The Stress Generation Theory Explains Unanswered Questions in Suicide Research: An Integrated Transactional Diathesis-Stress Model of Suicide

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at George Mason University

by

Evan M. Kleiman
Master of Arts
George Mason University, 2010

Director: John H. Riskind, Professor
Psychology

Summer Semester 2014
George Mason University
Fairfax, VA
This work is licensed under a creative commons attribution-noderivs 3.0 unported license.
DEDICATION

This dissertation is dedicated to my grandfather, Dr. Jerome A. Hirsch and my grandmother, Selma Hirsch.
ACKNOWLEDGEMENTS

I have been very lucky to have a long line of excellent teachers and mentors that have contributed to my passion for and success in psychology. Mrs. Diane Sharkey first introduced me to psychology in high school, and I was hooked ever since that first exposure. While an undergraduate, Dr. Lauren Alloy was the first to inspire me to create my own research rather than passively consume the work of others. She continues to actively influence my research to this day. In graduate school, I could not have asked for a better set of mentors. Most notable was my principal advisor, Dr. John Riskind. He provided a “secure base” to develop my own ideas and confidence as a researcher. Dr. Todd Kashdan has been at times my toughest critic, but has also pushed me to achieve more than I had ever dreamed of. Dr. Linda Chrosniak provided the warmest and welcoming experiences I had as a graduate student and truly inspired my passion for mentorship. Dr. Robyn Mehlenebeck inspired my passion for service to the community and taught me about the importance of making the best of a situation.

I am extremely grateful to have a mother like Judy Kleiman. She has been the most consistently supportive, loving part of my life from the time when I was worried about going off to preschool (she bribed me with Tastykakes) to the time when I was worried about graduate school (I received no bribes). My sister, Carly Kleiman, has been one of my strongest cheerleaders and supporters throughout graduate school.

I am incredibly grateful to have a group of friends that have been there to help me stay balanced by making sure I still had a strong balance of life outside of graduate school. This includes Brandon Resnick and Josh Smilk, my best friends from high school, Paul Richman, whose friendship is so old, it could drink (we’ve been friends for 22 years!), and Paul Weesemann. I was also lucky to have been placed in the best cohort of clinical psychology students I could have asked for. I am grateful to and for Leah Adams, Elizabeth Malouf, and Nina Farmer.

Lastly, I am beyond grateful to Sarah Erb, my girlfriend, best friend, cheerleader, and keeper of my sanity. All of the support she provided throughout the past five years was while she was going through the same challenges and hurdles. She is truly amazing.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>List of Tables</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Figures</td>
<td>vii</td>
</tr>
<tr>
<td>Abstract</td>
<td>viii</td>
</tr>
<tr>
<td>Introduction</td>
<td>ix</td>
</tr>
<tr>
<td>Cognitive Vulnerabilities to Suicide</td>
<td>1</td>
</tr>
<tr>
<td>Integration of Cognitive Vulnerability models with Stress Generation Research</td>
<td>3</td>
</tr>
<tr>
<td>An integrated transactional cognitive vulnerability model of suicide</td>
<td>5</td>
</tr>
<tr>
<td>The Present Study</td>
<td>7</td>
</tr>
<tr>
<td>Method</td>
<td>9</td>
</tr>
<tr>
<td>Participants</td>
<td>9</td>
</tr>
<tr>
<td>Procedure</td>
<td>10</td>
</tr>
<tr>
<td>Measures</td>
<td>10</td>
</tr>
<tr>
<td>Suicidal ideation</td>
<td>10</td>
</tr>
<tr>
<td>Negative cognitive style</td>
<td>10</td>
</tr>
<tr>
<td>Depressive Symptoms</td>
<td>11</td>
</tr>
<tr>
<td>Negative dependent and independent events</td>
<td>11</td>
</tr>
<tr>
<td>Thwarted belongingness and perceived burdensomeness</td>
<td>12</td>
</tr>
<tr>
<td>Data imputation</td>
<td>13</td>
</tr>
<tr>
<td>Analytic strategy</td>
<td>13</td>
</tr>
<tr>
<td>Assumptions of normality</td>
<td>13</td>
</tr>
<tr>
<td>Hypothesis 1</td>
<td>14</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td>14</td>
</tr>
<tr>
<td>Examining measurement models for hypothesis 2</td>
<td>16</td>
</tr>
<tr>
<td>Hypothesis 3</td>
<td>16</td>
</tr>
<tr>
<td>Results</td>
<td>18</td>
</tr>
<tr>
<td>Hypothesis 1: Specificity of suicide diathesis activating stressors</td>
<td>21</td>
</tr>
</tbody>
</table>
Hypothesis 2: An integrated transactional diathesis-stress model of suicide ........24
Alternative models .........................................................................................27
Alternative sequence of mediation .................................................................27
Alternative models of outcome specificity. .....................................................30
Hypothesis 3: Specificity of depression diathesis activating stressors .............33
Discussion ......................................................................................................37
Appendix A: Measures ..................................................................................42
Beck Suicide Scale .........................................................................................42
Cognitive Style Questionnaire .......................................................................43
INQ ..............................................................................................................44
Events from Life Events Inventory ...............................................................45
CES-D ...........................................................................................................49
Appendix B: Cognitive vulnerability to suicide: Review and expansion to an integrated, transactional model ............................................................50
Method ..........................................................................................................51
Selection of vulnerabilities .............................................................................51
Selection of relevant research. .......................................................................52
Nomenclature of suicide. ..............................................................................52
Beck’s Hopelessness Theory .........................................................................53
Alloy and Abramson’s Hopelessness Theory ..............................................58
Joiner’s Interpersonal Psychological Theory of Suicide ..................................60
Additional cognitive vulnerabilities to suicide ..............................................65
Rumination ....................................................................................................65
Anxiety sensitivity .........................................................................................66
Looming Cognitive Style .............................................................................67
Clinical Implications ......................................................................................67
An integrated transactional diathesis-stress model of suicide risk ...............69
Integrated diathesis stress model .................................................................69
Advent of Transactional Cognitive Models ..................................................70
References for appendix ...............................................................................73
References ....................................................................................................90
LIST OF TABLES

