

**Cause or symptom? A longitudinal test of bi-directional relationships between  
emotion regulation strategies and mental health symptoms**

Amy Dawel\*<sup>1</sup>, Yiyun Shou<sup>1</sup>, Amelia Gulliver<sup>2</sup>, Nicolas Cherbuin<sup>3</sup>, Michelle Banfield<sup>2</sup>,  
Kristen Murray<sup>1</sup>, Alison L. Callear<sup>2</sup>, Alyssa R. Morse<sup>2</sup>, Louise M. Farrer<sup>2</sup>, Michael Smithson<sup>1</sup>

<sup>1</sup>Research School of Psychology, The Australian National University, Canberra, ACT,  
Australia.

<sup>2</sup>Centre for Mental Health Research, Research School of Population Health, The Australian  
National University, Canberra, ACT, Australia.

<sup>3</sup>Centre for Research on Ageing, Health and Wellbeing, Research School of Population  
Health, The Australian National University, Canberra, ACT, Australia.

\*Correspondence concerning this article should be addressed to Dr Amy Dawel,  
Research School of Psychology (building 39), The Australian National University, Canberra,  
ACT 2600, Australia. Email: [amy.dawel@anu.edu.au](mailto:amy.dawel@anu.edu.au)

*Prepublication version of manuscript as accepted to Emotion 2021.*

©American Psychological Association, 2021. This paper is not the copy of record and  
may not exactly replicate the authoritative document published in the APA journal. The  
final article is available, upon publication, at: <https://doi.org/10.1037/emo0001018>

**Author note**

This study was funded by the ANU College of Health and Medicine, ANU Research  
School of Psychology, and ANU Research School of Population Health. YS is supported by  
ARC DECRA DE180100015. LMF is supported by ARC DECRA DE190101382. AG and  
ARM are supported by funding provided by the ACT Health Directorate for ACACIA: The  
ACT Consumer and Carer Mental Health Research Unit. ALC is supported by NHMRC  
Fellowships 1122544 and 1173146. Thank you to Patrice Ford for research assistance with this  
project. We have no conflicts of interest to disclose.

### Abstract

Previous work has generally conceptualized emotion regulation as contributing to mental health outcomes, and not vice versa. The present study challenges this assumption by using a prospective design to investigate the directionality of underlying relationships between emotion regulation and mental health in the context of a major population-level stressor. We surveyed a large nationally representative sample of adults (18-91 years,  $N = 704$ ) at three one-month intervals across the acute lockdown phase of the COVID-19 pandemic in Australia, using standardized measures of depression and anxiety symptoms. At each time point, we also measured the use of two emotion regulation strategies—cognitive reappraisal and emotional suppression—previously associated with adaptive and maladaptive mental health outcomes respectively. We found cognitive reappraisal was unrelated to mental health symptoms. In contrast, greater emotional suppression was robustly associated with higher symptom levels for both depression and anxiety. Longitudinal analyses revealed this association reflected bi-directional relationships. Higher symptoms of depression and anxiety each predicted greater subsequent use of emotional suppression, and greater use of emotional suppression predicted higher subsequent symptoms. This bi-directionality suggests emotional suppression is both symptomatic and predictive of psychological distress. The lack of a relationship for cognitive reappraisal is discussed with respect to the pandemic context and evidence that high stress might reduce people's ability to use this strategy effectively. Given the strong emphasis on reappraisal in clinical practice, there is a critical need to understand for whom, what and when this strategy is helpful.

**Keywords:** reappraisal; suppression; depression; anxiety; coronavirus.

The ability to effectively regulate one's emotions is core to psychological wellbeing. Conversely, problems with emotion regulation are a transdiagnostic feature of psychopathological distress observed in many mental disorders, including depression and anxiety (Campbell-Sills et al., 2006; Cludius et al., 2020). Emotion regulation is often described in terms of helpful and unhelpful strategies, such as cognitive reappraisal and emotional suppression respectively. Unfortunately, the overriding focus on how emotion regulation contributes to psychological functioning has obscured the possibility that some psychopathologies might, in turn, drive emotion regulation strategies. For instance, emotional suppression, which is generally characterized as causing unhelpful or maladaptive outcomes, might be better understood as symptomatic of intense negative affect. It is important to understand the underlying nature of the association between different emotion regulation strategies and psychopathology because interventions that target emotion regulation are popular in clinical practice (Barlow et al., 2017; Wang et al., 2020). While targeting factors that have a significant causal role can be expected to modify psychopathology, targeting those that are simply epiphenomena will not (Cludius et al., 2020). Recent literature has also highlighted that no emotion regulation strategy is likely to be universally helpful or harmful across all contexts (e.g., Ford et al., 2019; Haines et al., 2016; McRae, 2016; Troy et al., 2013). For instance, it is unclear whether cognitive reappraisal is helpful in highly stressful contexts (Cavanagh, Fitzgerald & Urry, 2014; Troy & Mauss, 2011; Raio et al., 2013). In the present study, the COVID-19 pandemic provided us with a unique opportunity to investigate how emotion regulation strategies are associated with mental health during a population-level stressor.

### **Emotion Regulation Strategies: Reappraisal and Suppression**

The present study focuses on two emotion regulation strategies characterized by extensive theoretical and empirical work: cognitive reappraisal and emotional suppression

(Gross, 2013; Gross & John, 2003; John & Gross, 2004). *Reappraisal* involves reinterpreting an event or its outcomes to preemptively alter an anticipated emotional response. *Suppression* refers to any attempt to inhibit or hide the expression of emotions once they occur. The focus on these two strategies originated from Gross' process model of emotion regulation (Gross, 2001; Gross, 2015). A key point of Gross' theorizing is that people are driven to regulate their emotions when there is a mismatch between their desired or goal state and their anticipated or actual state (Gross, 2015). Thus, the aim of emotion regulation is to achieve the goal state (although it may not always be successful in doing so).

However, emotion regulation is not always associated with positive outcomes. Broadly speaking, the extensive body of empirical work on emotion regulation has associated reappraisal with positive psychological outcomes, but suppression with negative ones (Aldao et al., 2010; Gross, 2013; Gross & John, 2003; John & Gross, 2004; but cf. Ford et al., 2019; Haines et al., 2016; McRae, 2016; Troy et al., 2013; for arguments about strategy-situation fit). For instance, meta-analyses that have scrutinized the association between emotion regulation and psychopathology indicate that reappraisal and suppression are associated with adaptive and maladaptive mental health outcomes respectively (Aldao et al., 2010; Hu et al., 2014), including specifically for anxiety and depression (Aldao et al., 2010).

The vast majority of evidence supporting the association between these two emotion regulation strategies and their putative outcomes has either not tested the direction of this relationship (e.g., cross-sectional correlations; Gross & John, 2003) or only tested the relationship in one direction, with emotion regulation as the independent (e.g., experimental studies; John & Gross, 2004) or predictor variable (e.g., longitudinal work; Aldao & Nolen-Hoeksema, 2012; Brewer et al., 2016; Cameron & Overall, 2018; Kraaij et al., 2002). Implicit in this approach is the assumption that emotion regulation has *only* a causal role in mental

health. The idea that emotion regulation may be an outcome as well as a contributor to mental health symptoms has been largely overlooked.

### **Why Might Emotion Regulation Strategy Use be an *Outcome* of Psychological Distress?**

There are strong theoretical and empirical reasons suggesting that emotion regulation might be an outcome, not just a cause, of psychological distress. First, theorizing suggests emotion regulation strategies are actioned when there is a mismatch between how a person feels or anticipates feeling and how they want to feel (i.e., the goal state; Gross, 2015). A logical consequence of this argument is that anticipating or experiencing higher levels of unwanted emotions, such as intense worry in anxiety, or low mood in depression, should cause people to use emotion regulation strategies more frequently.

