Emotion
2014, Vol. 14, No. 2, 388–396

1528-3542/14/$12.00 DOI: 10.1037/a0035249

Rethinking Emotion: Cognitive Reappraisal is an Effective Positive and Negative Emotion Regulation Strategy in Bipolar Disorder

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Bipolar disorder involves difficulties with emotion regulation, yet the precise nature of these emotion regulatory difficulties is unclear. The current study examined whether individuals with remitted bipolar I disorder ($n = 23$) and healthy controls ($n = 23$) differ in their ability to use one effective and common form of emotion regulation, cognitive reappraisal. Positive, negative, and neutral films were used to elicit emotion, and participants were cued to watch the film carefully (i.e., uninstructed condition) or reappraise while measures of affect, behavior, and psychophysiology were obtained. Results showed that reappraisal was associated with reductions in emotion reactivity across subjective (i.e., positive and negative affect), behavioral (i.e., positive facial displays), and physiological (i.e., skin conductance) response domains across all participants. Results suggest that reappraisal may be an effective regulation strategy for both negative and positive emotion across both healthy adults and individuals with bipolar disorder. Discussion focuses on clinical and treatment implications for bipolar disorder.

Keywords: bipolar disorder, emotion, cognitive reappraisal

Bipolar disorder (BD) is a severe and chronic psychiatric disorder that is consistently ranked by the World Health Organization in the top 10 causes of disability worldwide (e.g., Murray & Lopez, 1996). The core diagnostic criterion for BD involves disrupted affective functioning, including periods of abnormally and persistently elevated mood (i.e., mania; American Psychiatric Association, 2000). Indeed, recent empirically based models of BD emphasize the role of heightened and prolonged emotional responding, particularly positive emotional responding, as a risk factor for BD (Gruber, 2011; Johnson, 2005). An important next step is to isolate processes that may influence emotional responding in BD, and apply this information to refine therapeutic treatments.

Emotion Reactivity in BD

A prominent view is that BD is associated with heightened emotion reactivity, including an increase in the magnitude or duration of affective response, that is present even during periods of symptom remission (e.g., Gruber, 2011; Johnson, Gruber, & Eisner, 2007). Specifically, individuals with BD experience persistent elevations in positive emotion reactivity across differing contexts (e.g., Gruber, 2011), consistent with psychosocial models implicating heightened reward seeking and goal striving in the etiology of BD (e.g., Alloy, Abramson, Urosevic, Bender, & Wagner, 2009; Johnson, 2005). For example, remitted BD individuals self-report greater positive affect in response to emotionally evocative films (Gruber, Harvey, & Purcell, 2011) and static photos (M'Bailara et al., 2009). In addition, remitted BD individuals exhibit increased psychophysiological correlates of positive emotional responding (e.g., respiratory sinus arrhythmia) in response to positive and negative laboratory stimuli (Gruber, Harvey, & Johnson, 2009; Gruber et al., 2011). Neuroimaging studies further suggest that individuals with BD exhibit increased activity in brain regions typically associated with emotional salience and reward—including increased activity in the amygdala, putamen, and ventral striatal regions—in response to happy faces (e.g., Hassel et al., 2008). Heightened positive emotion reactivity further serves to differentiate BD from other mood disorders such as major depressive disorder (Kring & Bachorowksi, 1999), and has important clinical implications for psychosocial treatments aimed at reducing heightened positive emotionality in BD (e.g., Johnson, 2005).

Abnormalities in negative emotion reactivity might be expected in BD given frequent and recurrent bouts of depression (Judd et al., 2003). However, empirical research generates largely null findings for heightened negative reactivity among individuals with BD. People diagnosed with, and at risk for BD do not appear to differ from healthy controls in their experiential, behavioral, cognitive, or physiological responses to negative stimuli, including failure feedback (e.g., Ruggero & Johnson, 2006), interpersonal criticism (Cuellar, Johnson, & Ruggero, 2009), or negative photos (Sutton & Johnson, 2002). Studies of neural response to emotional stimuli in BD also do not provide conclusive evidence for heightened negative emotionality (e.g., Malhi et al., 2007). In sum, it appears that individuals with BD do not markedly differ from healthy controls in negative emotion reactivity (e.g., Johnson, Gruber, & Eisner, 2007).

Emotion Regulation in BD

A pressing question that emerges from research on emotion reactivity in BD is *why* such individuals show atypical patterns

This article was published Online First December 23, 2013.

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of emotional reactivity, particularly for positive emotions. One possibility is that individuals with BD are unable to regulate their emotions in the same ways that healthy individuals do, and possess a core deficit in their emotion regulation abilities (e.g., ability to effectively decrease emotion intensity). One way to investigate this possibility is to examine whether individuals with BD are able to successfully enact adaptive forms of emotion regulation. One such strategy is cognitive reappraisal, defined as construing an emotion-eliciting situation in such a way that it adaptively alters its emotional impact (Gross, 1998, 2002).