Table 1. Means, standard deviations, and intercorrelations between study variables........20
Table 2. Results of regression analyses testing hypothesis 1, prediction of time 2 suicidal ideation..............................................................22
Table 3. Results of regression analyses testing hypothesis 3, prediction of time 2 depressive symptoms..................................................................34


**LIST OF FIGURES**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1. Schematic diagram of transactional cognitive vulnerability model of suicide ...6</td>
<td></td>
</tr>
<tr>
<td>Figure 2. Plot of the relationship between negative cognitive style and time 2 suicidal ideation as a function of high vs. low levels of negative dependent events, controlling for time 1 suicidal ideation.................................................................23</td>
<td></td>
</tr>
<tr>
<td>Figure 3. Results of a structural equation model testing the integrated diathesis-stress cognitive vulnerability model of suicide ..................................................................................26</td>
<td></td>
</tr>
<tr>
<td>Figure 4. Results of a structural equation model testing the alternate direction ..........29</td>
<td></td>
</tr>
<tr>
<td>Figure 5. Results of a structural equation model testing the specificity of our model to suicidal ideation over depressive symptoms .................................................................32</td>
<td></td>
</tr>
<tr>
<td>Figure 6. Plot of the relationship between negative cognitive style and time 2 depressive symptoms as a function of high vs. low levels of negative dependent events, controlling for time 1 depressive symptoms ...............................................................35</td>
<td></td>
</tr>
</tbody>
</table>
ABSTRACT

THE STRESS GENERATION THEORY EXPLAINS UNANSWERED QUESTIONS IN SUICIDE RESEARCH: AN INTEGRATED TRANSACTIONAL DIATHESIS-STRESS MODEL OF SUICIDE

Evan M. Kleiman, Ph.D.
George Mason University, 2013
Dissertation Director: Dr. John H. Riskind

The thesis tests a transactional cognitive vulnerability model of suicidal ideation that integrates the findings from diathesis-stress (cognitive vulnerability) models and transactional (stress generation) research. In the first component of the two step model, we hypothesized that negative dependent events (events that are self generated) would moderate the relationship between negative cognitive style and suicidal ideation over time while negative independent events (events that are fateful) would not. In the second component, we hypothesized that the relationship between negative cognitive style and suicidal ideation would be mediated by the generation of negative dependent events and their impact on subsequent interpersonal beliefs that one is a burden to others and does not belong to a social group. A subsidiary hypothesis was that negative dependent events would moderate the relationship between negative cognitive style and depressive symptoms, while negative independent events would not. Participants (n = 193)
completed self report measures of negative cognitive style, thwarted belongingness and perceived burdensomeness, and suicidal ideation as well as an interview of life events twice over a six week period. Results confirmed both hypotheses of the new integrated model as well as the subsidiary hypothesis. Thus, the results provide support for an integrated transactional cognitive vulnerability model of suicide ideation.
INTRODUCTION

Worldwide, suicide represents currently represents 1.8% of the total burden of disease and this number is predicted to increase by an additional 50% by 2020 (World Health Organization, 2007). As a result of this high rate of suicide, there has been considerable research on factors that predict suicidal ideation and behaviors (Nock et al., 2008), such as cognitive vulnerability-stress (or diathesis-stress) models that propose that negative events activate vulnerabilities to generate suicidality. In contrast to these diathesis-stress models, recent research on transactional models of stress generation in depression demonstrate that individuals who are depressed or possess cognitive vulnerabilities to depression may produce negative dependent events (i.e., self generated events that are dependent on one’s behavior), leading to the generation and exacerbation of depressive symptoms (Hammen, 1991, 2006; see Liu & Alloy, 2010; Liu, 2013 for reviews). Such models have advanced the study of depression considerably. Despite the fact that many individuals who attempt suicide are depressed, a transactional perspective has not been applied to the study of suicide. Thus, the broad goal of the present study is to apply an integrated transactional cognitive vulnerability perspective to the study of suicidal ideation.

Cognitive Vulnerabilities to Suicide
Cognitive vulnerabilities to suicide are “…faulty beliefs, cognitive biases, or structures that are hypothesized to set the stage for later psychological problems [suicide] when they arise” (Riskind & Black, 2005, p. 122). According to cognitive theorists such as Alloy and Abramson (Abramson et al., 1998) and Joiner (Joiner, 2005), cognitive vulnerabilities increase the likelihood of suicidal ideation after the occurrence of negative events. Likewise, negative life events increase suicidal ideation, however; this would primarily be true for those who are high in cognitive vulnerability. Past research has focused on several primary cognitive models of suicide; however, the present study is limited to Alloy and Abramson’s Hopelessness Theory of Suicide (Abramson et al., 1998) and Joiner’s Interpersonal Psychological Theory of Suicide (Joiner, 2005).