Supporting this line of argument, studies of spontaneous emotion regulation indicate people attempt to regulate their emotions more in situations where they are likely to be experiencing distressing emotions, or if they have a history of psychopathology. For instance, emotion regulation strategies are used more when viewing negative compared to positive film clips (Gruber et al., 2012; Volokhov & Demaree, 2010) or high compared to low intensity negative images (Milyavsky et al., 2019). Also, individuals in remission from a mood or anxiety disorder use reappraisal and suppression more than control participants without a prior diagnosis (when viewing negative film clips; Campbell-Sills et al., 2006; Ehring et al., 2010; Gruber et al., 2012). Previous longitudinal studies have also demonstrated associations between higher levels of mental health symptoms and greater subsequent use of suppression (in adolescents; De France et al., 2018; Larsen et al., 2012), although not reappraisal (in adolescents and adults; De France et al., 2018; Everaert & Joormann, 2020; Haines et al., 2016).

Additionally, recent empirical work has revealed large within-individual variation in the use of different emotion regulation strategies over short periods of time (Benson et al., 2019; Gross & John, 2003; Haines et al., 2016; Sheppes et al., 2011). Indeed, these studies

suggest the amount of within-individual variation may be greater than that between individuals. For instance, Benson et al. (2019) found almost two-thirds of the variation in how much individuals used suppression and cognitive reappraisal across different social situations was within-person variation. In the context of the present study, this high level of variation opens up the possibility that emotion regulation could be influenced by psychological functioning. All in all, there are compelling reasons to consider that emotion regulation might be an outcome of psychological distress. Evidence that emotion regulation is an outcome, not just a cause, of psychological functioning would reshape how these processes are conceptualized in clinical practice.

### **Present Study**

The present study was conducted during the acute lockdown phase of the COVID-19 pandemic in Australia. This situation provided a unique opportunity to survey the natural operation of emotion regulation in the context of a severe population-level stressor that saw significant elevations in mental health problems across the general population (Dawel et al., 2020; Pierce et al., 2020; Xiong et al., 2020). Our primary research question concerned the underlying directionality of established associations between two emotion regulation strategies—cognitive reappraisal and emotional suppression—and mental health symptoms. To investigate this directionality, we used a prospective longitudinal design, measuring emotion regulation and symptoms of depression and generalized anxiety three times at monthly intervals. In line with previous evidence we predicted that, overall, greater reappraisal and suppression would demonstrate univariate associations with lower and higher levels of mental health symptoms respectively. However, we reasoned that these associations might be confounding symptomatic with causal effects of emotion regulation. Our key prediction was that, because people are theoretically motivated to engage in emotion regulation when they wish to avoid or get rid of unwanted emotions, experiencing higher levels of mental health

symptoms at earlier time points would be associated with greater reappraisal and suppression at later time points.

## Method

### Participant recruitment and sample characteristics

The present study used data from Waves 2, 4 and 6 of The Australian National COVID-19 Mental Health, Behaviour and Risk Communication Survey (COVID-19 MHBRC; Batterham et al., 2021; Dawel et al., 2020). This longitudinal survey used quota sampling to obtain a sample representative of the Australian adult population by age, gender and geographical location (by state/territory), from a market panel managed by Qualtrics Research Services. The study was approved by The Australian National University Human Ethics Committee (protocol 2020/152).

The first survey wave was initiated at the end of March 2020 (Wave 1 = 28-31 March), with data collected fortnightly thereafter until the end of June 2020 (7 waves). To provide context, on 24-25 March 2020 in Australia non-essential businesses were ordered to close, Australians were encouraged to work from home, and banned from travelling overseas. Various state borders were closed across the period of the survey, and social distancing was widely practiced. By the time Wave 2 started on 11 April 2020, Australia was under full nationwide lockdown.

Our main analyses use data from the 704 participants<sup>1</sup> who had complete data on the emotion regulation, depression and anxiety measures for the three waves in which emotion regulation was measured (i.e., Waves 2, 4 and 6). Table 1 reports key demographics for this sample. Comparison with equivalent gender and age data from the Australian Bureau of

---

<sup>1</sup> The most complex model tested in this manuscript has 35 parameters. Based on the 20:1 data point to parameter ratio rule, the available  $N = 704$  in the current study is sufficient for stable test results. Also, a previous simulation study shows that CLPM with 3 waves of data performs well with  $N = 500$  (Wu, Carroll, & Chen, 2018). Power analyses used to determine  $N$  for the total Wave 1 sample are described in Dawel et al. (2020).

Statistics (2016) indicate we achieved good representation of the Australian population on these attributes, with the exception that younger and older adults were slightly under and over represented respectively. This pattern reflects greater attrition of younger adults and lower attrition of older adults from our Wave 1 sample (see Table 1 of Dawel et al., 2020 for Wave 1 sample demographics). Note, as in many areas of psychology, a considerable amount of previous work on emotion regulation has tested college student samples (e.g., Brewer et al., 2016; Gross & John, 2003; Milyavsky et al., 2019). In this context, our sample provides valuable representative data across the adult lifespan from 18 to 91 years of age. The large size and representative nature of our sample also allowed us to test the generalizability of our findings across gender and age cohorts.

**Table 1***Sample Demographics*

	Sample <i>n</i>	Sample %	(Pop. %) <sup>1</sup>
<b>Gender</b>			
Male	378	53.7	(49.3)
Female	326	46.3	(50.7)
<b>Age</b>			
18-34	143	20.3	(29.3)
35-44	126	17.9	(17.6)
45-54	128	18.2	(17.3)
55-64	142	20.2	(15.4)
65+	165	23.4	(20.5)
<b>Ethnicity</b>			
European/Caucasian	544	77.3	

---

Asian	89	12.6
Other/mixed	71	10.1
<b>Household income (pre-tax)</b>		
Up to \$300/week (around \$16,000/year)	46	6.5
\$300-\$575 per week (\$30,000/year)	104	14.8
\$576-\$1075 per week (\$56,000/year)	170	24.1
\$1076-\$1700 per week (\$88,000/year)	132	18.8
\$1701-\$2400 per week (\$125,000/year)	86	12.2
More than \$2400/week (\$125,000/year)	129	18.3
Prefer not to say	37	5.3

---

<sup>1</sup>Population data for gender and age are from the 2016 Australian Census (Australian Bureau of Statistics, 2016). Equivalent data for ethnicity and household income were not available.

## Design

At each wave, participants completed an online questionnaire administered by Qualtrics Research Services. Each survey took approximately 15-25 minutes to complete, depending on wave content. Here, we describe the three questionnaire measures used in the current analyses. The full project protocol and measures for Waves 1-7 can be found here: <https://psychology.anu.edu.au/research/projects/australian-national-covid-19-mental-health-behaviour-and-risk-communication-survey>.

## Questionnaires

**Emotion Regulation: Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) adapted to two-week timeframe.** We adapted the primary measure used for assessing habitual suppression and reappraisal, the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003), to the same two-week time window used for our measures of depression and anxiety. Participants were asked to indicate “Over the last 2 weeks, to what extent have you

used the following strategies to deal with your emotions...” from 1 *Strongly Disagree* to 7 *Strongly Agree*, for each of ten items adapted from the original ERQ (6 reappraisal items + 4 suppression items; Gross & John, 2003). We changed the wording of the original ERQ items only insofar as was needed to change the timeframe of reference from habitual use to the past two weeks. We did not change the statement content, just the temporal tense. For example, item 1 of the ERQ was changed from “When I want to feel more positive emotion (such as joy or amusement), I change what I’m thinking about.” to “When I wanted to feel more positive emotion (such as joy or amusement), I changed what I was thinking about.” (see Supplement S1 for all items). Total subscale scores are calculated by summing item scores, with higher scores indicative of greater use of reappraisal or suppression emotion regulation strategies.

