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A Goal-Striving Life Event and the Onset of Hypomanic and Depressive Episodes and Symptoms: Perspective From the Behavioral Approach System (BAS) Dysregulation Theory

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On the basis of the behavioral approach system (BAS) dysregulation theory of bipolar disorder, this study examined the relation between occurrence of a BAS activation-relevant life event—goal striving—and onset of hypomanic and depressive episodes and symptoms. In particular, the authors examined the relation between preparing for and completing final exams (a goal-striving event) and onset of bipolar spectrum episodes and symptoms in college students with bipolar II disorder or cyclothymia (i.e., "soft" bipolar spectrum conditions). One hundred fifty-nine individuals with either a bipolar spectrum disorder ($n = 68$) or no major affective psychopathology (controls; $n = 91$) were further classified on the basis of whether they were college students (i.e., completed final exams). Consistent with the BAS dysregulation theory, preparing for and completing final exams was associated with an increase in hypomanic but not depressive episodes and symptoms in individuals with a soft bipolar spectrum diagnosis. Furthermore, self-reported BAS sensitivity moderated the presence of certain hypomanic symptoms during final exams.

Keywords: bipolar spectrum disorders, goal striving, life events, BAS

Bipolar disorder has been ranked the sixth leading cause of disability among both physical and psychiatric disorders worldwide (Murray & Lopez, 1996). A prominent biopsychosocial theory of bipolar disorder is the behavioral approach system (BAS) dysregulation theory (Depue, Krauss, & Spoont, 1987). An advantage of this theory is that it makes specific predictions about the types of life events that trigger the onset of bipolar episodes and symptoms (Johnson & Roberts, 1995). The current study examines a BAS activation-relevant event that, according to the theory, should trigger hypomanic episodes in individuals with bipolar spectrum diagnoses.

BAS Dysregulation Theory of Bipolar Disorder

The BAS is activated by reward as well as punishment avoidance cues (Gray, 1991). The objective of the BAS is to regulate appetitive motivation and goal-directed behavior to obtain rewards and/or avoid punishment. Researchers have highlighted the act of goal striving as a prototypic life event that turns on the BAS in humans (Depue, Luciana, Arbisi, Collins, & Leon, 1994; Johnson, 2005).

Depue et al. (1987; Depue & Iacono, 1989) proposed a BAS dysregulation theory of bipolar disorder. According to this theory, bipolar individuals are hypothesized to demonstrate an excessive increase in BAS activity in response to BAS activation-relevant events (e.g., reward incentives, goal striving) and an excessive decrease in BAS activity in response to BAS deactivation-relevant events (e.g., definite failure). According to Depue et al. (1987), the excessive increase in BAS activity (BAS hyperactivation) experienced by bipolar individuals is reflected in hypomanic and manic symptoms. Consistent with this hypothesis are results showing that, compared with relevant control groups, individuals with bipolar I disorder (Meyer, Johnson, & Winters, 2001) and people prone to hypomanic symptoms (Meyer, Johnson, & Carver, 1999) showed elevated scores on a self-report measure of BAS sensitivity (Carver & White, 1994) and psychophysiological indexes of BAS sensitivity (Harmon-Jones, Abramson, Sigelman, Bohlig, & Hogan, 2002). In contrast, an excessive decrease in BAS activity has been observed in bipolar depression (Allen, Iacono, Depue, & Arbisi, 1998).

The BAS dysregulation theory proposes that BAS activation-relevant events (e.g., reward incentives, goal striving) should be associated with an increase in hypomanic and manic, but not depressive, episodes in individuals with a bipolar diagnosis. To

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test this prediction, Johnson et al. (2000) hypothesized that, given the elevation of BAS in response to cues of reward, mania, but not depression, should be triggered by goal-attainment events among bipolar individuals. Results supported this hypothesis.

However, the definition of the BAS—a motivational system designed to move an organism toward a potential reward—suggests that the pursuit of reward also could induce BAS hyperactivation among bipolar individuals. That is, whereas Johnson et al. (2000) reported an increase in manic symptoms following goal attainment, goal-striving events (e.g., striving to obtain the reward) may also trigger manic or hypomanic symptoms in bipolar individuals. This prediction is consistent with recent data indicating that dysfunctional attitudes related to goal striving are a risk factor for bipolar disorder (Lam, Wright, & Smith, 2004).

The Present Study

The present study examined the relation between a goal-striving life event and the onset of bipolar spectrum episodes and symptoms in individuals with a "soft" bipolar diagnosis (i.e., cyclothymia, bipolar II disorder). Recently, there has been growing interest in the soft bipolar conditions as a result of evidence that these conditions are (a) on a continuum with more severe bipolar conditions (Akiskal, Djenderedjian, Rosenthal, & Khani, 1977), (b) often precursors to a more severe course (Klein & Depue, 1984), and (c) associated with significant impairment (Judd et al., 2005). Similar to the study by Johnson et al. (2000), the present study was a test of the BAS dysregulation theory insofar as it examined the effect of a proposed BAS activation-relevant life event (i.e., goal striving) on bipolar spectrum episodes and symptoms. In particular, we examined the relation between preparing for and completing final exams and the onset of bipolar spectrum episodes and symptoms in undergraduate students with a diagnosis of bipolar II disorder, cyclothymic disorder, or both.

Exams were operationalized as a goal-striving life event for a number of reasons. First, academic success may reflect a particularly salient goal for college students. Thus, final exams are an appropriate goal-striving event because they are the primary means through which students obtain academic success. Second, much goal striving occurs in final exams. Third, by operationalizing exams as a goal-striving event, we could determine when the event of interest occurred independently of the participant's report. Retrospective reporting over long intervals may be problematic for accurately dating less severe events (Brown & Harris, 1989).

Three comparison groups were included in the current study. The first was composed of individuals with no affective psychopathology who also completed final exams. Other comparison groups consisted of individuals with a soft bipolar spectrum diagnosis and control individuals who did not complete final exams. These latter two groups were composed of people who were in the study at the time of the final exam period but who were not students at the time.

