meta-analyses, which found suppression to be related with both psychopathology [21] and well-being outcomes [62]. One possible explanation might be that we solely included clinical samples, which constitutes a different study

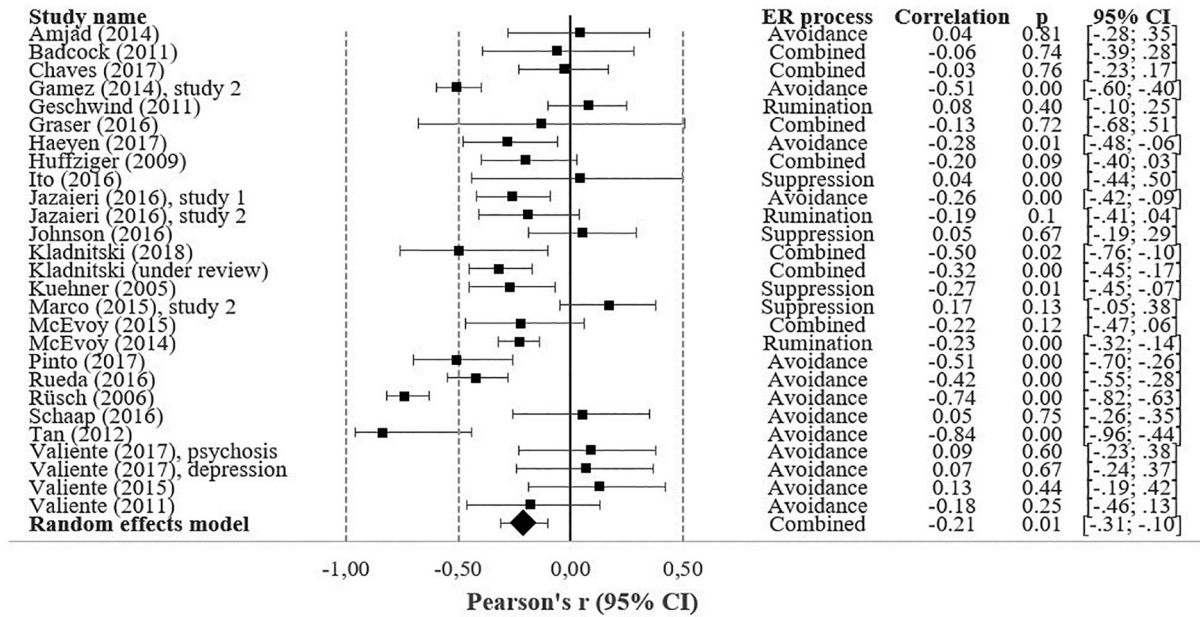


Fig. 3. Forest plot of the relationship between maladaptive emotion regulation strategies and well-being.

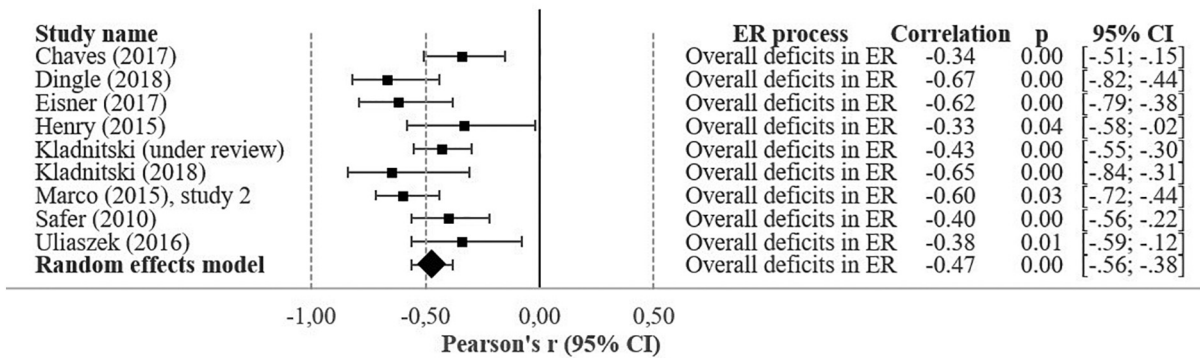


Fig. 4. Forest plot of the relationship between overall deficits in emotion regulation and well-being.