**Depression: Patient Health Questionnaire (PHQ-9; Spitzer et al., 1999).** The PHQ-9 comprises nine items that ask how often someone has experienced symptoms associated with depression (e.g., “little interest or pleasure in doing things”, “feeling down, depressed, or hopeless”) over the last two weeks. Response options are: 0 = *Not at all*, 1 = *Several days*, 2 = *More than half the days*, 3 = *Nearly every day*. Total scale scores are calculated by summing item scores, with higher scores indicating higher levels of depression.

**Anxiety: Generalized Anxiety Disorder Screener (GAD-7; Spitzer et al., 2006).** The GAD-7 comprises seven items that ask how often someone has experienced symptoms associated with generalized anxiety disorder (e.g., “feeling nervous, anxious, or on edge”, “not being able to stop or control worrying”) over the last two weeks. Response options are: 0 = *Not at all*, 1 = *Several days*, 2 = *More than half the days*, 3 = *Nearly every day*. Total scale scores are calculated by summing item scores, with higher scores indicating higher levels of anxiety.

## Results

### Questionnaire Means, Range and Reliability

Table 2 reports the means, standard deviations, range of scores and internal reliability for each questionnaire measure at each wave for our main sample of  $N = 704$  (see Supplement S2 for descriptive statistics for all of the data that was useable at each wave, and comparison of main sample data with data excluded at each wave). In all cases, the actual range of scores was spread across the full potential range. Internal consistency was in the acceptable to good range for ERQ-suppression, and excellent for all other scales at every wave (Groth-Marnat, 2009).

**Table 2***Descriptive Statistics for Questionnaire Measures, N = 704*

Scale	Wave	<i>M</i>	<i>SD</i>	Range		Cronbach's $\alpha$	
				Actual	Potential	Actual <sup>1</sup>	Prior studies
<b>ERQ-suppression</b>							
	w2	15.9	4.8	4-28	4-28	.77	.68-.76 <sup>2</sup> , .76-.80 <sup>3</sup>
	w4	15.8	4.8	4-28		.81	
	w6	15.8	5.0	4-28		.84	
<b>ERQ-reappraisal</b>							
	w2	26.8	6.9	6-42	6-42	.92	.75-.82 <sup>2</sup> , .89-.90 <sup>3</sup>
	w4	26.4	6.8	6-42		.93	
	w6	27.0	6.8	6-42		.93	
<b>PHQ-9 (depression)</b>							
	w2	5.6	6.0	0-27	0-27	.92	.86-.89 <sup>4</sup> , .93 <sup>5</sup> , .92 <sup>6</sup>
	w4	5.1	5.7	0-27		.92	
	w6	4.6	5.6	0-27		.93	
<b>GAD-7 (anxiety)</b>							
	w2	4.5	5.0	0-21	0-21	.94	.92 <sup>5</sup> , .93 <sup>6</sup> , .85 <sup>7</sup> , .92 <sup>8</sup>
	w4	4.0	4.9	0-21		.94	
	w6	3.6	4.6	0-21		.94	

*Notes.* <sup>1</sup>There are minor differences in the *N* for Cronbach's  $\alpha$  values because these calculations did not tolerate any missing items, and some participants had missing data for a single item within a given scale. If a single item was missing from a scale with >5 items, then a total score was calculated as the average of the remaining item scores multiplied by the total number of items. Note, when there are few cases with missing values (as is the situation here), mean

imputation is a good method for dealing with missing data (Shrive et al., 2006).<sup>2</sup>(Gross & John, 2003).<sup>3</sup>(Preece et al., 2020).<sup>4</sup>(Kroenke et al., 2001).<sup>5</sup>(Batterham et al., 2017).<sup>6</sup>(van Spijker et al., 2014).<sup>7</sup>(Hinz et al., 2017).<sup>8</sup>(Spitzer et al., 2006).

### **Data analysis overview**

We first examined univariate associations between ERQ-suppression, ERQ-reappraisal, PHQ-9 (depression) and GAD-7 (anxiety) scores within and across waves. Because scores were non-normally distributed for every measure at every wave, we used Spearman's  $\rho$  correlations. The non-normality of the ERQ-suppression and ERQ-reappraisal score distributions was primarily due to a middle response bias (i.e., some participants responded "neutral" to every statement within the suppression and/or reappraisal subscales of the ERQ at one or more waves). To check our findings were robust to this response pattern, we reran all of our analyses excluding data from participants who showed a middle response bias for both ERQ subscales within any given wave (15.9% of the sample showed this pattern in at least one wave; 2.3% of the sample showed this pattern at all three waves). Removing the 15.9% of participants who showed a middle response bias on both measures within any single wave did not change the pattern of findings.

Next, we moved on to building cross-lagged panel models (CLPMs) to test the directionality of relationships between emotion regulation and mental health symptoms. Each model included data from all three waves of interest (2, 4 and 6) for one of our emotion regulation measures (ERQ-suppression or ERQ-reappraisal) and one of our mental health symptom measures (PHQ-9 for depression or GAD-7 for anxiety). We initially tested the relationships between these variables separately for Wave 2 to 4 and Wave 4 to 6, using linear regression models. Because the findings from these models were consistent with our final CLPMs, the results of regression analyses are reported in Supplement S3. Note, as is typical in non-clinical samples, the PHQ-9 and GAD-7 variables had high frequencies at their lowest

possible values, resulting in incorrigible positive skew. However, we have previously found with this dataset that using compound Poisson-gamma (Tweedie distribution) generalized linear models produces results which are consistent with linear models (Dawel et al., 2020), suggesting our linear regression models are robust to this skew. In the CLPMs we accounted for the non-normality of our variables by using maximum likelihood estimation with robust errors and Satorro-Bentler scaled test statistics. Standard CLPM models were constructed following Hamaker et al. (2015) and estimated using the lavaan package in R (Rosseel, 2012). The model fit was evaluated by comparing each CLPM model with a null model that assumed the specified emotion regulation and mental health variables were not associated across waves (i.e., the cross-lagged paths were removed), using robust Comparative Fit Index (CFI), Standardized Root Mean Square Residual (SRMR), AIC and BIC values. We also tested the stationarity of the relationships by comparing the standard CLPM model with a restricted model that constrained both the autoregressive and cross-lagged paths to be the same across waves. A non-substantial difference in model fit indicates stationarity. Finally, we examined gender differences by testing the moderation effects of gender on each path.

### **Univariate associations between emotion regulation strategies and mental health**

Table 3 reports Spearman's  $\rho$  correlations within each measure across waves, and between each measure within and across waves. To interpret the correlations, we used a Bonferroni corrected  $\alpha$  value of  $.05/9 = .006$  to adjust for the family of nine correlations within each pair of variables (e.g., 3 waves of ERQ-suppression x 3 waves of PHQ-9 = 9 correlations). As expected, greater suppression was significantly associated with higher levels of both depression and anxiety within and across every wave, with  $\rho$  ranging from .334 to .448, all  $ps < .001$ .

We also repeated these analyses using (1) Pearson's  $r$  (to facilitate comparisons with previous data), (2) all of the useable data from each wave (e.g., including data from participants

who responded at w2 and w4 but not w6), (3) excluding data from participants who showed a middle response bias on both ERQ subscales within any given wave, (4) for males and females separately, and (5) for each age cohort separately. Detailed results from these analyses are reported in Supplements S4-S8, and invariably show greater suppression was associated with higher levels of both depression and anxiety within and across every wave, with  $\rho$  ranging from .231 to .494, all  $ps < .01$ . Overall, these findings for suppression are highly consistent with past work associating suppression with maladaptive mental health outcomes.