BAS Sensitivity, Goal Striving, and Hypomania Among Bipolar Spectrum Individuals

The current study also examined the extent to which self-reported BAS sensitivity interacts with a goal-striving life event (final exams) to predict hypomanic episodes and symptoms among bipolar spectrum individuals. It is important to note, however, that the BAS dysregulation theory does not require that BAS sensitivity differentiate among bipolar individuals (i.e., bipolar individuals who are likely to evidence hypomania in response to a goal-striving event vs. those who are not). Rather, the core feature of the BAS dysregulation theory is that levels of BAS sensitivity should differentiate bipolar individuals from nonbipolar individuals (Depue et al., 1987; Depue, Krauss, Spoont, & Arbisi, 1989). Thus, although these proposed analyses examining whether levels of BAS sensitivity moderate hypomania during a goal-striving event have implications for unpacking heterogeneity within bipolar disorder, they are not critical to testing the overall validity of the BAS dysregulation theory.

Predictions

We predicted that final exams would be associated with the onset of hypomanic episodes and symptoms in individuals with a soft bipolar spectrum condition. We further predicted that final exams would not be associated with the onset of either hypomania or depression in control participants. We hypothesized that there would be no overall increase in hypomania or depression during the exam period in the group of bipolar spectrum participants and control participants who did not take final exams. Last, we were agnostic as to the extent to which self-reported BAS sensitivity would interact with final exams to predict hypomanic episodes and symptoms among bipolar spectrum individuals.

Method

Participants

Participants in the current study were part of an ongoing longitudinal investigation of the bipolar spectrum disorders. Table 1 provides descriptive information regarding participants. At the time of recruitment, all participants were undergraduate or graduate students at the University of Wisconsin—Madison and ranged in age from 18 to 24 years. Participants were recruited from February 1999 through August 2001. They were selected by means of a two-stage screening procedure. In Stage 1, 9,995 students filled out the General Behavior Inventory (GBI; Depue et al., 1989), which is designed to identify individuals with cyclothymia. A subset of participants who met the cutoff criteria for cyclothymia (GBI Hypomania–Biphasic subscale [GBI-HB] score $>$ 13 and GBI Depression subscale [GBI-D] score $>$ 11) or for the absence of affective psychopathology (GBI-HB score $<$ 13 and GBI-D score $<$ 11), as specified by Depue et al. (1989), proceeded to Stage 2.

In Stage 2, 712 participants were administered an expanded Schedule for Affective Disorders and Schizophrenia—Lifetime diagnostic interview (exp-SADS–L; Endicott & Spitzer, 1978). On the basis of the exp-SADS–L interview and the GBI, two groups of individuals were identified: (a) individuals who met GBI cutoff criteria for cyclothymia and the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV;* American Psychiatric Association, 1994) criteria for either cyclothymic disorder, bipolar II disorder, or both cyclothymic and bipolar II disorder and (b) individuals who met both GBI cutoff criteria for absence of affective psychopathology and *DSM–IV* criteria for no major affective

Table 1
Descriptive Information on Participants

	Bipolar participants (n = 68)			Nonbipolar participants (n = 91)			
	%	*M*	*SD*	%	*M*	*SD*	*p*
Age (years)		22.1	1.8		22.4	1.6	*ns*
Caucasian	86.8			89.0			*ns*
Female	57.4			51.6			*ns*
Bipolar II diagnosis	79.4			0.00			.001
Cyclothymia diagnosis	86.7			0.00			.001
GBI-D at screening		23.7	8.0		1.7	2.5	.001
GBI-HB at screening		17.4	3.5		2.9	3.6	.001
Age at first depressive episode (years)		14.9	3.9				
Age at first hypomanic episode (years)		12.5	4.4				
Age at first hypomanic or depressive episode (years)		11.4	4.0				
BAS total		41.3	4.9		38.4	4.3	.001
BAS Drive		11.6	2.3		10.4	2.1	.001
BAS Fun Seeking		12.6	2.3		11.4	2.0	.001
BAS Reward Responsiveness		16.9	1.9		16.6	1.8	*ns*
BIS		20.6	4.0		20.6	3.3	*ns*

Note. GBI-D = General Behavior Inventory Depression Scale; GBI-HB = General Behavior Inventory Hypomania–Biphasic Scale; BAS = Behavioral Approach System Scale; BIS = Behavioral Inhibition System Scale.

psychopathology (control group). Individuals from these two groups composed the final sample of 159 participants (73 men, 86 women). Given this study's focus on the soft bipolar conditions, we excluded anyone with a current or past *DSM–IV* diagnosis of bipolar I disorder.

The bipolar spectrum group for the current study consisted of 68 individuals (14 [21%] met criteria for cyclothymic disorder, 9 [13%] met criteria for bipolar II disorder, and 45 [66%] met criteria for both bipolar II disorder and cyclothymic disorder). The control group consisted of 91 individuals with no past or current psychopathology at the time of the Stage 2 exp-SADS–L. Among the bipolar spectrum group, the average age of first depressive episode was 14.92 years (SD = 3.87), the average age of first hypomanic–cyclothymic episode was 12.49 years (SD = 4.41), and the average age of first depressive or hypomanic–cyclothymic episode was 11.41 years (SD = 4.02). At the time of data collection for the current study, some of the participants were still students at the University of Wisconsin—Madison, whereas some were not, given that participants were at different stages in their college careers at the time of initial recruitment.

Four different groups of individuals participated: (a) bipolar students (i.e., *bipolar exam group;* n = 45), (b) control students (i.e., *control exam group;* n = 65), (c) bipolar nonstudents (i.e., *bipolar nonexam group;* n = 23), and (d) control nonstudents (i.e., *control nonexam group;* n = 26). Participants' exam status was dependent on whether they were students during the exam period. If an individual was a student, he or she was in the exam group (all students took final exams), and if the individual was not a student and thus did not take final exams, he or she was in the nonexam group.