Alloy and Abramson’s (Abramson et al., 1998) model of suicide is an extension of their hopelessness model of depression (Abramson, Metalsky, & Alloy, 1989). According to their model, individuals who have the tendency to make global and stable attributions for the occurrence of negative events and believe these attributions will have negative implications for the future are more prone to depression and suicide than those who do not. Abramson et al. (1998) found that individuals with this negative cognitive style were more likely than those without to exhibit suicidal ideation over a 2.5-year period, controlling for depression.

Although not explicitly a cognitive-vulnerability-stress model, Joiner’s Interpersonal-Psychological Theory (IPTS; Joiner et al., 2009; Joiner, 2005; Van Orden, Witte, Gordon, Bender, & Joiner, 2008) identifies interpersonal beliefs (i.e., cognitions) that may play an important role in suicidal ideation and behavior. Joiner posits that
suicide is the final step of a series of processes. Beliefs about burdensomeness (being a burden on others) and thwarted belongingness (not belonging to a social group) create the desire to die. Joiner further posits that these beliefs may develop after the occurrence of negative life events (Van Orden et al., 2010). If these interpersonal beliefs occur in conjunction with an acquired capacity or fearlessness for the pain of death, actual suicidal behavior may occur. Studies supporting Joiner’s model demonstrate that the combination of perceived burdensomeness and thwarted belongingness predicted suicidal ideation in typical undergraduates (Joiner et al., 2009) and students at a university counseling center (Van Orden et al., 2008).

**Integration of Cognitive Vulnerability models with Stress Generation Research**

Stress generation research has shown that depressed individuals not only experience more stressful events but also actively generate them (Hammen, 1991, 2006; see Liu & Alloy, 2010; Liu, 2013 for reviews). This is particularly true for dependent events that are contingent on the person’s own behavior (e.g., an argument with a spouse) rather than independent events that occur regardless of behavior (e.g., a family member getting into a car accident). Modifications to the original stress generation theory suggest that stressful life events may activate cognitive vulnerabilities through stress-diathesis interaction to produce depression as well as the generation of negative dependent events, even in individuals who are vulnerable to depression but not currently depressed (Safford, Alloy, Abramson, & Crossfield, 2007; Simons, Angell, Monroe, & Thase, 1993). Subsequently, events generated by cognitive vulnerability contribute to the
perpetuation of depression and further generation of negative dependent events (Hankin & Abramson, 2001).

There has been little research to examine which types of negative events (e.g., dependent or independent) are most likely to activate cognitive vulnerabilities to suicide. Most studies examine negative life events as a unitary construct, ignoring the effect that different categories might have on activating cognitive vulnerabilities. Integrating these two areas of research, we hypothesize that negative dependent events are the most potent activator of cognitive vulnerabilities to suicide which in turn leads to both stress-generation of further negative dependent events and heightened suicidal ideation.

Several prior studies have found that negative dependent or interpersonal events (which are a category of dependent events) precipitate suicide attempts, which would also presumably precipitate suicidal ideation as well. This includes events that occurred one year (Beautrais, Joyce, & Mulder, 1997), three months (Cooper, Appleby, & Amos, 2002; Heikkinen et al., 1997; Yen et al., 2005), one month (Paykel, Prusoff, & Myers, 1975), and one week (Cooper et al., 2002; Heikkinen et al., 1997) before a suicide attempt. Several of these studies also failed to find (i.e., found a non-significant effect) that negative independent (or success-related) events predicted suicide attempts (Heikkinen et al., 1997; Yen et al., 2005). None of these studies, however, considered the moderating role of cognitive vulnerabilities in determining the impact of negative dependent events in increasing suicide ideation. All of these studies have examined negative dependent events as independent direct predictors of suicide attempts (which may presumably also extend to suicidal ideation), ignoring the moderating role cognitive
vulnerabilities may play. To our knowledge, only one study has tested a cognitive-vulnerability-stress model of suicide (Joiner & Rudd, 1995). They found that negative cognitive style for interpersonal events (i.e., the items of the Cognitive Style Questionnaire that assessed attributions for interpersonal events) interacted with the occurrence of interpersonal events (e.g., breakup of a relationship) to predict suicidal ideation. Consequently, we categorize events as dependent vs. independent in this study, hypothesizing that negative dependent events are the most potent activator of cognitive vulnerabilities to suicide. No prior studies to our knowledge have examined this specific hypothesis.

**An integrated transactional cognitive vulnerability model of suicide**

To integrate the transactional stress generation theory and Joiner’s interpersonal theory of suicide, we posit that negative dependent events activate distal cognitive vulnerabilities (e.g., negative cognitive style) leading an individual to generate further negative dependent events. Next, these negative dependent events lead to more proximal mediators of suicide: perceived burdensomeness and thwarted belonging. This conceptual model is presented in figure 1.
In the first diathesis-stress portion of the model, negative events occur that activate negative cognitive style. Negative interpretations of the events due to the cognitive vulnerability could lead an individual to behave in ways that generate future negative dependent events. For example, an individual may perceive rejection and then start an argument the next time the individual talks to his partner. In the second transactional portion of the model, generation of further negative dependent events and suicidal ideation lead to increases in negative interpersonal beliefs that increase the desire to die (i.e., thwarted belongingness and perceived burdensomeness). For example, after perceiving rejection after a short phone conversation, an individual could believe that their partner does not want to talk to them because they are a burden on their partner’s time, causing them to avoid returning their partner’s calls in the future. If relationships with others worsen, the individual may begin to perceive a lack of belongingness. Over time, this process of stress generation and increasingly more negative interpersonal beliefs leads to incremental increases in suicidal ideation.

