2021

Test of the Cognitive Vulnerability-Stress Model in Predicting Hypomanic Symptoms in College Students

Helena Meeri Juntunen

Test of the Cognitive Vulnerability-Stress Model in Predicting Hypomanic Symptoms in College Students

Helena Juntunen

Acknowledgments

I would first like to thank my advisor, Dr. Kelly Rohan for all the support and guidance she has given me throughout my two years in her lab. I would also like to thank my two wonderful graduate students, Jessica Perez and Richard Norton for all their help and for always believing in me. I will forever be grateful for my time spent learning and growing as a researcher in the Rohan lab. Next, I would like to thank my committee members, Ellen McGinnis (Department of Psychiatry) and Keith Burt (Department of Psychological Science). I would also like to extend my gratitude to the Department of Psychological Science, The College of Arts and Sciences and the Honors College for giving me the opportunity to publish and present an Honors Thesis. Finally, I would like to thank my friends and family for their unwavering support and encouragement throughout the whole process, none of this would be possible without you.

Abstract

The current thesis adds to the literature on the interaction of cognitive vulnerability, in particular dysfunctional attitudes, and negative life events in predicting hypomanic symptoms in a sample of college-aged students. Consistent with Beck's cognitive model, prior work has examined the cognitive vulnerability-stress interaction in predicting depression and depressive symptoms in college students. This study extends the model to predicting hypomania symptoms. Data were collected in a larger study, where 355 undergraduate students, aged 18 years and older, were evaluated on mood, stressful life events in the past year, and several cognitive vulnerabilities to depression at the beginning of the semester. The sample was reassessed at the end of the semester on mood and stressful life events in the interim. This study tested the hypothesis that baseline Dysfunctional Attitudes Scale (DAS) score would interact with both negative and positive life events over the semester to predict growth in hypomania symptoms over the semester. Hypomania was assessed through the Altman Self-Rating Mania Scale (ARMS). Hierarchical multiple regression analyses were conducted with end of semester ARMS score as the outcome and baseline DAS, negative (positive) life events in the interim, and the interaction term as predictors, after controlling for baseline ARMS score and negative (positive) life events in the past year. Dysfunctional attitudes did not interact with either negative or positive life events in the interim to predict growth in hypomania symptoms over the semester. There was a significant predictive effect of positive life events, whereby greater positive life events over the semester was associated with increased hypomania symptoms over the semester. These results do not support the cognitive vulnerability-stress model for hypomanic symptoms, as tested using these methods in this sample. This study is limited by the relatively short follow-up interval of approximately 4-months, which restricted the time for significant negative and

positive life events to develop. These results provide evidence that perceived impact from positive life events might confer risk for increased hypomanic symptoms over a semester in college students, which can inform prevention efforts for students.

Introduction

In America, according to a 2007, National Comorbidity Survey, an estimated 1% lifetime (and 12-month) prevalence of the population meets criteria for bipolar spectrum disorder (Merikangas et al., 2007). Bipolar spectrum disorders are mental health problems characterized by manic or hypomanic episodes that typically alternate with major depressive episodes (APA, 2013). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013), the essential feature characterizing manic and hypomanic episodes is a mood disturbance involving abnormally expansive, elevated, or irritable mood, accompanied by an increase in goal-directed activity and/or energy. Beyond this essential mood disturbance, the associated features of manic and hypomanic episodes include inflated self-esteem, reduced need for sleep, rapid speech, flight of ideas, hyperactivity, distractibility, and excessive risk-taking (APA, 2013). The distinction between mania and hypomania is based on duration (at least one week in mania vs. at least four days in hypomania) and severity (marked impairment in mania vs. an observable change in hypomania) of symptoms. A challenging part of studying bipolar disorder is parsing apart the risk factors and vulnerabilities associated with hypomania/mania versus those associated with a major depressive episode, which are often part of the disorder.

The majority of people with bipolar disorder experience their first manic/hypomanic episode around the age of 18, a time when impactful life changes often occur (e.g., graduating high school, starting college, getting a job, moving out, serious romantic relationships, etc.). Having a better understanding of the predictive factors of hypomanic/manic episodes can help target treatment to reduce severity or even prevent onset of these episodes. This study aims to add to the growing literature on the interaction of a cognitive vulnerability to depression (i.e., dysfunctional attitudes) and negative life events in predicting hypomanic symptoms by

leveraging existing data on initially non-depressed college students assessed on cognitive vulnerabilities, life events, and mood symptoms over the course of a semester.

Cognitive vulnerabilities are broadly defined as maladaptive patterns of thinking, perceiving, interpreting, and reacting to events in one's life (Hankin et al., 2009). Beck's (1987) cognitive model of depression states that individuals with cognitive vulnerabilities are at high risk for depression onset when they experience a negative life event. Beck's model is a cognitive vulnerability-stress model, a type of diathesis-stress model, whereby cognitive vulnerabilities (i.e., the diathesis) contribute to the development of depression when faced with a stressful negative life event (i.e., the stress). The central cognitive vulnerability in Beck's theory is the negative cognitive triad, comprised of negative core beliefs regarding the self, one's personal world, and the future. These beliefs are typically learned through early experiences. When this negative cognitive triad is activated by stressful circumstances, moment-to-moment thoughts become negative, leading to symptoms of depression. The negative cognitive triad leads to the development of an intermediate class of beliefs, dysfunctional attitudes, which are negative attitudes, rules, and assumptions commonly endorsed by depressed individuals. Dysfunctional attitudes are most commonly measured using a self-report questionnaire, the Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1987), where respondents rate their agreement on a 1 (totally disagree) to 7 (totally agree) Likert scale. Example DAS items are "If I am to be a worthwhile person, I must be truly outstanding in one major respect" and "I cannot be happy unless most people I know admire me." The DAS is the mostly commonly used scale to assess a cognitive vulnerability to depression commensurate with Beck's model.