Collapsed across diagnostic status, participants in the exam group and nonexam group did not differ on ethnicity, gender, GBI-D, GBI-HB, or cumulative grade point average (GPA). Collapsed across exam group status, bipolar spectrum and control individuals did not differ on ethnicity, gender, or age. However, as expected, bipolar spectrum individuals did score significantly higher than control individuals on the GBI-D (23.7 vs. 1.7, $p < .01$) and the GBI-HB (17.4 vs. 2.9, $p < .01$) at the time of initial screening. Additionally, participants in the nonexam group (mean age = 23.5) were significantly older than participants in the exam group (mean age = 21.7, $p < .01$). This difference on age was significant both when we compared bipolar spectrum individuals in the nonexam group (mean age = 23.1) with bipolar spectrum individuals in the exam group (mean age = 21.6, $p < .01$) and when we compared control individuals in the nonexam group (mean age = 23.8) with control individuals in the exam group (mean age = 21.8, $p < .01$). These differences on age are to be expected, given that the nonexam group was composed largely of individuals who had already graduated from college, which meant they were older, on average, than individuals in the exam group. In analyses in which it was statistically appropriate, we controlled for age.

Furthermore, bipolar spectrum individuals in the exam group and the nonexam group did not differ on ethnicity, gender, exp-SADS–L status (cyclothymia vs. bipolar II vs. bipolar II and cyclothymia), GBI-D, GBI-HB, cumulative GPA, or use of medication or psychosocial treatment. Control individuals in the exam group and the nonexam group did not differ on ethnicity, gender, exp-SADS–L status, GBI-D, GBI-HB, or cumulative GPA. Twenty-three (34%) of the bipolar spectrum individuals were taking psychotropic medications for mood-related issues, and 16 (24%) were participating in psychosocial interventions at the time of data collection. These numbers are consistent with the percentage of individuals seeking treatment in other reports on the soft bipolar conditions (Judd et al., 2005). None of the control participants was taking psychotropic medications or participating in

psychosocial interventions. Cumulative GPA, ethnicity, gender, age, psychotropic medication status, and use of psychosocial interventions did not independently predict rates of hypomania or depression during the final exam period for either bipolar students or bipolar nonstudents. Additionally, GPA for the spring 2001 semester did not predict hypomania or depression among bipolar students.

Procedure

Data were collected for two distinct time periods based on the final exam schedule for participants who were college students at the time of data collection. The first period was defined as the exam period, which began 6 days prior to the 1st day of final exams and continued through the end of final exam week (May 7 through May 18, 2001). The second period was a 12-day baseline period that occurred 6 weeks prior to the exam period (March 29 through April 9, 2001). These same date ranges served as the exam period and baseline period for the nonstudents who were not taking final exams during the exam period.

The diagnostic data for this study came from diagnostic interviews via the expanded Schedule for Affective Disorders and Schizophrenia—Change Version (exp-SADS–C; Spitzer & Endicott, 1978). These interviews are administered at 4-month intervals as part of our laboratory's longitudinal investigation. For the most part, the baseline period and the exam period were assessed within the same interview interval and by the same interviewer. However, for 25 of the 159 participants, the baseline period and the exam period were assessed in separate interview intervals, and of these 25 participants, 5 had their baseline period and exam period diagnostic status assessed by separate interviewers. The average number of days between the beginning of the baseline period (March 29, 2001) and exp-SADS–C interview assessment was 75.24 days, and the average number of days between the beginning of the exam period (May 7, 2001) and exp-SADS–C interview assessment was 71.83 days. It is important to note that all of the interviewers were completely blind to the study's hypotheses.

Measures

Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) Scale (Carver & White, 1994)

The BIS/BAS Scale assesses self-reported sensitivity of the BAS and the BIS. It consists of the BIS scale and the BAS scale, which is composed of three subscales—Drive, Fun Seeking, and Reward Responsiveness. The Drive subscale consists of four items that assess persistence in reward pursuit and has an alpha coefficient of .76 and test–retest reliability of .66 (Carver & White, 1994). The Fun Seeking subscale consist of four items that assess willingness to approach rewards and novel stimuli and has an alpha coefficient of .66 and test–retest reliability of .69 (Carver & White, 1994). The Reward Responsiveness subscale consists of five items that assess positive responses to reward and has an alpha coefficient of .73 and test–retest reliability of .59 (Carver & White, 1994). The BIS scale contains seven items that assess sensitivity to the possibility of punishment; it has a coefficient alpha of .74 and test–retest reliability of .66 (Carver & White, 1994). The BIS/BAS Scale was administered, on average, 3 months prior to the exam period and 4.5 months prior to the exp-SADS–C interview corresponding to the exam period.

GBI

The GBI was developed (Depue et al., 1981) to serve as an efficient first-stage case identification procedure for identifying individuals with cyclothymia who are at high risk for developing a more severe bipolar condition. The revised GBI contains 73 items that assess core bipolar experiences and their intensity, duration, and frequency on two subscales: the GBI-D and GBI-HB. The GBI uses a 4-point frequency scale for each item (1 = *never or hardly ever,* 4 = *very often or almost constantly*). Following Depue et al. (1981, 1989), we used the case-scoring method in which only items rated a 3 *(often)* or 4 *(very often or almost constantly)* contribute toward the total score. We used this scoring method to maximally differentiate cases from noncases. Thus, high GBI scores indicate not only high intensity of cyclothymic symptoms but also high frequency. The GBI has an alpha of .90–.96, test–retest reliability of .71–.74, adequate sensitivity (.78), and high specificity (.99; Depue et al., 1989). The GBI scale was administered, on average, 1 year and 11 months prior to the exam period and just over 2 years prior to the exp-SADS–C interview corresponding to the exam period.