Research on cognitive reappraisal has focused on the extent to which it preemptively influences emotional responses, with studies in nonclinical college samples indicating that reappraisal is associated with reduced negative emotion experience and behavior (e.g., Gross, 1998) and decreased neural activity in the amygdala and insula (Ochsner & Gross, 2005). The self-reported tendency to use cognitive reappraisal in everyday life is further associated with decreased negative emotion and increased well-being (Gross & John, 2003). Research on emotion regulation among depressed (Ehring, Tuschen-Caffier, Schnülle, Fischer, & Gross, 2010) and socially anxious (Goldin, Manber-Ball, Werner, Heimberg, & Gross, 2009) individuals bolsters the feasibility of implementing these strategies in clinical samples.

Importantly, no experimental studies to date have examined whether cognitive reappraisal is an effective emotion regulation strategy for decreasing emotion reactivity in BD. Two lines of work suggest that this is a promising possibility. First, work in healthy adults suggests that engagement in cognitive reappraisal promotes down-regulation of positive emotions like amusement (Giuliani, McRae, & Gross, 2008). Second, existing cognitive–behavioral treatments that include cognitive reframing exercises for BD center on down-regulating harmful positive mood states (e.g., Lam, Hayward, Watkins, Wright, & Sham, 2005). Understanding whether the cognitive reappraisal component actively contributes to changes in positive emotionality in BD has important implications for isolating processes involved in the onset and maintenance of BD as well as positive emotion regulation more generally.

The Present Investigation

The goal of the present study was to examine the impact of cognitive reappraisal on positive and negative emotion reactivity in BD and healthy community individuals (CTL) using a within-subjects approach to assess subjective, behavioral, and physiological domains of emotion reactivity. Specifically, we tested whether BD and CTL groups would differ in the magnitude of emotion reactivity change following cognitive reappraisal instructions compared with an uninstructed control condition in which participants were instructed to watch the film carefully. Based on literature suggesting difficulties with emotion reactivity in BD, it was predicted that individuals with BD would show compromised emotion regulation ability (i.e., smaller reductions in emotion intensity) when using cognitive reappraisal compared with the CTL group.

Method

Participants

Participants were persons diagnosed with BD Type I ($n = 23$), currently remitted (i.e., neither manic, depressed nor mixed mood phase; remission duration: $M_{\text{months}} = 24.72$, $SD = 59.91$), and a CTL group ($n = 23$) who did not meet lifetime criteria for any *DSM–IV–TR* Axis I disorders (i.e., no anxiety disorders, major depression, mania/hypomania, dysthymia, schizophrenia, schizoaffective disorder, substance abuse, eating disorders, hypochondriasis, and pain disorder). Exclusion criteria for both groups included severe head trauma or neurosurgery, stroke, neurological disease, autoimmune disorder, and current alcohol or substance abuse/dependence (see Table 1). It should be noted that the participants with BD were a relatively high-functioning group in terms of comorbidities, medications, and length of symptom remission (see Table 1). Participants in both groups were primarily recruited using online advertisements (e.g., Craigslist) for a study on "bipolar disorder, mood, and sleep" for the BD group or "mood and sleep" for the CTL group. Additional BD participants were recruited via flyers posted in mental health centers in the San Francisco Bay Area region.

Clinical Diagnosis and Symptoms

Diagnostic status (i.e., presence of any current and lifetime Axis I disorder) for all participants was confirmed using the Structured Clinical Interview for *DSM–IV* (SCID-IV; First, Spitzer, Gibbon, & Williams, 1995). Current manic symptoms were assessed using the Young Mania Rating Scale (YMRS; Young, Biggs, Ziegler, & Meyer, 1978), an 11-item, clinician-rated measure of current manic symptoms with scores ranging from 0 to 60, and current depressive symptoms were assessed using the Clinician-Rated Inventory of Depressive Symptoms (IDS-C; Rush, Gullion, Basco, Jarrett, & Trivedi, 1996), a 30-item, clinician-rated measure of current depressive symptoms with scores ranging from 0 to 84. Following previously published guidelines, remitted mood status for participants was verified using the SCID-IV mood modules for the past month (i.e., absence of current manic/hypomanic or depressive episode) and scoring below symptom cutoffs for the past week (i.e., YMRS ≤ 7 and IDS-C ≤ 11; Gruber, Harvey & Gross, 2012; Talbot, Hairston, Eidelman, Gruber, & Harvey, 2012).

All diagnostic and symptom interviews were administered by trained clinical psychology doctoral students ($n = 3$) and postdoctoral psychology fellows ($n = 1$). The same interviewer administered the SCID-IV, IDS-C, and YMRS for a given participant. Trained doctoral student interviewers had at least 2 years prior diagnostic interviewing experience prior to the study, and were directly supervised by a clinical psychology faculty member. Additional consensus meetings among all interviewers were conducted at study onset and occurred as needed to provide diagnostic clarity. Fifteen random SCID-IV audiotapes were rated by an independent reviewer, which matched 100% ($\kappa = 1.00$) for group diagnoses, and intraclass correlations for absolute agreement between the interviewer and an independent rater were strong for the IDS-C (ICC = 0.98) and YMRS (ICC = 0.99).