Figure 1. Schematic diagram of transactional cognitive vulnerability model of suicide
Implicit in our model is that negative cognitive style is a stable, distal predictor, whereas perceived burdensomeness and thwarted belongingness are more proximal and variable predictors of suicidal ideation. There are reasons to support this assumption. Abramson et al. (1998) have described negative cognitive style as a “general tendency” to attribute negative events to stable, global factors. In contrast, Joiner and colleagues have described both thwarted belongingness and perceived burdensomeness as a “dynamic cognitive-affective state, rather than a stable trait” (Van Orden et al., 2010, p. 582).

Although the main focus of the present study is on predictors of suicidal ideation, a subsidiary, final hypothesis is that negative dependent events would moderate the relationship between negative cognitive style and depressive symptoms, while negative independent events would not. Although the present literature does not appear to have tested the differential impact of dependent and independent negative events on depression in a diathesis-stress framework, the hypothesis parallels our logic for the predictions for suicide ideation. Cognitively vulnerable individuals may be far more likely to develop subsequent depressive symptoms if the negative events are self-produced (and are more easily blamed on their own deficits) than if they are clearly fateful and independent of their actions.

The Present Study

The goal of this study is to test an integrated transactional cognitive vulnerability model of suicide. This integrated model is a mediated moderation model. As such, it has two component hypotheses. The first component hypothesis is a moderated model. We expected negative dependent, but not independent, events to interact with (i.e., moderate)
the relationship between negative cognitive style and suicidal ideation over time, controlling for baseline suicidal ideation. The second component hypothesis tests mediators of the moderated effect found in the first component. We expect that the prior moderated effects of negative cognitive style and negative dependent events on suicidal ideation will be mediated by further generation of negative dependent events and negative interpersonal beliefs related to thwarted belongingness and perceived burdensomeness. An additional but subsidiary moderation hypothesis is that negative dependent events, but not negative independent, events would moderate the relationship between negative cognitive style and depressive symptoms.
METHOD

Participants

A total of 193 undergraduates (70% female) participated in an IRB-approved study for course credit. The mean age was 20.66 years ($SD = 3.88$, range 17 - 44). Approximately 45% of the sample was Caucasian, 17% Asian, 15% African American, and the rest self-identified as other/multiple race.

Although the study was open to all participants (as stress generation occurs in individuals with and without psychopathology), recruitment was targeted at a high suicide risk population by wording our study description to encourage individuals with a suicide history to participate. As a result, approximately 17% of the sample ($n = 33$) reported some level of suicidal ideation (i.e., BSS scores above 0) at T1, 12% of the sample ($n = 24$) reported some level of suicidal ideation at T2, and 27% ($n = 52$) of the sample endorsed some level of suicidal ideation at either T1 or T2. Eight percent ($n = 15$) of the sample had attempted suicide at some point in their lifetime. This is notably higher compared to cohort studies that found 12% of college students experienced suicidal ideation during college (Wilcox et al., 2010) and 6% had a lifetime suicide attempt history (Arria et al., 2009). Means and standard deviations on the Beck Suicide Scale at both time points ($M_{T1} = 1.51, SD = 3.70; M_{T2} = 1.26, SD = 3.89$) were greater than typically found in other studies in undergraduate populations (e.g., Van Orden et al., 2003).
2008; Study 1: $M = 0.77, SD = 2.55$). Thus, our sample experienced more suicidal ideation and behavior than typical unselected college samples.

**Procedure**

Participants were assessed twice, separated by approximately six weeks ($M = 45.34$ days, $SD = 11.67$ days). After completing an informed consent at time 1, participants were given a structured interview of life events (detailed below), and then completed a computerized set of self-report measures on their laptop or a tablet computer (including the BSS and CSQ). At time 2, they were interviewed in the same way and completed a shorter selection of measures (including the BSS and INQ). Stringent suicide risk assessment procedures were used to ensure participant safety.

**Measures**

**Suicidal ideation.** The Beck Suicide Scale (BSS; Beck & Steer, 1991) is a 21-item measure with 19 items that assess current suicidal ideation and two items that assess past suicidal behavior. We used only the 19 suicidal ideation items as the other two items are for clinician usage. Higher scores equal higher levels of suicidal ideation. The BSS has a strong relationship with clinician ratings of suicidal ideation and demonstrates acceptable test-retest reliability over time periods as short as one week (Beck, Steer, & Ranieri, 1988). The BSS demonstrated acceptable internal consistency at time 1 ($\alpha = .74$) and time 2 ($\alpha = .87$).

**Negative cognitive style.** The Cognitive Style Questionnaire (CSQ; Haeffel et al., 2008) asks participants to imagine themselves experiencing a negative event (e.g., “A
person you’d really like to develop a close friendship with does not want to be friends with you”) and then write down a cause for this event. Participants then rate the internality, stability, and globality of this cause as well as the self importance and future implications of the event on 1 (low) to 7 (high) likert scale. Thus, this measure includes all dimensions relevant to the Hopelessness Theory (Abramson et al., 1989). The CSQ is found to be a more potent predictor of cognitive vulnerability to depression (and by extension, suicide) than related measures such as the Dysfunctional Attitudes Scale (Haeffel et al., 2003). In accordance with general guidelines for the CSQ (Haeffel et al., 2008), all dimension scores are averaged for a total cognitive vulnerability score. The internality (α = .74), stability (α = .90), gloablity (α = .92), future implications (α = .91) and self importance (α = .93) subscales all had acceptable internal consistency, as did the overall CSQ score (α = .97).