Exp-SADS–L

Participants who met Phase 1 screening criteria were administered an exp-SADS–L interview. To ensure the clinical validity of our diagnostic procedures for assessing bipolar spectrum disorders, we consulted with experts on bipolar disorders: Drs. Hagop S. Akiskal, Jules Angst, Paula J. Clayton, Jean Endicott, and Alan Gruenberg. Aided by these consultations, we expanded both the SADS–L and the SADS–C interviews (see below for an overview of the SADS–C) to enable greater accuracy in diagnosis of bipolar conditions, including (a) expansion of the number of items and improvements in the probes in the Depression, Mania/Hypomania, and Cyclothymia sections; (b) additional probes to assess the precise number of days participants felt depressed or euphoric–irritable and for what percentage of waking hours of each day they felt depressed or euphoric–irritable in the Depression or Mania/Hypomania sections, respectively; (c) improvements of the probes in the Depression, Mania/Hypomania, and Cyclothymic sections on the basis of incorporating aspects of Depue's (1985) Behavioral Variability Interview; (d) addition of items in the Cyclothymia section that assess the frequency, duration, and switch rapidity of depression and hypomanic periods; and (e) addition of probes to examine the extent to which changes in participants' behavior were noticeable to people in their lives. Last, for each symptom item in both the exp-SADS–L and the exp-SADS–C, we used a 5-point scale (0 to 4) to make ratings, on which 3 was the cutoff for presence of the symptom. An interrater reliability study based on 105 jointly rated exp-SADS–L interviews yielded kappas greater than .96 for bipolar spectrum diagnoses. The exp-SADS–L and exp-SADS–C interviews were conducted by extensively trained project interviewers who were blind to participants' Phase 1 diagnostic group status and GBI scores. For both the exp-SADS–L and the exp-SADS–C, consensus *DSM–IV* diagnoses were determined by a three-tiered consensual standardized review

procedure involving project interviewers, senior diagnosticians (i.e., Lyn Y. Abramson), and our expert diagnostic consultant, Alan Gruenberg. Project interviewers completed an intensive interviewer training program for the administration of the exp-SADS–L and exp-SADS–C interviews, involving about 200 hr of reading and didactic instruction.

Criteria for bipolar spectrum disorders. *DSM–IV* criteria were used for the diagnosis of both bipolar spectrum disorders and bipolar spectrum episodes. Bipolar II disorder was operationalized as the occurrence of one or more major depressive episodes accompanied by at least one *DSM–IV* hypomanic episode (see below for episode definition). The presence of a manic or mixed episode precluded a bipolar II diagnosis. Consistent with the *DSM–IV*, the symptoms of bipolar II disorder must have caused clinically significant distress or impairment in social, occupational, or other areas of functioning. However, also consistent with the *DSM–IV*, hypomanic episodes themselves did not need to cause impairment but must have been associated with an unequivocal change in mood and functioning that was observable to others.

DSM–IV criteria were used for the diagnosis of cyclothymic disorder. Accordingly, cyclothymic disorder was operationalized as recurrent periods of depression (not meeting criteria for major depressive episodes) and of hypomania (not meeting criteria for a manic episode) that occurred over at least a 2-year period. Furthermore, during this 2-year period, any symptom-free interval lasted no longer than 2 months. Given that *DSM–IV* Criterion A for cyclothymic disorder does not specify the minimum duration of depressive or hypomanic periods required for the diagnosis, we required a 2-day minimum duration for both kinds of cyclothymic periods on the basis of the Research Diagnostic Criteria (Spitzer, Endicott, & Robins, 1978) for hypomania and Depue et al. (1981). We also required that individuals have had at least two hypomanic and two depressive periods within a year for a cyclothymic diagnosis. On the basis of consultation with Jean Endicott at the New York State Psychiatric Institute, Criterion A symptoms for both depression (sadness or loss of interest) and hypomania (elevated, expansive, irritable) needed to be present at least 50% of the day, and participants needed at least two additional symptoms for both kinds of cyclothymic periods. Finally, according to *DSM–IV* criteria, significant distress or impairment in important areas of functioning must have been reported as a result of cyclothymic disorder. However, consistent with the *DSM–IV*, this distress or impairment need not have been observed during periods of hypomania. The diagnosis of cyclothymic disorder was made only if the initial 2-year period of cyclothymic symptoms was free of major depressive episodes. After the initial 2-year period of cyclothymic disorder, major depressive episodes could have been superimposed on the cyclothymic disorder, in which case both cyclothymic and bipolar II disorders were diagnosed.

Criteria for bipolar spectrum episodes. For both the exp-SADS–L and the exp-SADS–C, full-blown hypomanic episodes were defined according to *DSM–IV* criteria (note that the criteria for full-blown *DSM–IV* hypomanic episodes are different than our operationalized criteria for cyclothymic hypomanic periods). These criteria require an abnormally and persistently elevated, expansive, or irritable mood that lasts at least 4 days. Persistence of hypomanic mood must be at least 50% of waking hours in each hypomanic day, accompanied by three additional hypomanic symptoms (note that Jean Endicott suggested that we operationalize *DSM–IV* persistence as at least 50% of waking hours). If the mood is irritable rather than elevated or expansive, at least four additional symptoms must be present. Consistent with the *DSM–IV*, the episode must be associated with an unequivocal change in mood and functioning that is observable to others. However, as required by *DSM–IV* criteria, a hypomanic episode is not severe enough to cause marked impairment in social or occupational functioning or necessitate hospitalization, and there are no psychotic features present (as this is the criterion for mania, as opposed to hypomania).[1] Indeed, research suggests that hypomanic symptoms among bipolar spectrum individuals sometimes may even enhance functioning (Judd et al., 2005). The hypomanic symptoms are not due to the effects of a substance or medical condition. Date of onset was coded as the 1st day of the 4-day period for which the participant met full syndromal criteria for a hypomanic episode.

Major depressive episodes also were defined according to *DSM–IV* criteria, which require persistence of depressed mood or pervasive loss of interest to be at least 90% of waking hours in each depressed day and to be accompanied by four additional depressive symptoms (note that Jean Endicott suggested that we operationalize the *DSM–IV* persistence requirement of "most of the day" as at least 90% of waking hours). Consistent with the *DSM–IV*, this depression had to be present for at least 2 weeks, cause clinically significant distress or impairment, and not be the result of substance use or a medical condition.

