



Which Emotion Regulation Strategies are Most Associated with Trait Emotion Dysregulation? A Transdiagnostic Examination

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Abstract

Although definitions of emotion dysregulation infer difficulties in selecting and implementing emotion regulation (ER) strategies, surprisingly few studies have examined the relationship between trait emotion dysregulation and a wide range of specific ER strategies. The present study used a data-driven approach to assess trait- and state-related ER strategy use in 99 women (aged 18–55) recruited from the community with varying levels of trait emotion dysregulation. Participants completed self-report questionnaires assessing habitual ER strategy implementation and self-ratings of ER strategy use in vivo during negative mood inductions. Principal components analysis revealed four self-report questionnaire-based and three mood-induction-based groupings comprising both optimal and suboptimal strategies. After adjusting for demographic and clinical variables, results from self-report questionnaires indicated that trait emotion dysregulation was significantly associated with higher endorsements of suboptimal strategies in two groupings (e.g., self-criticism, rumination, and social withdrawal; catastrophizing and blaming others) and lower endorsements of optimal ER strategies in one grouping (e.g., cognitive reappraisal and problem solving). In the context of mood induction, trait emotion dysregulation was significantly associated with higher endorsements of suboptimal ER strategies from one cluster only (e.g., expressive suppression, thought avoidance, and self-criticism). Such transdiagnostic, data-driven approaches can uncover how the application of specific ER strategies both habitually and during negative mood states is associated with trait emotion dysregulation.

Keywords Emotion regulation · Coping strategies · Emotion dysregulation · Principal components analysis

Emotion dysregulation is a transdiagnostic symptom dimension underlying many forms of psychopathology (Beauchaine 2015) and a prominent treatment target in psychological interventions (Sloan et al. 2017). Here, we define emotion dysregulation as the consequence of using fewer effective, and more ineffective, strategies to regulate negative emotions leading to the persistence of undesired negative emotional states over time (Gross and Jazaieri 2014; Linehan 2014), which increases the risk for different mental disorders. There is interest in understanding how self-report assessments of emotion

dysregulation converge with emotional experiences in daily life, but thus far research has mostly focused on trait- and state-ER strategy convergence (Medland et al. 2020). Understanding the trait- and state-ER strategies used by individuals with varying trait levels of emotion dysregulation—regardless of their clinical diagnostic status—could reveal new targets of interventions that may serve a broader population of individuals with psychopathology. The present study uses an existing dataset to provide a preliminary assessment of trait- and state-ER (and broader coping) strategy use among women with varying levels of trait emotion dysregulation.

Definitions of emotion dysregulation allude to detriments in the implementation or selection of ER strategies. From an affective science perspective, emotion dysregulation is hypothesized to result from using ER strategies that are poorly matched to the context in which they are used and/or not using ER strategies when it would be helpful to do so (Gross and Jazieri 2014). Others define emotion dysregulation as a pattern of emotional experiences and/or expression that interferes with goal-directed behavior (Beauchaine 2015) or

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the persistence of undesired emotional states after effortful ER attempts are made (Cole and Hall 2008; Linehan 2014). The Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004) is often used to assess emotion dysregulation using a multidimensional model consisting of difficulties in accepting negative emotional experiences, poor emotional awareness and clarity, difficulties engaging in goal-directed and non-impulsive behaviors, and accessing situationally-appropriate ER strategies.¹ The DERS assesses these dimensions using dispositional tendencies, with instructions asking participants to rate their average or typical experiences, similar to trait-like characteristics that endure over time. Emotion dysregulation measured by the DERS is significantly higher in individuals with psychiatric diagnoses (e.g., borderline personality disorder [BPD], post-traumatic stress disorder) compared to non-clinical controls and is significantly associated with greater psychiatric symptoms, such as depression, anxiety, substance use, and dysregulated eating (see Gratz et al. 2020, for review). In the present study, we therefore operationalize the DERS total score as a trait symptom dimension of emotion dysregulation underlying psychopathology.

The DERS does not measure the relative endorsement frequency of specific ER strategies (e.g., cognitive reappraisal), however. Other research attempts to examine emotion dysregulation by studying the ER strategy endorsements in clinical samples consisting of different psychiatric diagnoses (e.g., major depressive disorder, generalized anxiety disorder) or their associations with psychiatric symptoms, such as depression or anxiety measured dimensionally (Aldao et al. 2010; Liu and Thompson 2017; Salters-Pedneault et al. 2006). Results generally indicate that individuals with various psychiatric conditions, or greater symptoms of mental disorder, self-report using more faulty strategies to regulate negative emotions compared to healthy individuals or those with fewer psychiatric symptoms. Psychiatric groups appear more similar than different in this regard (e.g., Svaldi et al. 2012a), possibly due to shared underlying symptom dimensions around the experience of negative emotions and subsequent ER strategy use. Collectively, the literature on ER strategy use and emotion dysregulation support transdiagnostic approaches that go beyond the limitations of within-diagnosis heterogeneity and diagnostic comorbidity that are inherent to a categorical diagnostic system of psychiatric classification (see Kotov et al. 2017).

¹ The original DERS emphasizes responses to negative emotions, asking participants to often think of times “When I am upset...” and prompting negative affective states such as “ashamed”, “guilty”, and “irritated” suggesting an emphasis on emotion dysregulation in response to negative emotional experiences. Alternate versions address emotion dysregulation in response to positive emotions (Weiss et al. 2015) and current state- versus trait-like experiences in response to negative emotions (Lavender et al. 2017).