Depressive Symptoms. The Center for Epidemiology Scale for Depression (CES-D; Radloff, 1977) is a 20-item self report measure of depressive symptoms. Participants rate the frequency with which a variety of symptoms (e.g, “I felt lonely) occurred over the past week. Higher scores reflected higher levels of symptoms. The CES-D has demonstrated strong psychometric properties in college populations (Radloff, 1991). In the present study, the CES-D had excellent internal consistent at time 1 (α = .91) and time 2 (α = .92).

Negative dependent and independent events. Life events were assessed using a modified version of the Life Events Interview (LEI; Francis-Raniere, Alloy, & Abramson, 2006). In an interview format, participants were asked about the occurrence
(yes/no), date of last occurrence, and number of times the event occurred over an
identified period. At time 1, participants were asked about past six weeks. At time 2,
participants were asked about events that occurred since time 1, which was usually about
six weeks (see above for discussion on time between prospective intervals). Participants
were reminded of the date six weeks prior at time 1 or the date of their last session at time
2 as well as an anchor to help them remember this date (e.g., “this was around finals
time”, “this was right before Thanksgiving break”). Utilizing an interview method such
as the LEI encourages accurate recall of events compared to a checklist measure. Indeed,
participants who completed the LEI prospectively correctly recalled 100% of the events
they had listed in a daily diary (Alloy & Abramson, 1999). The LEI includes an a priori
rating system of events on dimensions of positive vs. negative and dependent vs.
independent developed using normative data on college undergraduates (Alloy &
Abramson, 1999) with trained raters that had high inter-rater reliability (K = .89; Safford
et al., 2007). Only the negative events were used in this study (n = 63), of which 35 were
rated as negative dependent events and 28 were rated as negative independent events.

**Thwarted belongingness and perceived burdensomeness.** The
Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, Witte, & Joiner, 2012)
is a 15-item measure of the variables associated with the Interpersonal Theory of
Suicide. Six items measure thwarted belongingness and nine items measure perceived
burdensomeness. The measure is coded such that higher scores for both scales equal
higher thwarted belongingness and perceived burdensomeness. The INQ demonstrates
strong convergent validity with measures of related constructs, such as social support and
loneliness (Van Orden et al., 2012). Both the perceived burdensomeness (α = .95) and thwarted belonging (α = .90) subscales demonstrated acceptable internal consistency.

**Data imputation**

Upon examining all variables included in the study for missing data, less than 2% of our data were missing. To determine if there was a pattern to the missing data, or if the was missing at random, we used Little’s Test for Missing Completely at Random (MCAR; Little, 1988). Since the χ² value for this test was not-significant (χ² [df = 7070] = 4002.93, p = .999), the data were determined to be MCAR. Following’s Scheffer’s (2002) recommendation for MCAR data, we imputed missing data using expectation maximization in SPSS 21.

**Analytic strategy**

**Assumptions of normality.** One assumption of regression is that the dependent variable is normally distributed (Cohen, Cohen, West, & Aiken, 2002). Despite the successful recruitment of participants with current suicidal ideation, many did not exhibit suicidal ideation, thus time 2 BSS (i.e., the outcome variable) still demonstrated a moderate positive skew (Skew = 3.83, S.E. = 0.18, Kolmogorov-Smirnov Z = 7.02, p < .001). A log transformation is typically recommended to correct such a distribution (Keene, 1995); however, log-transforming the time 2 BSS scores affected neither the distribution (Skew = 2.32, S.E. = 0.18, Kolmogorov-Smirnov Z = 6.68, p < .001) nor the interpretation of any of the models. Thus, for ease of interpretation, analyses with the non-transformed values are reported.
**Hypothesis 1.** To test our first hypothesis, that negative dependent, but not independent events, would moderate the relationship between negative cognitive style and time 2 suicidal ideation, we tested two sets of hierarchal regression analyses. The first step of each analysis included time 1 suicidal ideation and the main effect of negative cognitive style and the relevant category of life events at time 1 (i.e., negative independent or dependent events). The second step of the model included the interaction between negative cognitive style and the relevant category of life events at time 1. Both models used time 2 suicidal ideation as the outcome variable. Negative cognitive style and negative life event scores were mean-centered prior to the calculation of the interaction term according to reduce collinearity between the main effects (Aiken & West, 1991).

**Hypothesis 2.** To test the second hypothesis that the moderated effects of negative cognitive style and negative dependent events on time 2 suicidal ideation (i.e., the moderated, diathesis-stress portion) were transmitted (mediated) first by time 2 negative dependent events and then by the subsequent beliefs of perceived burdensomeness and thwarted belonging (i.e., the mediated, transactional portion). We tested a mediated moderation structural equation model in AMOS 21.0 (Arbuckle, 2012). We did not examine mediators of the interaction with negative independent events, as it would not be appropriate to examine mediators of a non-significant relationship. According to the recommendations of MacKinnon, Lockwood, & Williams (2004) bias-corrected bootstrapping was used to examine indirect (mediated) effects.
We also tested two sets of alternative models: one of alternative directionality and one of specificity. First, we tested an alternative model of directionality where the effects of negative cognitive style and negative dependent events on T2 suicidal ideation were transmitted first by perceived burdensomeness and thwarted belonging (i.e., the IPT variables) and then by the generation of negative dependent events, rather than in the opposite hypothesized order. Second, we tested an alternative model of specificity using depressive symptoms as the main endogenous variable instead of suicidal ideation. Given that Joiner’s model is posited to apply only to suicide and not depression, we hypothesized that our model using depressive symptoms would not fit the data.