Exp-SADS–C. Data relevant to diagnoses and symptoms during the baseline period and the exam period came from interviews using the exp-SADS–C. To ensure the clinical validity of our diagnostic procedures for assessing bipolar spectrum disorders and episodes, we made the identical five changes to the SADS–C interview as outlined above for the exp-SADS–L interview. Exp-SADS–C interviews also used the identical *DSM–IV* criteria for bipolar II disorder, cyclothymic disorder, hypomanic episode, and major depressive episode as outlined above in the *Exp-SADS–L* section. In addition to these changes, we incorporated features of the Longitudinal Interval Follow-Up Evaluation (Shapiro & Keller, 1979) into the exp-SADS–C to provide a systematic method for tracking the course of the disorder. This measure, a semistructured interview, provides information relevant to assessing the degree to which participants have recovered from an episode of depression or mania/hypomania and whether any new episodes have developed. For the exp-SADS–C, interviewers also used calendars with anchoring events to help date episode onset and assess the duration of episodes. Last, probes were added to the exp-SADS–C to assess sleep loss during both euthymic and clinical states. Sleep loss was rated on a 6-point Likert scale ranging from 1 (*no change in sleep*) to 6 (*4 or more hours less than usual*). Individuals received a rating on this index for each day of both the

[1] *DSM–IV* criteria were used to assess for manic episodes. The criteria for manic episodes are the same for hypomanic episodes except (a) the abnormal and persistently elevated, expansive, or irritable mood needs to last 1 week (or any duration if hospitalization is necessary), as opposed to 4 days, and (b) this mood disturbance is sufficiently severe to cause marked impairment in important domains, necessitate hospitalization, or be associated with psychotic features.

baseline and the exam periods. These ratings were then averaged separately for the baseline and exam periods.

We calibrated the *DSM–IV* diagnoses we derived from our exp-SADS–L and exp-SADS–C with Alan Gruenberg, an expert on psychiatric diagnoses. He reviewed 100 interviews from this project, and our agreement with him yielded a kappa of .86. An interrater reliability study on exp-SADS–C data among different interviewers from the current project yielded an average interrater correlation of .93 for both depression and hypomanic symptoms.

Results

Control individuals evidenced no hypomania or depression during the baseline period or exam period. We therefore were unable to include control individuals in analyses because of a lack of variance and thus only report results from analyses involving bipolar spectrum individuals. It is important to note that the finding of no hypomania or depression among control individuals is consistent with predictions. Also, statistical assumptions were satisfied for all analyses.

Final Exams and the Onset of Hypomanic Episodes

The first set of analyses examined the relation between preparing for and completing final exams and the onset of a *DSM–IV* hypomanic episode.[2] In line with our hypothesis, bipolar spectrum individuals in the exam group were noticeably more likely to exhibit hypomanic episodes during the exam period than were bipolar spectrum individuals in the nonexam group at the same time (see Figure 1). However, as predicted, no difference between groups was present during the baseline period. A logistic regression controlling for baseline depression, baseline hypomania, and age demonstrated that bipolar spectrum individuals in the exam group were significantly more likely to have a hypomanic episode during the exam period relative to bipolar spectrum individuals in the nonexam group ($\beta = 3.74$), Wald $\chi^2(1, N = 68) = 9.39$ (odds ratio [OR] = 41.92), $p = .005$.[3]

To clarify the preceding analysis, we further examined whether the bipolar exam group differed from the bipolar nonexam group in the onset of exam-period-specific hypomanic episodes. One of the advantages of this analysis is that it allowed us to fully control for the possibility that a hypomanic episode recorded during the exam period was the continuation of a hypomanic episode observed during the baseline period. To conduct this analysis, we computed a new variable based on whether a bipolar spectrum individual had a hypomanic episode during the exam period that was not present during the baseline period (i.e., exam period specific). Figure 2 reveals that among all of the bipolar spectrum individuals who took final exams, a full 42% (19 of 45) had an exam-period-specific hypomanic episode, as compared with only 4% (1 of 23) of those bipolar spectrum individuals who did not take exams. A logistic regression controlling for baseline depression and age demonstrated that bipolar spectrum individuals in the exam group were significantly more likely to have an exam-period-specific hypomanic episode relative to bipolar spectrum individuals in the nonexam group ($\beta = 2.83$), Wald $\chi^2(1, N = 68) = 6.13$ (OR = 16.98), $p < .05$.

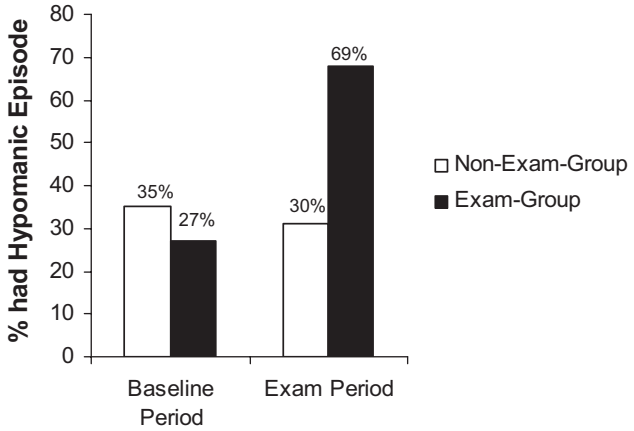

Figure 1. Percentage of bipolar spectrum individuals who had a hypomanic episode during the baseline period versus the exam period.

Final Exams and the Onset of Hypomanic Symptoms

Next, we examined the relation between final exams and the presence of hypomanic symptoms among bipolar spectrum individuals. We identified the number of days that an individual had a particular hypomanic symptom separately for both the baseline period and the exam period (see Table 2 for the average number of days hypomanic symptoms were present during the baseline period and exam period for bipolar students vs. bipolar nonstudents). We then performed a linear regression for each symptom, in which baseline hypomania, baseline depression, and age were controlled for and student status was the primary predictor. As Table 3 indicates, bipolar spectrum individuals in the exam group had a significantly higher average number of days of the following *DSM–IV* hypomanic symptoms during the exam period relative to individuals in the nonexam group: (a) inflated self-esteem or grandiosity, (b) decreased need for sleep, (c) distractibility, and (d) increased goal-directed activity or psychomotor agitation. In contrast, the two groups did not differ on average number of days of talkativeness, flight of ideas or racing thoughts, or excessive involvement in pleasurable activities.

BAS Sensitivity, Goal Striving, and Hypomania Among Bipolar Spectrum Individuals

We next examined the extent to which self-reported BAS sensitivity, as indexed by the BIS/BAS Scale (Carver & White, 1994), interacted with exam group status to predict rates of hypomanic episodes and symptoms during the exam period among bipolar spectrum individuals. In analyses involving episodes, the criterion variable was presence or absence of a *DSM–IV* hypomanic episode during the exam period, and a series of logistic regressions was performed, controlling for baseline hypomania, baseline depression, and age. None of the analyses involving episodes was sig-

[2] No manic episodes were observed during the study period.