Few studies comprehensively assess multiple ER strategies in a single research design, instead focusing on one or a handful of well-defined strategies such as rumination, experiential avoidance, and suppression. Given evidence that flexible use of multiple ER strategies can contribute to mental and emotional well-being (Bonanno and Burton 2013) and that use of typically more effective ER strategies can mitigate the detrimental impact of generally less effective ER strategies (e.g., Aldao and Nolen-Hoeksema 2012), researchers have attempted to measure an individual’s larger repertoire of ER strategies and the association with different forms of psychopathology (e.g., Blanke et al. 2020; De France and Hollenstein 2017; Dixon-Gordon et al. 2015). Studies also tend to combine ER strategies based on their putatively adaptive (e.g., problem-solving, cognitive reappraisal) or maladaptive (e.g., suppression, rumination) effects, with the former negatively and the latter positively associated with psychopathology (Aldao et al. 2010). Though this relationship appears straightforward on the surface, there are some diverse findings that are important to consider. For example, cognitive reappraisal is not always successful at modulating emotions, nor is it always adaptive across contexts (Ford and Troy 2019). In those with BPD, experience-sampling and laboratory-based mood inductions have shown that expressive suppression and avoidance tend to have more beneficial emotional effects in the short-term (e.g., lower urges to engage in impulsive behaviors), whereas acceptance is associated with short-term emotional consequences (e.g., increased urge to engage in self-injury and higher subjective distress; Chapman et al. 2009; Pistorello et al. 2015; Svaldi et al. 2012b). Such findings have led to the assertion that contextual factors (e.g., situational, such as social context, and personal, such as beliefs about emotions) contribute to the differential use of ER strategies, and that the flexibility in using different strategies across contexts is more predictive of well-being and psychopathology (Aldao 2013). The present study therefore measured multiple ER strategies and made no a priori assumptions about the proposed adaptiveness of different strategies.

At the same time, other researchers have proposed data-driven approaches to group ER strategies into more manageable groupings that function similarly in response to an emotional stressor. The most comprehensive analysis to date reviewed 10 ER strategies assess via self-report questionnaires (Naragon-Gainey et al. 2017). Three groupings were found: disengagement ER strategies characterized by attempts to avoid, inhibit, or shift focus away from an emotionally relevant situation (e.g., distraction, experiential avoidance, expressive suppression); engagement ER strategies characterized by attempts to actively engage with an emotional experience or material (e.g., problem solving, mindfulness, cognitive reappraisal); and aversive cognitive perseveration ER strategies characterized by difficulty disengaging from negative cognitions (e.g., worry, rumination). Although these groupings should be relatively consistent across studies using self-report methods, results may differ slightly based on the

specific sample or methods involved in each study. For example, one previous study in college students found two groupings from eight ER strategies (Daros et al. 2020). In this study, trait emotion dysregulation at baseline was positively associated with a higher likelihood of endorsing disengagement versus engagement ER strategies in daily life during periods of high negative affect. The present study attempts to extend these findings by observing the convergence between trait emotion dysregulation and trait and state measures of ER using data from five separate self-report questionnaires and a laboratory-based mood induction procedure directly after which participants self-reported their ER strategy use. Data-driven techniques were used to reduce the number of ER strategies assessed into manageable groupings.

Finally, evidence for differential associations between facets of emotion dysregulation as assessed by the DERS (i.e., non-acceptance) and ER strategy use exist. Controlling for other facets, greater non-acceptance of negative emotions is associated with endorsing a higher proportion of disengagement versus engagement ER strategies during moments of high negative affect (Daros et al. 2020), as assessed by experience sampling methods. Moreover, difficulties with impulsivity and accessing ER strategies were associated with more ER strategy attempts. Difficulties with impulsivity during negative moods also differentially predicted greater purging frequency and lifetime non-suicidal self-injury—two behavioral mechanisms of ER—in a large heterogeneous eating disorder sample (Pisetsky et al. 2017). Thus, examining relationships between facets of trait emotion dysregulation and ER strategies were also considered in the present study.

The previous works were concerned with determining the differences in ER strategies between clinical diagnostic groups. There we found that a BPD group endorsed higher rates of maladaptive ER strategies and lower rates of effective ER strategies compared to healthy controls on both self-report measures (Daros et al. 2018a) and immediately following negative mood induction (Daros et al. 2018b). The BPD group did not differ from those with depressive and/or anxiety disorders on either assessment; however, in the first study, the BPD group endorsed a greater frequency of harmful regulatory behaviors (e.g., self-injury, eating binges) and in the second study, they reported higher perceived difficulty in regulating emotions, supporting higher levels of emotion dysregulation in BPD. The present study differs in several ways. First, we studied the relationships of ER strategies with trait emotion dysregulation regardless of diagnostic group. Second, we comprehensively assessed self-reported habitual ER strategies (including additional measures not already analyzed) alongside *in vivo* ratings during mood inductions; therefore, the multi-method nature of the data provides information about trait- and state-related ER strategy use and clarifies relationships with trait emotion dysregulation. Third, the present analysis takes a data-driven approach to grouping ER strategies rather than assigning them into pre-defined

categories based on presumed adaptiveness, which can vary depending on situational and personal contextual factors.

Given previous findings on the structure of common ER strategies, we expected to find at least three ER strategy groupings closely aligning to disengagement, engagement, and cognitive perseveration on both the self-report questionnaires and endorsements made *in vivo* following mood induction. We then expected trait emotion dysregulation to be positively associated with endorsements of disengagement and cognitive perseveration ER strategies and negatively associated with engagement ER strategies. We then explored whether the same patterns existed for facets of trait emotion dysregulation (i.e., non-acceptance, difficulties with impulsivity), as measured by the DERS. Findings from this study have potential to highlight how specific habitual and mood-induction-based endorsements of ER strategies contribute to trait emotion dysregulation in a sample of women with varying levels of psychopathology, which may aid further transdiagnostic-focused clinical research and inform treatment considerations.