However, in stark contrast, reappraisal did not show the expected adaptive relationship with mental health symptoms. Examining the correlations both within and across waves, there was not one instance in our main analyses (Table 3) where we observed a significant association between greater reappraisal and lower levels of depression or anxiety. The only correlation between reappraisal and depression or anxiety that was significant in our main analyses was in the opposite-to-expected direction: greater reappraisal at w2 was associated with *higher* anxiety at w2,  $\rho = .109, p = .004$ . Our Supplementary analyses also found minimal evidence of the expected adaptive relationship between reappraisal and depression or anxiety symptoms (see Supplement S9 for full evaluation of the evidence).

Finally, it is worth noting that each of the ERQ subscales correlated only moderately with itself across waves (average inter-wave  $\rho$  of .615 for reappraisal and .584 for suppression), consistent with our premise that the use of these strategies can change over relatively short periods of time. We also found that how much an individual's score changed on one of the ERQ subscales from wave to wave correlated with how much their score changed on the other subscale across the same time period: (w2 ERQ-suppression - w4 ERQ-suppression) was significantly correlated with (w2 ERQ-reappraisal - w4 ERQ-reappraisal),  $\rho = .348, p < .001$ , and (w4 ERQ-suppression - w6 ERQ-suppression) was significantly correlated with (w4 ERQ-reappraisal - w6 ERQ-reappraisal),  $\rho = .282, p < .001$ . These results indicate that if someone

reported using one strategy more (or less) they also reported using the other strategy more (or less) than they had at the previous wave.

**Table 3**

*Spearman's  $\rho$  Correlations Between Measures Within and Across Waves,  $N = 704$*

ERQ-reappraisal			ERQ-suppression			PHQ-9 (depression)			GAD-7 (anxiety)		
w2	w4	w6	w2	w4	w6	w2	w4	w6	w2	w4	
<b>ERQ-reappraisal</b>											
w4	.620***										
w6	.594***		.630***								
<b>ERQ-suppression</b>											
w2	.216***		.102		.029						
w4	.059	.186***		.060		.594***					
w6	.035	.054	.140***		.553***		.605***				
<b>PHQ-9 (depression)</b>											
w2	.033	-.024	.023		.367***		.339***		.381***		
w4	.040	-.013	.038		.334***		.388***		.398***		
w6	.041	-.003	.047		.345***		.398***		.448***		
<b>GAD-7 (anxiety)</b>											
w2	.109**		.040		.069		.354***		.343***		
w4	.072	.012		.040		.332***		.388***		.364***	
w6	.079	.009		.071		.326***		.364***		.430***	

Notes. \*\* $p < .006$ . \*\*\* $p < .001$ .

### **Do depression and anxiety symptom levels predict subsequent use of emotion regulation strategies, and vice versa?**

The core question in this study was whether the use of emotion regulation strategies is symptomatic, as well as causal, of depression and/or anxiety. Figure 1 reveals the answer to this question is yes for suppression, but no for reappraisal. Additional details of the CLPM

results, including 95% confidence intervals and model comparisons, are in Supplements S10-S11.

First, Figure 1A shows that higher levels of both depression and anxiety significantly predicted greater suppression at subsequent waves. In turn, greater suppression significantly predicted higher levels of depression and anxiety at subsequent waves, in three out of four instances. Together, these results support a bi-directional relationship between suppression and depression/anxiety.

In contrast, Figure 1B shows the use of reappraisal did not significantly predict depression nor anxiety at subsequent waves. Nor did depression or anxiety significantly predict the use of reappraisal at subsequent waves. Though surprising in the context of the broader literature (Aldao et al., 2010; Hu et al., 2014), the finding of no relationship between reappraisal and depression or anxiety is consistent with our univariate and regression results (see Supplements S3-8).

For both suppression and reappraisal, the tests of stationarity indicated that both the autoregressive and cross-lagged paths were not significantly different across waves. The AIC and BIC values all favored the more parsimonious models where the paths between variables were constrained to be the same across waves (Supplement S10).

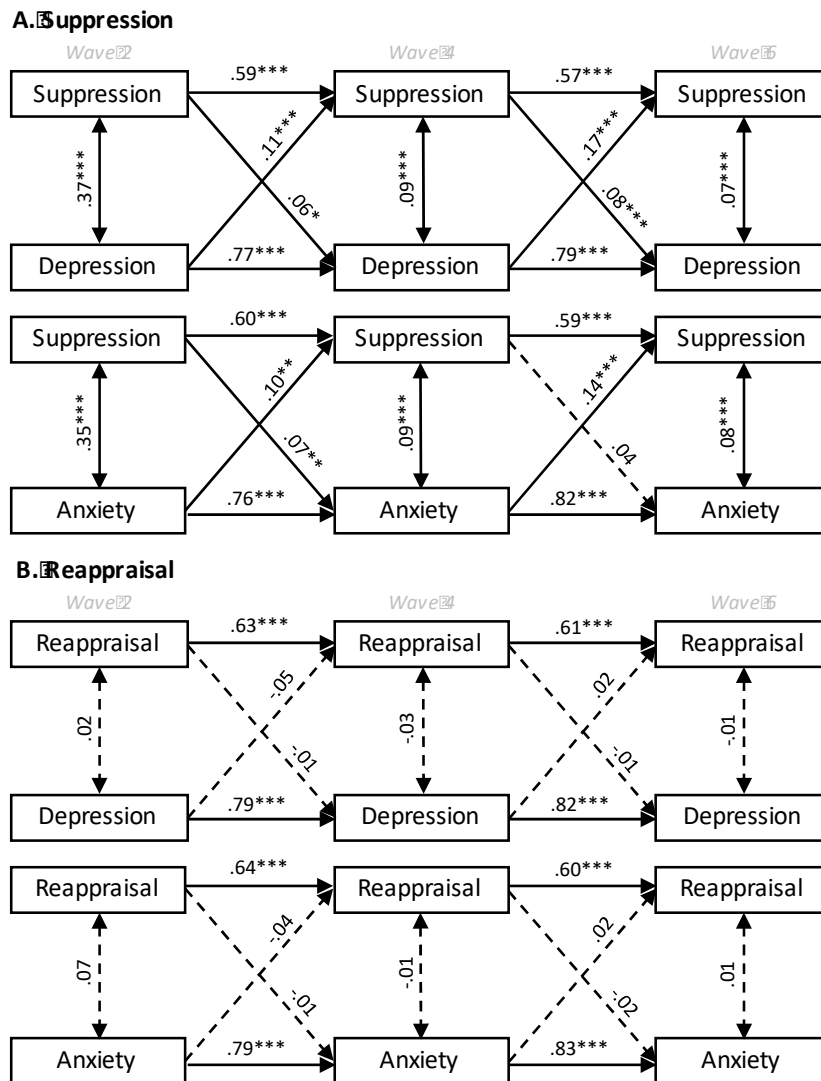
### **Gender differences**

Moderation analyses revealed some significant gender differences in the models (Supplement S10). First, anxiety at Wave 2 predicted suppression at Wave 4 more positively for males than females,  $\beta = -.068$ ,  $SE = .034$ ,  $CI_{95} = [-.134, -.002]$ ,  $p = .045$ . Second, suppression at Wave 4 predicted anxiety at Wave 6 more positively for males than females,  $\beta = -.046$ ,  $SE = .020$ ,  $CI_{95} = [-.086, -.006]$ ,  $p = .023$ . Third, depression at Wave 2 predicted depression at Wave 4 more positively for males than females, suppression model:  $\beta = -.076$ ,  $SE = .032$ ,  $CI_{95} = [-.139, -.013]$ ,  $p = .019$ ; reappraisal model:  $\beta = -.068$ ,  $SE = .029$ ,  $CI_{95} = [-.125, -.011]$ ,  $p =$

.020. Finally, reappraisal at Wave 4 predicted depression at Wave 6 more positively for males than females,  $\beta = -.041$ ,  $SE = .021$ ,  $CI_{95} = [-.081, -.001]$ ,  $p = .046$ .