Table 1
Demographic and Clinical Participant Characteristics

	BD	CTL	Statistic
Age (Yrs)	39.13 (12.86)	35.24 (12.46)	$F = 1.03$
Female (%)	73.9%	52.2%	$\chi^2 = 2.33$
Caucasian (%)	30.4%	43.5%	$\chi^2 = 0.84$
Partnered (%)	65.2%	73.9%	$\chi^2 = 0.41$
Education (Yrs)	15.30 (2.30)	14.61 (1.67)	$F = 1.37$
YMRS	3.29 (2.47)	1.26 (1.63)	$F = 10.46^*$
IDS-C	7.68 (4.36)	3.72 (2.95)	$F = 12.89^*$
Age at onset (yrs.)	22.00 (12.56)		
Illness duration (yrs.)	17.00 (12.48)		
# Hospitalizations	1.28 (0.45)		
# Manic episodes	7.43 (7.27)		
# Depressive episodes	7.04 (5.67)		
# Medications	2.30 (1.22)		
# Current comorbid disorders	0.57 (0.69)		

Note. BD = Bipolar disorder group; CTL = Healthy control group; YMRS = Young Mania Rating Scale; IDS-C = Inventory of Depressive Symptomatology-Clinician Rating; # Medications = number psychotropic medications taken, including anticonvulsants, lithium, neuroleptics, anxiolytics, stimulants, antidepressants, and sedative-hypnotics[3]; # Comorbid Disorders = number of current *DSM-IV-TR* Axis I comorbidities.[4] Mean values are displayed with standard deviations in parentheses where applicable.
$^* p < .05$.

Film Stimuli

The present study used two happy, two sad, and two neutral films. Happy films included figure skater Sarah Hughes winning the Olympic gold medal (150 s) and Andy Roddick winning the U.S. Open (181 s). Sad films included scenes from *The Champ* involving a young boy crying at the death of his father (170 s) and scenes from *21 Grams* involving a mother crying over the death of her family (231 s). Neutral films depicted scenes of a man and woman doing household tasks (94 s) and two men sitting quietly in a room (131 s). Participants were shown three films (neutral, happy, sad) in the uninstructed condition, followed by three different films (neutral, happy, sad) in the reappraisal condition. In each of the two conditions, the neutral film was presented first and followed by either the sad or happy film in counterbalanced order. The specific film used for a given valence (e.g., Sarah Hughes vs. Andy Roddick for the happy film; *The Champ* vs. *21 Grams* for the sad film; household tasks vs. sitting in a room for the neutral film) was also counterbalanced across the uninstructed and reappraisal conditions.

Emotion Reactivity to Film Stimuli

A multimethod approach was employed to measure emotion reactivity at subjective, behavioral, and physiological levels across two time periods. The first time period consisted of a 60 s resting baseline that preceding each film, and the second time period was when each film was viewed.

Subjective. Subjective positive (PA) and negative (NA) affect was assessed using the 10-item self-report short form of the Positive and Negative Affect Schedule (PANAS; Mackinnon et al., 1999) with good internal consistency (PA_{mean} $\alpha = .89$; NA_{mean} $\alpha = .72$).

Behavior. Behavioral displays of PA (i.e., AU6 [cheek raiser] + AU12 [lip corner puller]) and NA (i.e., AU6 [cheek raiser], AU15 [lip corner depressor]) were digitally videotaped and coded offline using the Facial Action Coding System (FACS; Ekman, Friesen, & Hager, 2002). An emotional expression received an intensity score from 1 (*trace*) to 5 (*marked*), or 0 (*absent*). Three certified FACS coders blind to diagnostic status independently coded half ($n = 28$) of all participants and demonstrated good intraclass correlations for absolute agreement for PA (ICC = 0.80) and NA (ICC = 0.88) displays. Average values were computed across coders for this overlapping subset, and remaining participants were divided among coders.

Physiology. Physiological data were recorded continuously at 1,000 Hz using a Biopac multichannel device (MP150-BIOPAC Systems Inc., Goleta, CA) and analyzed using AcqKnowledge v3.9.1 software. Data were analyzed and corrected for artifacts offline (< 1.6% of data). A transistor-transistor logic (TTL) digital signal enabled the synchronization of physiological data with distinct prefilm and film periods. We focus on two specific physiological parameters that reflect activity in the sympathetic and parasympathetic nervous system, respectively.

Skin conductance response (SCR) provided a measure of sympathetic nervous system activity, associated with phasic increases in emotional arousal (Dawson, Schell, & Filion, 2000; Demaree, Schmeichel, & Robinson, 2004). Electrodermal activity recordings were obtained using a Biopac GSR 100C amplifier with constant voltage of 0.5 v between two 10 mm Ag-AgCl electrodes. A 0.5% NaCl paste was applied on the palmar surface of the distal phalanges of the first and third fingers of the nondominant hand. SCRs were identified as increases in skin conductance level exceeding 0.05 μ Siemens, and quantified as the number of SCRs/minute. The frequency of SCRs/minute was computed for each baseline and film period.