Method

Participants

The previous work involved the recruitment of three target diagnostic groups from 2015 to 2016: women with current BPD; women with a current depressive and/or anxiety disorder; and healthy women with no current or previous diagnosis. Because of our difficulty in recruiting men with BPD from the community (see Ruocco et al. 2019) and notable sex and gender differences with respect to emotional experience and ER reported in the literature (e.g., Kring and Gordon 1998; McRae et al. 2008), we elected to recruit women exclusively. We recruited 101 women (aged 18–55) from the community who were English speaking and able to provide written informed consent. Online postings were used (e.g., Kijiji, Facebook) to seek individuals who had seen a doctor or a mental health professional for depression, anxiety, and/or BPD; all participants were screened by telephone before attending the study. Exclusion criteria for all groups included any psychotic or bipolar I disorder, neurological illness, neurodevelopmental disorder, and current alcohol or non-alcohol substance dependence. The exclusion criteria extended from the original work and were implemented to reduce potential confounds on cognitive and physiological tasks that were delivered in a laboratory (i.e., non-hospital) setting. Participants in the healthy group were not excluded if they had a history of psychotherapy. Participants in the clinical groups were not excluded if they were currently or previously completing psychotherapy or pharmacological treatments.

Following participation, two women were excluded from the present analyses because they did not complete the DERS,

leaving 99 participants with the necessary self-report measures completed. During the mood induction procedure, one participant requested discontinuation and was removed from analysis. Two other participants were presented with an incorrect video due to experimenter error, thus these data were simply treated as missing (the other videos they watched were retained). Participants were compensated up to \$50 for their participation in the larger study (more details can be found in our previous studies). The University of Toronto Research Ethics Board approved the study.

Diagnostic Assessments

Participants were assessed using the Structured Clinical Interview for DSM-IV Axis I disorders – Patient Edition (First et al. 2002). The modules for mood, bipolar, psychotic, substance use, and anxiety disorders were used, but due to time constraints, we were unable to assess eating or other classes of psychiatric disorders. Interviews were completed by Master's- and doctoral-level interviewers under supervision of a licensed clinical psychologist (A.C.R.). Interviewers prepared diagnostic reports that were discussed at “best-estimate” diagnostic meetings to establish consensus (Klein et al. 1994). The present sample had the following diagnostic characteristics: Major Depressive Disorder, Current/Past ($N=28/29$); Dysthymic Disorder, Current ($N=1$); Bipolar II Disorder, Current ($N=1$); Alcohol Abuse or Dependence, Past ($N=22$); Substance Abuse or Dependence, Past ($N=13$); Panic Disorder with or without Agoraphobia, Current/Past ($N=17/10$); Agoraphobia, Current/Past ($N=2/1$); Social Phobia, Current/Past ($N=28/8$); Specific Phobia, Current ($N=1$); Obsessive Compulsive Disorder, Current/Past ($N=2/3$); Post-Traumatic Stress Disorder, Current/Past ($N=10/10$); and Generalized Anxiety Disorder, Current ($N=18$).²

Interviewers also used the BPD module of the Structured Interview for DSM-IV Personality (Pfohl et al. 2009b) to assess the presence of BPD symptoms. According to the test manual, each symptom is assessed on a 4-point scale: 0 = not present, 1 = subthreshold, 2 = present, and 3 = present and associated with subjective distress and/or functional impairment. Participants had to meet 5 or more current criteria in the past 5 years for the BPD diagnosis to be applied. In the current sample participants met an average of 2.88 symptom criteria ($SD = 3.10$) and 32 participants met the diagnostic threshold for BPD.

Trait Measure of Emotion Dysregulation

Each participant included in the study completed the DERS (Gratz and Roemer 2004), which consists of 36 items rated on

a 1 (*almost never, 0–10%*) to 5 (*almost always, 90–100%*) scale, with higher scores indicative of greater difficulties regulating emotions. The DERS is an established measure of emotion dysregulation used to assess “maladaptive responses to emotions” (Gratz et al. 2020) compared to other measures that typically assess emotional responses themselves (e.g., emotional reactivity and perceived intensity). Thus far, the DERS remains the only measure associated with objective measures of emotion dysregulation assessed via behavioral, physiological, and neuroimaging methods. Total scores of 80–100 are often reported by individuals with emotional disorders, with scores above 110 often found in those with BPD (Daros et al. 2018a; Svaldi et al. 2012a). Along with a total score, six subscale scores can be computed: (a) non-acceptance of negative emotions (*Non-acceptance*, 6 items); (b) difficulties engaging in goal-directed behaviors (*Goals*; 5 items); (c) difficulties refraining from impulsive behaviors during negative emotions (*Impulsivity*; 6 items); (d) lack of emotional awareness (*Awareness*; 6 items); (e) lack of emotional clarity (*Clarity*; 5 items); and (f) limited access to situationally appropriate strategies (*Strategies*; 8 items). In the current study, internal consistencies for the DERS total and each subscale were either acceptable or higher ($\alpha > .79$), which was similar to the initial validation ($\alpha > .80$; Gratz and Roemer 2004). Evidence for test-retest reliability for the DERS total score was high ($r = .88$) over one to two months in the initial validation (subscales $r_s = .57-.89$; Gratz and Roemer 2004), supporting the trait-like quality of emotion dysregulation as measured by the DERS.

Symptom Measures

The Depression, Anxiety, and Stress Scale (DASS-42; Lovibond and Lovibond 1995) was used to assess depression, anxiety, and stress symptoms over the past two weeks. The internal consistency of the depression and anxiety subscales were good-to-excellent ($\alpha > .89$). Participants also completed the first 12 items of the Borderline Evaluation of Severity over Time (BEST; Pfohl et al. 2009a), a self-report measure of BPD symptom severity over the past two weeks. The internal consistency of the total score was excellent ($\alpha = .90$).