**Figure 1**

*Cross-Lagged Panel Models (CLPMs) for depression and anxiety with (A) reappraisal and (B) suppression.*



*Notes.* Reappraisal = ERQ-reappraisal. Suppression = ERQ-suppression. Depression = PHQ-9. Anxiety = GAD-7. Estimates are standardized estimates. Unbroken lines indicate significant paths. Dashed lines indicate non-significant paths. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

### Discussion

The present study provides compelling evidence that the association between emotional suppression and mental health symptoms is bi-directional. Our key finding was that higher levels of depression or anxiety symptoms predicted greater subsequent use of emotional suppression. As causal theories of emotion regulation suggest, this relationship was also found to be significant in reverse. Importantly, stationarity tests showed these relationships involving suppression were stable across waves. In contrast, cognitive reappraisal was not associated with symptoms of mental disorders in our sample. This effect was robust; it held in univariate and longitudinal analyses, for males and females, and across age cohorts. While this finding conflicts with previous meta-analytic findings (Aldao et al., 2010; Hu et al., 2014), it is consistent with recent work showing reappraisal is not always associated with reduced mental health symptoms (e.g., Cavanagh, Fitzgerald & Urry, 2014; Haines et al., 2016).

Our hypothesis that emotion regulation strategy use might be symptomatic, not just causal, of psychopathological distress was supported for suppression. Higher depression and anxiety symptoms both predicted greater use of emotional suppression at later waves. However, there also remained a forward contribution of suppression to mental health symptoms. Together, these findings indicate that the well-established association between higher suppression and poorer mental health reflects a bi-directional relationship. The bi-directionality of this association may be one reason why effect sizes tend to be quite large in studies of suppression and mental health relative to some other emotion regulation strategies, including cognitive reappraisal, for which effects are smaller (Aldao et al., 2010). While further research is needed to tease apart how much each direction of effect contributes to the overall association between suppression and mental health, our results from a nationally representative adult sample suggest that both depression and anxiety symptoms predict suppression at least as strongly as the reverse. In contrast, previous longitudinal work in adolescents found evidence

was strongest for a uni-directional relationship whereby depression predicted subsequent suppression but rarely the reverse (De France et al., 2018; Larsen et al., 2012). Thus the findings from adolescents suggest that suppression did not have any causal role in depression. The reason for the difference between our adult findings and previous adolescent findings is unclear, but could be related to age specifically, or the pandemic context in which we conducted our study.

A key question is why mental health symptoms lead to greater suppression. While the present study is unable to answer this question directly, we have proposed that the psychological distress and intense negative emotions associated with psychopathology—including anxiety and depression symptoms—are likely to motivate people to regulate their emotions, including via suppression. Theoretically, this argument aligns with Milyavsky et al.'s (2019) recent application of cognitive energetics theory (Kruglanski et al., 2012) to emotion regulation. This theoretical framework contends that emotion regulation is the outcome of driving forces (e.g., how important it is to regulate an emotion) in combination with restraining forces (e.g., how difficult it is to regulate an emotion). In the present study, the psychological distress associated with depression or anxiety symptoms can be conceptualized as a driving force for emotion regulation. This driving force may be further increased in people with mood disorders because they tend to appraise negative or strong emotions as unacceptable (e.g., “I shouldn’t feel this way”) (Campbell-Sills et al., 2006). Supporting this argument, such appraisals are associated with increased suppression (Campbell-Sills et al., 2006). Distressed individuals may also be motivated to suppress the expression of their emotions by social display rules that encourage them to hide negative feelings (Matsumoto et al., 2008). For instance, distressed individuals in Western cultures may believe they need to put on a “happy face”. It will be important for future research to test these theoretical ideas more directly.

Neurobiological evidence also points to the possibility of a bi-directional relationship between psychological distress and suppression. Some of the brain regions most consistently implicated in anxiety and depression symptomatology include the amygdala, the hippocampus, the thalamus and striatum (Espinoza Oyarce et al., 2020). These are evolutionarily old structures which are strongly connected to frontal cortical regions known to be involved in suppression including the anterior cingulate and medial prefrontal cortex (Pan et al., 2018). It is therefore expected that the activity of older limbic regions would be modulated by newer frontal regions underlying suppression processes. However, it is also well-established that limbic activity, and specifically in the amygdala, also modulates frontal activity (Garcia et al., 1999; McGaugh, 2004), and thus greater psychological distress associated with increased limbic activity is likely to modulate suppression processes in frontal regions. In addition, the anterior cingulate and medial prefrontal cortex, which underlie suppression (Hermann et al., 2014), are also involved in the neuropathophysiology of depression (Pandya et al., 2012). It is implausible that unidirectional influences would occur between suppression and psychological distress within the same cortical regions.

Turning now to cognitive reappraisal, we found no evidence that the use of this strategy was associated with depression nor anxiety. Our results are contrary to the usual finding that cognitive reappraisal is associated with reduced mental health symptoms (e.g., Aldao et al., 2010), including when faced with various stressors (e.g., in PTSD, Boden et al., 2012; and depression, Troy et al., 2010). However, our results are in line with those of Cavanagh, Fitzgerald and Urry (2014), who found no association between ERQ-reappraisal scores and mental health symptoms following the 2011 earthquake, tsunami and nuclear crisis in Japan. One possibility is that people are not able to successfully use cognitive reappraisal when they are acutely stressed. Speaking to this possibility, Raio et al. (2013) found that people who were trained to use cognitive reappraisal to regulate their emotions in a fear conditioning paradigm

were less able to do so when acutely stressed (but cf. Shermohammed et al., 2017 for evidence that cognitive reappraisal can be effective when moderate stress is induced). A second possibility is that reappraisal is an ineffective strategy for responding to the factors that were impacting most strongly on mental health symptoms during the lockdown. For instance, major factors associated with mental health problems during lockdown in Australia included financial distress and disruption to work and social functioning (Batterham et al., 2021; Dawel et al., 2020). Reappraisal may be an ineffective strategy for managing the acute emotional impacts of such large and sudden disruptions, when reframing the situation is difficult or unrealistic (Iglewicz et al., 2020).

Overall, our results for cognitive reappraisal highlight the importance of recent arguments that no emotion regulation strategy is universally helpful or harmful (e.g., Ford et al., 2019; Haines et al., 2016; McRae, 2016; Troy et al., 2013). Understanding when and for whom reappraisal helps is critical because this strategy is core to many psychological therapies. For example, reappraisal is espoused as a key component of psychological interventions for emotional disorders (e.g., Barlow et al., 2017), and a brief reappraisal intervention is the focus of one of three studies in the Psychological Science Accelerator Rapid Response COVID-19 Project (<https://psysciacc.org/studies/psacr-1-2-3/>) (Wang et al., 2020).

### **Limitations and Future Directions**

There are several important limitations to consider. Firstly, the results of the present study are limited to self-reported general use over two-week periods, with waves spaced at monthly intervals. Medium-term data like this is useful, but only part of the picture. It is plausible that these associations will have distinct fast and slow dynamics, with the shorter-term dynamics being more situationally influenced and the longer-term dynamics more strongly influenced by psychological traits. Ecological momentary assessment (EMA) methods have potential to give more nuanced insight into associations between emotion regulation and

mental health over shorter time periods, including providing nuanced information about strategy-situation fit. In the present study, it is possible that some people applied reappraisal in situations where it did help with mental health symptoms, but others did not, or applied cognitive reappraisal in ways that were unhelpful.