Respiratory sinus arrhythmia (RSA) provided a noninvasive index of cardiac vagal tone, or parasympathetic nervous activity. RSA has been associated with positive emotion (e.g., Kok & Fredrickson, 2010; Oveis et al., 2009) and emotion regulation capacity (Butler, Wilhelm, & Gross, 2006). Electrocardiogram recordings were obtained with two prejelled Ag-AgCl snap disposable vinyl electrodes placed in a modified Lead II configuration using a Biopac ECG100C amplifier. RSA was calculated using AcqKnowledge v3.9.1 software following the well-validated peak-valley method in which expiratory and inspiratory periods were used as windows to determine the range of cardiac-interval fluctuations associated with the respiratory phase (Grossman, van Beek, & Wientjes, 1990). RSA was calculated in ms, with higher values reflecting greater parasympathetic activity. Average RSA values were computed for each baseline and film period.

[3] Current psychotropic medications for the BD group included antidepressants ($n = 19$), anticonvulsants ($n = 11$), neuroleptics ($n = 9$), benzodiazepines ($n = 7$), lithium ($n = 3$), sedative-hypnotics ($n = 2$), and stimulants ($n = 1$).

[4] Current Axis I comorbidities for the BD group included specific phobia ($n = 4$), social phobia ($n = 3$), generalized anxiety disorder ($n = 2$), obsessive–compulsive disorder ($n = 2$), agoraphobia ($n = 1$), and anorexia ($n = 1$).

Manipulation Check Items

One item at the end of each film across both conditions assessed whether participants had previously seen the film. Two questions at the end of each film during the reappraisal condition assessed the extent to which participants expended effort reappraising ("I tried not to feel anything at all") and were successful reappraising ("I was successful at adopting a detached and unemotional attitude") on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale.

Procedure

After obtaining informed consent, the SCID-IV, YMRS, and IDS-C were administered. Participants were then seated in front of a 17" high-resolution computer monitor. All questionnaires, films, and instructions were presented using Medialab software. Two instructional sets were used.

In the first (uninstructed) condition, participants completed a 60-s baseline period during which they read the following instructions: "Please relax and watch the screen for the next minute." At the end of the baseline, participants completed the PANAS. Next, they received the following instructions: "We will now be showing you a short film clip. It is important that you watch the film clip carefully" followed by either the neutral, happy, or sad film. At the end of the film, participants completed the PANAS and manipulation check items. This procedure was repeated for each of the three films. Following well-validated cognitive reappraisal protocols previously utilized in healthy adult samples (e.g., Ehring et al., 2010; Gross, 1998, 2002), participants first completed the uninstructed condition to capture individuals' natural pattern of emotion reactivity, from which we could then measure subsequent changes in emotion response as a function of cognitive reappraisal instruction which came second.

In the second (reappraisal) condition, the experimenter entered the room and explained the cognitive reappraisal task. To ensure comprehension and compliance with reappraisal task instructions, the experimenter guided the participant verbally through a practice run using a neural practice photo of a landscape, asking the participant to verbally define cognitive reappraisal and how they would implement the strategy to reduce emotion intensity while viewing the photo. Questions were also addressed during this time. Next, participants completed a 60-s baseline period during which they read the following instructions: "Please relax and watch the screen for the next minute." At the end of the baseline participants completed the PANAS. Next, participants read the following standardized cognitive reappraisal instructions (Gross, 1998, 2002): "We will now be showing you a short film clip that will begin shortly. This time, please try to adopt a detached and unemotional attitude as you watch the film. As you watch the film clip, try to think about what you are seeing objectively, in terms of the technical aspects of the events you observe. Watch the film carefully, but please try to think about what you are seeing in such a way that you don't feel anything at all" followed by either the neutral, happy, or sad film. At the end of the film, participants completed the PANAS and manipulation check items. This procedure was repeated for each of the three films.

Data Analysis and Reduction

Following statistical convention using validated reappraisal paradigms (e.g., Gross & Levenson, 1997), we conducted a 2 (Group: BD, CTL) × 3 (Film: Neutral, Happy, Sad) × 2 (Condition: Uninstructed, Reappraise) repeated-measures analysis of covariance (ANCOVA) for each of the six emotion reactivity variables, controlling for current symptom scores (YMRS, IDS-C). Emotion reactivity variables were calculated by subtracting the baseline period from the respective film period (Gross & Levenson, 1997; Rogosa & Willett, 1983).[1] Given our focus on changes in emotion reactivity as a function of reappraisal, in addition to prior published work on baseline group differences in emotion reactivity in BD[2], our results focused specifically on testing Condition main effects, Condition × Film interactions, and Condition × Group interactions. For variables that were positively skewed or leptokurtic, log transformations were performed (though nontransformed data are presented for ease of interpretation). A Greenhouse-Geisser correction was used when assumptions for sphericity were not met and adjusted F, df, and p values are reported. Effect sizes for significant results are reported as partial eta squared (η_p^2). All reported p values are two-tailed, and means are presented (with standard error noted in parentheses) below.