When tested as the interaction of dysfunctional attitudes and negative life events, studies have largely supported the cognitive vulnerability-stress model of unipolar depression, including

major depressive episode onset and increased depression symptoms over time (Seeds & Dozois, 2010). In three similarly structured studies, Hakin et al. (2004) tested the cognitive vulnerability-stress model in predicting depression in a group of undergraduate students. In Study 1, undergraduates were assessed at baseline (time 1) on cognitive vulnerabilities using the DAS and the Cognitive Style Questionnaire (CSQ; Abramson & Metalsky, 1989), negative life events, and depressive symptoms. After 5 weeks (time 2), they were reassessed. Results indicated that cognitive vulnerabilities interacted with negative life events in the 5-week interim to predict change in depressive symptoms over time, whereby higher cognitive vulnerability (on either DAS or CSQ) and greater negative life events contributed to an increase in depression symptoms over the 5 weeks. Study 2 had a similar design but included a longer follow-up interval of 2 years. Results were similar to the first study, whereby the cognitive vulnerabilities interacted with negative life events in predicting change in depressive symptoms at time 2. In Study 3, Hankin and colleagues assessed mood, CSQ, and DAS in undergraduates 1 to 2 weeks before a midterm. Each cognitive vulnerability interacted with the midterm (stressful life event) in predicting depression 5 days after the exam. These three studies illustrate the interactive relationship between cognitive vulnerability to depression and stressful negative life events in predicting increased depression symptoms over time, therefore supporting the cognitive vulnerability-stress model (Hankin et al., 2004).

The parent study leveraged for this Thesis project included a test of the cognitive vulnerability-stress hypothesis in predicting increased depressive symptoms over a semester in initially nondepressed college students (Perez & Rohan, 2021). The study examined three cognitive diatheses: unprimed cognitions (i.e., DAS score), cognitive reactivity (i.e., change in DAS score from before to after a dysphoric mood induction), and mood reactivity (i.e., change in

mood from before to after a dysphoric mood induction). After controlling for sex, negative life events in the past year, and baseline depressed mood, DAS score significantly predicted depression symptoms at the end of the semester in the expected direction, with more rigid dysfunctional attitudes associated with higher depressive symptoms. Neither cognitive reactivity nor mood reactivity significantly predicted later depression severity, and none of the cognitive vulnerabilities interacted significantly with negative life events to predict later depression severity. Additional analyses added history of major depression to the predictive models. After controlling for sex, negative life events in the past year, history of depression, and baseline depressed mood; mood reactivity interacted with depression history to predict later depression severity. Specifically, a greater increase in sad mood during the dysphoric mood induction was associated with higher depression scores at the end of the semester in those with prior history of depression and lower depression scores in those without personal history of depression. These results suggest that different cognitive vulnerabilities may confer risk for future depressive symptoms, depending on whether one has experienced Major Depressive Disorder.

The Temple-Wisconsin Cognitive Vulnerability to Depression (CVD) study, pioneered by researchers Lauren Alloy and Lyn Abramson, is one of the most influential studies testing cognitive vulnerabilities as a risk factor for depression onset. The study recruited first year college students who were not currently depressed, separated into "low" and "high" cognitive risk for depression groups, based, respectively, on scores in the lowest and highest quartile on both the DAS and the CSQ. At baseline, individuals in the high risk group had a significantly higher lifetime prevalence of Major Depressive Disorder (38.7%) than those in the low risk group (17.0%), indicating a two-fold higher risk for past depression in the high vs. the low risk group (Alloy et al., 2000). In following the students from the Temple-Wisconsin CVD study for

two and a half years, individuals in the high risk group were at greater risk for the onset of major depression over this interval, with a nearly 7-fold higher risk than those in the low risk group (Alloy et al, 2006). Additionally, their results suggested that negative cognitive styles were similarly predictive of both first onsets and recurrences of major depression, indicating that cognitive vulnerabilities are not differentially related to first and subsequent depressive episodes and are strong predictors of both (Alloy et al., 2006). Although the Temple Wisconsin CVD study provides strong evidence that more negative cognitive styles precede and predict later major depression, stressful life events were not measured and, therefore, were not examined in interaction with cognitive styles in predicting depression. In this respect, the CVD study is more a test of the cognitive model than of the cognitive vulnerability-stress model. It remains unknown whether the results of the Temple-Wisconsin study, and other work supporting the cognitive vulnerability-stress model of unipolar depression, generalize to bipolar spectrum mood disorders or to mania/hypomania symptoms.

Although originally developed to explain the onset of major depressive episodes, the cognitive vulnerability-stress model may generalize to onset of manic/hypomanic episodes. According to Alloy and colleagues (2006), there are two possible types of stressors that can lead to the onset of manic/hypomanic episodes. They argue that positive and/or negative life events can lead to different cognitive styles that may engender hypomanic episodes. Individuals with positive cognitive styles may experience euphoria and hypomanic/manic symptoms when something positive happens to them. Alloy (2018) suggested that individuals prone to mania have positive self-schemas involving unrealistic positive expectations of themselves, the world, and the future, and that these overly positive expectations lead to an increase in hypomanic symptoms, particularly in the context of a positive life event.

Johnson et al. (2000) suggested that goal-attainment events may increase positive affect and energy in those with bipolar, which can lead to an onset of hypomania/mania. To test this idea, Johnson and colleagues (2000) followed 43 bipolar I patients monthly for 2 years, recording and measuring their symptoms and life events. They reported that goal-attainment life events increased mania in these individuals, but not depression. Similarly, Urosević and colleagues (2008) have suggested that the behavioral approach system (BAS) is maladaptive in those with bipolar spectrum disorder, such that they are highly sensitive to reward-relevant environmental cues. Life events that involve opportunity for achievement, growth, and reward (positive in nature) leads to a hypersensitization of the BAS, which is reflected as hypomania/mania.