[3] Of interest, 16% of bipolar students switched the polarity of their diagnostic status from the baseline period to the exam period. That is, of the 69% of bipolar students who had a hypomanic episode during the exam period, 16% had a depressive episode during the baseline period.

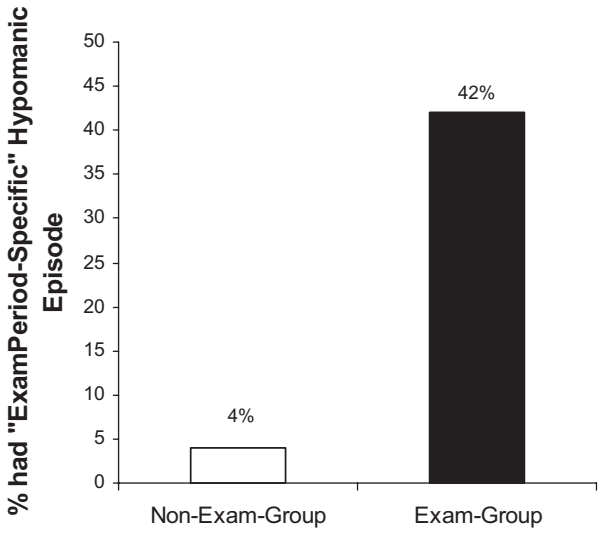

Figure 2. Percentage of bipolar spectrum individuals who had an exam-period-specific hypomanic episode during the exam period.

nificant, which suggests that BAS sensitivity did not predict rates of hypomanic episodes during a goal-striving event among bipolar spectrum individuals.

In contrast, BAS sensitivity moderated the presence of particular hypomanic symptoms during a goal-striving event among bipolar spectrum individuals. Controlling for baseline hypomania, baseline depression, and age, we performed a series of linear regressions using a criterion variable of the number of days a particular symptom was present during the exam period. A significant Exam Group × BAS Total interaction was obtained for the hypomanic symptoms of inflated self-esteem or grandiosity ($\beta = 1.51$), $t(60) = 2.39$, $p < .05$ (partial $r = .30$), and increased goal-directed activity or psychomotor agitation among bipolar spectrum individuals ($\beta = 1.69$), $t(60) = 1.93$, $p = .05$ (partial $r = .24$). An examination of the simple relationships (controlling for the same variables outlined above) revealed that high BAS total scores predicted inflated self-esteem during the exam period for bipolar students ($\beta = 0.413$), $t(39) = 3.89$, $p < .001$ (partial $r = .53$), but not for bipolar nonstudents ($\beta = 0.015$), $t(17) = 0.18$, $p = .86$ (partial $r = .043$). In addition, high BAS total scores predicted increased goal-directed activity and psychomotor agitation for bipolar students ($\beta = 0.27$), $t(39) = 2.02$, $p < .05$ (partial $r = .31$), but not for bipolar nonstudents ($\beta = -0.122$), $t(17) = -0.71$, $p = .49$ (partial $r = -.17$). Last, none of the BAS subscales (Drive, Fun Seeking, Reward Responsiveness) interacted with exam group status to predict rates of hypomanic episodes or symptoms during the exam period.

Sleep Loss as a Possible Mediator of Hypomania During the Exam Period

Relevant to circadian rhythm and zeitgeber theory (Ehlers, Frank, & Kupfer, 1988; Jones, 2001), analyses were conducted to examine the extent to which sleep loss during the exam period mediated the presence of *DSM–IV* hypomanic episodes during the exam period among bipolar spectrum participants. Sleep loss was operationalized according to the 6-point Likert sleep index we added to the exp-SADS–C. Four conditions should hold if sleep loss mediated the relationship between student status and rates of *DSM–IV* hypomanic episodes during the exam period (Baron & Kenny, 1986). Condition 1, requiring that student status predict rates of *DSM–IV* hypomanic episodes during the exam period, was supported by the analyses reported above. Condition 2 was supported, as bipolar spectrum individuals with greater sleep loss during the exam period evidenced higher rates of hypomanic episodes during the exam period when we controlled for baseline depression, baseline hypomania, and age ($\beta = 0.234$), Wald $\chi^2(1, N = 68) = 6.070$ (OR = 1.26), $p < .05$. Condition 3 was supported, as bipolar students had significantly more sleep loss during the exam period relative to bipolar nonstudents when we controlled for age and sleep loss during the baseline period ($\beta = .298$), $t(64) = 3.01$, $p < .01$ (partial $r = .350$). Condition 4, however, was not supported. That is, the relationship between student status and hypomanic episodes during the exam period was not reduced when we controlled for sleep loss; indeed, the significance value remained essentially unchanged ($\beta = 3.982$), Wald $\chi^2(1,$

Table 2
Average Number of Days Hypomanic Symptoms Were Present During the Baseline Period and Exam Period Among Bipolar Students Versus Bipolar Nonstudents

	Bipolar students				Bipolar nonstudents			
	Baseline period		Exam period		Baseline period		Exam period	
Symptom	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Inflated self-esteem or grandiosity	2.6	3.7	5.1	4.9	2.9	4.5	2.5	4.6
Decreased need for sleep	1.4	3.0	3.7	4.9	2.4	3.9	1.6	3.5
Distractibility	1.6	3.2	2.7	4.0	1.7	4.0	0.8	2.6
Increased goal-directed activity or psychomotor agitation	3.4	4.1	6.1	4.7	5.5	5.1	4.9	5.3
Increased talkativeness	3.3	4.1	5.0	4.7	3.5	4.5	4.4	5.1
Flight of ideas/thoughts racing	2.2	3.8	4.4	4.7	3.3	4.6	3.8	5.0
Excessive involvement in pleasurable activities	1.0	2.7	1.5	3.5	1.3	3.5	1.7	4.1

Table 3
Statistics for Analyses Examining the Average Number of Days Hypomanic Symptoms Were Present During the Exam Period Among Bipolar Students Versus Bipolar Nonstudents

Symptom	β	*t*(62)	*p*	partial *r*
Inflated self-esteem or grandiosity	0.314	3.35	.001	.392
Decreased need for sleep	0.396	3.44	.001	.400
Distractibility	0.210	1.98	.05	.244
Increased goal-directed activity or psychomotor agitation	0.280	2.71	.009	.326
Increased talkativeness	0.040	0.38	*ns*	.048
Flight of ideas/thoughts racing	0.124	1.16	*ns*	.146
Excessive involvement in pleasurable activities	−0.106	−1.09	*ns*	−.137

Note. For all significant symptom analyses, bipolar students had a higher average number of days of that particular symptom during the exam period relative to bipolar nonstudents. For all analyses, we controlled for baseline hypomania, baseline depression, and age.

