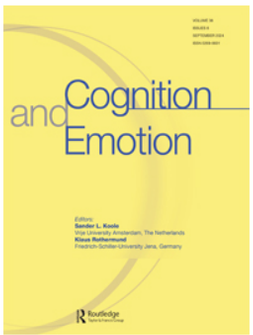

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Emotion malleability beliefs matter in emotion regulation: a comprehensive review and meta-analysis

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ABSTRACT

Individuals' beliefs about the malleability of emotions have been theorised to play a role in their psychological distress by influencing emotion regulation processes, such as the use of emotion regulation strategies. We conducted a meta-analysis to test this idea across studies with a focus on the relationships between emotion malleability beliefs and five distinct emotion regulation strategies: cognitive reappraisal, suppression, avoidance, rumination, and acceptance. Further, using two-stage meta-analytic structural equation modelling (TSSEM), we examined whether the emotion regulation strategies mediate the cross-sectional relationship between emotion malleability beliefs and psychological distress across studies. Thirty-seven studies were included in the meta-analyses and 55 cross-sectional studies were included in the TSSEM. Results demonstrated that, across studies, emotion malleability beliefs were significantly associated with greater use of putatively helpful strategies (particularly with cognitive reappraisal) and less use of putatively unhelpful strategies (particularly with avoidance). The use of cognitive reappraisal and avoidance partially mediated the relationship between emotion malleability beliefs and psychological distress. These results highlight the importance of considering beliefs about the malleability of emotions in the context of emotion regulation. These findings suggest the potential role of emotion malleability beliefs in interventions for individuals with emotion regulation-related difficulties and psychological distress.

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Emotion growth mindsets; implicit theories of emotion; emotion controllability beliefs

Emotion regulation (ER) occurs throughout the day in our lives, profoundly impacting our psychological well-being (e.g. Garnefski & Kraaij, 2006; Kring & Sloan, 2010; Mennin et al., 2007). Successful ER can help a person respond effectively to situational demands by experiencing more helpful and fewer unhelpful emotions within a given context, which leads to decreased psychological distress (e.g. Gross, 2015). Indeed, previous studies identified several ER strategies germane to psychological distress (e.g. Aldao et al., 2010): for example, heightened distress is typically linked to higher levels of suppression and lower levels of cognitive reappraisal. While the ER strategies-psychological distress relationships have been widely studied, it is crucial to understand factors that predict individual differences in ER strategy use (Yoon & Rottenberg, 2020). These factors could serve as important targets when intervening in individuals with ER-related difficulties. One potential factor that warrants investigation is individuals' beliefs about the malleability of emotions. In this meta-analytic study, we sought to investigate the relationships between emotion malleability beliefs and ER strategies, and whether emotion malleability beliefs predict psychological distress via ER strategies.

Emotion malleability beliefs refer to individuals' beliefs regarding whether emotions are malleable or fixed, which has been studied under diverse names,

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including implicit theories of emotion, incremental theories of emotion, growth mindsets of emotion, and emotion controllability beliefs (referred to as emotion malleability beliefs hereafter). Several theories on motivation and self-regulation provide possible explanations on why and how emotion malleability beliefs would relate to ER. For example, expectancy-value theory (Atkinson, 1957; Eccles & Wigfield, 2002) and self-efficacy theory (Bandura, 1997; Ozer & Bandura, 1990) posit that individuals who hold stronger beliefs in their ability to control and achieve a desired outcome are more likely to engage in the outcome-related behaviours. Although researchers differentiated emotion malleability beliefs from one's ER self-efficacy (how well or confidently individuals believe that they can control their emotions; Tamir et al., 2007), emotion malleability beliefs are closely related to the individuals' perceived ability to control/regulate emotions and attain their desired emotional state. Accordingly, individuals who believe that emotions are relatively malleable and controllable may be more motivated to engage in emotion-regulatory behaviours, compared to those who believe that emotions are relatively uncontrollable.

More directly, Dweck (2000) referred to beliefs about the malleability of personal qualities (e.g. intelligence) as implicit theories, as these beliefs work as frameworks/theories to understand the world and are often implied rather than overtly stated. Research on implicit theories argues that a person who holds stronger malleability beliefs of human attributes (i.e. believing that human attributes are changeable and developable) is more likely to make assertive and effective efforts in self-regulation, thereby increasing the likelihood of their achieving successful outcomes (Dweck, 2000; Dweck et al., 1995). A meta-analysis (Burnette et al., 2013) showed that believing personal attributes are malleable was associated with effective self-regulatory processes, including greater use of mastery-oriented strategies (e.g. longer practice time to achieve a goal) and less use of helpless-oriented strategies (e.g. procrastinating and diverting away from a goal). It is possible that emotion malleability beliefs are related to the use of putatively helpful strategies that could lead to reduced emotional distress.

As ER is an integral form of self-regulation (e.g. Bonanno, 2001), implicit theories have been studied in the domain of ER (Tamir et al., 2007) and researchers theorised the role of beliefs about emotions in emotional/psychological well-being (an ER outcome) from an ER perspective (e.g. Ford & Gross, 2019; Kneeland, Dovidio, et al., 2016). According to a theoretical model on beliefs about emotions (Ford & Gross, 2019), emotion malleability beliefs guide the overall ER processes, such as the choice and use of ER strategies, and in turn influence emotional outcomes. Consistent with this model, a recent meta-analysis (Burnette et al., 2020) revealed that believing personal attributes are malleable was significantly associated with active coping/ER strategies (reappraisal, problem-solving) and decreased psychological distress. To the best of our knowledge, a systematic meta-analytic review examining specifically between emotion malleability beliefs and various ER strategies (including both putatively helpful/active and unhelpful strategies) and investigating whether emotion malleability beliefs predict psychological distress through ER strategies has not yet been conducted.

Based on our systematic literature review, the most frequently studied ER strategies in relation to emotion malleability beliefs were cognitive reappraisal, suppression, rumination, avoidance, and acceptance.[1] This meta-analytic study focuses on these five ER strategies in relation to the malleability beliefs. Although it is important to note that the effectiveness of ER strategies can vary depending on the contexts (e.g. Bonanno & Burton, 2013), cognitive reappraisal and acceptance have been generally considered as putatively beneficial for psychological well-being (e.g. Aldao et al., 2010; Hayes & Lillis, 2014). Cognitive reappraisal refers to the act of actively modifying the meaning of a situation or/and its situational goal typically before one's emotion fully arises (Gross & John, 2003), while acceptance involves letting reactions proceed without any forms of resistance (Biglan et al., 2008). In contrast, suppression, avoidance, and rumination have been viewed as putatively unhelpful. Different forms of suppression and avoidance were included in this study: For suppression, suppressing either one's internal state (e.g. thoughts; Wenzlaff & Wegner, 2000) or/and outward emotional expression (expressive suppression; Gross, 1998) were included. For avoidance, avoiding one's unwanted thoughts and situations (cognitive avoidance, behavioural avoidance; Mowrer, 1947) and overall uncomfortable internal states (experiential avoidance; Hayes et al., 1996) were included. Rumination entails repetitively focusing on one's emotional experiences and contemplating their causes and consequences (Nolen-Hoeksema et al., 2008).