A limitation of the ERQ is that it measures the extent to which people use reappraisal and suppression, not their ability to use them effectively. Logically, emotion regulation strategies should only impact mental health symptoms if they are used effectively—and using a strategy more does not necessarily equate to using it more effectively (Troy et al., 2010). Indeed, Cavanagh et al. (2014) found reappraisal ability but not use was associated with reduced mental health symptoms following the 2011 Japan crises. It would be beneficial for future studies to routinely measure reappraisal ability as well as use. Self-report measures can also be subject to personal biases (Wilhelm & Grossman, 2010), and thus it would be helpful to include behavioral measures of emotion regulation such as Cavanagh et al.'s (2014) measure of reappraisal ability.

Implicit to the correlational design of this study, causation cannot be definitively demonstrated but only inferred. It is also possible that a third variable might explain the observed association between suppression and depression or anxiety. For instance, stress, which has known associations with all three variables (Aldao et al., 2010; McEwen, Eiland, Hunger & Miller, 2012; Park et al., 2019), could account for the associations we observed or mediate the effect of suppression on depression and anxiety, or vice versa. A key next step will be to use experimental methods to causally test whether a bi-directional relationship exists between suppression and mental health symptoms. It will also be important to see if the findings of the present study generalize to non-crisis times. For instance, to test if a longitudinal bi- or uni-directional relationship between cognitive reappraisal and mental health symptoms can be found once the pandemic recedes.

A final limitation is that, although we deliberately designed the study to be representative of the Australian population, it is possible the survey did not adequately capture all groups. For example, the study was conducted online, so people without internet access were not able to be included. In addition, an important question for future research is whether a bi-directional relationship between suppression and mental health is universally present across cultures and ethnicities. Meta-analytic work indicates suppression is not associated with poorer mental health in Eastern cultures (Hu et al., 2014), and Asian Americans endorse suppression more than European Americans (Gross & John, 2003; Mauss, Butler, Roberts and Chu, 2010) yet experience smaller increases in anger expression and experience when provoked (Mauss et al., 2010). These East-West differences in findings for suppression may reflect Eastern cultural norms that value not openly showing or expressing emotions to protect group harmony (Bond, 1993). That is, the drivers and outcomes of suppression may differ in Eastern relative to Western cultures.

### **Implications for clinical practice**

There is no universal emotion regulation strategy that is useful for all people in all situations, particularly during dramatic and life-altering events. Indeed, evidence-based psychological treatments, such as cognitive behavior therapy (CBT), aim to equip clients with a range of skills so that these can be employed effectively in different situations as relevant to a client. For example, in CBT for anxiety and depression, a highly distressed client may be encouraged to first use techniques other than cognitive reappraisal, such as breathing or grounding exercises (Barlow et al., 2018). Indeed, other data from the present survey indicate that many people turned to breathing techniques during lockdown: over 80 percent of respondents who had a history of psychological therapy reported using breathing techniques, and most found breathing very or somewhat helpful (Gulliver et al., 2021). The key for clinicians is to equip clients with a variety of tools for effectively managing emotions *and*

knowledge about when to use different tools. The present study emphasizes that cognitive reappraisal is not always effective for reducing mental health symptoms. The findings are a reminder that clinicians should carefully explore with their clients the conditions under which they find cognitive reappraisal helpful, including when they are likely to have the necessary cognitive resources required for this, and remain cognizant that some clients may not find this strategy helpful at all.

Our results suggest a fundamentally new interpretation of the phenomenon of emotional suppression: that it is not just a driver but also a symptom of distress. It may be useful to monitor emotional suppression in clinical practice, particularly for clients who have difficulty reporting their level of distress. However, our finding that the relationship between suppression and mental health symptoms is bi-directional reinforces the role of suppression in perpetuating mental health symptoms, consistent with traditional causal arguments. These findings suggest that the relationship between emotional suppression and mental health is perhaps more complex than previously conceptualised. In clinical settings, it is therefore important to explore with clients the underlying drivers and functions of emotional suppression rather than instructing them to avoid suppressing their emotions. Rather than asking clients to avoid suppressing their emotions, we suggest that clinicians explore the underlying beliefs that are driving suppression in the first place. For example, beliefs about negative and strong emotions being unacceptable are associated with increased suppression (Campbell-Sills et al., 2006). If psychological distress is indeed driving suppression, directly helping clients to reduce their felt distress (e.g., breathing exercises) is also likely to alleviate suppression.

## **Conclusion**

The present study found a bi-directional relationship between higher symptoms of depression or anxiety and greater emotional suppression. The nature of this relationship is consistent with suppression having a symptomatic as well as causal role in mental health

disorders. However, unlike previous research (Aldao et al., 2010), we did not find a relationship between cognitive reappraisal and depression or anxiety symptoms. These results challenge the accepted wisdom that cognitive reappraisal is universally helpful and bolster recent arguments that applying different strategies in the right situations is key (Ford et al., 2019; Haines et al., 2016; McRae, 2016; Troy et al., 2013). Exactly what the right situations are is a critical question for future research. We believe a systematic multi-lab approach that tests the boundary conditions of strategy efficacy is needed, with a focus on using representative samples and testing replicability across the globe.

### References

- Aldao, A., & Nolen-Hoeksema, S. (2012). When are adaptive strategies most predictive of psychopathology? *Journal of Abnormal Psychology, 121*(1), 276-281. <https://doi.org/10.1037/a0023598>
- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review, 30*(2), 217-237. <https://doi.org/10.1016/j.cpr.2009.11.004>
- Barlow, D. H., Farchione, T. J., Sauer-Zavala, S., Latin, H. M., Ellard, K. K., Bullis, J. R., Bentley, K. H., Boettcher, H. T., & Cassiello-Robbins, C. (2017). *Unified Protocol for Transdiagnostic Treatment of Emotional Disorders: Therapist Guide* (2nd ed.). Oxford University Press.
- Batterham, P. J., Calear, A. L., McCallum, S. M., Morxe, A. R., Banfield, M., Farrer, L. M., Gulliver, A., Cherbuin, N., Rodney Harris, R. M., Shou, Y., & Dawel, A. (2021). Trajectories of depression and anxiety symptoms during the COVID-19 pandemic in a representative Australian adult cohort. *Medical Journal of Australia*. <http://doi.org/10.5694/mja2.51043>
- Batterham, P. J., Sunderland, M., Carragher, N., & Calear, A. L. (2017). Psychometric properties of 7- and 30-day versions of the PROMIS emotional distress item banks in an Australian adult sample. *Assessment, 26*(2), 249-259. <https://doi.org/10.1177/1073191116685809>
- Benson, L., English, T., Conroy, D. E., Pincus, A. L., Gerstorf, D., & Ram, N. (2019). Age differences in emotion regulation strategy use, variability, and flexibility: An experience sampling approach. *Developmental Psychology, 55*(9), 1951-1964. <https://doi.org/10.1037/dev0000727>