[1] We note that Gruber, Harvey, and Purcell (2011) contained all participants reported in the present study (plus one additional CTL participant not reported in the present study due to missing data for the reappraisal condition). In their article, Gruber et al. report a significant Group main effect for positive emotion reactivity across the positive, negative and neutral film clips such that the BD group reported increased PA and RSA reactivity (i.e., using a change score to subtract prefilm baselines from response during the respective film) across the three films during the uninstructed condition compared to the CTL group. The authors did not report significant Group × Film interactions for any emotion reactivity variables. These emotion reactivity group differences are consistent with prior findings in college-aged students at risk for BD (Gruber, Johnson, Oveis, & Keltner, 2008).

[2] Interested participants were invited to complete a brief phone screen to determine eligibility. Approximately 260 individuals in total were screened of which 55 were deemed eligible for the BD or CTL group as part of a broader investigation on "mood, emotion and sleep." Of these 55 participants invited to the laboratory who completed the experimental task, five in the BD group were excluded either because they were currently symptomatic or BD type II, two in the BD group were excluded due to technical difficulties during the experiment, and two participants in the CTL group were excluded due to poor study compliance (i.e., sick or falling asleep during task). This resulted in a remaining sample of 46 participants presented in the present study (23 BD and 23 CTL). Additional measures collected but not reported as part of the present investigation include baseline group differences in emotion reactivity during the film clips and emotion recovery during a postfilm period (see Gruber et al., 2011), self-reported spontaneous regulation strategies in response to viewing the film clips including self-reported reappraisal and suppression (see Gruber et al., 2012), and trait measures of emotion regulatory dispositions including rumination over mood states (e.g., Gruber, Eidelman, Johnson, Smith, & Harvey, 2011). Additional clinical interview and self-report measures of sleep disorders and sleep patterns were collected as part of the broader investigation not pertinent to the present study. No additional exclusions or experimental manipulations were administered in the context of this present investigation.

Results

Preliminary Analyses

As evident in Table 1, BD and CTL participants did not significantly differ with respect to age, gender, ethnicity, education level, employment status, and partnership status ($ps > .05$). Both groups scored below symptom cutoffs on the YMRS (≤ 7) and IDS-C (≤ 11), though the BD group scored somewhat higher on both symptom measures than the CTL group ($ps < .05$). Current symptoms were thus included as covariates. There were no significant main effects or interactions for gender, film order, or prior film viewing for any emotion reactivity variables ($ps > .05$). Also, the BD and CTL groups did not differ on reported effort or success for the reappraisal condition, consistent with comparable engagement with reappraisal instructions ($ps > .05$).

Main Analyses

Subjective. For PA, a significant Condition main effect emerged, $F(1, 38) = 10.62$, $p < .01$, $\eta_p^2 = 0.22$, suggesting that the reappraisal condition ($M = 0.01$, $SE = 0.06$) was associated with reduced PA compared with the uninstructed condition ($M = 0.23$, $SE = 0.06$) for all participants across all films. Neither the Condition × Film nor Condition × Group interactions reached significance for PA ($ps = .38$ and .86, respectively).

For NA, a significant Condition main effect emerged, $F(1, 43) = 4.24$, $p < .05$, $\eta_p^2 = 0.10$, suggesting that the reappraisal condition ($M = 0.08$, $SE = 0.03$) was associated with reduced NA compared with the uninstructed condition ($M = 0.13$, $SE = 0.04$) across all participants. This main effect was qualified by a higher-order Condition × Film interaction, $F(2, 86) = 4.11$, $p < .05$, $\eta_p^2 = 0.10$. Follow-up analyses conducted separately for each specific film comparing NA during the reappraisal with the uninstructed condition for each film revealed that, across all participants, the reappraisal condition was associated with less NA compared with the uninstructed condition for the sad film (Reappraisal: $M = 0.35$, $SE = 0.06$; Uninstructed: $M = 0.52$, $SE = 0.10$; $\eta_p^2 = 0.11$, $p < .05$) but not for the happy (Reappraisal: $M = -0.07$, $SE = 0.03$; Uninstructed: $M = -0.06$, $SE = 0.05$; $\eta_p^2 = 0.01$, $p = .52$) or neutral film (Reappraisal: $M = -0.06$, $SE = 0.03$; Uninstructed: $M = -0.07$, SE-.04; $\eta_p^2 = 0.01$, $p = .63$). The Condition × Group interaction did not reach significance ($p = .69$) for NA (see Table 2; Figure 1).

Behavior. For PA displays, a significant Condition main effect emerged, $F(1, 38) = 13.99$, $p < .01$, $\eta_p^2 = 0.27$, suggesting that the reappraisal condition ($M = 0.21$, $SE = 0.06$) was associated with reduced PA displays compared to the uninstructed condition ($M = 0.47$, $SE = 0.09$) for all participants. This main effect was qualified by a trending high-order Condition × Film interaction, $F(2, 76) = 2.92$, $p = .06$, $\eta_p^2 = 0.07$. Although nonsignificant, we note that follow-up analyses conducted separately for each specific film comparing the reappraisal with the uninstructed condition suggested that the reappraisal condition may have been associated with decreased PA displays compared to the uninstructed condition for the happy film (Reappraisal: $M = 0.43$, $SE = 0.11$; Uninstructed: $M = 0.87$, $SE = 0.14$; $\eta_p^2 = 0.28$, $p < .001$) but not for the sad (Reappraisal: $M = 0.06$, $SE = 0.03$; Uninstructed: $M = 0.08$, $SE = 0.06$; $\eta_p^2 = 0.06$, $p = .13$) or neutral films (Reappraisal: $M = 0.07$, $SE = 0.06$; Uninstructed: $M = 0.29$, $SE = 0.12$; $\eta_p^2 = 0.01$, $p = .63$). The Condition × Group interaction did not reach significance ($p = .27$) for PA displays ($ps > .05$).