In all models, an observed variable representing the CSQxLMSQ interaction by the standardized (i.e., mean-centered) scores for CSQ and LMSQ multiplied. Each model (i.e., the main model, the alternative test of directionality, and the alternative test of specificity) contained two nested models (i.e., two models that share the same variables but different paths identified between the variables). We tested both partially mediated models, in which the direct relationship between the independent (IV) and dependent (DV) variables were specified (i.e., only part of the relationship between IV and DV is transmitted by the mediators) and fully mediated models where there was no direct paths between the independent and dependent variables specified (i.e., all of the effect of the IV on the DV is transmitted by the mediators). The first nested model was a partially mediated model with all relevant direct paths identified. Paths were drawn from all exogenous variables (i.e., T1 CSQ, T1 LEI, T1 LEI x CSQ, T2 LEI, IPT variables) to the main endogenous variable (i.e., T2 BSS or T2 CES-D). Covariances were added between
endogenous T1 variables (i.e., T1 CSQ, T1 LEI, T1 LEI x CSQ) and covariates (i.e. T1 BSS or T1 CES-D). The second nested model was a fully mediated model that had all distal direct paths (i.e., T1 CSQ, T1 LEI, T1 LEI x CSQ, T2 LEI), to T2 BSS (or T2 CES-D in the alternative model of specificity) removed (i.e., constrained to zero) leaving only the direct path from the IPT variables to T2 BSS or T2 CES-D.

Examining measurement models for hypothesis 2. In the initial analyses, perceived burdensomeness and thwarted belonging were treated as separate, observed variables. However, models using this configuration of variables demonstrated relatively poor fit. Thus we tested an additional model where perceived burdensomeness and thwarted belonging were loaded on to a single latent variable. We did so for both empirical (i.e., they were highly correlated, a model with individual variables produced a suppressor effect, and the modification index function in AMOS indicated considerable benefit from doing so) and theoretical (i.e., they are highly related constructs) reasons. Additionally, studies of the factor structure INQ find support for both the two-factor model as well as an overall one-factor model (Freedenthal, Lamis, Osman, Kahlo, & Gutierrez, 2011).

Hypothesis 3. To test our third hypothesis, that negative dependent, but not independent events, would moderate the relationship between negative cognitive style and time 2 depressive symptoms, we tested two sets of hierarchal regression analyses similar to the analyses from the first hypothesis, but used depressive symptoms instead of suicidal ideation as the dependent variable. The first step of each analysis included time 1 depressive symptoms and the main effect of negative cognitive style and the relevant
category of life events at time 1 (i.e., negative independent or dependent events). The second step of the model included the interaction between negative cognitive style and the relevant category of life events at time 1. Both models used time 2 depressive symptoms as the outcome variable. Negative cognitive style and negative life event scores were mean-centered prior to the calculation of the interaction term according to reduce colinearity between the main effects (Aiken & West, 1991).
RESULTS

Means, standard deviations, and intercorrelations are displayed in table 1. Consistent with previous research, negative cognitive style was positively correlated with all study variables except for Time 1 (T1) and Time 2 (T2) negative independent events (Safford et al., 2007). T1 negative dependent events were positively correlated with all study variables except for T2 thwarted belongingness (only assessed at T2). T1 suicidal ideation was positively correlated with all study variables except for T1 negative independent events. T2 suicidal ideation was positively correlated with all study variables except for T1 and T2 negative independent events. T2 perceived burdensomeness was positively correlated with all study variables except for T1 negative independent events. T2 thwarted belongingness was positively correlated with all study variables except for T1 negative dependent events and T1 and T2 negative independent events. T1 and T2 depressive symptoms were correlated with all study variables except for T1 negative independent events. Finally, in line with previous research (Dohrenwend, Link, Kern, Shrout, & Markowitz, 1990) dependent and independent life events at T1 and T2 were all positively intercorrelated.

The average score on the BSS for the entire sample decreased from T1 to T2 (M₁ = 1.51, SD₁ = 3.70, M₂ = 1.26, SD = 3.90), however this difference was not significant (t = 1.03, p = .306). When examining only those who reported suicidal ideation (i.e., BSS
scores greater than zero), a different pattern emerged. Among those who reported suicidal ideation at T1, there was a significant decrease in suicidal ideation from T1 to T2 ($M_1 = 7.72, SD_1 = 4.75, M_2 = 7.06, SD = 1.24, t = 2.49, p = .019$). Among those who reported suicidal ideation at T2 (i.e., those who would become or remain suicidal), there was a near-significant increase in suicidal ideation from T1 to T2 ($M_1 = 6.54 SD_1 = 6.09$, $M_2 = 8.63, SD = 6.42, t = -1.87, p = .075$). Moreover, only 9% of the sample ($n = 17$) reported suicidal ideation at both T1 and T2. This suggests that the overall decrease in suicidal ideation was a reflection of more individuals who were suicidal at T1 not reporting suicidal ideation at T2 than individuals who were not suicidal at T1 but did report suicidal ideation at T2. A similar pattern of results where BSS scores decrease over time has been found in other studies of the BSS in college samples over a relatively short time period (Chioqueta, & Stiles, 2006).
### Table 1. Means, standard deviations, and intercorrelations between study variables