There are two possibilities pertaining to how emotion malleability beliefs are associated with each ER strategy. On the one hand, distinct patterns of relationships with emotion malleability beliefs may exist per ER strategy (Hong & Kangas, 2022; Tamir et al., 2007). Based on the research on implicit theories (Dweck, 2000; Dweck et al., 1995), individuals who embrace the idea that emotions are relatively malleable may adopt a proactive approach to ER that increases the likelihood of achieving successful ER outcomes. Because holding malleability beliefs in overall human attributes is linked to executing more assertive and effective efforts in self-regulation (Dweck, 2000), emotion malleability beliefs would be associated with more frequent use of purportedly helpful and active ER strategies, and less frequent use of putatively unhelpful ER strategies, which in turn would predict reduced psychological distress. On the other hand, emotion malleability beliefs may be associated with greater use of ER strategies regardless of the nature of each strategy. Given that malleability beliefs are generally associated with greater efforts in self-regulation processes (Dweck & Leggett, 1988), individuals with higher levels of emotion malleability beliefs may exert more effort in overall ER processes and more often use both putatively helpful and unhelpful ER strategies. This study intended to explore which possible account holds across studies.

To sum up, the primary goals of this comprehensive review were as follows. Firstly, using a meta-analysis, we aimed to quantify the direction and magnitude of the relationships between emotion malleability beliefs and each of the five ER strategies across studies. Secondly, although Burnette et al. (2013)'s meta-analysis examined the mediation model of malleability beliefs in overall human attributes predicting regulatory outcomes via self-regulation, implicit theories are domain-specific (Tamir et al., 2007). In other words, an individual can endorse malleability beliefs in a specific domain while simultaneously not perceiving other attributes as malleable. Therefore, this study intended to test and extend this mediation model to the domain of emotion. Using the two-stage structural equation modelling approach (TSSEM; Cheung, 2014; Cheung & Chan, 2005), a form of meta-analytic structural equation modelling, we sought to test the mediation model of emotion malleability beliefs predicting psychological distress via ER. Lastly, to provide a comprehensive overview of this topic, we summarised results from a small number of experimental studies that examined causality and studies that investigated a longitudinal mediation model.

Method

Search process

We identified relevant articles published until August 2023 using PsycInfo, PubMed, and ProQuest Dissertation & Theses. Combinations of the following terms were used in the search process within all text fields (within abstract for ProQuest Dissertation & Theses to narrow down the number of searched articles): emotional growth mindset* OR emotion mindset* OR implicit theories of emotion* OR emotion malleability beliefs* OR emotion controllability beliefs*. In addition, we performed a supplementary search using Google Scholar. Duplicates from multiple sources were excluded. When two studies used the same dataset, we chose one study. For example, an earlier published study was included in our analyses when two published studies used the same data. We opted for a published study when an unpublished dissertation was later published in a journal. A flow diagram of the search process was presented in Figure 1.

Eligibility criteria

Articles were included when they (1) were written in English, (2) assessed emotion malleability beliefs, and (3) measured at least one of the five ER strategies (cognitive reappraisal, suppression, rumination, avoidance, and acceptance). Two studies measured malleability beliefs about a discrete emotion (anxiety) in relation to ER strategy uses (Schroder et al., 2015; Sung et al., 2020). For consistency, this study focused on malleability beliefs about emotions in general.

The TSSEM was used to test the path model of ER strategies mediating the emotion malleability beliefs and psychological distress. It allows including studies with incomplete correlation among variables (e.g. some studies did not measure ER strategy or did not report correlation coefficients between emotion malleability beliefs and ER strategy). Thus, for the mediation analysis, we included studies that (4) assessed psychological distress in relation to emotion malleability beliefs in the TSSEM even when they did not measure ER strategies.[2] To be consistent with the recent meta-analysis on the relationship between