**Table 2**  
Relationship of specific emotion regulation strategies and well-being.

	Mean	95% CI	p-value	k	n	Heterogeneity	
						Q-value	I <sup>2</sup>
Reappraisal	0.19	[0.10; 0.27]	< 0.001	8	498	6.14	0.00
Acceptance	0.42	[0.32; 0.52]	< 0.001	3	271	1.29	0.00
Avoidance	-0.31	[-0.45; -0.14]	< 0.001	14	1013	82.18***	84.18
Rumination	-0.19	[-0.28; -0.10]	< 0.001	10	1065	16.10	44.09
Suppression	-0.02	[-0.16; 0.12]	0.75	8	505	14.95*	53.19

Notes. \*p < .05, \*\*\*p < .001.

population compared to previous meta-analyses [21,62]. Another explanation could be that well-being cannot simply be considered as the opposite of psychopathology [33,36,42,48,91]. Suppression might thus be differently related with well-being and psychopathology.

When we clustered findings into putatively adaptive (i.e. reappraisal and acceptance) and maladaptive strategies (i.e. suppression, rumination and avoidance), we found that adaptive strategies were positively related with well-being and maladaptive strategies were negatively related with well-being. This is not surprising, since the specific strategies of the clusters already tended to show correlations corresponding to this classification. Although emotion regulation remains a multifaceted

**Table 3**  
Relationship of adaptive and maladaptive strategies and overall deficits in emotion regulation with well-being.

	Mean	95% CI	p-value	k	n	Heterogeneity	
						Q-value	I <sup>2</sup>
Adaptive strategies	0.25	[0.15; 0.35]	< 0.001	10	758	17.62*	48.91
Maladaptive strategies	-0.21	[-0.31; -0.10]	< 0.001	27	2263	139.76***	81.40
Overall deficits in emotion regulation	-0.47	[-0.56; -0.38]	< 0.001	9	566	13.75	41.82

Notes. \*p < .05, \*\*\*p < .001.

construct and (in practice) cannot be classified to be always adaptive or maladaptive, our findings suggest that there appears to be a set of specific emotion regulation strategies which are generally either adaptive or maladaptive across several different contexts [18,21,22]. It should be noted though that more studies assessed maladaptive strategies and none of the included studies included problem-solving as specific adaptive emotion regulation strategy. Therefore, the findings should be interpreted with caution, especially regarding the role of putatively adaptive strategies.



**Table 4**  
Relationship of adaptive and maladaptive emotion regulation strategies and overall deficits in emotion regulation with hedonic and eudaimonic well-being.

	Mean	95% CI	p-value	k	n	Heterogeneity	
						Q-value	I <sup>2</sup>
<b>Hedonic well-being</b>							
Adaptive strategies	0.23	[0.11; 0.35]	< 0.001	8	680	16.99*	58.81
Maladaptive strategies	-0.21	[-0.30; -0.11]	< 0.001	15	1568	46.37***	69.81
Overall deficits in emotion regulation	-0.40	[-0.51; -0.28]	< 0.001	5	323	5.97	33.03
<b>Eudaimonic well-being</b>							
Adaptive strategies	0.34	[0.18; 0.49]	< 0.001	3	132	0.14	0.00
Maladaptive strategies	-0.18	[-0.38; 0.04]	0.10	15	933	114.05***	90.08
Overall deficits in emotion regulation	-0.50	[-0.62; -0.35]	< 0.001	4	267	6.09	50.76

Notes. \*p < .05, \*\*\*p < .001.