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 Negative cognitive style (CSQ)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T1 Negative dependent events (LEI)</td>
<td>.16*</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T1 Negative independent events (LEI)</td>
<td>.09</td>
<td>.82***</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T1 Suicidal ideation (BSS)</td>
<td>.33***</td>
<td>.20*</td>
<td>.07</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T1 Depressive symptoms (CES-D)</td>
<td>.53***</td>
<td>.19*</td>
<td>.15</td>
<td>.41***</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T2 Negative dependent events (LEI)</td>
<td>.26**</td>
<td>.35***</td>
<td>.23**</td>
<td>.22**</td>
<td>.38***</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T2 Negative independent events (LEI)</td>
<td>.13</td>
<td>.24**</td>
<td>.24**</td>
<td>.16*</td>
<td>.23**</td>
<td>.67***</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T2 Perceived burdensomeness (INQ)</td>
<td>.38***</td>
<td>.19*</td>
<td>.08</td>
<td>.57***</td>
<td>.58***</td>
<td>.27***</td>
<td>.21**</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T2 Thwarted belongingness (INQ)</td>
<td>.34***</td>
<td>.09</td>
<td>.01</td>
<td>.47***</td>
<td>.55***</td>
<td>.19*</td>
<td>.14</td>
<td>.72***</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>T2 Suicidal ideation (BSS)</td>
<td>.28***</td>
<td>.20*</td>
<td>.06</td>
<td>.68***</td>
<td>.41***</td>
<td>.18*</td>
<td>.12</td>
<td>.66***</td>
<td>.46***</td>
<td>--</td>
</tr>
<tr>
<td>T2 Depressive symptoms (CES-D)</td>
<td>.51***</td>
<td>.19*</td>
<td>.08</td>
<td>.50***</td>
<td>.70***</td>
<td>.33***</td>
<td>.21**</td>
<td>.73***</td>
<td>.70***</td>
<td>.57***</td>
</tr>
<tr>
<td>Mean</td>
<td>3.86</td>
<td>4.87</td>
<td>2.78</td>
<td>1.51</td>
<td>22.00</td>
<td>3.91</td>
<td>1.75</td>
<td>1.82</td>
<td>2.47</td>
<td>1.26</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.93</td>
<td>4.30</td>
<td>3.52</td>
<td>3.70</td>
<td>10.38</td>
<td>2.90</td>
<td>2.19</td>
<td>1.04</td>
<td>1.25</td>
<td>3.89</td>
</tr>
</tbody>
</table>

Note. CSQ = Cognitive Style Questionnaire, BSS = Beck Suicide Scale [untransformed], LEI = Life Events Interview, INQ = Interpersonal Needs Questionnaire. *** p < .001, *** p < .01, * p < .05
Hypothesis 1: Specificity of suicide diathesis activating stressors

Our first component hypothesis was a moderated model. Table 2 displays the results of the moderated analyses testing the interaction between negative cognitive style and negative dependent events predicting changes in suicidal ideation (i.e., T2 suicidal ideation was the dependent variable, controlling for T1 suicidal ideation). The first step of the model predicted 49% of the variance in T2 suicidal ideation. T1 suicidal ideation was the only significant predictor in this step. The second step in this model, which included the interaction between negative cognitive style and negative dependent events predicted an additional 2% of the variance in time 2 suicidal ideation beyond the predictors in the first step.

We plotted and probed the interaction to better understand its effects. Figure 2 illustrates that the pattern of findings were consistent with our hypothesis that negative cognitive style would only predict suicidal ideation when activated by negative dependent events. Indeed, at high levels of negative dependent events (1 SD above the mean), there was a positive relationship between negative cognitive style and T2 suicidal ideation (simple slope = 1.01, t = 3.13, p < .001). At low levels of negative dependent events, there was no relationship between negative cognitive style and T2 suicidal ideation (simple slope = -0.43, t = -1.47, p = .147).
Table 2. Results of regression analyses testing hypothesis 1, prediction of time 2 suicidal ideation.

<table>
<thead>
<tr>
<th></th>
<th>T1 Negative dependent events</th>
<th></th>
<th>T1 Negative independent events</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B SE  B  T  P   Δ R²</td>
<td>B SE  B  T  P   Δ R²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 suicidal ideation (BSS)</td>
<td>0.67 0.06 10.36 &lt; .001</td>
<td>0.69 0.06 10.75 &lt; .001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 negative cognitive style (CSQ)</td>
<td>0.29 0.25 1.13 .259</td>
<td>0.27 0.26 1.05 .297</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 negative dep. / ind. events (LEI)</td>
<td>0.02 0.05 0.33 .739</td>
<td>-0.01 0.07 -0.08 .934</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative cognitive style X events</td>
<td>0.17 0.07 2.40 .012</td>
<td>0.04 0.10 0.41 .680</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. BSS = Beck Suicide Scale, LEI = Life Events Interview, CSQ = Cognitive Style Questionnaire, dep = dependent, ind = independent, *** p < .001, * p < .05
Table 2 also displays the results of analyses testing the interaction between negative cognitive style and negative independent events predicting changes in suicidal ideation. The first step of the model predicted 46% of the variance in T2 suicidal ideation. Again, T1 suicidal ideation was the only significant predictor in this step. In contrast with negative dependent events, negative independent events did not interact with negative cognitive style to predict suicidal ideation. Thus, consistent with our
predictions, in the second step of this model, the interaction between negative cognitive style and negative independent events did not predict any additional variance in T2 suicidal ideation. As the interaction with independent negative events was not significant, it is not plotted or discussed further. Taken together, these findings confirm our hypothesis that within a diathesis-stress framework, high levels of negative dependent, but not independent, events activate negative cognitive style.