On the other hand, negative life events have been found to trigger manic episodes as well as depressive episodes in bipolar individuals (Alloy et al., 2006). This indicates that bipolar individuals' cognitive styles for construing negative events, rather than how they construe positive events, may be more important in determining their vulnerability to manic or hypomanic episodes. Individuals who have a negative cognitive style, when encountered with a negative life event, may have an onset of manic/hypomanic episodes as a sort of "defense" (Klein, 1994). This is a psychodynamic approach suggesting that the grandiosity of manic states acts as a counter-reaction to the underlying depressive tendencies that they may experience. Overall, the cognitive vulnerability-stress model can be applied to both positive life events and negative life events in triggering a manic and hypomanic episode in individuals with or prone to bipolar.

Currently, there is mixed research in the field supporting the cognitive vulnerability-stress model as it applies to mania/hypomania. Alloy and colleagues (1999) studied cognitive styles and life events in four groups of undergraduates. The first group were students diagnosed

with cyclothymia, which is a mood disorder involving recurrent subclinical depressive symptoms alternating with subclinical hypomanic symptoms. The next group met diagnostic criteria for dysthymia, which is a mild, chronic form of depression. The third group met DSM-III criteria for hypomania, as determined by semi-structured diagnostic interview using the Schedule for Affective Disorder and Schizophrenia Lifetime. The last group was a normal control group with no previous diagnosis. The participants completed cognitive style, life events, and symptom measures on three separate occasions throughout the year. Those who met criteria for hypomania were assessed once in a normal state and twice while in a hypomanic state. Results indicated that negative attributions interacted with a negative event to predict longitudinal increases in depressive symptoms in those with cyclothymia, dysthymia, and hypomania. Alloy and colleagues noted that the cyclothymic and dysthymic groups had more dysfunctional attitudes and more depressive attributions for negative events than the hypomanic and the normal control groups. Those with hypomania alternating with depression had more negative cognitive attributions than those with only hypomania. Directly relevant to the cognitive vulnerability-stress theory, in the sample as a whole, cognitive style at time 1 interacted with positive life events in the interim to predict hypomanic symptoms at time 2 (Alloy et al., 1999). Specifically, participants with a nondepressed attributional style for positive life events (i.e., attributing positive events to internal, stable, global causes) at time 1 who reported more positive life events in the interim had higher hypomanic symptoms at time 2. This study is significant, as it was one of the first to apply cognitive vulnerabilities to phases of hypomania and longitudinally test predictive relations between the interaction of cognitive vulnerabilities and stress and later hypomanic symptoms.

Additionally, Reilly-Harrington et al. (1999) studied the interaction of cognitive styles, including dysfunctional attitudes, and stressful life events in predicting depression and manic symptoms in participants with a pre-existing bipolar diagnosis. Negative cognitive styles at time 1 interacted with negative life events to increase both depression and hypomania in bipolar patients at time 2, which was between 2 weeks to 4 months after time 1. These results contrast with those of Alloy et al. (1999), where positive rather than negative life events interacted with cognitive vulnerability to lead to an increase in hypomanic symptoms over time. These differing results may be due to differences in the samples, e.g., Reilly-Harrington used bipolar II and I individuals, whereas Alloy used "milder" cyclothymic and hypomanic individuals. Bipolar II and I individuals are more likely to experience depressive episodes, which may make them more emotionally responsive to negative life events.

Similarly, Alloy, Abramson, Walshaw, Whitehouse, and Hogan (2006) longitudinally examined whether cognitive vulnerabilities predicted the onset of depression and/or hypomanic episodes. After 33 months, negative attributions for negative events and private self-consciousness predicted the onset of both depression and hypomania. Other work, however, suggests that cognitive vulnerabilities may not predict later hypomania. For example, Johnson and Fingerhut (2004) recruited 60 individuals with bipolar and assessed their symptoms monthly. At a 6 month follow-up, they assessed cognitive vulnerabilities, such as dysfunctional attitudes, and then followed participants for another six months. They concluded that negative cognitive styles predicted the onset of depression but not hypomania. Although their results do not support the hypothesis of negative cognitive vulnerabilities predicting hypomania, it adds to the growing research of cognitive vulnerabilities in predicting depression among individuals with bipolar disorder.

The goal of this research project is to contribute to the growing literature on cognitive vulnerability-stress models to bipolar-spectrum mood disorders. Whereas most prior work has focused on the onset of diagnosed hypomanic or manic episodes over time, this project focuses more broadly on growth in hypomanic/manic symptoms over time. In specific, this study is a comparison of two cognitive-vulnerability models, tested in a college student sample: one model that posits that positive life events interact with dysfunctional attitudes significantly to predict increased hypomania symptoms, and the other that posits that negative life events interact with dysfunctional attitudes to significantly predict increased hypomania symptoms. After reviewing the current literature, we hypothesize and expect that baseline dysfunctional attitudes will interact with negative life events in the interim to predict increased hypomanic symptoms at follow-up at the end of the semester, more so than positive life events will. If dysfunctional attitudes interact with negative life events to predict increased hypomanic symptoms in college students, prevention and intervention efforts can target dysfunctional attitudes to help college students who may be at risk for developing symptoms of hypomania. This could help students succeed academically and socially and, for first years, help them cope with the stressful transition to college life.

Methods

Participants

Undergraduate students, aged 18 and older, at the University of Vermont were recruited for the parent study, "Thinking and Mood," for undergraduate psychology course credit. Beyond age, the only study inclusion criterion was a score in the normal mood range (0-13) on the Beck Depression Inventory-Second Edition (BDI-II; Beck, Steer, & Brown, 1996) at study outset. Initially, 331 participants were enrolled in the study, but 9 failed to return for follow-up at the

end of the semester, resulting in *N* = 322 included in these analyses. The majority of participants were female (*n* = 258, 78.2%). The racial and Hispanic ethnicity demographics for the sample are as follows: 85.2% White (*n* = 281), 0.9% African American (*n* = 3), 1.2% Hispanic/Latino (*n* = 4), 0.3% American Indian (*n*=1), 3% Asian (*n* = 10), and 5.5% multi-racial/ethnic (*n* = 18). The mean age was 19.6 years (SD 6.84).