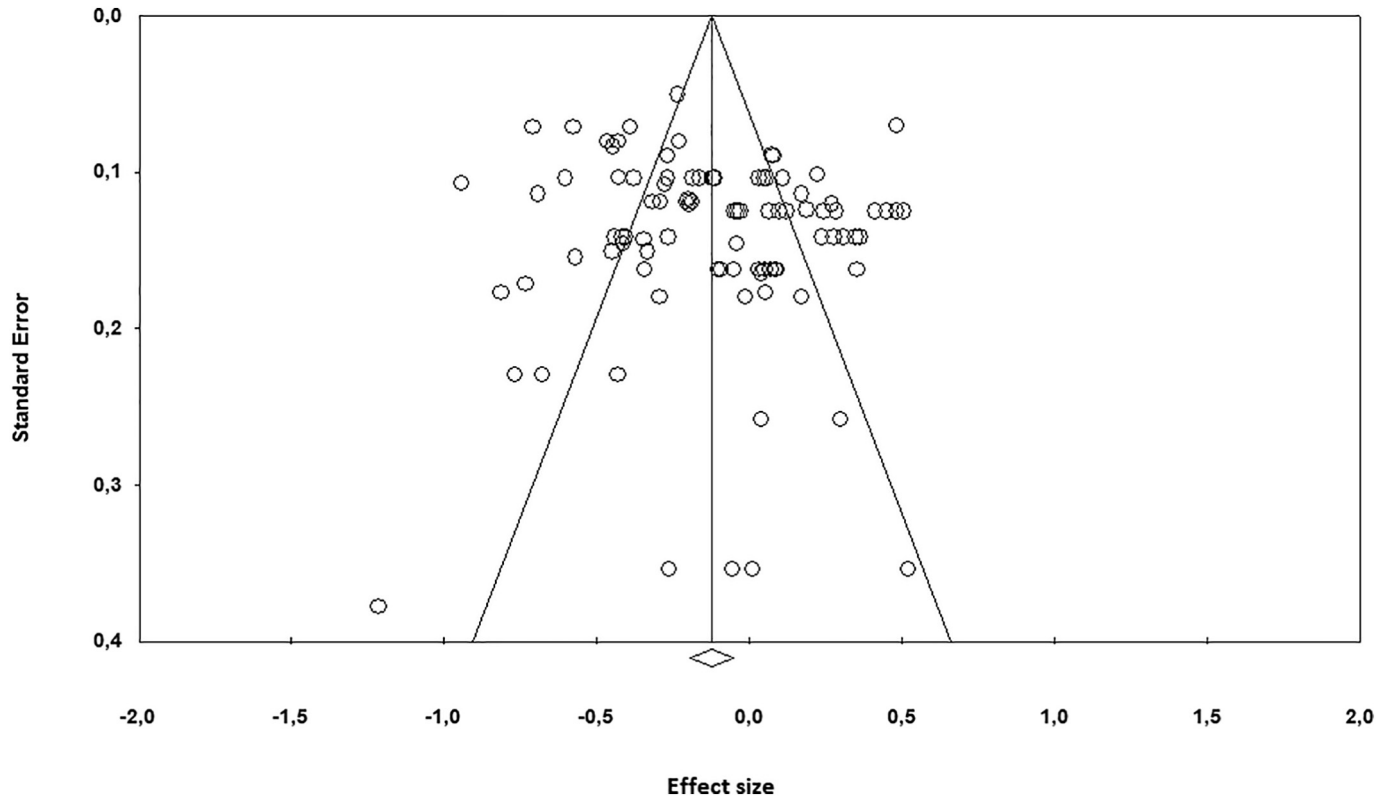


Fig. 5. Funnel plot of effect sizes included in the meta-analyses.

Overall deficits in emotion regulation as proposed by Gratz and Roemer [23] was found to be negatively related with well-being and this association was actually significantly stronger than the relationship between maladaptive strategies and well-being. This stronger relationship can be explained by the multidimensional nature of the framework by Gratz and Roemer [23]. Their framework provides a broader and more comprehensive representation of emotional functioning compared to the three specific maladaptive strategies suggested by Aldao, Nolen-Hoeksema [21]. Another explanation is that no association between suppression and well-being was found, which is likely to suppress the correlation between the group of maladaptive strategies and well-being.

We found no differences in the strengths of relationships between emotion regulation and different types of well-being (i.e. hedonic or eudaimonic). Although the relationship between maladaptive strategies and eudaimonic well-being fell short of significance, overall this suggests that emotion regulation strategies [21] and overall deficits in emotion regulation [23] are not

exclusively important for specific types of well-being. Instead, they appear to be relevant for both emotional well-being [37] and outcomes of individual functioning [34,35]. It should be mentioned though that this classification into different types of well-being remains rather general and does not allow conclusions about the role of emotion regulation in the context of more specific aspects of well-being.

**Limitations and future directions**

The current study has several limitations which should be considered. First, due to the relatively low number of studies, we could not conduct analyses for diagnostic subgroups. Therefore, our findings rather apply to people with mental disorders in general rather than to specific patient groups. However, since transdiagnostic factors are common among different mental disorders, samples included in this study may also share overlap in their processes and symptoms [5,89,92,93]. Furthermore, one could argue that it would be a first logical step to