- Boden, M. T., Bonn-Miller, M. O., Kashdan, T. B., Alvarez, J., & Gross, J. J. (2012). The interactive effects of emotional clarity and cognitive reappraisal in posttraumatic stress disorder. *Journal of Anxiety Disorders, 26*(1), 233-238. <https://doi.org/10.1016/j.janxdis.2011.11.007>
- Bond, M. H. (1993). Emotions and their expression in Chinese culture. *Journal of Nonverbal Behavior, 17*(4), 245-262.
- Brewer, S. K., Zahniser, E., & Conley, C. S. (2016). Longitudinal impacts of emotion regulation on emerging adults: Variable- and person-centered approaches. *Journal of Applied Developmental Psychology, 47*, 1-12. <https://doi.org/10.1016/j.appdev.2016.09.002>
- Cameron, L. D., & Overall, N. C. (2018). Suppression and expression as distinct emotion-regulation processes in daily interactions: Longitudinal and meta-analyses. *Emotion, 18*(4), 465-480. <https://doi.org/10.1037/emo0000334>
- Campbell-Sills, L., Barlow, D. H., Brown, T. A., & Hofmann, S. G. (2006). Acceptability and suppression of negative emotion in anxiety and mood disorders. *Emotion, 6*(4), 587-595. <https://doi.org/10.1037/1528-3542.6.4.587>
- Cavanagh, S. R., Fitzgerald, E. J., & Urry, H. L. (2014). Emotion reactivity and regulation are associated with psychological functioning following the 2011 earthquake, tsunami, and nuclear crisis in Japan. *Emotion, 14*(2), 235. <https://doi.org/10.1037/a0035422>
- Cludius, B., Mennin, D., & Ehring, T. (2020). Emotion regulation as a transdiagnostic process. *Emotion, 20*(1), 37-42. <https://doi.org/10.1037/emo0000646>
- Dawel, A., Shou, Y., Smithson, M., Cherbuin, N., Banfield, M., Calear, A. L., Farrer, L. M., Gray, D., Gulliver, A., Housen, T., McCallum, S. M., Morse, A. R., Murray, K., Newman, E., Rodney Harris, R. M., & Batterham, P. J. (2020). The Effect of COVID-

- 19 on Mental Health and Wellbeing in a Representative Sample of Australian Adults. *Frontiers in Psychiatry, 11*. <https://doi.org/10.3389/fpsy.2020.579985>
- De France, K., Lennarz, H., Kindt, K., & Hollenstein, T. (2018). Emotion regulation during adolescence: Antecedent or outcome of depressive symptomology? *International Journal of Behavioral Development, 43*(2), 107-117. <https://doi.org/10.1177/0165025418806584>
- Ehring, T., Tuschen-Caffier, B., Schnulle, J., Fischer, S., & Gross, J. J. (2010). Emotion regulation and vulnerability to depression: Spontaneous versus instructed use of emotion suppression and reappraisal. *Emotion, 10*(4), 563-572. <https://doi.org/10.1037/a0019010>
- Espinoza Oyarce, D. A., Shaw, M. E., Alateeq, K., & Cherbuin, N. (2020). Volumetric brain differences in clinical depression in association with anxiety: A systematic review with meta-analysis. *Journal of Psychiatry & Neuroscience, 45*(6), 406-429. <https://doi.org/10.1503/jpn.190156>
- Everaert, J., & Joormann, J. (2020). Emotion regulation habits related to depression: A longitudinal investigation of stability and change in repetitive negative thinking and positive reappraisal. *Journal of Affective Disorders, 276*, 738-747. <https://doi.org/10.1016/j.jad.2020.07.058>
- Ford, B. Q., Feinberg, M., Lam, P., Mauss, I. B., & John, O. P. (2019). Using reappraisal to regulate negative emotion after the 2016 U.S. Presidential election: Does emotion regulation trump political action? *Journal of Personality and Social Psychology, 117*(5), 998-1015. <https://doi.org/10.1037/pspp0000200>
- Garcia, R., Vouimba, R. M., Baudry, M., & Thompson, R. F. (1999). The amygdala modulates prefrontal cortex activity relative to conditioned fear. *Nature, 402*, 294-296.

- Gross, J. J. (2001). Emotion regulation in adulthood: Timing Is everything. *Current Directions in Psychological Science*, 10, 215-219.
- Gross, J. J. (2013). Emotion regulation: Taking stock and moving forward. *Emotion*, 13(3), 359-365. <https://doi.org/10.1037/a0032135>
- Gross, J. J. (2015). The Extended Process Model of Emotion Regulation: Elaborations, Applications, and Future Directions. *Psychological Inquiry*, 26(1), 130-137. <https://doi.org/10.1080/1047840x.2015.989751>
- Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85(2), 348-362. <https://doi.org/10.1037/0022-3514.85.2.348>
- Groth-Marnat, G. (2009). *Handbook of psychological assessment*. Wiley.
- Gruber, J., Harvey, A. G., & Gross, J. J. (2012). When trying is not enough: emotion regulation and the effort-success gap in bipolar disorder. *Emotion*, 12(5), 997-1003. <https://doi.org/10.1037/a0026822>
- Gulliver, A., Banfield, M., Batterham, P. J., Calear, A. L., Farrer, L. M., Dawel, A., ... & Morse, A. R. (2021). Effects of previous exposure to psychotherapeutic strategies on depression and anxiety symptoms during the COVID-19 pandemic. *BJPsych Open*, 7(1). <https://doi.org/10.1192/bjo.2020.170>
- Haines, S. J., Gleeson, J., Kuppens, P., Hollenstein, T., Ciarrochi, J., Labuschagne, I., Grace, C., & Koval, P. (2016). The wisdom to know the difference. *Psychological Science*, 27(12), 1651-1659. <https://doi.org/10.1177/0956797616669086>
- Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, 20(1), 102-116. <https://doi.org/10.1037/a0038889>

- Hermann, A., Bieber, A., Keck, T., Vaitl, D., & Stark, R. (2014). Brain structural basis of cognitive reappraisal and expressive suppression. *Social Cognitive and Affective Neuroscience*, 9(9), 1435-1442. <https://doi.org/10.1093/scan/nst130>
- Hinz, A., Klein, A. M., Brahler, E., Glaesmer, H., Luck, T., Riedel-Heller, S. G., Wirkner, K., & Hilbert, A. (2017). Psychometric evaluation of the Generalized Anxiety Disorder Screener GAD-7, based on a large German general population sample. *Journal of Affective Disorders*, 210, 338-344. <https://doi.org/10.1016/j.jad.2016.12.012>
- Hu, T., Zhang, D., Wang, J., Mistry, R., Ran, G., & Wang, X. (2014). Relation between emotion regulation and mental health: A meta-analysis review. *Psychological Reports: Measures & Statistics*, 114(2), 341-362. <https://doi.org/10.2466/03.20.PR0.114k22w4>
- Iglewicz, A., Shear, M. K., Reynolds, C. F., 3rd, Simon, N., Lebowitz, B., & Zisook, S. (2020). Complicated grief therapy for clinicians: An evidence-based protocol for mental health practice. *Depression and Anxiety*, 37(1), 90-98. <https://doi.org/10.1002/da.22965>
- John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, 72(6), 1301-1333.
- Kraaij, V., Pruyboom, E., & Garnefski, N. (2002). Cognitive coping and depressive symptoms in the elderly: A longitudinal study. *Aging & Mental Health*, 6(3), 275-281. <https://doi.org/10.1080/13607860220142387>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16, 606-613.
- Kruglanski, A. W., Bélanger, J. J., Chen, X., Köpetz, C., Pierro, A., & Mannetti, L. (2012). The energetics of motivated cognition: A force-field analysis. *Psychological Review*, 119(1), 1-20.