Procedures

Participants were involved in the parent study over the course of a single academic semester, with assessments at the start (Time 1) and end of the semester (Time 2), approximately four months apart. The larger study design included assessment of several cognitive vulnerability constructs, mood, and stressful life events in the past year at Time 1 and reassessment of mood and stressful life events in the interim at Time 2. The current study uses Time 1 and Time 2 hypomanic symptoms on the Altman Self-Rating Mania Scale (ARMS; Altman et al., 1994), Time 1 cognitive vulnerability as indexed by Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978) score, and Time 1 and Time 2 stressful life events measured using the Life Experience Survey (LES; Sarason, Johnson, & Siegel, 1978).

Measures

Altman Self-Rating Mania Scale (ARMS)

The Altman Self-Rating Mania Scale (ARMS; Altman et al., 1994) is a five item self-report scale assessing the presence and severity of hypomanic/manic symptoms over the past week. The five questions correspond to five symptom domains central to hypomania: positive mood (i.e., unusual happiness or cheerfulness), self-confidence (i.e., inflated self-esteem), sleep patterns (i.e., high energy despite little sleep), speech (i.e., rapid, pressured speech), and activity levels (i.e., over-activity). Each item is rated on a 0-4 scale, with 0 being the least (e.g., “I do *not*

talk more than usual" for speech) and 4 being the highest (e.g., "I talk *constantly* and cannot be interrupted" for speech). The ARMS test-retest reliability was high and has strong validity (Altman et al., 1997).

Dysfunctional Attitudes Scale (DAS)

The Dysfunctional Attitude Scale (DAS; Beck & Weissman, 1978) is a self-report scale containing 40 items, representing statements (e.g., "I am nothing if a person I love does not love me") that are rated on a 7-point Likert scale (7 = "totally agree," 1 = "totally disagree"). Total DAS scores range from 40-280, with higher scores reflecting more rigid dysfunctional attitudes. The DAS has shown high test-retest reliability (Beck & Weissman, 1978), as well as sufficient internal consistency, item-total correlations, and convergent construct validity (de Graaf, Roelofs & Huibers, 2009). Parallel versions of the DAS (Form A and Form B) were administered to participants at Time 1, as the study included a dysphoric mood induction with repeat administrations of the DAS before and after mood induction. The order of DAS administration was randomized, such that approximately half of the sample completed Form A before and Form B after the mood induction, and the other half completed them in the reverse order. The current study uses the DAS administered before the negative mood induction, whether it was Form A or Form B, because the current study is focused on naturally occurring (i.e., unprimed) dysfunctional attitudes.

Life Experiences Survey (LES)

The Life Experience Survey (LES; Sarason et al., 1978) measures the perceived positive and negative impact of various life events. The LES contains 57 items, each corresponding to potential life events (e.g., death of a partner or changing jobs), including several that are geared more towards students (e.g., failing a class or dropping a class) and 3 blank items where

respondents can write-in any additional events experienced. For each experienced life event, participants rate the impact of that event on a 7-point Likert scale, ranging from -3 ("extremely negative") to 3 ("extremely positive"). The positive and negative ratings are summed separately across all items to yield positive and negative impact scores, respectively. This study uses both negative and positive impact scores. Instructions for the LES at Time 1 were focused on events in the past 12 months and, at Time 2, were focused on events experienced "since the start of the semester." The LES has been found to have moderate test-retest reliability in a group of undergraduate psychology students over a span of 5-6 weeks. It is important to note that in that span of time, participants could experience a number of positive or negative events that change their response. The scale also has good validity and is relatively free from social desirability bias (Sarason et al., 1978).

Data Analysis

Data were analyzed using SPSS (Version 27). Prior to running the primary regression analysis, described below, potential covariates were explored, including sex, semester of participation (fall or spring), race/ethnicity (White, non-Hispanic vs. all others), and year in school. None of these were correlated significantly with outcome (Time 2 ARMS score), and all were dropped from the regression.

The analysis consisted of a hierarchical multiple regression with follow-up hypomania (ARMS) scores as the dependent variable. Time 1 negative life events were entered in Step 1 to control for negative life events experienced over the past year; Time 1 ARMS score was entered in Step 2; Time 2 (past semester) LES negative impact score was entered in Step 3; Time 1 DAS score was entered in Step 4; and an interaction term for centered Time 1 DAS by centered Time 2 (past semester) LES negative impact score was entered in Step 5. A second exploratory

hierarchical multiple regression with follow-up hypomania (ARMS) scores as the dependent variable, was run, all the steps were the same as the first, but with the replacement of negative life events in Step 3, with positive life events, and controlling for Time 1 (past year) positive life events rather than negative life events in Step 1.

Results

Participant characteristics and descriptive statistics for study variables are presented in Table 1, and bivariate correlations are presented in Table 2. Our sample consisted of 322 undergraduate students at the University of Vermont. Most participants were white (*n*=281; 87%) and female (*n*=258; 80%). There were 11 cases of missing data which were handled using listwise deletion, due to comprising a small percentage of the sample (5%). Although there was variability in hypomania scores at both time points, mean ARMS scores decreased slightly from Time 1 to Time 2 in the sample. Potential covariates were analyzed to determine inclusion in the analysis. To test the cognitive vulnerability-stress model, dysfunctional attitudes interacting with life events, to predict follow-up hypomanic symptoms, two separate hierarchical regressions were conducted, one using negative life events and one using positive life events as the "stress."