$N = 68$) = 8.607 (OR = 53.64), $p = .003$. Additionally, sleep loss did not continue to predict hypomania during the exam period when the effect of student status was controlled ($\beta = 1.113$), Wald $\chi^2(1, N = 68) = 2.470$ (OR = 3.043), *ns*. Thus, although sleep loss appeared to be related to *DSM–IV* hypomanic episodes during the exam period, it did not mediate the increased rates of hypomania among bipolar students.

Final Exams and the Onset of Depressive Episodes and Symptoms

Last, we examined the relation between final exams and the onset of a *DSM–IV* major depressive episode among bipolar spectrum participants. Consistent with visual inspection of Figure 3, a logistic regression demonstrated that bipolar spectrum individuals in the exam group did not have significantly different rates of depression during the exam period relative to bipolar spectrum individuals in the nonexam group (controlling for baseline hypomania, baseline depression, and age), Wald $\chi^2(1, N = 68) = 0.003$, *ns*. Therefore, we did not conduct follow-up analyses examining exam-period-specific depressive episodes. Additionally, linear regression analyses indicated that bipolar spectrum individuals in the exam group did not have a higher average number of days of any of the depression symptoms during the exam period relative to individuals in the nonexam group.

Discussion

It has been proposed that goal striving is a prototypic life event that increases BAS activity in humans (Depue et al., 1994; Johnson, 2005). Furthermore, the BAS dysregulation theory of bipolar disorder (Depue et al., 1994) predicts that goal-striving life events should be associated with an increase in hypomanic and manic, but not depressive, episodes in bipolar individuals. To test this prediction, we examined the relationship between a goal-striving life event (final exams) and the onset of bipolar spectrum episodes and symptoms in individuals with a bipolar spectrum diagnosis and control individuals. Consistent with the BAS dysregulation theory, bipolar spectrum individuals who took final exams displayed a significantly higher rate of hypomanic episodes during the exam period relative to bipolar spectrum individuals who did not take final exams. As predicted, control individuals displayed no hypomanic episodes or symptoms during either the baseline period or the exam period. Also consistent with predictions, final exams were not associated with higher rates of depressive episodes or symptoms in bipolar spectrum individuals.

Our findings, in combination with those of Johnson et al. (2000), support the hypothesis of the BAS dysregulation theory that BAS activation-relevant events should be associated with a heightened rate of hypomanic and manic, but not depressive, episodes in bipolar spectrum individuals. With regard to symptoms, our findings suggest that engaging in a goal-striving event is not associated with a heightened rate of all hypomanic symptoms equally. Rather, we found that bipolar spectrum individuals who took final exams displayed a significantly higher rate of the following hypomanic symptoms during the exam period relative to bipolar spectrum individuals who did not take final exams: (a) inflated self-esteem or grandiosity, (b) decreased need for sleep, (c) distractibility, and (d) increased goal-directed activity or psychomotor agitation.

We did not find evidence that individual differences in BAS sensitivity among bipolar spectrum individuals moderated the likelihood that participants would develop bipolar spectrum episodes during a goal-striving event. However, we did find limited support for such a moderation effect for bipolar symptoms. That is, bipolar spectrum individuals with high self-reported BAS sensitivity were more likely to evidence hypomanic symptoms of (a) inflated self-esteem or grandiosity and (b) increased goal-directed activity or psychomotor agitation during a goal-striving event, relative to bipolar spectrum individuals with low BAS sensitivity. It is interesting that this effect was only observed for the BAS total scale of the BIS/BAS Scale (Carver & White, 1994), which suggests that the composite of the BAS subscales moderates the presence of hypomanic symptoms during goal striving. As noted above, the BAS dysregulation theory does not require that BAS sensitivity differentiate among bipolar individuals. Rather, these results are

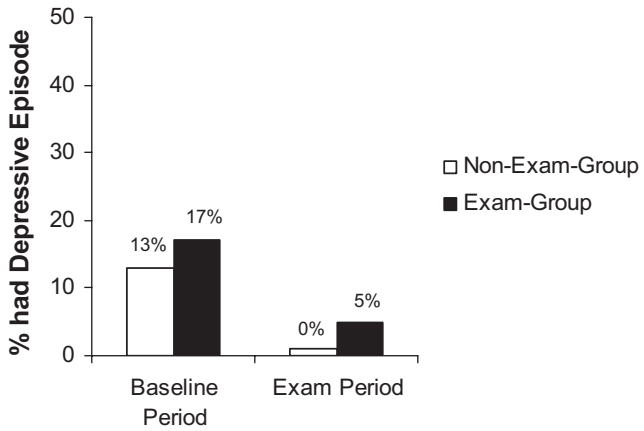

Figure 3. Percentage of bipolar spectrum individuals who had a major depressive episode during the baseline period versus the exam period.

more relevant to unpacking heterogeneity among bipolar individuals.[4]

Last, our findings, in combination with those of Johnson et al. (2000), suggest that there are at least two types of BAS activation-relevant life events relevant to the onset of hypomanic and manic episodes. As reported by Johnson et al. (2000), goal attainment life events are associated with an increase in manic symptoms in individuals with bipolar I disorder. The findings from the current study, however, demonstrate that the act of goal striving also can trigger hypomanic episodes in individuals with a bipolar diagnosis. As noted by a participant in the current study who had a bipolar spectrum diagnosis, "I am most up when I am working toward something, when I am out of my rut, because I love to tackle the impossible. . . . It is a euphoric but serious mood that almost drives you to be distracted."