For NA displays, neither the Condition main effect, Condition × Film interaction or Condition × Group interaction reached significance ($ps = .37$, .70, and .09, respectively).

Table 2
Mean Change Score (and Standard Error Values) of Self-Reported Emotion, Behavior, and Physiological Responding of Participants by Film Condition and Diagnostic Group

	Uninstructed condition (Emotion reactivity)		Instructed condition (Cognitive reappraisal)	
	BD	CTL	BD	CTL
Neutral film				
PA	−0.20 (0.16)	0.00 (0.16)	−0.23 (0.11)	−0.30 (0.17)
NA	−0.10 (0.05)	−0.04 (0.06)	−0.11 (0.06)	−0.04 (0.06)
Happy display	0.49 (0.27)	0.23 (0.19)	0.19 (0.15)	0.00 (0.10)
SCR	0.02 (0.23)	−0.22 (0.25)	−1.16 (0.33)	−0.69 (0.48)
Happy film				
PA	1.17 (0.17)	0.85 (0.18)	0.46 (0.20)	0.25 (0.19)
NA	−0.08 (0.07)	−0.04 (0.07)	−0.14 (0.05)	0.00 (0.04)
Happy display	0.99 (0.27)	0.97 (0.22)	0.47 (0.23)	0.38 (0.18)
SCR	−0.18 (0.29)	0.08 (0.23)	−0.44 (0.23)	0.11 (0.25)
Sad film				
PA	−0.10 (0.17)	−0.38 (0.12)	−0.03 (0.12)	−0.13 (0.10)
NA	0.67 (0.17)	0.38 (0.12)	0.37 (0.08)	0.33 (0.10)
Happy display	0.05 (0.04)	0.06 (0.05)	0.10 (0.11)	0.10 (0.12)
SCR	−0.10 (0.17)	−0.38 (0.12)	−0.03 (0.12)	−0.13 (0.10)

Note. BD = Bipolar participants; CTL = Healthy control group; PA = Positive affect; NA = Negative affect; SCR = Skin conductance response rate/min; Self-reported PA and NA rated on a 1 (*very slightly or not at all*) to 7 (*extremely*) scale. Emotional displays coded on a 0 (*none*) to 5 (*marked*) scale. All numerical values for all channels reflect changes scores (film period–baseline period). We note that values presented for the Uninstructed Condition partially overlap with previously published group differences in emotion reactivity (see Footnote 1).

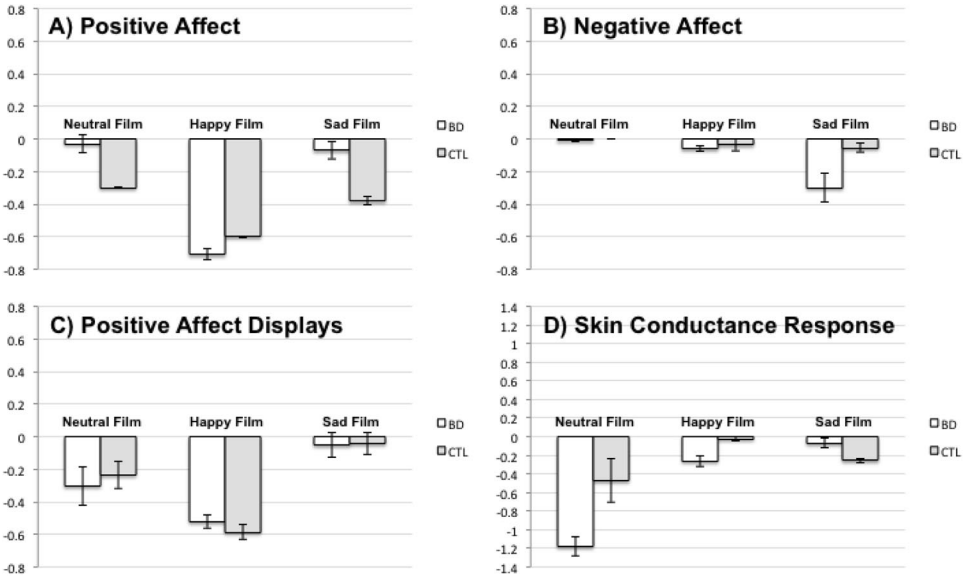

Figure 1. Change scores reflecting significant differences in emotion reactivity score as a function of condition, by diagnostic group and film. Negative values represent a decrease (and positive values an increase) in emotion reactivity scores as a function of reappraisal (compared with the uninstructed condition). Error bars depict standard error (*SE*) values. Note: BD = Bipolar disorder group; CTL = Healthy control group.