DAS by Negative Life Events Regression Model

Overall, this model significantly predicted the outcome variable Time 2 ARMS ($F[5, 316] = 6.25$ $p < .001$), and remained significant throughout all the Steps. In Step 1, Time 1 (past year) negative life events was not significantly associated with Time 2 ARMS scores, ($b = .06$, $t(320) = .170$, $p = .865$). Introducing Time 1 ARMS scores was significant ($b = 0.27$, $t(319) = 5.28$, $p < .001$) in Step 2 for predicting Time 2 ARMS, such that as Time 1 ARMS increased so did Time 2 ARMS. Further, Time 1 ARMS accounted for approximately 8% of the unique variance in Time 2 ARMS over and above previous steps ($\Delta R^2 = 0.08$, ΔF [2,319] = 27.89, *p*

<.001). Time 2 (past semester) negative life events in Step 3 did not significantly predict Time 2 ARMS, (b = -0.04, t(318) = -0.87, p = 0.39) and, therefore, the addition of semester negative life events did not significantly contribute to the variance in Time 2 ARMS accounted for by the model (ΔR^2 = 0.002, ΔF [3,318] = 0.74, p = 0.39). Similarly, Step 4, baseline DAS scores did not significantly predict Time 2 ARMS, (b = 0.01, t (317) = 1.33, p = 0.18). The addition of baseline DAS scores did not significantly contribute to the variance in Time 2 ARMS accounted for by the model, (ΔR^2 = 0.005, ΔF [4,317] = 1.79, p = 0.18). Finally, Step 5, the interaction of DAS and negative life events over the semester, did not significantly predict Time 2 ARMS (b = -.002, t (316) = -0.88, p = 0.38). The addition of this interaction term did not significantly contribute to the variance in Time 2 ARMS accounted for by the model, (ΔR^2 = 0.002, ΔF [5,316] = 0.77, p = 0.38). See Table 3 for additional information.

DAS by Positive Life Events Regression Model

Overall, this model significantly predicted Time 2 ARMS scores (F [5, 316] = 8.7, p < .000) and remained significant throughout all the Steps. In Step 1, Time 1 (past year) positive life events was significant in predicting a change in Time 2 ARMS, (b = .07, t (320) = 2.53, p = 0.01). Time 1 ARMS significantly predicted Time 2 ARMS, when introduced in Step 2, whereby as Time 1 ARMS scores increased, so did Time 2 ARMS (b = 0.26, t (319) = 4.8, p < 0.001). Time 1 ARMS accounted for approximately 6% of the unique variance in Time 2 ARMS over and above previous Steps (ΔR^2 = 0.06, ΔF [2,319] = 23.20, p < 0.001). Introducing positive life events over the semester in Step 3 significantly predicted Time 2 ARMS, such that as number of positive life events increased, so did Time 2 ARMS (b = 0.16, t (318) = 3.38, p = .001). Further, positive life events over the semester accounted for 3% of the unique variance in Time 2 ARMS over and above previous steps (ΔR^2 = 0.03, ΔF [3,318] = 11.43, p = .001). In Step 4, the addition

of baseline DAS did not significantly predict the outcome variable, (b = 0.09, t (317) = 1.01, p = .31). As such, the addition of baseline DAS did not significantly contribute to the variance in Time 2 ARMS accounted for by the model (ΔR^2 = 0.03, ΔF [4,317] = 1.02, p = 0.31). Finally, in Step 5, the interaction of DAS and semester positive life events did not significantly predict Time 2 ARMS, (b = 0.00, t (316) = 0.07, p = 0.95). The interaction of DAS and semester positive life events did not significantly contribute to the variance in Time 2 ARMS accounted for by in the model (ΔR^2 = 0.00, ΔF [5 ,3 16] = 0.005, p = 0.95). See Table 4 for additional information.

Discussion

The current study used data from an existing study of college students assessed at the beginning and end of an academic semester to explore the applicability of the cognitive vulnerability-stress model (Beck, 1987) to hypomanic symptoms. The current study examined hypomanic symptoms over the semester on the Altman Self-Rating Mania Scale (ARMS; Altman et al., 1994) rather than the onset of hypomanic/manic episodes and a general college sample rather than bipolar patients. These results are contrary to the a priori hypothesis for an interactive relationship between the cognitive diathesis of dysfunctional attitudes and the "stress" of negative life events in predicting increased hypomanic symptoms during the semester. After controlling for initial hypomanic symptoms and negative life events over the past year, neither DAS scores, negative life events over the semester, nor their interaction were significantly predictive of hypomania symptoms at the end of the semester. Instead, we found that positive life events over the semester predicted an increase in hypomanic symptoms at the end of the semester, after controlling for initial hypomanic symptoms and positive life events over the past year. This was a predictive main effect of semester positive life events, not a predictive effect of

the interaction between positive life events over the semester and cognitive vulnerability (i.e., dysfunctional attitudes), as would be consistent with the cognitive vulnerability-stress model. Our results are consistent with those of Johnson and Fingerhut (2004), where cognitive vulnerabilities, such as dysfunctional attitudes, did not predict hypomania in bipolar patients followed for 6 months.

The small body of work testing the applicability of the cognitive vulnerability-stress model to mania/hypomania onset/symptoms is still in its infancy relative to the literature examining this model's relevance to major depression onset/symptoms. It is possible that the model may have greater relevance to explaining depression than hypomanic symptoms because Major Depressive Disorder and Bipolar Disorder are two different psychological disorders and major depressive episodes are distinct from hypomanic/manic episodes in the current DSM-5 nomenclature (American Psychiatric Association, 2013). The mood disturbance in major depression is comprised of depressed moods, whereas, in hypomania, it often expresses as the polar opposite in mood, specifically as expansive or elevated mood.