Interpretation of Findings and Directions for Future Research

We interpret the current study's findings from the perspective of the BAS dysregulation theory, given our proposal that final exams are a prototypic BAS activation-relevant event (i.e., goal striving). However, one alternative explanation for our findings is that stress, rather than goal striving, was responsible for the increased rates of hypomania during the exam period, given the evidence indicating that final exams are associated with a heightened stress response (Glaser, Pearl, Kiecolt-Glaser, & Malarkey, 1994). Although this is a plausible explanation, one would expect that if stress played a significant role, there would be an increase in depression rather than hypomania during the exam period among bipolar individuals in the exam group (or at least a simultaneous increase in both depression and hypomania). This prediction is based on research identifying a relation between life stress and increased rates of depression (Mazure, 1998). In contrast, we did not observe an increase in depression during the exam period among bipolar spectrum individuals in the exam group; if anything, these individuals actually tended to show a decrease in depression during the exam period. However, it may be the case that different types of stressors (e.g., BAS-activating stressors vs. BAS-deactivating stressors) are associated with different outcomes (hypomania vs. depression). Further research is needed to examine this possibility.

On the basis of another alternative explanation—circadian rhythm or zeitgeber theory (Ehlers et al., 1988; Jones, 2001)—it could be argued that the heightened rates of hypomania during the exam period were the result of the disruption in sleep patterns that this type of event likely induces. Inconsistent with this argument, however, are mediational analyses demonstrating that the rates of hypomania observed during the exam period among bipolar students were not mediated by sleep loss during the exam period. However, future research is still required to examine whether circadian or social rhythm disruption is involved in driving hypomania observed during goal-striving events. This research would benefit from the use of an experiential sampling methodology in which data are collected on a day-by-day basis. This methodology would provide the temporal resolution needed to determine whether sleep disruption preceded the onset of hypomania or vice versa.

However, it is important to consider the possibility that theories of circadian rhythm disruption, stress, and BAS dysregulation may be compatible with each other. For example, the sleep and social rhythm disruption associated with staying up late to engage in goal striving may exacerbate any increase in BAS activity associated with goal striving. Similarly, an excessive increase in BAS activity may result in an individual being motivated to stay up late in response to a goal-striving event, thus exacerbating social rhythm disruption and/or stress levels. Although the idea is still only speculative, there may be important interactions among social rhythm disruption, stress, and BAS dysregulation. By examining these possible interactions, researchers may gain a better understanding of the mechanisms through which life events precipitate bipolar episodes.

As presented in Figure 1, bipolar spectrum individuals had rates of hypomania during both the baseline and the exam period that may seem high. However, as we argue below, these rates are very reasonable for three reasons: (a) our use of the GBI as a screening measure, (b) the lack of research needed to make any definitive conclusions as to what the typical rates of hypomania are among bipolar spectrum individuals, and (c) the high percentage of our bipolar spectrum individuals who had a cyclothymic diagnosis. Related to Point a, the GBI (Depue et al., 1989), an assessment of proneness to cyclothymia, was used as a Phase 1 screening device for bipolar spectrum disorder. The GBI uses a 4-point frequency scale for each item, ranging from 1 = *never or hardly ever* to 4 = *very often or almost constantly.* Following Depue et al. (1981, 1989), we used the case-scoring method, in which only items rated a 3 (*often*) or 4 (*very often or almost constantly*) contribute a point toward the total score. The fact that all of the bipolar spectrum individuals in the current study met GBI cutoff criteria suggests that our participants were prone to high rates of hypomanic periods and depressive periods.

Furthermore, there has been a paucity of research examining rates of hypomanic and depressive episodes among the soft bipolar conditions (Judd et al., 2005), and the few studies that have been conducted have not typically recruited individuals with a cyclothymic diagnosis. This is of import given that 87% of the bipolar spectrum individuals in the current study had a cyclothymic diagnosis (either alone or in combination with a bipolar II diagnosis), which, by definition, requires mood changes that are "too numerous to count" (Spitzer et al., 1978, p. 25).[5] Thus, it may be too early to conclude what the typical rates of hypomania are among individuals with cyclothymia or bipolar II disorder with cyclothymic oscillations. Last, the fact that we observed high rates of hypomania among bipolar individuals who engaged in a goal-

[4] The core feature of the BAS dysregulation theory is that levels of BAS sensitivity should differentiate bipolar individuals from nonbipolar individuals (Depue et al., 1987, 1989). Consistent with this statement, we predicted and found that bipolar spectrum individuals in the current study scored higher on Carver and White's (1994) subjective measure of BAS sensitivity (BAS subscales of the BIS/BAS Scale) than individuals with no psychopathology. See Table 1 for details.

[5] Twenty-one percent of the bipolar spectrum individuals had a diagnosis of cyclothymic disorder, and 66% had a diagnosis of both bipolar II disorder and cyclothymic disorder.

striving event is consistent with the BAS dysregulation theory. That is, the exam period is precisely when rates of hypomania should have been high among bipolar individuals in the exam group, given that the theory predicts an increase in rates of hypomania when bipolar individuals confront a BAS activation-relevant event.

Given that the individuals in the current study had a soft bipolar condition, it is important to determine the extent to which our findings generalize to the onset of mania in individuals with a bipolar I diagnosis. Furthermore, the current study used a college student bipolar sample. Individuals with a bipolar spectrum disorder who are college students may have certain protective factors (e.g., high intellect, high socioeconomic status) that differentiate them from bipolar spectrum individuals in the community. It may also be the case that goal-striving events are more salient to bipolar spectrum individuals who pursue advanced degrees. Accordingly, it is important to examine whether our results generalize to bipolar patients treated in the community.

In Closing

The current study has found a strong relation between the experience of a hypothesized goal-striving life event and the onset of hypomanic episodes and symptoms in individuals with a diagnosis of cyclothymia or bipolar II disorder. This finding has significant clinical implications in that an important aspect of managing and treating a psychiatric disorder is identifying the types of events that are relevant to precipitating episodes of that disorder. By informing bipolar individuals of the importance of monitoring their emotions and regulating their sleep (Wehr et al., 1998) during goal-related events, clinicians can reduce the risk that these events will precipitate a bipolar episode in their clients (Johnson, 2005).

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