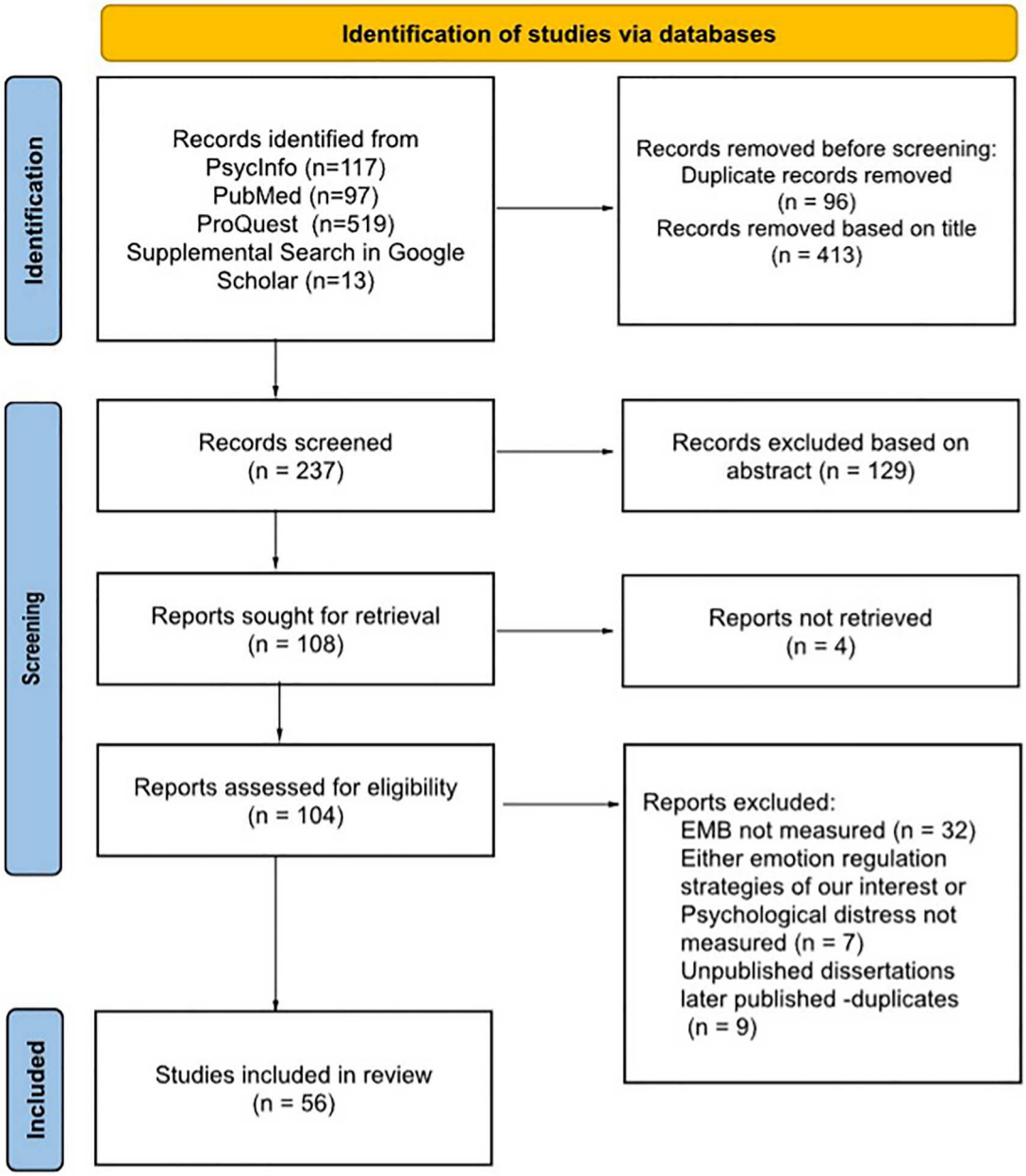

Figure 1. The PRISMA flow diagram of the data search process.

growth mindsets and psychological distress (Burnette et al., 2020), we included the following domains for psychological distress: depression, anxiety, social anxiety, stress, and others (e.g. suicidal ideation, internationalising symptoms, [lack of] well-being).

We excluded articles that had participants with developmental disorders (e.g. autism spectrum disorder) or psychosis, as previous studies indicated that individuals with such conditions showed distinct patterns of emotional information processing (Bruggink et al., 2016; Kohler & Martin, 2006).

Coding procedure

The initial literature search was performed by the first author. The second and the third authors recorded

the following variables independently: (1) effect size, (2) sample size, (3) gender ratio (female ratio), (4) mean age, and (5) belief types (whether emotion malleability beliefs was about people in general/second person [e.g. everyone/you can learn to control their/your emotions; general], or themselves [e.g. I can learn to control my emotions; personal]), (6) study design (cross-sectional vs. longitudinal) were coded. Intraclass correlations for continuous variable (age and female ratio) ranged from .98 to 1, while the kappa coefficients for categorical moderators were .95 (belief type) and 1 (study design), indicating excellent inter-rater agreement (Landis & Koch, 1977).

To avoid dependency issues, studies with multiple effect sizes were handled using two approaches. Firstly, the main approach used in both our meta-analyses and TSSEM was an aggregation approach. We created an aggregated effect size per study, when studies measured an ER strategy using multiple scales or domains (e.g. cognitive and behavioural avoidance for avoidance), assessed multiple domains of psychological distress (e.g. anxiety and depression together) and/or two belief types (i.e. both general and personal), and/or reported both longitudinal and cross-sectional correlation coefficients between emotion beliefs and an ER strategy(es). For example, De Castella et al. (2013) examined both general and personal emotion beliefs in relation to cognitive reappraisal, and assessed stress and depression. To estimate the pooled effect size of the emotion beliefs-cognitive reappraisal relationship, we averaged the correlations between two belief types with cognitive reappraisal from the study and included the effect size in the analysis. In TSSEM where correlation coefficients of each pair of variables are required to test a mediation model, we further averaged the correlations between two belief types with stress, and between two belief types with depression to obtain the effect sizes of the relationship between emotion malleability beliefs and distress. Additionally, we averaged the correlations between depression and cognitive reappraisal, and between stress and cognitive reappraisal, to obtain the effect size of the relationship between cognitive reappraisal and distress.

Secondly, to test belief type (general vs. personal) and study design (longitudinal vs. cross-sectional) as moderators in meta-analyses, we performed analyses including one effect size from each study in a way to bolster moderator analyses with fewer studies (e.g. when a study reported effect sizes of both general and personal types, we included either general or personal type in the analysis). To ensure that the results are robust, we compared the results between analyses where one effect size was selected from each study, versus where the other effect size was selected from the studies. In the same example of De Castella et al. (2013), we performed a moderator analysis by selecting one effect size (e.g. personal beliefs) and reported the results. Another moderator analysis was performed with the other effect size (e.g. general beliefs) included, and we compared the results of these two analyses for comparability (see Supplementary Material C). We included the study design as a moderator only for the cognitive reappraisal and suppression analyses due to the limited number of longitudinal studies on other ER strategies ($k = 1$ for avoidance, $k = 2$ for rumination, $k = 0$ for acceptance).

Data analysis

We performed five separate random-effects meta-analyses to examine the relationships between emotion malleability beliefs and the five ER strategies, respectively. For all analyses, correlation coefficients were used as the main effect size, and other statistics were converted to Pearson *r*. We used Fisher's *Z*-transformed values in the analyses and then back-transformed these values to *r* to make the interpretation easier. Restricted maximum likelihood (REML) was used to estimate the random-effects variance (τ^2), and 95% confidence intervals (CI) were calculated. Additionally, a 95% prediction interval was computed as it provides the probable range of true effects/underlying correlations with the wider population (IntHout et al., 2016). A sensitivity analysis was performed to test the impact of the outliers. We evaluated heterogeneity across the included studies, using the *Q* test and I^2 statistics. Significant *Q* test indicates the presence of between-study variability in effect sizes, and I^2 statistics denotes the proportion of total variation due to between-study variation. Furthermore, publication bias was assessed through a funnel plot and Egger's regression test (Egger et al., 1997). Cohen (1992)'s conventions were used to interpret the magnitude of relationships: .10 as small, .30 as medium, and .50 as large.

We used the TSSEM to test whether ER strategies mediate the relationship between emotion malleability beliefs and psychological distress. In the model, we included ER strategies significantly associated with emotion malleability beliefs based on the results

from our meta-analyses. TSSEM had two stages. In the first stage, correlation matrices from the included studies were combined into a pooled correlation matrix. Missing data (e.g. when studies reported or examined only parts of the correlations among the variables of interest) was handled by the maximum likelihood method. In the second stage using a random-effects model, the mediation model was fitted to the pooled correlation matrix from the first stage. To examine indirect, direct, and total effects, we used the 95% likelihood-based CIs. The estimates were significant when their 95% CIs did not include zero. Although we acknowledge that the optimal way to examine a mediation model is via longitudinal analysis (Maxwell & Cole, 2007), we included only cross-sectional studies in TSSEM due to a paucity of longitudinal studies and to increase homogeneity among the included studies. One longitudinal study (De France & Hollenstein, 2021) was removed as it did not measure a cross-sectional relationship between emotion malleability beliefs and ER strategies. All statistical analyses were performed with the metaSEM (Cheung, 2015) and metafor (Viechtbauer, 2010) packages in R software version 4.2.1 (R Core Team, 2020).