Trait Measures of ER Strategies

Participants completed five separate self-report measures to assess habitual ER strategy use and coping: The White Bear Suppression Inventory (WBSI; Wegner and Zanakos 1994), the Ruminative Response Style (RRS; Treynor et al. 2003), the Multidimensional Experiential Avoidance Questionnaire (MEAQ; Gámez et al. 2011), the Cognitive Emotion Regulation Questionnaire (CERQ; Garnefski and Kraaij 2007), and the Coping Strategies Inventory (Tobin et al. 1989). Because none of these measures comprehensively

² Two participant diagnostic reports could not be completed because of incomplete information and were coded as Diagnosis Deferred.

assess the wide array of cognitive and behavioral ER strategies that have been identified in the affective science research literature (see Aldao and Dixon-Gordon 2014), the present study considered all 25 of the resulting variables computed from these measures with the intention of using principal components analysis (PCA) to reduce them to a more manageable number suitable for statistical analysis.³

The WBSI is a 15-item unidimensional measure to assess suppression of unwanted thoughts, with the total score reflecting an individual's tendency to engage in thought suppression. The RRS is a 22-item unidimensional measure of repetitive, ruminative thought patterns in reaction to negative events, with the total score typically used as a general indication of rumination. The MEAQ is a 62-item measure of experiential avoidance and a tendency to avoid negative experiences encompassing 6 subscales: behavioral avoidance, distress aversion, distress endurance, repression/denial, distraction/suppression, and procrastination. The CERQ is a widely used 36-item measure assessing nine different cognitive strategies to regulate emotions: positive refocusing, positive reappraisal, putting into perspective, refocus on planning, acceptance, blaming others, self-blame, rumination, and catastrophizing. The CSI is a 72-item inventory that assesses a eight types of coping/ER strategies in response to negative life events: problem-solving, cognitive reappraisal, emotional expression, social support, problem avoidance, wishful thinking, self-criticism, and social withdrawal. All items were presented in their original format with their corresponding Likert rating scales.

The WBSI, RRS, and MEAQ produced excellent internal consistency in one of our previous studies with a similar sample (α s > .89; Daros et al. 2018a). The temporal stability of the WBSI and RRS has been reported as .69 over three weeks to three months (Wegner and Zanakos 1994) and .60 over 1 year (Trenor et al. 2003); test-retest reliability has not been evaluated for the MEAQ (see Gámez et al. 2011). In its initial validation, each CERQ subscale produced an internal consistency above .75 and test-retest reliabilities were between .48 and .65 over a 1-year period (Garnefski and Kraaij 2007). In its initial validation, each subscale from the CSI produced an internal consistency above .72 and the test-retest reliabilities were between .68 and .83 over two weeks (Tobin et al. 1989).

³ These measures were chosen because of an interest in how individuals down-regulate negative emotional experiences associated with depression, anxiety, and BPD. We also chose measures that would allow us to assess a diverse range of strategies and coping tactics while also achieving adequate coverage (e.g., full scale or subscale) for the most commonly researched emotion regulation strategies from the affective science literature: cognitive reappraisal, problem-solving, emotional acceptance, thought and expressive suppression, rumination, experiential and behavioral avoidance.

State Measures of ER Strategies during Mood Induction

The mood induction procedure included one neutral and three negative videos that were all four minutes in length. Here, only the negative videos were considered as it allowed for repeated within-person measurements of ER strategy endorsements. The negative videos depicted (a) a scene of domestic abuse between a man and a pregnant woman, where afterwards it is suggested that she loses the baby; (b) a funeral scene in which a young girl struggles to accept the death of her friend; and (c) a scene involving sexual assault by a police officer while interrogating a woman, with her husband watching. Participants completed a measure of baseline mood using the Positive and Negative Affect Scale (PANAS; Watson et al. 1988), which was then assessed again after each negative video, along with ratings of nine ER strategies written in lay terms (see below) and ratings of induced discrete emotions (e.g., disgust, sadness, fear, anger, happiness, and surprise). Using the current sample, each video was found to significantly increase negative affect on the PANAS compared to baseline using paired-samples t-tests, t s > 5.83, p s < .0001. Compared to the neutral video, the three negative videos also elicited higher ratings of negative emotions (i.e., sum of individual ratings for fear, sadness, disgust, and anger; t s > 3.60, p s < .001). These clips were presented on a computer monitor using links to a private YouTube account embedded into a Qualtrics survey that was locked to a countdown timer so that the participant could not stop the video nor move forward until it was finished. Participants were instructed to maintain their visual attention on the computer monitor, avoid closing their eyes as much as possible, and were told that the goal of the study was to simply immerse themselves into each video. The entire mood induction procedure lasted approximately 40 min and participants were shown de-stressing (i.e., comedy or amusing animal) videos and could listen to music to aid in mood correction.

Immediately after each negative video, participants were asked to rate the extent to which they used a series of unstructured ER strategies to manage their emotional response during the induction, written in lay-person descriptions: experiential avoidance (closing or averting your eyes), acceptance (allowing or accepting your feelings), cognitive reappraisal (thinking of the situation differently to change how you feel), problem-solving (coming up with ideas to change the situation or fix the problem), thought suppression (pushing down feelings or putting them out of mind), expressive suppression (hiding feelings from others), self-criticism (criticizing yourself for your feelings), thought avoidance (avoiding thinking about it), and rumination (worrying or ruminating about the situation). Participants rated each strategy on a Likert scale ranging from 1 (*not at all*) to 4 (*a lot*) based on a previous study (Aldao and Nolen-Hoeksema 2013). The mean ratings

on these nine strategies collapsed over three videos were subjected to PCA.

Principal Components Analysis

Zero-order correlations between variables were not too low or too high (r s between .10 and .75), which supported the use of PCA (Field 2013). A direct oblimin rotation and Kaiser normalization was used for both subsets of data, allowing the resulting components to be correlated with each other. Considering the sample size, factor loadings below .51 were suppressed and only variables with an internal consistency greater than or equal to .79 in the present sample were used to improve the resulting output of the analysis (Field 2013). The resultant scores created by the analyses for each participant were saved for simultaneous entry in regression models, which is an effective method to reduce multi-collinearity. Linear regression models were then used to estimate trait emotion dysregulation as a dependent variable using the resultant component scores for each participant and their clinical and demographic variables as control predictors. Age and years of education were continuous predictors whereas ethnicity was entered as a binary predictor (Caucasian = 1; Other = 0).