A possible reason why negative life events did not predict, singly or in interaction with dysfunctional attitudes, increased hypomanic symptoms over the semester is the potentially low relevance of the Life Experiences Scale LES; Sarason et al., 1978) to this sample. The LES has comparatively few items specifically geared towards college students, with a majority of the items focused on larger stressors most college-aged students may not typically experience. There are multiple questions assessing spousal issues (e.g. Death of spouse), financial crises (e.g., Foreclosure on mortgage or loan), or trouble with current employment (e.g., trouble with employer- danger of losing job, being suspended, demoted). Importantly, the LES is a measure of the perceived impact of negative and positive life events. It prompts subjects to rate events

experienced within the reference timeframe from -3 (“extremely negative”) to 3 (“extremely positive”), with not applicable events rated as zero, indicating no impact. Visual inspection of the data reveals many zeroes, which indicates that most students found these events not applicable to them, limiting the number of negative life time events. For example, 99.4% (*n* = 320) rated the LES item “Death of a spouse” as zero, with only 0.6% (*n* = 2) rating its impact as extremely negative. On an item geared more towards college students, “failing an important exam,” there was more variability in the responses, as 84.5% (*n* = 272) rated this event zero (no impact), 2.5 % (*n* = 8) rated it -1, somewhat negative, 5.3% (*n* = 17) rated it -2, moderately negative, and 7.8% (*n* = 25) rated it -3, as extremely negative. Therefore, the LES may be more applicable to evaluating negative life events in older adults, not the older adolescent/young adult population we were studying. The positive events assessed on the LES were more geared to a younger college population, such as “Major change in social activities, e.g., parties, movies, visiting,” 64.0% (*n* = 206) responded 0/no impact, 14% (*n* = 45) responded 1/somewhat positive, 16.1% (*n* = 52) responded 2/moderately positive and 5.9 (*n* = 19) responded 3/extremely positive. Other positive life events included as LES items are “joining a fraternity/sorority” and “beginning a new school experience”. Older populations were not as able to relate to these particular positive life events measured on the LES because they are not in the age range where they are going to parties or joining new school events.

There are alternative methods for measuring life events beyond self-report measures of the perceived impact of life events such as the LES. One method includes the Life Events and Difficulties Schedule (LEDS; Brown & Harris, 1978). The LEDS is a semi-structured interview that has explicit rules and operational criteria for defining acute and chronic stress, the ability to distinguish between complex stressors, and a comprehensive manual for rating these stressors.

This system provides “contextual” ratings for each life event and takes into consideration the individual’s biographical circumstances to evaluate the meaningfulness of the event (e.g., considered a stressor or difficulty based off duration). The LEDS is successful in preventing confounding of the life event severity ratings with depression diagnosis or symptoms of depression. The LEDS may have been a better measure than the LES, as it would have allowed us to have a deeper understanding of any negative life events experienced while avoiding potential biases (Monroe, Slavich & Georgiades, 2009).

Positive life events were found to be a significant predictor of hypomanic symptoms at semester’s end, after controlling for positive life events in the past year and baseline hypomanic symptoms. This finding lends further support to the limited research in the field suggesting that those with hypomania experience positive events in a euphoric or hyper-sensitized way, adding on to their already existing state (Alloy, 2018). These findings may be informative to the development of preventive interventions aimed at helping students who have a predisposition to hypomania/mania be more aware of their moods and in the context of current life events and to use strategies to fortify themselves against risk for a hypomanic/manic episode in response to a positive life event. Positive life events signaling the possibility of reward may be particularly salient risk events, consistent with the notion of a hypersensitive BAS (Urosević et al., 2008).

The current study has several limitations to note. The study sample was limited to college students at a single University in the Northeastern United States and was relatively homogeneous in race and ethnicity. For this sample, 85.2% of the participants were White and non-Hispanic, meaning only 14.8% of our sample was made up of minority groups such as; Black (.09%) Hispanic (1.2%), American Indian (0.3%), Asian (3%) and multi-racial/ethnic (5.5%). The lack of diversity in our sample reduces the generalizability of results across multiple

racial groups. When studying negative life events, it is important to acknowledge the concept of White privilege, and how certain targeted minority groups may have experienced more negative life events relative to Whites. According to the U.S. Bureau of Justice Statistics (2016), Blacks are 5.9X more likely to be arrested than Whites. In terms of the LES items for negative life events, the items "Detention in jail or comparable institution" and "minor law violations" would be expected to show a disparity between Whites and other racial groups, particularly Blacks. This expected racial discrepancy and the fact that the sample consisted of mainly women (78.2%) leads to an inability to generalize the results across racial and gender groups.

Additionally, the sample's mean hypomania score actually decreased slightly from the start to the end of the semester. This is problematic for testing hypotheses about a predictive relationship between a cognitive vulnerability-stress interaction and an increase in hypomania symptoms over time. This study's longitudinal interval between Time 1 (start of the semester) and Time 2 (end of the semester) was at most 4, more typically 3, months. This provides a relatively short window for the development of various life events and, as a consequence, limits variability in the dysfunctional attitudes by semester life events interaction term relative to what would be expected over a longer interval. A longer timeframe would presumably capture more negative and positive life events that might interact with dysfunctional attitudes to predict changes in hypomania over time. In addition, although this study's longitudinal design is an improvement over a cross-sectional (single time point) study, future work would benefit by including more frequent assessments of both life and events and cognitive vulnerabilities than our baseline/follow-up assessment schedule. At least three time points assessing both vulnerability factors and outcome would allow more elegant testing of these longitudinal relationships, including mediation. It is not a given that dysfunctional attitudes remain stable

over time. There is some evidence that they wax and wane with a major depressive episode (Hamilton & Abramson, 1983).