Results[3]

Characteristics of the included studies of meta-analyses and the TSSEM

A total of 56 studies were included in the current analyses, with 37 articles included in the meta-analyses and 55 articles in the TSSEM. Among the included studies, 18 studies were only included in the TSSEM as they assessed emotion malleability beliefs and psychological distress without measuring ER strategies. Five studies examined longitudinal relationships between emotion malleability beliefs and an ER strategy(s), and the measurement intervals between emotion malleability beliefs and an ER strategy(s) of five longitudinal studies ranged from 1 day (De France & Hollenstein, 2021) to 4 years (Gutentag et al., 2022). Among the 37 studies that reported the emotion malleability beliefs and ER strategy relationship(s), about 58% of articles assessed two or more ER strategies. The detailed characteristics of the included articles are presented in Supplementary material A and the list of the included studies is in Supplementary B.

The overall results of the following meta-analyses were summarised in Table 1 (See Supplementary material D for forest plots).

Emotion malleability beliefs and cognitive reappraisal

The emotion malleability beliefs-cognitive reappraisal analysis included 31 studies with 38 effect sizes and 12,575 participants in total (*mean* sample size [*SD*] = 330.92 [303.93], *range* = 29–1,353, *mean* age = 23.73 [7.83], female ratio = .61 [.13]). Two studies did not report the average age (Romero, 2013 study 3; Kneeland & Dovidio, 2020) and one study did not report the female ratio (Schroder et al., 2015).

Results showed a significant medium positive correlation between emotion malleability beliefs and reappraisal across studies, with significant heterogeneity within studies, $r = .31$, 95% CI [.26, .35], $z = 12.93$, $p < .001$, 95% predict on interval [.05, .53], $Q(37) = 250.40$, $p < .001$, $I^2 = 85.18$. That is, those who more strongly believe that emotions are malleable tend to use cognitive reappraisal more. Since one discrepant effect size was detected (Zerwas et al., 2023 sample 3 in study 1), the same analysis was re-performed without the outlier. The result was comparable: $r = .30$, 95% CI [.26, .34], $z = 13.59$, $p < .001$, 95% prediction interval [.07, .49]. Using mixed models, we tested if the correlation coefficients were moderated by the emotion malleability beliefs type (first vs. general/second), study design (cross-sectional vs. longitudinal), gender, and age. To test beliefs type, we excluded 4 effect sizes from 3 studies that measured emotion malleability beliefs using a questionnaire that included

Table 1. Results of meta-analyses on the relationship between emotion malleability beliefs and ER strategies.

	k	Effect size (*r*)	95% LLCI	95% ULCI	*Z*	*p*	95% LLPI	95% ULPI	Q-statistic *p*-value
Cognitive reappraisal	38	.31	.26	.35	12.93	<.001	.05	.53	<.001
Suppression	28	−.09	−.13	−.05	−4.29	<.001	−.25	.08	<.001
Avoidance	13	−.29	−.35	−.24	−10.08	<.001	−.43	−.15	.027
Rumination	11	−.13	−.23	−.03	−2.57	.010	−.42	.18	<.001
Acceptance	7	.10	−.01	.19	1.86	.062	−.16	.34	<.001

Note. ER, Emotion regulation; LLCI, Lower limit of confidence interval; ULCI, Upper limit of confidence interval; LLPI, Lower limit of prediction interval; ULPI, Upper limit of prediction interval.

mixed (both personal and general) statements (Hama, 2016; Livingstone, 2012; Skymba et al., 2022 study 1 & 2). Study design, $Q(1) = 2.75$, $p = .097$, gender, $Q(1) = 1.47$, $p = .225$, and age, $Q(1) = .92$, $p = .338$, were not significant. Although beliefs type was a significant moderator, $Q(1) = 5.04$, $p = .025$, the overlapped confidence intervals indicated non-significant difference in the relationships with emotion malleability beliefs between the two: $r = .36$, 95% CI [.30, .42], $z = 10.23$, $p < .001$ for personal emotion malleability beliefs, $r = .27$, 95% CI [.21, .32], $z = 9.38$, $p < .001$ for general emotion malleability beliefs.

Emotion malleability beliefs and suppression

For the emotion malleability beliefs-suppression relationship analysis, 22 articles with 28 effect sizes and a total participant of 9,540 (*mean* sample size [*SD*] = 340.71 [276.35], *range* = 56–1,227, *mean* age = 23.93 [7.95], female ratio = .59 [.13]) were included. Four studies did not report either the mean age of the sample (Kneeland & Dovidio, 2020; Vuillier et al., 2021) or/and female ratio (Schroder et al., 2015 study2; Vuillier et al., 2021).

Results from a random-effects model showed a significant small negative correlation between emotion malleability beliefs and suppression across studies with significant heterogeneity between the samples, $r = -.09$, 95% CI [−.13, −.05], $z = -4.29$, $p < .001$, $Q(27) = 81.06$, $p < .001$, $I^2 = 70.21$. However, the 95% prediction interval [−.25, .08] included zero, indicating that the negative relationship between emotion malleability beliefs and suppression may not hold in future samples. Sensitivity analysis did not detect a significant outlier. Four mixed models were computed with beliefs type (excluding mixed emotion malleability beliefs, Hama, 2016; Livingstone, 2012), study design, age, and gender as moderators. Gender was a marginally significant moderator, $Q(1) = 3.64$, $p = .056$, $b = .38$, $SE = .16$, $z = 1.92$, indicating that the emotion malleability beliefs and suppression relationship was stronger when a study had a higher female ratio. All the other moderators were not significant: $Q(1) = .71$, $p = .400$ for emotion malleability beliefs type, $Q(1) = 1.32$, $p = .252$ for study design, $Q(1) = 1.13$, $p = .288$ for age.

Emotion malleability beliefs and avoidance

Eleven studies were included with 13 effect sizes and 2,473 participants in total (*mean* sample size [*SD*] = 190.23 [150.19], *range* = 56–616, *mean* age = 25.85 [9.71], female ratio = .66 [.17]) with one study not reporting the average age of the sample (Zimmermann, 2021).