Physiology. For SCR, a significant Condition main effect emerged, $F(1, 35) = 5.00$, $p < .05$, $\eta_p^2 = 0.12$, suggesting that the reappraisal condition ($M = -0.52$, $SE = 0.15$) was associated with reduced SCR compared to the uninstructed condition ($M = -0.14$, $SE = 0.11$) for all participants across all films. Neither the Condition × Film interaction or Condition × Group interaction reached significance for SCR ($ps = .15$ and .16, respectively).

For RSA, neither the Condition main effect, Condition × Film interaction or Condition × Group interaction reached significance ($ps = .46$, .16, and .14, respectively).

Discussion

The present investigation examined whether an experimentally manipulated emotion regulation strategy alters emotional responses in individuals diagnosed with BD and healthy adults. Results revealed that reappraisal was associated with reductions in emotion reactivity across subjective (i.e., PA, NA), behavioral (i.e., PA displays), and physiological (i.e., SCR) measures across all participants; that is, both BD and CTL participants appeared to be able to successfully down-regulate emotional responses when cued with reappraisal instructions, and participant groups do not differ in the apparent success of reappraisal on emotion reactivity. This is consistent with prior work indicating that cognitive reappraisal is associated with reduced negative emotion reactivity (Gross, 1998; Gross & Levenson, 1997) and reduced positive emotion reactivity (Giuliani et al., 2008). Importantly, cognitive reappraisal was equally effective in reducing emotion reactivity for both individuals diagnosed with BD and healthy controls.

Implications for BD

A pressing question introduced at the outset was why individuals with BD show atypical patterns of emotional reactivity. One perspective is that individuals with BD possess a core deficit in their emotion regulation abilities needed to adaptively harness emotion reactivity (i.e., ability-deficit perspective). An alternative perspective supported by the present study results is that BD individuals are able to regulate their emotions in similar ways as healthy adults, but simply fail to engage in successful emotion regulation performance on their own (i.e., performance-deficit perspective). In other words, those with BD may possess the capacity to regulate when cued, and in fact can decrease emotion reactivity using such regulatory cues in a comparable manner with healthy adults. However, individuals with BD may fail to engage in successful emotion regulation performance when uncued, leading to prolonged and amplified emotion responses when left to spontaneously regulate in the laboratory (e.g., Gruber et al., 2011) or when navigating daily emotional life (e.g., Gruber, Kogan, Mennin, & Murray, in press). As such, although people with BD can engage in cognitive reappraisal it is likely they either engage less frequently in it or may not engage in as effectively as those without BD.

Findings from the present investigation align with prior work in BD suggesting an intact capacity to utilize other types of cognitive strategies when cued (Gruber, Harvey, & Johnson, 2009) and a more general capacity to understand and implement cognitive regulation strategies (Gruber et al., 2012). The fact that such difficulties may arise from a performance deficit suggests a potential disjunction between possessing the capacity or ability to regulate and yet failing to regulate successfully without instruction. The regulation failure observed in BD likely has a multifactorial causal sequence, including deficits selecting regulation strategies that are well matched to the context (e.g., Gruber et al., 2012) as well as pursuing regulation tactics that are attainable and realistic (Baumeister & Heatherton, 1996). Several other possibilities exist that may explain why those with BD fail to regulate, despite

having the ability to do so. Future work should be geared toward testing each of these possibilities.

An alternative perspective suggests that although individuals with BD may engage in reappraisal, they ultimately fail to reap the long-term regulatory benefits or sustained mood changes associated with reappraisal. Specifically, Mansell, Morrison, Graeme, Lowens, and Tai (2007) suggest that individuals with BD exhibit multiple and contradictory appraisals of their own internal emotional states, which subsequently prompt increased but unsuccessful efforts to exert control over their emotions (e.g., Dodd, Mansell, Morrison, & Tai, 2011a; 2011b; Kelly, Mansell, Sadhnani, & Wood, 2012). Cognitive interventions arising from this perspective thus emphasize the resolution of these competing appraisals about internal mood states, as opposed to instruction in how to use adaptive regulation strategies like reappraisal. With respect to the present study findings, this perspective cautions that the ability to engage in adaptive regulation strategies, like reappraisal in BD, may yield transient shifts in emotion responses in BD, at best. Future research is thus warranted that more carefully tests this alternative perspective via careful examination of the temporal dynamics of cognitive regulation of, and internal responses to, emotional states in BD. Additionally, it may be the case that failure of emotion regulation in BD may be partially influenced by a relative absence of emotion awareness, both in terms of knowing which strategies to use and the context in which to best utilize them. This is particularly salient for positive emotions whereby individuals with BD may prefer to amplify or sustain problematic positive moods rather than contain and decrease emotion intensity and risk for subsequent relapse. Finally, it may be the case that even though we did not see group differences in the success of cued reappraisal in a laboratory setting, it is possible that in everyday life that those with BD may fail to successfully utilize reappraisal.