first examine this relationship in community samples before exploring it in clinical samples. We decided to conduct this study in clinical samples, as an earlier study assessing the relationship between specific emotion regulation strategies and well-being already included community and student samples [62]. However, it might be possible that the samples in our study, since they contain clinical groups, show restricted well-being and emotion regulation scores possibly suppressing the correlations. This should be considered when interpreting the results. To further clarify the role of specific emotion regulation strategies and overall deficits in emotion regulation in the context of well-being, we encourage future research to incorporate well-being measures when assessing emotion regulation. Second, no conclusion can be made about causality of the current findings, since the extracted effect sizes were exclusively based on correlational data. Therefore, it remains unclear whether specific emotion-regulation strategies lead to change in well-being or vice versa. Third, our study surely does not provide a complete picture of the role of emotion regulation for well-being. We only included studies explicitly assessing one of the six emotion regulation strategies proposed by Aldao, Nolen-Hoeksema [21] or the concept of overall deficits in emotion regulation [23]. Studies assessing other facets of emotion regulation and other specific emotion regulation strategies were thus excluded. For example, we did not explicitly search for coping, but one could argue that emotion regulation is an important part of coping [94]. However, searching for literature on coping would have been beyond the scope of this study. Furthermore, coping is often researched in the field of somatic groups (e.g. HIV or cancer), which would not have been relevant for this study. But it should also be noted here, that we did include specific terms related to specific emotion regulation and coping strategies in the search string, to also search for specific emotion regulation strategies related with coping (e.g. avoidance or problem-solving). Therefore, we think that our search also covered a substantial part of the coping literature. Also, we did not analyze the six dimensions of overall deficits in emotion regulation provided by Gratz and Roemer [23] separately. The reason for this was that the data for these subgroup analyses was not available. Only one of the studies included in this meta-analysis reported the correlation between the DERS and well-being, but only for the total DERS scores, while the data had to be explicitly requested from the authors of other studies. The authors of these 8 studies were also requested to provide the correlation for total scores only. There is thus no data available to conduct meta-analyses specifically for the subscales of the DERS, although this certainly might have added valuable information to the meta-analysis. Therefore, it would be interesting for future research to further explore the relationship between the specific dimensions of the DERS and well-being. Moreover, we limited our search to studies that have used the DERS specifically and did not include studies that used measures related to some conceptual domains of the DERS (e.g. emotional clarity is measured by several other measures). Including these more specific measures in the meta-analysis might have provided a more comprehensive picture of specific processes related to difficulties in emotion regulation. Finally, it would have been interesting to investigate whether and in which patient groups strategies of positive emotion regulation [57,61], such as dampening, positive rumination or savoring are beneficial. One prior theoretical review focused on this question [63], but again we had not sufficient data to answer this question meta-analytically. Future research may consider to more regularly investigate these processes in relation to well-being in people with mental disorders and also provide the relationships between subscales in their studies. This might help to extend the amount of available data and to gain a more fine-grained picture of this relationship.

### Implications

Several clinical and scientific implications arise from the current findings. Emotion regulation appears to be an important factor, not merely in the context of psychopathology [3,4,21], but also for the

improvement of well-being. This finding is relevant for both clinical practice and the science of clinical psychology. Growing evidence emphasizes the importance of well-being for people with mental disorders [40–42,46] and psychiatric patients value well-being outcomes as part of their recovery [44,95,96]. This meta-analysis indicates that specific emotion regulation strategies and emotional functioning in general might be important processes to address in clinical therapy, also when striving for the improvement of well-being and recovery. Since well-being is an important outcome for people with mental disorders as well, it might have incremental value to focus on emotion regulation (strategies) when striving for the improvement of well-being and not merely psychopathology [21]. The specific strategies of avoidance, rumination and reappraisal seem to be related with well-being and may thus reflect a relevant treatment target.

Furthermore, it is notable that considerably more studies included outcomes of maladaptive emotion regulation strategies. Therefore, we encourage future research to include adaptive emotion regulation strategies such as acceptance, reappraisal or problem-solving in their studies. We also identified merely one longitudinal study, which underlines the need for research assessing the longitudinal relationship between these concepts. Another interesting question might be whether emotion regulation predicts well-being above and beyond psychopathology. This would require correlation coefficients that are adjusted for levels of distress. Data to answer this question was not available for the current study, since merely correlation coefficients were reported in the included studies or requested from authors that were not adjusted for levels of psychopathology. Moreover, it is remarkable that in all included studies emotion regulation was exclusively measured with traditional self-report methods. Recent trends within psychological assessment emphasize the potential of experience sampling and ecological momentary assessment methods [97,98]. Especially for emotion regulation processes, this type of measurement may be particularly interesting, since emotional states (and their reactions to them) often fluctuate and show a rather dynamic than static course [99,100]. Experience sampling may thus represent a more valid method for assessing both emotional states, but also the strategies people use to regulate them and their association with well-being. Future research might consider applying these intensive longitudinal assessment methods on a more regular basis.