A random-effects model yielded a significant medium negative correlation between emotion malleability beliefs and avoidance, $r = -.29$, 95% CI [−.35, −.24], $z = -10.08$, $p < .001$, 95% prediction interval [−.43, −.15]. There was significant heterogeneity among the studies, $Q(12) = 23.04$, $p = .027$, $I^2 = 47.90$. We re-ran the analysis without one discrepant effect size (De Castella et al., 2018 study 2), and the overall result was comparable, $r = -.27$, 95% CI [−.31, −.23], $z = -13.34$, $p < .001$, 95% prediction interval [−.31, −.23]. Results from mixed models showed no significant moderators: $Q(1) = 1.06$, $p = .304$ for beliefs type (excluding mixed emotion malleability beliefs, Skymba et al., 2022 study 2), and $Q(1) = .22$, $p = .642$ for gender, and $Q(1) = 1.65$, $p = .199$ for age.

Emotion malleability beliefs and rumination

Nine articles with 11 effect sizes were included in the emotion malleability beliefs-rumination analysis with a total of 3,063 participants (*mean* sample size [*SD*] = 278.45 [166.86], *range* = 102–616, *mean* age = 27.46 [10.49], female ratio = .56 [.11]). The mean sample age was not reported in one study (Kneeland & Dovidio, 2020).

We found a significant small negative correlation between emotion malleability beliefs and rumination, $r = -.13$, 95% CI [−.23, −.03], $z = -10.56$, $p = .01$, with significant heterogeneity between studies, $Q(10) = 68.67$, $p < .001$, $I^2 = 86.05$. Based on the 95% prediction interval [−.42, .18] that contained zero and the opposite effect, we cannot conclude that believing that emotions are changeable will be negatively associated with the use of rumination in future samples. No significant outliers were observed in the sensitivity analysis. Results from mixed models showed that emotion malleability beliefs type (excluding mixed emotion malleability beliefs, Hama, 2016; Livingstone, 2012; Skymba et al., 2022 study 1 & 2) and gender were not significant moderators: $Q(1) = .66$, $p = .413$ for beliefs type and $Q(1) = .47$, $p = .491$ for gender. However, age was a marginally significant moderator, $Q(1) = 3.62$, $p = .057$, $b = .01$, $SE = .01$, $z = 1.90$, showing that the emotion malleability beliefs and rumination relationship was stronger in older samples.

Emotion malleability beliefs and acceptance

Six articles with 7 effect sizes were included with 3,097 participants (*mean* sample size [*SD*] = 442.42 [410.63],

range = 102–1,297, *mean* age = 32.27 [8.38], female ratio = .58 [.11]).

We found an overall non-significant relationship between emotion malleability beliefs and acceptance, $r = .10$, 95% CI [−.01, .19], $z = 1.86$, $p = .062$, with significant heterogeneity among samples, $Q(6) = 35.24$, $p < .001$, $I^2 = 85.11$. After removing one outlier (Kneeland et al., 2016a), emotion malleability beliefs had a significant small and positive relationship with acceptance, $r = .14$, 95% CI [.08, .21], $z = 4.23$, $p < .001$, 95% prediction interval [.00, .28]. While gender was not significant, $Q(1) = 1.75$, $p = .185$, age significantly moderated the relationship, $Q(1) = 3.93$, $p = .047$, $b = -.01$, $SE = .005$, $z = -1.98$, showing that the emotion malleability beliefs-acceptance relationship is stronger in younger samples. Beliefs type was not tested as a moderator because only one study examined personal emotion malleability beliefs in relation to acceptance.

Publication bias

We used visual inspection of the funnel plot and Egger's regression test to check whether studies with smaller sample sizes reported larger effect sizes (publication bias), which is reflected as an asymmetrical distribution of effect sizes when plotting effect sizes on *X*-axis and variance (sample size) on *Y*-axis. The distributions of the effect sizes appeared symmetrical for all the analyses (See Figure 2 for funnel plots). This was confirmed by the regression tests, $z = .79$, $p = .429$ for the cognitive reappraisal, $z = -.52$, $p = .603$ for the suppression, $z = -.88$, $p = .377$ for the avoidance, $z = .27$, $p = .784$ for the rumination, and $z = -1.48$, $p = .136$ for the acceptance analyses.

Summary of experimental studies

Four experimental studies examined whether emotion malleability beliefs manipulation caused changes in the use of ER strategies during an emotion-evoking task (Kneeland et al., 2016a, 2016b; Kneeland & Simpson, 2022; Wilson, 2019). Emotion malleability beliefs were manipulated by reading passages (Kneeland et al., 2016a, 2016b; Kneeland & Simpson, 2022) and watching videos (Wilson, 2019) that convey "fixed (fixed emotion condition)" or "malleable (malleable emotion condition)" nature of emotion. The results from these studies were mixed. Results from two studies showed that participants in the malleable emotion condition reported greater use of cognitive reappraisal, compared to those in the fixed condition, while there was no significant group difference in expressive suppression (Kneeland et al., 2016b), rumination, and acceptance (Kneeland & Simpson, 2022). By contrast, Kneeland et al. (2016a) showed that participants in the malleable emotion condition were less likely to use acceptance, relative to those in the fixed condition, while there was no significant group difference in reappraisal, cognitive suppression, and rumination. Finally, these results were not replicated in Wilson (2019) where no significant differences between the fixed and malleable emotion conditions were found in the use of cognitive reappraisal (study 1–3) as well as rumination and acceptance (study 1 & 3) during an emotional task.

TSSEM: ER strategies mediating the emotion malleability beliefs-Psychological Distress Relationship

Given that results from the current meta-analyses showed cognitive reappraisal and avoidance were two ER strategies significantly correlated with emotion malleability beliefs based on both summary effect estimates (pooled correlation coefficient and 95% CI) and 95% prediction intervals and not significantly influenced by outliers, a mediation model was tested with cognitive reappraisal and avoidance as potential mediators in the relationship between emotion malleability beliefs and psychological distress. Fifty-five studies ($k = 66$, including sub-studies and multiple samples in a study) with 135 observed statistics were included.

In the first stage, pooled correlations among variables were estimated. Greater emotion malleability beliefs were significantly associated with more frequent use of cognitive reappraisal and less frequent use of avoidance, which was in line with the results from our meta-analyses. Consistent with results from a previous meta-analysis (Burnette et al., 2020), emotion malleability beliefs had a significant negative relationship with psychological distress, meaning that those who strongly believe emotions are changeable are less likely to experience psychological distress. Further, both greater use of cognitive reappraisal and lower levels of avoidance were significantly associated with decreased psychological distress. There was significant heterogeneity, $Q(129) = 683.37$, $p < .001$. Detailed results are presented in Table 2.