- Larsen, J. K., Vermulst, A. A., Geenen, R., van Middendorp, H., English, T., Gross, J. J., Ha, T., Evers, C., & Engels, R. C. M. E. (2012). Emotion regulation in adolescence. *The Journal of Early Adolescence*, 33(2), 184-200. <https://doi.org/10.1177/0272431611432712>
- Matsumoto, D., Seung Hee, Y., & Fontaine, J. (2008). Mapping expressive differences around the world. *Journal of Cross-Cultural Psychology*, 39(1), 55-74. <https://doi.org/10.1177/0022022107311854>
- McEwen, B. S., Eiland, L., Hunter, R. G., & Miller, M. M. (2012). Stress and anxiety: structural plasticity and epigenetic regulation as a consequence of stress. *Neuropharmacology*, 62(1), 3-12. <https://doi.org/10.1016/j.neuropharm.2011.07.014>
- McGaugh, J. L. (2004). The amygdala modulates the consolidation of memories of emotionally arousing experiences. *Annual Review of Neuroscience*, 27, 1-28. <https://doi.org/10.1146/annurev.neuro.27.070203.144157>
- McRae, K. (2016). Cognitive emotion regulation: A review of theory and scientific findings. *Current Opinion in Behavioral Sciences*, 10, 119-124. <https://doi.org/10.1016/j.cobeha.2016.06.004>
- Milyavsky, M., Webber, D., Fernandez, J. R., Kruglanski, A. W., Goldenberg, A., Suri, G., & Gross, J. J. (2019). To reappraise or not to reappraise? Emotion regulation choice and cognitive energetics. *Emotion*, 19(6), 964-981. <https://doi.org/10.1037/emo0000498>
- Pan, J., Zhan, L., Hu, C., Yang, J., Wang, C., Gu, L., Zhong, S., Huang, Y., Wu, Q., Xie, X., Chen, Q., Zhou, H., Huang, M., & Wu, X. (2018). Emotion regulation and complex brain networks: Association between expressive suppression and efficiency in the fronto-parietal network and default-mode network. *Frontiers in Human Neuroscience*, 12, 70. <https://doi.org/10.3389/fnhum.2018.00070>

- Pandya, M., Altinay, M., Malone, D. A., Jr., & Anand, A. (2012). Where in the brain is depression? *Current Psychiatry Reports*, *14*(6), 634-642. <https://doi.org/10.1007/s11920-012-0322-7>
- Park, C., Rosenblat, J. D., Brietzke, E., Pan, Z., Lee, Y., Cao, B., ... & McIntyre, R. S. (2019). Stress, epigenetics and depression: A systematic review. *Neuroscience & Biobehavioral Reviews*, *102*, 139-152. <https://doi.org/10.1016/j.neubiorev.2019.04.010>
- Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., Kontopantelis, E., Webb, R., Wessely, S., McManus, S., & Abel, K. M. (2020). Mental health before and during the COVID-19 pandemic: A longitudinal probability sample survey of the UK population. *The Lancet Psychiatry*, *7*(10), 883-892. [https://doi.org/10.1016/s2215-0366\(20\)30308-4](https://doi.org/10.1016/s2215-0366(20)30308-4)
- Preece, D. A., Becerra, R., Robinson, K., & Gross, J. J. (2020). The Emotion Regulation Questionnaire: Psychometric properties in general community samples. *Journal of Personality Assessment*, *102*(3), 348-356. <https://doi.org/10.1080/00223891.2018.1564319>
- Raio, C. M., Orederu, T. A., Palazzolo, L., Shurick, A. A., & Phelps, E. A. (2013). Cognitive emotion regulation fails the stress test. *Proceedings of the National Academy of Sciences*, *110*(37), 15139-15144. <https://doi.org/10.1073/pnas.1305706110>
- Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48*(2), 1-36. <http://www.jstatsoft.org/v48/i02/>
- Sheppes, G., Scheibe, S., Suri, G., & Gross, J. J. (2011). Emotion-regulation choice. *Psychological Science*, *22*(11), 1391-1396. <https://doi.org/10.1177/0956797611418350>
- Shermohammed, M., Mehta, P. H., Zhang, J., Brandes, C. M., Chang, L. J., & Somerville, L. H. (2017). Does psychosocial stress impact cognitive reappraisal? Behavioral and

- neural evidence. *Journal of Cognitive Neuroscience*, 29(11), 1803-1816.  
[https://doi.org/10.1162/jocn\\_a\\_01157](https://doi.org/10.1162/jocn_a_01157)
- Shrive, F. M., Stuart, H., Quan, H., & Ghali, W. A. (2006). Dealing with missing data in a multi-question depression scale: A comparison of imputation methods. *BMC Medical Research Methodology*, 6, 57. <https://doi.org/10.1186/1471-2288-6-57>
- Spitzer, R. L., Kroenke, K., Williams, J. B., & Lowe, B. (2006). A brief measure for assessing Generalized Anxiety Disorder: The GAD-7. *Archives of Internal Medicine*, 166(10), 1092-1097. <https://doi.org/10.1001/archinte.166.10.1092>
- Spitzer, R. L., Kroenke, K., & Williams, J. B. W. (1999). Validation and utility of a self-report version of PRIME-MD. *JAMA*, 282, 1737-1744.
- Statistics, A. B. o. (2016). *Australian 2016 Census QuickStats*. Australian Bureau of Statistics. [https://quickstats.censusdata.abs.gov.au/census\\_services/getproduct/census/2016/quickstat/036](https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/036)
- Troy, A. S., Ford, B. Q., McRae, K., Zorola, P., & Mauss, I. B. (2017). Change the things you can: Emotion regulation is more beneficial for people from lower than from higher socioeconomic status. *Emotion*, 17(1), 141-154. <https://doi.org/10.1037/emo0000210>
- Troy, A. S., & Mauss, I. B. (2011). Resilience in the face of stress: Emotion regulation as a protective factor. In S. M. Southwick, B. T. Litz, D. Charney, & M. J. Friedman (Eds.), *Resilience and mental health: Challenges across the lifespan* (pp. 30-44). Cambridge University Press.
- Troy, A. S., Shallcross, A. J., & Mauss, I. B. (2013). A person-by-situation approach to emotion regulation: Cognitive reappraisal can either help or hurt, depending on the context. *Psychological Science*, 27(3), 428-431. <https://doi.org/10.1177/0956797615627417>

- Troy, A. S., Wilhelm, F. H., Shallcross, A. J., & Mauss, I. B. (2010). Seeing the silver lining: cognitive reappraisal ability moderates the relationship between stress and depressive symptoms. *Emotion, 10*(6), 783-795. <https://doi.org/10.1037/a0020262>
- van Spijker, B. A., Batterham, P. J., Calear, A. L., Farrer, L., Christensen, H., Reynolds, J., & Kerkhof, A. J. (2014). The suicidal ideation attributes scale (SIDAS): Community-based validation study of a new scale for the measurement of suicidal ideation. *Suicide and Life-Threatening Behavior, 44*(4), 408-419. <https://doi.org/10.1111/sltb.12084>
- Volokhov, R. N., & Demaree, H. A. (2010). Spontaneous emotion regulation to positive and negative stimuli. *Brain and Cognition, 73*(1), 1-6. <https://doi.org/10.1016/j.bandc.2009.10.015>
- Wang, K., Goldenberg, A., Dorison, C. A., Miller, J. K., Lerner, J. S., & Gross, J. J. (2020). A global test of brief reappraisal interventions on emotions during the COVID-19 pandemic. *Registered Report Nature Human Behaviour*.
- Wilhelm, F. H., & Grossman, P. (2010). Emotions beyond the laboratory: theoretical fundamentals, study design, and analytic strategies for advanced ambulatory assessment. *Biological Psychology, 84*(3), 552-569. <https://doi.org/10.1016/j.biopsycho.2010.01.017>
- Wu, W., Carroll, I. A., & Chen, P. Y. (2018). A single-level random-effects cross-lagged panel model for longitudinal mediation analysis. *Behavior Research Methods, 50*(5), 2111-2124. <https://doi.org/10.3758/s13428-017-0979-2>
- Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A., & McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders, 277*, 55-64. <https://doi.org/10.1016/j.jad.2020.08.001>