For the self-report measures, the output produced four components (linear combinations of the inputted variables) with all eigenvalues greater than 1.64. The factor matrix is reproduced in Table 1 along with the internal consistency of each variable used to generate the output of the procedure. The Kaiser-Meyer-Olkin (KMO = .81) measure verified the sampling adequacy of the analysis (Hutcheson and Sofroniou 1999). Four variables were dropped due to low internal consistency prior to analysis and one variable was dropped because it did not load onto any resulting component (see Table 1). For the mood induction portion, the KMO (.75) measure verified the sampling adequacy of the analysis and only one variable was dropped because it did not load onto any component (see Table 2). The output produced three components, with all eigenvalues greater than 1.05. The factor matrix is reproduced in Table 2. The internal consistency of mean ratings for the nine strategies across the three negative videos was .79.

Results

Sample Characteristics

On average, the women were 28.27 years old ($SD = 9.14$) and had completed some university or college education (years of education: $M = 14.68$, $SD = 1.81$). The sample was racially/ethnically diverse: Caucasian (50.50%), Asian/Southeast Asian (18.18%), Mixed/Other (11.11%), South Asian (9.09%), Black (6.06%), Latinx (3.03%), and Arab (2.02%). On average,

participants reported a DERS total score of 92.64 out of a maximum of 180 ($SD = 29.71$, Range = 39–158; Median = 90.00) and the scores were pseudo-normally distributed, with no statistical outliers beyond ± 2.0 SD. A frequency distribution of total scores according to the original recruitment groups is presented in Fig. 1, demonstrating that the distribution was not biased in extreme ways. The average depression and anxiety scores were 13.31 ($SD = 12.33$; Range = 0–40; Median = 11.00) and 8.81 ($SD = 8.26$; Range = 0–32; Median = 6.00) respectively, which both corresponded to mild symptoms. In addition, the average BEST score for BPD symptom severity was 10.67 ($SD = 10.06$, Range = 0–35; Median = 8.00). Trait emotion dysregulation was significantly associated with depression, anxiety, and BPD symptoms (r s > .61, $ps < .001$).

Component Analyses

Self-Report Measures The four emerging components explained 68.50% of the variance. Self-report component 1 (SRC1) largely subsumed the less putatively optimal strategies of self-criticism, withdrawal, thought suppression, rumination, denial, and wishful thinking. SRC2 loaded onto the putatively more effective strategies of cognitive reappraisal, problem-solving, seeking social support, reframing, and tolerance of distress. SRC3 covered physical avoidance, distraction/suppression, and positive thinking. SRC4 concerned catastrophizing, blaming others, and negative evaluations of stress. SRC1 was negatively correlated with SRC2 ($r = -.33$) and SRC3 ($r = -.18$) and was positively associated with SRC4 ($r = .28$). Additional inter-correlations between components were non-significant ($|r|$ s < .14).

SRC1 ($r = .80$) and SRC4 ($r = .47$) were significantly positively correlated with trait emotion dysregulation, while SRC2 was negatively associated ($r = -.42$). SRC3 was not significantly associated with trait emotion dysregulation ($r = .04$). SRC1 and SRC4 were also significantly associated with depression, anxiety, and BPD symptoms (r s > .27), SRC2 was negatively associated with depression ($r = -.36$) and BPD symptoms ($r = -.31$), and SRC3 was not significantly associated with any clinical measures. A linear regression predicting trait emotion dysregulation from the four components while also controlling for demographic and clinical symptoms significantly improved prediction over a baseline model with demographic variables only (Table 3, upper portion). SRC1 and SRC4 were positive predictors of trait emotion dysregulation while SRC2 and years of education were negative predictors after controlling for demographic variables.

Mood Induction The three emerging components explained 60.36% of the variance. Mood induction component 1 (MIC1) consisted of thought avoidance, suppression, and self-criticism; MIC2 subsumed acceptance and rumination; and MIC3 covered the primarily more functional cognitive

Table 1 Results of the first principal components analysis reducing 25 variables from five self-report measures into four component clusters of ER strategies

Measure	ER Strategy Score/Subscale (Descriptor as per documentation)	α	Components and factor loadings			
			SRC1	SRC2	SRC3	SRC4
CSI	Self-Criticism (blaming oneself for situation)	.95	.89			
CERQ	Self-Blame (blaming oneself for experience)	.85	.87			
CSI	Social Withdrawal (shutting off from others)	.93	.77			
RRS	Rumination (repetitive and passive focus on one's negative thoughts)	.91	.74			
WBSI	Thought Suppression (tendency to suppress unwanted thoughts)	.94	.70			
MEAQ	Repression/Denial (dissociation from or lack of awareness of distress)	.87	.68			
CSI	Wishful Thinking (reluctance to reframe)	.86	.60			
CSI	Problem Solving (change stressful situation)	.84		.91		
CSI	Cognitive Restructuring (alter the meaning)	.92		.87		
CERQ	Refocus on Planning (thoughts on how to handle experience)	.83		.75		
CERQ	Positive Reappraisal (give a positive meaning to experience in terms of personal growth)	.90		.73		
MEAQ	Distress Endurance (effective behavior during distress)	.86		.67		
CERQ	Putting into Perspective (relativize negative event compared to others)	.80		.59		
CSI	Social Support (emotional support from others)	.91		.53		
MEAQ	Distraction/Suppression (attempts to ignore or suppress distress)	.85			-.73	
CERQ	Positive Refocus (thinking positive/pleasant thoughts)	.86			-.69	
MEAQ	Behavioral Avoidance (overt, situational avoidance of distress)	.88			-.63	
CERQ	Blame Others (blame others for experience)	.85				.82
CERQ	Catastrophizing (thoughts emphasizing negativity of the experience)	.81				.76
MEAQ	Distress Aversion (negative attitudes or evaluations of distress)	.91				.59