In the second stage, a path model was tested with cognitive reappraisal and avoidance as mediators. The overall model fits the data well, $\chi^2(1) = .06$, $p = .813$,

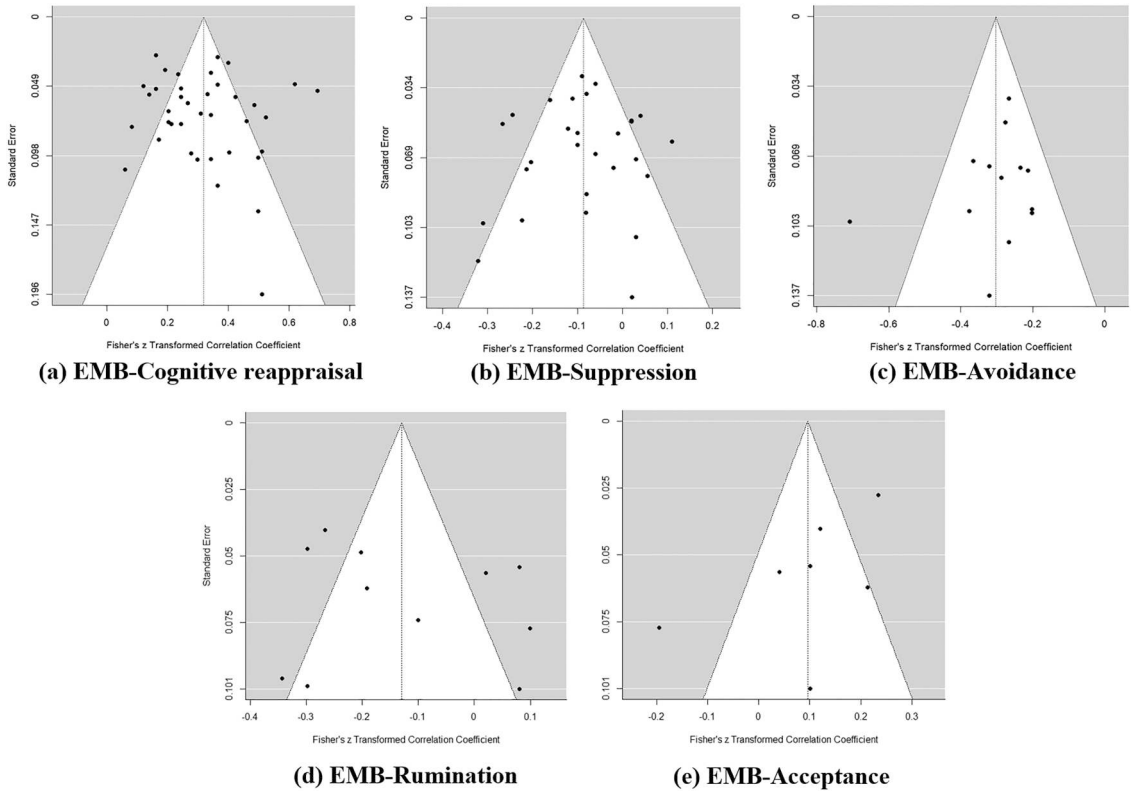

Figure 2. Funnel plots of standard error by Fisher's Z-transformed correlation coefficients.
Note. EMB, emotion malleability beliefs.

RMSEA = 0.00, CFI = 1.00, TLI = 1.00. We estimated the indirect effects of emotion malleability beliefs on psychological distress via cognitive reappraisal and avoidance, respectively. For cognitive reappraisal, the total effect of emotion malleability beliefs on psychological distress was significant (c path = −.20, 95% CI [−.25, −.14]). Both indirect effect (a*b path = −.05, 95% CI [−.07, −.04]) and direct effect (c′ path = −.14, 95% CI [−.20, −.08], which decreased relative to c path) were significant, indicating that the use of cognitive reappraisal partially mediated the relationship between emotion malleability beliefs and psychological distress. Likewise, the significance of indirect effect (a*b path = −.09, 95% CI [−.14, −.04]) and direct effect (c′ path = −.14, 95% CI [−.20, −.08]), which decreased relative to the total effect (c path = −.23, 95% CI [−.27, −.19]), indicated that avoidance partially mediated the emotion malleability beliefs-distress relationship. Figure 3 illustrates the overall results of the TSSEM analysis.

Summary of longitudinal studies investigating cognitive reappraisal and avoidance as a mediator[4]

Four longitudinal studies examined the mediation of ER strategies in the emotion malleability beliefs-distress relationship (De France & Hollenstein, 2021;

Table 2. Pooled correlations among emotion malleability beliefs, ER strategies, and psychological distress.

	EMB	Cognitive reappraisal	Avoidance	Psychological distress
EMB	–			
Cognitive reappraisal	.30***	–		
Avoidance	−.29***	−.07	–	
Psychological distress	−.29***	−.25***	.36***	–

Note. EMB, Emotion Malleability Beliefs; ER, Emotion Regulation.
*** $p < .001$.

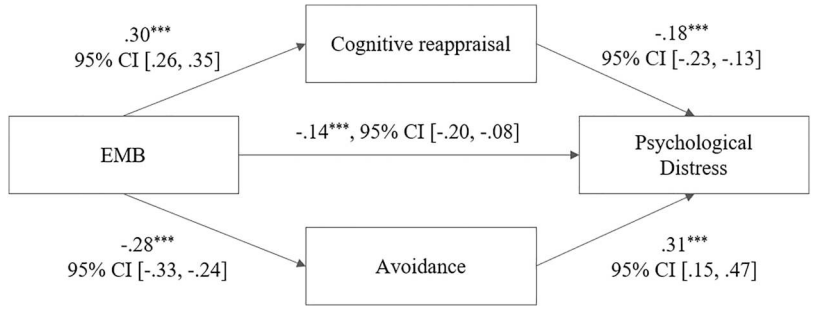

Figure 3. Path diagram of the stage two mediation model of the TSSEM with cognitive reappraisal and avoidance as mediators between EMB and psychological distress.

Note. EMB, Emotion Malleability Beliefs; TSSEM, two-stage meta-analytic structural equation modelling. Standardised path coefficients were presented with 95% confidential intervals in brackets. $^{***}p < .001$.

Ford et al., 2018; Kneeland & Dovidio, 2020; Zimmermann et al., 2021). Among them, three of the studies employed half-longitudinal design in which the temporal interval was between emotion malleability beliefs-ER or ER-psychological distress, rather than between all three variables (Ford et al., 2018; Kneeland & Dovidio, 2020; Zimmermann et al., 2021). The average time interval across the four studies was 235.75 days. Four studies tested cognitive reappraisal and one study examined avoidance as a mediator. Cognitive reappraisal significantly mediated the relationship between emotion malleability beliefs and psychological distress in three studies (De France & Hollenstein, 2021; Ford et al., 2018; Kneeland & Dovidio, 2020). However, this finding was not replicated in Zimmermann et al. (2021)'s study. Instead, the authors found that avoidance significantly mediated the emotion malleability beliefs-distress relationship.