### 5. Conclusion

This study provides the first comprehensive overview and meta-analysis of the relationship between emotion regulation and well-being in clinical samples with psychiatric disorders. Our findings indicate that emotion regulation plays an important role in the context of well-being. Several specific strategies as well as overall deficits in emotion regulation have been found to be related with well-being. Future research should consider investigating this relationship in specific groups to widen the evidence base regarding the role of emotion regulation. This would help to better understand which processes are relevant for which groups and receive a more complete picture of the multidimensional construct of emotion regulation.

### Acknowledgements

Not applicable.

### Funding information

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**Appendix A. search strategy**

**Scopus.**

- #1 TITLE-ABS-KEY (emotion-regulat\* OR “emotional regulation” OR suppression OR acceptance OR problem-solving OR reappraisal OR rumination OR avoidance)
- #2 TITLE-ABS-KEY (impact OR effect\* OR effic\* OR relat\* OR correl\* OR associat\* OR predict\*)
- #3 TITLE-ABS-KEY (well-being OR well-being OR happiness OR “satisfaction with life” OR “life satisfaction”)
- #4 TITLE-ABS-KEY (symptom OR disorder OR diagnos\* OR psychopatholog\* OR clinic\*)
- #5 #1 AND #2 AND #3 AND #4 (filters: article, publication year 1985–2019)

**PsycINFO.**

- #1 (emotion-regulat\* OR “emotional regulation” OR suppression OR acceptance OR problem-solving OR reappraisal OR rumination OR avoidance)
- #2 (DE “Rumination” OR SU “Thought Suppression” OR SU “Emotional Regulation”)
- #3 (impact OR effect\* OR effic\* OR relat\* OR correl\* OR associat\* OR predict\*)
- #4 (well-being OR well-being OR happiness OR “satisfaction with life” OR “life satisfaction”)
- #5 (SU “Well Being” OR SU “Mental Health”)
- #6 (symptom OR disorder OR diagnos\* OR psychopatholog\* OR clinic\*)
- #7 (SU “Mental Disorders” OR SU “Psychiatric Symptoms” OR SU “Clinical Psychology”)
- #8 #1 OR #2
- #9 #4 OR #5
- #10 #6 OR #7
- #11 #3 AND #8 AND #9 AND #10 (filter: academic journal, publication year 1985–2018)

**PubMed.**

- #1 (emotion-regulat\*[tiab] OR “emotional regulation” OR suppression[tiab] OR acceptance[tiab] OR problem-solving[tiab] OR reappraisal [tiab] OR rumination[tiab] OR avoidance[tiab])
- #2 (“Self-Control”[Mesh])
- #3 (impact[tiab] OR effect\*[tiab] OR effic\*[tiab] OR relat\*[tiab] OR correl\*[tiab] OR associat\*[tiab] OR predict\*[tiab])
- #4 (well-being[tiab] OR well-being[tiab] OR happiness[tiab] OR “satisfaction with life”[tiab] OR “life satisfaction”[tiab])
- #5 (“Mental Health”[Mesh])
- #6 (symptom\*[tiab] OR disorder\*[tiab] OR diagnos\*[tiab] OR psychopatholog\*[tiab] OR clinic\*)
- #7 (“Psychology, Clinical”[Mesh] OR “Mental Disorders”[Mesh])
- #8 #1 OR #2
- #9 #4 OR #5
- #10 #6 OR #7
- #11 #3 AND #8 AND #9 AND #10 (filter: publication year 1985–2019)

**A.1. PRISMA-checklist**

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data	2–3

(continued)

Section/topic	#	Checklist item	Reported on page #
		sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4–7
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	7–8
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	8
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	9
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	8
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	9
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	10
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	9
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	11–12
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	10–11
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I <sup>2</sup> ) for each meta-analysis.	10–11
<b>RESULTS</b>			
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	11–12
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	10–11
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	12
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the	12–13

(continued on next page)

(continued)

Section/topic	#	Checklist item	Reported on page #
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	15–16
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	14–15
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	14–15
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	15–16
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	14–15
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	16–19
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	19–20
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	20–21
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	22

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:<https://doi.org/10.1371/journal.pmed1000097>  
For more information, visit: [www.prisma-statement.org](http://www.prisma-statement.org)

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