SRC Self-report component, CSI Coping Strategies Inventory, CERQ Cognitive Emotion Regulation Questionnaire, RRS Rumination and Response Style Questionnaire, WBSI White Bear Suppression Inventory, MEAQ Multidimensional Experiential Avoidance Questionnaire; α = refers to Cronbach α , a measure of internal consistency. The following variables were excluded from the principal components analysis because of low internal consistency (Cronbach α noted in brackets): CSI Express Emotions (.74; described as releasing and expressing emotions in documentation), CSI Problem Avoidance (.63; described as denial of problems/avoidance of thoughts), CERQ acceptance (.65; described as acceptance and resignation thoughts), and CERQ rumination (.62; described as having thoughts about the feelings and thoughts associated with negative events). The following variables were excluded because they did not load onto any component: MEAQ procrastination (.88; described as delaying impending distress)

reappraisal and problem-solving strategies. MIC1 was negatively correlated with MIC3 ($r = -.25$) but all other inter-correlations were non-significant ($|r|s < .09$), likely because of the weaker MIC2 component.

MIC1 ($r = .46$) was positively associated with trait emotion dysregulation, while MIC3 was negatively associated ($r = -.15$). MIC2 did not reach statistical significance ($r = .13$) using a more stringent threshold of alpha (.01). MIC1 was positively associated with depression, anxiety, and BPD symptoms ($r_s > .41$), MIC3 was negatively associated with BPD symptoms only ($r = -.27$), and MIC2 was not significantly associated with clinical measures. A linear regression predicting trait emotion dysregulation from the three components while also controlling for demographic and clinical

symptoms significantly improved prediction over a baseline model with demographic variables only (Table 3, lower portion). However, only MIC1 remained a significant positive predictor of trait emotion dysregulation, whereas years of education remained the only significant negative predictor, after controlling for demographic variables.

Ancillary Analyses

To explore specific relationships between ER strategy clusters and facets of trait emotion dysregulation, correlations between the clusters and DERS subscales were computed using partial correlations that controlled for age, years of education, and ethnicity. As seen in Table 4, several patterns were revealed.

SRC1 (self-criticism, withdrawal, thought suppression, wishful thinking, denial, and rumination strategies) was most strongly and significantly associated with all facets of trait emotion dysregulation, particularly non-acceptance and lack of access to situationally appropriate ER strategies. SRC2 (cognitive reappraisal, problem-solving, seeking social support, reframing, and overall distress tolerance) was significantly associated with most facets of trait emotion dysregulation, except non-acceptance and difficulties in goal-directed behavior during negative emotions. MIC1 (thought avoidance, suppression, and self-criticism) is most similar to SRC1 and was associated with most trait emotion dysregulation facets, except difficulties in emotional awareness. SRC4 (catastrophizing, blaming others, and negative evaluations of stress) was significantly associated with difficulties around access to strategies, goal-directed behavior, and impulsivity during negative emotions. MIC3 (cognitive reappraisal and problem-solving) had weak, non-significant associations with facets of trait emotion dysregulation, especially when the significance threshold was controlled.

Discussion

This study is unique in that it examines trait emotion dysregulation in a transdiagnostic manner (rather than comparing across clinical groups), simultaneously examines multiple ER strategies in a single research design, and utilizes a data-driven approach to cluster strategies derived from two methods assessing trait- and state-related ER strategy implementation. The most prominent ER strategies utilized by women with high trait emotion dysregulation were those that tend to be detrimental to mental health in the long-term and are associated with increased psychopathology as evidenced

by the SRC1 and MIC1 groupings: self-criticism, withdrawal, social isolation, denial, wishful thinking, and rumination (Aldao et al. 2010; Naragon-Gainey et al. 2017). It is possible that lower distress tolerance and higher negative urgency (other dimensions associated with high trait emotion dysregulation) may increase motivation to end negative emotional experiences more quickly to limit negative emotional experiences with less cognitive effort (Jeffries et al. 2016; King et al. 2018). Given that SRC1 was highly associated with non-acceptance and difficulties selecting situationally appropriate ER strategies in our facet analyses, this may suggest that women with high trait emotion dysregulation have difficulties tolerating and engaging with negative emotional experiences.

Strategies that seem ineffective may have been learned as appropriate or adaptive in certain developmental contexts (e.g., hiding thoughts and feelings to prevent punishment; Linehan 2014; Thompson 2019). For example, first-degree family members of individuals with BPD tend to report intermediary levels of trait emotion dysregulation compared to non-familial healthy controls (Ruocco et al. 2019) and parents who report higher emotion dysregulation tend to invalidate their children's emotional experiences, which in turn predicts higher levels of emotion dysregulation in children (Buckholdt et al. 2014; Han and Shaffer 2013). It is possible that the high loadings of self-criticism and self-blame on SRC1, and their positive relationship to trait emotion dysregulation, may relate to how self-criticism can exacerbate the variability of negative emotions (Vansteelandt et al. 2020). Still, more research is needed to understand the reasons why ER strategies that seem ineffective on the surface are used more often by those with higher trait emotion dysregulation.