Discussion

Emotion malleability beliefs has been theorised to play a significant role in psychological health by guiding the overall ER processes, including the use of ER strategies (Ford & Gross, 2018, 2019; Kneeland, Dovidio, et al., 2016). Using a meta-analysis and TSSEM, this study aimed to examine the relationships between emotion malleability beliefs and the five ER strategies (cognitive reappraisal, suppression, avoidance, rumination, and acceptance), and whether the relationship between the malleability beliefs and psychological distress would be mediated by the use of ER strategies. The main findings are as follows: (1) Results from meta-analyses based on both summary effect estimates and 95% prediction interval revealed that cognitive reappraisal and avoidance had significant relationships with emotion malleability beliefs: those who more strongly believe that emotions are malleable more likely to use cognitive reappraisal and less likely to use avoidance when regulating their emotions. (2) The TSSEM results showed that both cognitive reappraisal and avoidance partially mediated the relationship between emotion malleability beliefs and psychological distress.

Firstly, results from our meta-analyses confirmed that emotion malleability beliefs are crucial factors associated with individual differences in the use of ER strategies. These findings also supported the idea that emotion malleability beliefs have distinct relationships with the five ER strategies. Emotion malleability beliefs had negative relationships with putatively unhelpful ER strategies (particularly with avoidance) while it had positive relationships with putatively helpful strategies (particularly with cognitive reappraisal). Notably, the most pronounced results were observed with reappraisal and avoidance, suggesting a potentially stronger relationship of these two strategies with emotion malleability beliefs compared to others. Dweck (2000) argued that individuals with higher malleability beliefs tend to invest more effort in self-regulation, as they believe that regulatory outcomes are more malleable and, consequently, attainable. Accordingly, cognitive reappraisal, recognised for its cognitive demands and efforts (e.g. requiring the ability to inhibit irrelevant information; Cohen et al., 2014; Joormann & Gotlib, 2010), may have a more robust association with emotion malleability beliefs than less effortful strategies. In contrast, avoidance has been identified as a characteristic behaviour in individuals with limited perceived control (e.g. Bandura, 1997; De Castella et al., 2018),

and thus it may demonstrate a stronger negative association with the belief that emotions are controllable/malleable, compared to other strategies.

Why would believing that emotions are malleable be associated with a putatively beneficial pattern of using ER strategies for psychological health? One possible explanation is that emotion malleability beliefs have a causal relationship with ER strategy use via ER self-efficacy and ER-related motivation. Malleability beliefs about emotions are necessary for a person to believe that they can successfully change their current emotions to their desired ones when needed (ER self-efficacy). Dweck (2000) maintained that holding these beliefs leads to an increased willingness to initiate and continue the efforts to achieve self-regulatory outcomes (ER motivation). Similarly, according to self-efficacy theory (Bandura, 1997; Ozer & Bandura, 1990), individuals choose to actively engage with a situation/activity when they believe they can successfully control it. Previous research revealed that malleability beliefs in overall human attributes are associated with greater self-regulatory motivation (e.g. Blackwell et al., 2007), and emotion malleability beliefs and general ER self-efficacy are positively correlated (Tamir et al., 2007). It is possible that greater emotion malleability beliefs predict greater confidence in employing active strategies and increased motivation to exert the needed efforts, and in turn may predict a greater likelihood of engaging with an emotion or/and emotion-evoking situation by actively modifying one's perspectives about them. On the contrary, those who believe that emotions are relatively uncontrollable may have lower levels of self-efficacy in employing putatively helpful strategies and decreased motivation to persist in ER, and therefore may avoid an emotion or/and the emotion-evoking situation.

To confirm the causality between malleability beliefs and the use of ER strategies, experimental studies are necessary. Previous studies produced conflicting results on the influence of beliefs manipulation on cognitive reappraisal and acceptance while the manipulation did not change the use of rumination and suppression across studies (Kneeland et al., 2016a, 2016b; Kneeland & Simpson, 2022; Wilson, 2019). Although we cannot rule out the possibility that these results indicate a weak or non-significant causal relationship between emotion malleability beliefs and ER strategies, the finding may have been influenced by a relatively brief manipulation of emotion malleability beliefs. Participants in previous studies received information about malleable vs. fixed mindsets of emotion via videos and passages. However, a person's emotion malleability beliefs may require a more intense manipulation to produce meaningful changes relevant to the beliefs. Studies using relatively more intense manipulations of malleability beliefs (e.g. two 25-min online sessions in which various aspects of malleability beliefs of intelligence were discussed; Yeager et al., 2019) showed significant decreases in negative affect and psychological distress (see Burnette et al., 2023 for review). It is possible that a relatively longer manipulation may more reliably change emotion malleability beliefs that can influence the use of ER strategies.

Another equally possible explanation is that there exist bi-directional associations between emotion malleability beliefs and ER strategies. We tested a model that posits emotion malleability beliefs predicting the use of ER strategies where we found a significant relationship between emotion malleability beliefs and ER strategies in both longitudinal and cross-sectional designs (e.g. cognitive reappraisal and suppression); however, effective ER may also predict emotion malleability beliefs. Results from research on self-efficacy theory showed that not only does a person's higher self-efficacy help engage in behaviours that increase the likelihood of success, but more success experiences also produce the person's strong sense of their ability to achieve the wanted outcomes (e.g. Bandura, 1994; Maddux, 2016). It is possible that individuals who habitually use ER strategies that successfully reduce negative emotions are more likely to believe that emotions are malleable due to their successful experiences in ER. In turn, they may more often employ active and potentially effective strategies as they believe the wanted outcome is feasible (emotion is controllable). Indeed, Gutentag et al. (2022) showed that students who used cognitive reappraisal more frequently prior to entering college were more likely to believe that emotions are relatively malleable at the end of college, while such pattern was not found with expressive suppression. This idea of the bi-directional relationships between emotion malleability beliefs and ER needs further empirical investigation with other ER strategies. For example, a longitudinal study can assess both emotion malleability beliefs and ER strategies simultaneously across multiple waves, allowing for an examination of the reciprocal relationships between the two.