Clinically, such findings provide evidence for the inclusion of cognitive reappraisal in psychological interventions for BD despite known cognitive impairment difficulties in this population (e.g., Johnson & Fulford, 2009; Lam et al., 2005). Such findings raise the tantalizing possibility that even limited training in cognitive reappraisal may promote regulation of momentary emotions in a clinical BD sample. It will be critical to test whether the ability to use cognitive reappraisal is an effective strategy for the prevention, delay, or reduction of mood severity and frequency in BD.

Limitations and Future Directions

The present study suggests that individuals with BD possess the capacity to effectively utilize emotion regulation strategies when cued, despite their apparent emotion regulation difficulties in everyday life. The present findings should, however, be interpreted in the context of several limitations associated with this study.

First, findings were based on a relatively short period of cognitive reappraisal during films that elicited relatively modest levels of emotion. It is possible that if the regulation period had been longer—or the emotion had been more intense—differences between BD and healthy individuals might have emerged (e.g., Mansell et al., 2007). Also, it bears noting that instructional order was fixed. This was done to ensure that regulation effects did not carry over to the uninstructed condition that was designed as a measure of naturalistic emotion reactivity. Although it is possible that the observed reappraisal effects could have been influenced by habituation to the emotional film stimuli, we note that previously experimental studies in BD have found comparable patterns in the magnitude of emotion responding when comparing sets of emotional films presented in a fixed order (e.g., Gruber et al., 2011). Nonetheless, future studies nonetheless are warranted to compliment these study findings by utilizing a between-subjects design to compare differences between instructed versus uninstructed conditions, thus lessening the likelihood of habituation.

Second, we acknowledge that our sample sizes were relatively modest and mirror those typically reported in experimental psychopathology research with severe psychiatric samples (e.g., Chentsova-Dutton et al., 2007; Ehring et al., 2010). Power analyses (using standard estimates of adequate power of 0.80) suggest that our sample size was adequately powered to detect a medium to large effect size (i.e., $\eta_p^2 \geq 0.11$), but it is possible that we may have failed to detect more subtle effects. Even though our sample size necessarily constrained our statistical power and ability to reject the null hypothesis, group means were not suggestive of possible differences. If anything, observation of group means (see Table 2) were suggestive of potentially enhanced utilization of reappraisal in BD (i.e., somewhat larger decreases in emotion reactivity). Thus, it is unlikely that larger sample sizes would have revealed a diminished ability to utilize reappraisal in the BD. Nevertheless, future studies with larger sample sizes to examine the generalizability of these findings are an important next step.

Third, the present study tightly focused on the measurement of a particular type of emotion regulation strategy, cognitive reappraisal. As such, it is unclear whether individuals with BD may have also engaged in utilizing additional—and importantly maladaptive—forms of emotion management common in psychopathology, including suppression, substance abuse, binge eating, and risk-taking. Moreover, given commonly comorbid cognitive difficulties among individuals with BD, it is possible such individuals may have encountered difficulty accessing sufficient cognitive resources to fully implement cognitive reappraisal and instead may have compensated using regulation strategies such as attentional distraction to minimize emotion reactivity (e.g., Opitz, Gross, & Urry, 2012). Additional work experimentally manipulating and assessing the spontaneous use of additional regulation strategies is warranted. Finally, future studies should examine not only whether individuals with BD can effectively a wide array of emotion regulation strategies during periods of symptomatic remission, but also during symptomatic (depressive, manic, and mixed) mood phases to examine trait versus state related influences on regulation patterns. It will also be interesting to consider how the ability to use cognitive reappraisal and other emotion regulation strategies may predict illness course.

Fourth, we note that our BD sample may have represented a somewhat higher functioning and less psychiatrically severe subset of the general patient population. As such, it is possible that these results may not be generalizable to a more severe, chronic, and lower functioning BD group. Importantly, though, we do note that despite this potentially higher-functioning sample, patients were on complex pharmacological regimens, exhibited extended illness durations, and reported a history of recurrent depressive and manic mood episodes (see Table 1).

Finally, BD participants were not excluded on the basis of psychiatric comorbidities or medication status. With respect to

comorbidities, we did not include a comparison clinical group with heightened positive emotionality (e.g., pathological gambling). However, we argue that acquiring a comorbidity-free BD sample is neither feasible nor ecologically valid, and therefore findings from the present study are critical insofar as they demonstrate results that can be generalized to typical treatment-seeking BD populations. Furthermore, we note that exploring personality disorder comorbidities in bipolar disorder will be an important and interesting direction for future research.

With respect to medication status, given the challenges of accessing an unmedicated BD sample, we were unable to investigate the influence of medication effects on results. However, we note that levels of each class of medication were recorded using the Somatotherapy Index (Bauer, McBride, Shea, & Gavin, 1997). Bivariate correlations conducted between intensity of medication dosage in the BD group and emotion reactivity variables yielded a pattern of modest and inconsistent findings. Future studies with larger sample sizes, assessment of blood serum levels and random assignment of individuals on different medication classes are warranted in order to afford adequate examination of the potential myriad effects of complex pharmacological regimens in this disorder.

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Received April 18, 2013
Revision received September 20, 2013
Accepted October 15, 2013 ■