Future research should include a larger and more racially diverse sample size with a longer period of time to observe changes in both life events and hypomanic symptoms and more frequent assessments of cognitive vulnerability, stressful life events, and mood. In addition, future studies should consider different measures for assessing life events in college students, as the current scale may be more suitable to an older population. Future studies should look to continue to expand on the diathesis-stress model beyond the focus of Beck's cognitive model on cognitive diatheses to explore other possible diatheses, such as the behavioral approach system (BAS; Urosević et al.,2008), in examining a vulnerability-stress interaction as it applies to positive life events and increased risk for hypomania/hypomanic symptoms.

References

Abramson, L. Y., & Metalsky, G. I. (1989). The Cognitive Style Questionnaire: Measurement of negative cognitive styles about self and consequences. *Unpublished manuscript*.

Alloy, L. (2018). Cognitive vulnerability to depression and bipolar disorder. In *Science and practice in cognitive therapy: Foundations, mechanisms, and applications* (pp. 105-123). The Guilford Press.

Alloy, L. B., Abramson, L. Y., Hogan, M. E., Whitehouse, W. G., Rose, D. T., Robinson, M. S., . . . Lapkin, J. B. (2000). The Temple-Wisconsin Cognitive Vulnerability to Depression Project: Lifetime history of Axis I psychopathology in individuals at high and low cognitive risk for depression. *Journal of Abnormal Psychology, 109*(3), 403-418. http://dx.doi.org/10.1037/0021-843X.109.3.403

Alloy, L. B., Abramson, L. Y., Walshaw, P. D., & Neeren, A. M. (2006). Cognitive vulnerability to unipolar and bipolar mood disorders. *Journal of Social and Clinical Psychology, 25*(7), 726-754. http://dx.doi.org/10.1521/jscp.2006.25.7.726

Alloy, L. B., Abramson, L. Y., Whitehouse, W. G., Hogan, M. E., Panzarella, C., & Rose, D. T. (2006). Prospective incidence of first onsets and recurrences of depression in individuals at high and low cognitive risk for depression. *Journal of Abnormal Psychology, 115*(1), 145-156. http://dx.doi.org/10.1037/0021-843X.115.1.145

Alloy, L. B., Reilly-Harrington, N., Fresco, D. M., Whitehouse, W. G., & Zechmeister, J. S. (1999). Cognitive styles and life events in subsyndromal unipolar and bipolar disorders: Stability and prospective prediction of depressive and hypomanic mood swings. *Journal of Cognitive Psychotherapy, 13*(1), 21-40.

Altman, E. G., Hedeker, D., Peterson, J. L., & Davis, J. M. (1997). The Altman Self-Rating Mania Scale. *Biological Psychiatry, 42*(10), 948-955.

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders (5th Ed.).* Washington, DC: American Psychiatric Press, Inc.

Beck, A. T. (1987). Cognitive models of depression. *The Journal of Cognitive Psychotherapy: An International Quarterly, 1*, 5-37.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck depression inventory-II. *San Antonio*, *78*(2), 490-498.

Brown GW, Harris TO. *Social origins of depression: A study of psychiatric disorder in women.* New York: Free Press; 1978.

de Graaf, L. E., Roelofs, J., & Huibers, M. J. (2009). Measuring Dysfunctional Attitudes in the General Population: The Dysfunctional Attitude Scale (form A) Revised. *Cognitive therapy and research*, *33*(4), 345–355.

Hankin, B. L., Abramson, L. Y., Miller, N., & Haeffel, G. J. (2004). Cognitive vulnerability-stress theories of depression: Examining affective specificity in the prediction of depression versus anxiety in three prospective studies. *Cognitive Therapy and Research, 28*(3), 309-345.

Hankin, B. L., Oppenheimer, C., Jenness, J., Barrocas, A., Shapero, B. G., & Goldband, J. (2009). Developmental origins of cognitive vulnerabilities to depression: review of processes contributing to stability and change across time. *Journal of clinical psychology*, *65*(12), 1327–1338. https://doi.org/10.1002/jclp.20625

Johnson, S.L., & Fingerhut, R. (2004). Cognitive styles predict the course of bipolar depression, not mania. *Journal of Cognitive Psychotherapy: An International Quarterly,* 18, 149-162. http://doi.org/10.1891/jcop.18.2.149.65960

Johnson, S. L., Sandrow, D., Meyer, B., Winters, R., Miller, I., Solomon, D., & Keitner, G. (2000). Increases in manic symptoms after life events involving goal attainment. *Journal of abnormal psychology*, *109*(4), 721–727.

Klein, M. (1994). Mourning and its relation to manic-depressive states. In R.V. Frankiel (Ed.), Essential papers on object loss. Essential papers in psychoanalysis (pp. 95-122).

Merikangas, K. R., Akiskal, H. S., Angst, J., Greenberg, P. E., Hirschfeld, R. M., Petukhova, M., & Kessler, R. C. (2007). Lifetime and 12-month prevalence of bipolar spectrum disorder in the National Comorbidity Survey replication. *Archives of general psychiatry*, *64*(5), 543–552.

Monroe, Scott & Slavich, George & Georgiades, K.. (2009). The social environment and depression: the roles of life stress. Handbook of Depression. 296-314.

Perez, J., & Rohan, K. J. (2021). Cognitive predictors of depressive symptoms: Cognitive reactivity, mood reactivity, and dysfunctional attitudes. *Cognitive Therapy and Research,* 45, 123-135. https://doi.org/10.1007/s10608-020-10174-5

Sarason, I. G., Johnson, J. H., & Siegel, J. M. (1978). Assessing the impact of life changes: Development of the Life Experiences Survey. *Journal of Consulting and Clinical Psychology*, *46*(5), 932-946. http://doi.org/10.1037/0022-006X.46.5.932

Seeds, P. M., & Dozois, D. J. (2010). Prospective evaluation of a cognitive vulnerability-stress model for depression: The interaction of schema self-structures and negative life

events. *Journal of Clinical Psychology, 66*(12), 1307-1323. http://doi.org/10.1002/jclp.20723

Urosević, S., Abramson, L. Y., Harmon-Jones, E., & Alloy, L. B. (2008). Dysregulation of the behavioral approach system (BAS) in bipolar spectrum disorders: review of theory and evidence. *Clinical psychology review*, *28*(7), 1188–1205.