Women with higher levels of trait emotion dysregulation were also significantly less likely to endorse ER strategies associated with mental health benefits and fewer symptoms

Table 2 Results of the second principal components analysis reducing nine variables from the mood induction study into three component clusters of ER strategies

ER Strategy (Lay terms presented to participants)	Components and factor loadings		
	MIC1	MIC2	MIC3
Expressive Suppression (hiding your feelings from others)	.78		
Thought Avoidance (avoided thinking about it)	.74		
Thought Suppression (pushing down feelings or putting them out of mind)	.72		
Self-Criticism (criticizing self for feelings)	.70		
Acceptance (allowing or accepting your feelings)		.69	
Rumination (worrying or ruminating about the situation)		.69	
Cognitive Reappraisal (thinking of the situation differently to change how you feel)			-.86
Problem Solving (coming up with ideas to change the situation or fix the problem)			-.69

MIC Mood induction component; Experiential Avoidance (closing or averting eyes) was removed due to lack of substantial loading

Fig. 1 The distribution of total score on the DERS according to original recruitment group in Daros et al. (2018a). In the present study, an additional seven participants ($n=99$ versus $n=92$) were included because of our transdiagnostic approach. BPD = Borderline personality disorder; MAD = Mixed anxiety and/or depression; HC = Healthy control

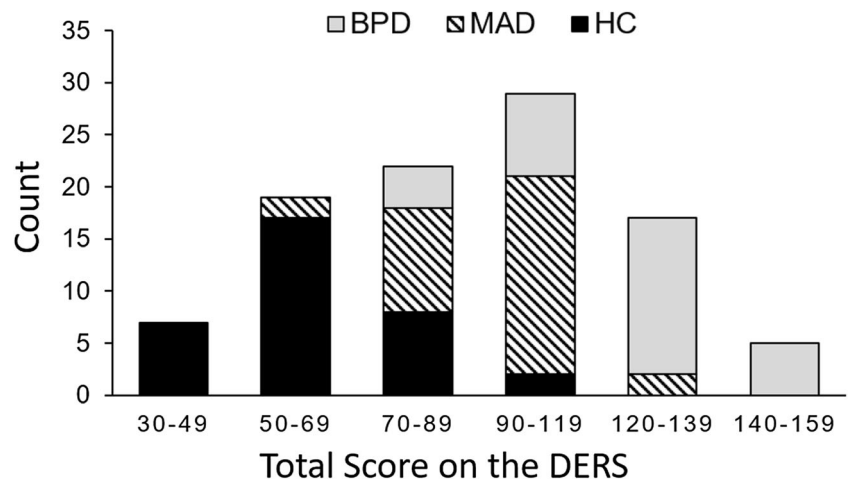


Table 3 Linear regression predicting trait emotion dysregulation from resulting component clusters of ER strategies controlling for demographic and clinical variables

Step	Variable	β	t	p	Model Fit and Test
Self-Report					
1	Age	-.04	-.56	.58	<i>Model F</i> = 30.79 <i>Model p</i> < .001 R^2 = .68
	Years of education	.07	1.08	.28	
	Ethnicity	-.04	-.69	.49	
	Depression Symptoms	.21	1.93	.06	
	Anxiety Symptoms	.17	1.90	.06	
2	BPD Symptoms	.56	5.82	< .001	<i>Model F</i> = 37.78 <i>Model p</i> < .001 R^2 = .82 ΔR^2 = .14, p < .001
	Age	-.07	-1.33	.19	
	Years of education	.02	.41	.69	
	Ethnicity	.01	.19	.85	
	Depression Symptoms	.02	.17	.87	
	Anxiety Symptoms	.06	.85	.40	
	BPD Symptoms	.35	4.31	< .001	
	SRC1	.46	6.48	< .001	
SRC2	-.13	-2.49	.015		
SRC3	.03	.57	.57		
SRC4	.15	2.76	.007		
Mood Induction					
1	Age	-.04	-.57	.57	<i>Model F</i> = 31.56 <i>Model p</i> < .001 R^2 = .68
	Years of education	.07	1.05	.30	
	Ethnicity	-.05	-.73	.47	
	Depression Symptoms	.20	1.90	.06	
	Anxiety Symptoms	.18	1.98	.051	
2	BPD Symptoms	.56	5.86	< .001	<i>Model F</i> = 24.11 <i>Model p</i> < .001 R^2 = .72 ΔR^2 = .04, p = .016
	Age	-.06	-.94	.35	
	Years of education	.05	.72	.47	
	Ethnicity	-.02	-.31	.76	
	Depression Symptoms	.16	1.54	.13	
	Anxiety Symptoms	.11	1.29	.20	
	BPD Symptoms	.55	5.86	< .002	
	MIC1	.23	3.22	.002	
MIC2	-.05	-.80	.43		
MIC3	.08	1.19	.24		

β = standardized regression coefficient; SRC Self-Report Component, MIC Mood Induction Component

Table 4 Partial correlations between facets of trait emotion dysregulation and component clusters of ER strategies controlling for demographic variables

DERS Subscale	Cronbach α	Partial correlation (controlling for demographic variables) with component number				
		SRC1	SRC2	SRC4	MIC1	MIC3
Nonacceptance	.84	.71*	-.18	.33*	.53*	-.23
Goals	.90	.53*	-.24	.48*	.33*	-.14
Impulse	.92	.56*	-.41*	.48*	.42*	-.20
Awareness	.79	.57*	-.44*	-.05	.32	.04
Strategies	.94	.71*	-.49*	.58*	.42*	-.23
Clarity	.90	.60*	-.42*	.08	.52*	-.10

SRC Self-report component, *MIC* Mood Induction component. Components SRC3 and MIC2 were dropped from analyses as they were not significantly associated with trait emotion dysregulation as measured by the DERS total score. In this correlation matrix, a more stringent alpha was applied to determine statistical significance, therefore all asterisks refer to $ps \leq .001$

of psychopathology: cognitive reappraisal, problem-solving, seeking social support, reframing, and tolerance of distress (at least when measured via self-report questionnaires, SRC2). Strategies such as cognitive reappraisal tend to be more effortful because they involve engaging with the emotional stimulus (see Naragon-Gainey et al. 2017). This may be more challenging for people with high trait emotion dysregulation given other overlapping cognitive and emotional problems, similar to what is reported in major depressive disorder (Joormann and Stanton 2016). Other theories as to why optimal strategies are endorsed less often in high trait emotion dysregulation may relate to an individual's beliefs about specific ER strategies, their actual abilities or skill in modulating negative emotions, and the heightened intensity of emotional experience during exposure to negative stimuli (Yoon and Rottenberg 2020). Trait emotion dysregulation is also negatively correlated with mindfulness abilities which, in turn, may mediate greater thought avoidance (Prakash et al. 2017). SRC2 strategies were negatively associated with difficulties in emotional awareness and clarity (i.e., knowing what emotion one is feeling and distinguishing it from others) in our facet analyses. Those with more of these difficulties may have more challenges selecting situationally appropriate ER strategies and restrict themselves to less effective strategies to reduce emotional arousal (e.g., Vine and Aldao 2014). Collectively, more research is needed to determine the underlying mechanisms for reduced ER strategy effectiveness in individuals with higher trait emotion dysregulation.