Secondly, our results from the TSSEM showed that emotion malleability beliefs predicted psychological

distress partially through cognitive reappraisal and avoidance. These results are consistent with the theoretical model of beliefs about emotions (Ford & Gross, 2019; Kneeland, Dovidio, et al., 2016) that posits emotion malleability beliefs influence emotional distress by guiding the overall ER processes. It should be noted that, however, this study included only cross-sectional studies in the TSSEM, and a longitudinal mediation model should ideally be tested with longitudinal data (Maxwell & Cole, 2007). Since a lacking number of longitudinal studies showed inconsistent findings on the mediation of limited ER strategies in the malleability beliefs-distress relationship, more longitudinal studies with a broader range of ER strategies are needed to test the longitudinal mediation model.

Lastly, our results have significant clinical implications. The current study showed that emotion malleability beliefs is one of the factors that can explain individual differences in the use of ER strategies. Thus, addressing emotion malleability beliefs could be an important target for those who struggle with ER. Beliefs about emotions have already been addressed in various psychological interventions, including dialectical behaviour therapy (DBT; Linehan et al., 1999) and emotional schema therapy (Leahy, 2016). Previous studies revealed that individuals' emotion malleability beliefs of anxiety significantly increased after cognitive behavioural therapy-based treatments (De Castella et al., 2015; Reffi et al., 2020; Schroder et al., 2019). Furthermore, post-treatment emotion malleability beliefs of anxiety were significantly associated with post-treatment anxiety symptoms (De Castella et al., 2015; Reffi et al., 2020). Schroder (2021) suggested that malleability beliefs are related to a person's greater willingness to tolerate difficult emotions and can serve as a predictor of treatment motivation and outcomes. Accordingly, assessing these beliefs in therapy can provide clinicians with information on a client's general reactions to difficult emotions and relevant behavioural responses, which are the essential treatment targets (Schroder, 2021). Building upon previous research highlighting the clinical implications of malleability beliefs, we also propose that future clinical studies are necessary to examine improved ER as a potential mechanism of changes in emotion malleability beliefs and their relation to symptom improvement.

This study has several limitations. Firstly, due to the correlational nature of the included studies, the causal relationship could not be ascertained. Our systematic literature search yielded only four experimental studies (Kneeland et al. 2016a, 2016b; Kneeland & Simpson, 2022; Wilson, 2019). More experimental studies are needed to confirm the causal relationship between emotion malleability beliefs and various ER strategies. Secondly, this study explored only a limited number of moderators, and there may be other potential moderators. For example, culture and cultural values may moderate the relationships between emotion malleability beliefs and ER, as they can shape the overall emotional experiences and ER processes (English & John, 2013; Ford et al., 2015). It is possible that emotion malleability beliefs may not predict the less frequent use of expressive suppression in East Asian culture where controlling emotional expression is highly valued (Eid & Diener, 2001). Unfortunately, since most of the included studies were conducted in Western countries (96.7%), we were not able to test culture as a moderator. Relatedly, this study was not designed to provide explanations for the significant moderation of age (for rumination and acceptance) as well as gender (for suppression) in emotion malleability beliefs-ER relationships. We suggest a future study delve into the opposite patterns in the moderation of age: the emotion malleability beliefs-acceptance correlation was stronger in younger samples, while the negative emotion malleability beliefs-rumination relationship was stronger in older samples.

Thirdly, although contextual factors were not the focus of this study, it could be important to investigate how emotion malleability beliefs might interact with contextual factors in relation to emotion regulation strategies and distress. Previous research has argued that context plays a crucial role in understanding the adaptiveness of emotion regulation strategies (e.g. Aldao 2013; Haines et al., 2016; Troy et al., 2013). For instance, cognitive reappraisal was found to be beneficial only in situations perceived as uncontrollable, whereas using cognitive reappraisal in controllable stressful situations was associated with greater depression (Troy et al., 2013). Although Ortner and Pennekamp (2020) showed that individuals with strong emotion malleability beliefs were less likely to use expressive suppression and more likely to use reappraisal as the perceived importance of events increased, limited research has examined emotion malleability beliefs in relation to contextual factors. We suggest that future studies delve into how contextual factors, such as situational controllability, moderate

the relationship between emotion malleability beliefs and emotion regulation strategies as well as distress. For example, it is possible that individuals high in emotion malleability beliefs may be more likely to use cognitive reappraisal as their perceived situational control decreases, whereas the use of cognitive reappraisal by those with low emotion malleability beliefs might remain unchanged irrespective of perceived situational control due to their persistently low beliefs regarding regulatory outcomes, emotions. We encourage future studies to explore this idea. Lastly, given that emotion malleability beliefs have been investigated under diverse names, it is possible that we overlooked relevant studies assessing these beliefs using terms not included in our search, despite our supplementary search via Google Scholar.

Despite these limitations, our meta-analytic study is novel in quantitatively summarising the relationships between emotion malleability beliefs and five discrete ER strategies. Further, this study was the first to use the TSSEM and test a theory of beliefs about emotion that emotion malleability beliefs predict psychological distress via the use of ER strategies (Ford & Gross, 2019; Kneeland, Dovidio, et al., 2016). Focusing on emotion malleability beliefs within ER research presents the importance of investigating factors that can explain individual differences in the use of ER strategies, which can help us understand why individuals with ER difficulties show putatively unhelpful patterns of ER (e.g. employing more ineffective and less effective ER strategies when needed). We believe that emotion malleability beliefs are particularly important in therapeutic contexts for individuals experiencing ER-related difficulties and psychosocial distress as these beliefs themselves are malleable, which means they can improve via psychological treatment (De Castella et al., 2015; Reffi et al., 2020; Schroder et al., 2019). We call for greater attention to emotion malleability beliefs in clinical intervention research as well as research on ER.

Notes

1. Although Burnette et al. (2020)'s meta-analysis examined problem-solving (combined with reappraisal) as active coping in relation to growth mindsets in general, this study did not include problem-solving due to the paucity of previous work on emotion malleability beliefs that specifically assessed problem-solving.
2. For the current meta-analyses on the beliefs-ER relationships, we included all articles regardless of whether psychological distress was measured.
3. The results from moderator analyses in cognitive reappraisal (study design and belief type), suppression (study design), and avoidance (belief type) were consistent with those from the analyses involving the other sets of effect sizes (see Supplementary Material C for details).
4. Two studies examined expressive suppression as a mediator and showed conflicting results: suppression was a significant mediator in De France and Hollenstein (2021) but not in Ford et al. (2018). One study found that rumination significantly mediated the emotion malleability beliefs-distress relationship (Kneeland & Dovidio, 2020).

Contributors

Yunsu Kim: Conceptualisation, Formal analysis, and Writing-original draft; Sooyeon Kim: Data coding and Writing- review & editing; Sunkyung Yoon: Conceptualisation, Data coding, Formal analysis, and Writing- review & editing.

Data availability

Data used in this study is available at https://doi.org/10.17605/OSF.IO/2TZF3.

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