Weissman, A. N., & Beck, A. T. (1978). Development and validation of the Dysfunctional Attitude Scale: A preliminary investigation. Paper presented at the annual meeting of the American Educational Research Association, Toronto, Ontario, Canada.

Zimmerman, M., Sheeran, T., & Young, D. (2004). The Diagnostic Inventory for Depression: A self-report scale to diagnose DSM-IV major depressive disorder. *Journal of Clinical Psychology, 60*(1), 87-110. https://doi.org/10.1002/jclp.10207

Table 1

Baseline characteristics and descriptive statistics for study variables

	No.	%
Gender	318	
Male	60	18.20
Female	258	78.20
Ethnicity	317	
American Indian	1	0.30
Asian	10	0.32
Hispanic	4	1.30
White	281	87.30
Multi-Ethnic	18	5.60
ARMS Scores		
Time 1 ARMS	4.97	3.29
Time 2 ARMS	3.35	3.19
DAS Scores		
Time 1 DAS	140.90	18.40
Time 2 DAS	144.20	21.62
Neg Life Events		
Time 1 NLE	6.12	5.38
Time 2 NLE	3.83	4.64
Pos Life Events		
Time 1 PLE	8.99	6.42
Time 2 PLE	4.63	4.16

Notes. DAS = Dysfunctional Attitudes Scale score. PLE = positive life events impact score on the Life Experiences Survey at Time 1 (T1; reflecting the past year) and Time 2 (T2; reflecting the past semester). NLE = negative life events impact score on the Life Experiences Survey at Time 1 (T1; reflecting the past year) and Time 2 (T2; reflecting the past semester). DASxPLE = the interaction between the centered DAS and centered Time 2 PLE score. DASxNLE = the interaction between the centered DAS score and centered Time 2 NLE score.

Table 2

Bivariate correlations between study variables

	1	2	3	4	5	6	7	8	9
1. T1 Pos	-								
2. T2 Pos	0.46**	-							
3. T1 ARMS	0.23**	0.25**	-						
4. T2 ARMS	0.14*	0.26**	0.28**	-					
5.T1 NLES	0.07	0.02	-0.02	0.01	-				
6. T2 NLES	0.04	-0.04	-0.08	-0.05	0.57**	-			
7. Gender	-0.04	-0.06	0.11	0.06	-0.13*	-0.07	-		
8. Ethnicity	-0.07	-0.13*	0.03	0.03	0.04	-0.01	0.10	-	
9. Baseline DAS	-0.06	0.08	-0.03	0.06	0.15**	0.14*	0.10	-0.03	-

*Notes. *p< .05. **p< .01.* DAS = Dysfunctional Attitudes Scale score at Time 1. ARMS = Altman Mania Scale score at Time 1 (T1) and Time 2 (T2). NLE = negative life events impact score on the Life Experiences Survey at Time 1 (T1) and Time 2 (T2). PLE = Time 1 positive life events impact score on the Life Experiences Survey at Time 1 (T1) and Time 2 (T2).

Table 3

Regression analyses predicting Time 2 ARMS score from dysfunctional attitudes, negative life events, and their interaction

	b	SE	t	p	F	p	R^2	ΔR^2	ΔF	p
1. T1 ARMS	**0.27**	0.05	5.3	.000	13.96	.000	**0.08**	0.08	27.89	0.000
2. T1 Neg. Life Events	.006	0.03	0.17	.865	.029	.86	.000	.000	0.029	.865
3. T2 Neg. Life Events	-0.04	0.04	-0.87	0.38	9.55	.000	0.08	0.002	0.75	0.38
4. DAS	0.01	0.009	1.33	0.18	7.62	.000	0.08	0.005	1.78	0.18
5.DASxNLE	-.002	0.002	-0.88	0.38	6.25	.000	0.09	0.002	0.77	0.38

Notes. T1 ARMS = Time 1 score on the Altman Mania Scale. T1 Neg. Life events = Time 1 (past year) negative life events impact score on the Life Experiences Survey. T2 Neg. Life events = Time 2 (past semester) negative life events impact score on the Life Experiences Survey. T1 DAS = Time 1 score on the Dysfunctional Attitudes Scale. DASxNLE = the interaction between the centered Time 1 Dysfunctional Attitudes Scale score and the centered Time 2 negative life events impact score on the Life Experiences Survey.

Table 4

Regression analyses predicting Time 2 ARMS score from dysfunctional attitudes, positive life events, and their interaction

	b	SE	t	p	F	p	R^2	ΔR^2	ΔF	p
1. T1 Pos. life events	**.070**	.028	2.54	.012	6.44	.012	**.020**	.020	6.44	.012
2. T1 ARMS	**.257**	.053	4.8	.000	15.04	.000	**.086**	.066	23.2	.000
3. T2 Pos. life events	**.209**	.046	3.38	.001	14.17	.000	**.118**	.032	11.4	.001
4. DAS	.009	.009	1.01	.313	10.88	.000	.121	.003	1.02	.313
5. DASxPLE	.000	.002	.068	.946	8.68	.000	.121	.000	.005	.946

Notes. See Table 3 for abbreviations. T1 Pos. life events = Time 1 (past year) positive life events impact score on the Life Experiences Survey. T2 Pos. Life events = Time 2 (past semester) positive life events impact score on the Life Experiences Survey. DASXPLE = the interaction between the centered Time 1 Dysfunctional Attitudes Scale score and the centered Time 2 positive life events impact score on the Life Experiences Survey.