Finally, women with higher trait emotion dysregulation also self-reported engaging in higher degrees of blaming others, catastrophizing, and evaluating distress in a more negative light. This grouping (SRC4) was also associated with a lack of access to situationally appropriate ER strategies when examining facets of trait emotion dysregulation. These findings fit with previous research on BPD demonstrating that trait emotion dysregulation is highly associated with repetitive

thought processes (e.g., rumination, catastrophizing, and brooding; Selby et al. 2009), as well as anger rumination and interpersonal problems, which may lead to outbursts with others (e.g., Peters et al. 2015; Stepp et al. 2014). Specific evidence for the relationship between trait emotion dysregulation and "blaming others" is sparse, although it is associated with expressions of anger (e.g., Martin and Dahlen 2005). As a specific subscale on the CERQ, "blaming others" is associated with psychopathology but much more weakly than other subscales (Garnefski and Kraaij 2007). People with high trait emotion dysregulation evaluate emotions more negatively (e.g., negative feelings are bad, they last forever, and control behavior; Veilleux et al. 2020). Low perceived distress tolerance is associated with higher endorsements of suppression, avoidance, and rumination strategies (Jeffries et al. 2016), perhaps to avoid confronting or engaging with negative emotions in the present moment (see Leyro et al. 2010).

Our PCA produced one additional self-report questionnaire component compared to a previous meta-analysis (Naragon-Gainey et al. 2017); however, we also had 15 additional variables. SRC1 and MIC1 most closely map onto the cognitive perseveration class, with overlap on rumination, worry, and thought suppression. The present study suggests that self-criticism, self-blame, denial, and wishful thinking may be additional cognitive perseveration strategies. SRC2 and MIC3 most closely map onto the engagement class, with cognitive reappraisal and problem-solving (as well as variants of these) the clearest overlapping ER strategies. The present study did not include a strong measure of acceptance/mindfulness; therefore, we were unable to replicate previous effects involving this strategy. SRC3 most closely aligns with the disengagement ER strategy grouping with overlap on distraction, behavioral avoidance, and experiential avoidance/suppression. SRC4 was a novel grouping, with strategies that were not examined in the previous meta-analysis. One other difference was that acceptance and rumination were in the same

direction and separated on MIC2, whereas the previous meta-analysis suggested they might have loaded in the opposite direction and on MIC1. The reasons for this could relate to how the strategies were presented during the mood induction procedure and what participants interpreted them to mean. Because the current study avoided labeling these two strategies as antagonistic to each other (e.g., adaptive versus maladaptive), results indicated that endorsement ratings were more similar than different, at least during the mood induction procedure. These results are compelling evidence for data-driven approaches to grouping ER strategies, as it may be difficult to determine their common structure before data analysis; moreover, that structure may also depend on the sample assessed.

Although we had the benefit of a broad range of trait emotion dysregulation scores, limitations of this work include the relatively small sample size, restrictions to participation based on the presence of psychotic or substance use disorders, and the inability to generalize these results to all women or outside the clinical characteristics of the current sample. Moreover, the restriction of the current sample to women was based on the previous work which was primarily conducted to examine differences in women with BPD compared to women with depressive and/or anxiety disorders and non-clinical healthy controls. There are plausible differences in the ways that men and women utilize ER strategies (e.g., Zlomke and Hahn 2010); therefore, the current study requires replication and extension to samples that include men. Considerations of ethnicity could also be improved, given this study only examined potential differences between Caucasian women and those of other ethnicities. Although two methods of assessment were used, they both relied on self-reflection to report emotional experiences, which may be difficult for some individuals. As noted above, people with higher (versus lower) trait emotion dysregulation may also exhibit lower emotional clarity and awareness, which may impact how they report their use of ER strategies. More broadly, this work is correlational in its design and we cannot draw conclusions about causality or the directionality of the effects, or whether a third variable may have influenced the results. Future research will be needed to address these limitations, extend them to more diverse demographic samples, and investigate alternative assessment methodologies.

Despite these limitations, the present study provides an initial, comprehensive investigation of the relationship between trait emotion dysregulation and specific ER strategies in the context of trait- and state-relevant assessment methods. Our findings suggest that women with higher levels of trait emotion dysregulation are most likely to use suboptimal strategies to regulate their emotions (i.e., self-criticism, social isolation, rumination, blaming others, and catastrophizing) and less likely to use generally more effective ones (i.e., cognitive reappraisal, problem-solving, seeking social support, and

tolerance of distress), while controlling for demographic variables. These findings are in line with theories on the development of emotion dysregulation from a transdiagnostic clinical perspective (Linehan 2014; Thompson 2019) and may be used to understand how habitual and negative mood-state-related use of certain ER strategies contributes to psychopathology and vice versa (i.e., how psychopathology is maintained by ER strategy use). Further, these results could be used to understand how treatments work to reduce the use of sub-optimal ER strategies and increase the implementation of more effective ones.

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Data Availability Consent to deposit our dataset online was not included in the informed consent procedures during data collection.

Compliance with Ethical Standards

Conflict of Interest There are no conflicts of interest or financial disclosures to declare.

Experiment Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Ethics Approval This study received an institutional review board (IRB) ethics approval from the University of Toronto before data collection began.

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