**Hypothesis 2: An integrated transactional diathesis-stress model of suicide**

Our second component hypothesis was a mediated moderation model. We tested our primary hypothesis that the moderated effects of negative cognitive style and negative dependent events predicting T2 suicidal ideation would be mediated first by T2 negative dependent events and then T2 IPT variables using two nested models. The first model was a partially mediated model in that it retained direct paths to T2 suicidal ideation from negative dependent events, negative cognitive style, and the interaction between negative cognitive style and negative dependent events, as well as mediated path through the IPT variables. The other was a fully mediated model in which all other paths to T2 suicidal ideation were removed (i.e., constrained to zero) except for the sequence postulated in the model. According to commonly accepted conventions (e.g, $\chi^2$/df $< 2$, CFI close to 1, RMSEA $< .08$; Hu & Bentler, 1999), the overall fit of the fully mediated model ($\chi^2_{[df=16]} = 27.27$, $p = .039$; $\chi^2$/df $= 1.71$, $CFI = 0.97$, $RMSEA = .07$) was excellent, as was the fit for the partially mediated model ($\chi^2_{[df=12]} = 24.57$, $p = .017$; $\chi^2$/df $= 2.05$, $CFI = 0.97$, $RMSEA = .08$). Although a chi-square difference test ($\chi^2_{[4]} = 2.70$, $p = .390$)
suggested no significant differences in fit between the models; the more parsimonious fully-mediated model is preferable to the less parsimonious partially-mediated model (Schermelleh-Engel, Moosbrugger, & Muller, 2003). Thus, the fully mediated model is displayed in figure 3 and discussed in further detail below.
Figure 3. Results of a structural equation model testing the integrated diathesis-stress cognitive vulnerability model of suicide

Note. Standardized estimates displayed. T1 = time 1, T2 = time 2, CSQ = Cognitive Style Questionnaire, LEI = Life Events Interview, INQ = Interpersonal Needs Questionnaire, BSS = Beck Suicide Scale. All solid paths significant at p < .01.
Covariance between T1 suicidal ideation and T1 negative cognitive style not pictured for clarity reasons (r = .31, p < .001).
The variables in the fully mediated model predicted 53.5% of the variance in time 2 suicidal ideation. The combined indirect (mediated) effects of the endogenous variables (negative cognitive style, negative dependent events, and the interaction between the two) on suicidal ideation through both T2 negative dependent events and the T2 IPT latent variable was significant (b = .007, 95% CI: .001 to .015, p = .019). Thus, our hypothesized model was supported by the data. Finally, we conducted power analyses to determine if our sample size was large enough to detect the effects reported. Results indicated that our sample size was sufficiently large to detect the large effect ($r^2 = .535$) that we observed ($a = .99$; MacCallum, Browne, & Sugawara, 1996). However, the power to detect the relatively small differences between the nested models was not sufficient ($a = .07$; MacCallum, Browne, & Cai, 2006).

**Alternative models**

**Alternative sequence of mediation.** We tested two models that reversed the directional sequence of stress generation and interpersonal beliefs as mediators proposed in our integrated model. In this alternative model the synergistic effects of negative cognitive style and negative dependent events on T2 suicidal ideation were mediated first by T2 IPT variables and then T2 negative dependent events, rather than in the reverse order (i.e., first T2 negative dependent events and then T2 IPT variables). We again tested two nested models: a partially mediated model and a fully mediated model. In the partially mediated model, direct paths to T2 suicidal ideation from negative cognitive style, T1 and T2 negative dependent events, the interaction between negative cognitive style and T1 negative dependent events, and the IPT variables were identified. In the fully
mediated model, all direct paths to T2 suicidal ideation except for the path from T2 negative dependent events were removed (i.e. constrained to zero). The fit for the partially mediated model was poor ($\chi^2_{[df=10]} = 40.27, p < .001; \chi^2/df = 4.11 \text{ CFI} = 0.92, \text{RMSEA} = 0.11$) as was the fit for the fully mediated model ($\chi^2_{[df=16]} = 65.79, p < .001; \chi^2/df = 4.11, \text{CFI} = 0.87, \text{RMSEA} = .14$). Although neither model demonstrated desirable fit, a chi-square difference test ($\chi^2 = 25.25, p < .001$) suggested that the partially mediated model had better fit to the data than the fully mediated model. This partially mediated model is pictured in figure 4 and discussed further.
Figure 4. Results of a structural equation model testing the alternate direction

Note. Standardized estimates displayed. T1 = time 1, T2 = time 2, CSQ = Cognitive Style Questionnaire, LEI = Life Events Interview, INQ = Interpersonal Needs Questionnaire, BSS = Beck Suicide Scale. All solid paths significant at p < .01. Paths not displayed for clarity reasons: T1 CSQ → T2 LEI (b = .15, p = .069), T1 CSQ x T1 LEI → T2 LEI (b = 0.06, p = .447), T1 CSQ → T2 BSS (b = .12, p = .057), T1 CSQ x T1 LEI → T2 BSS (b = .07, p = .291), T1 BSS → T2 INQ (b = .52, p < .001), T1 BSS → T2 IPT (b = .51, p < .001), T1 CSQ ← T1 BSS (r = .31, p < .001)
As can be seen in the figure, many of the relevant paths (e.g., from T2 IPT variables to T2 negative dependent events) were non-significant. The variables in the model predicted 43% of the variance in T2 suicidal ideation scores. The combined indirect effect of the exogenous variables on T2 suicidal ideation was also not significant ($b < .001$, 95% CI -.005 to .004, $p = .581$).

Given that this alternative model and the hypothesized model were non-nested (i.e., they contained different paths), their model fit indices cannot be directly statistically compared. Thus, the Akaike information criterion (AIC; Akaike, 1987) was used to compare the two models, where lower AIC values are better (Harrell, 2001). The hypothesized model (AIC = 83.27) demonstrated better comparative fit to the data than this alternative model (AIC = 108.27). Taken together, these results support the directional sequence of the mediators that was hypothesized in our proposed model.

**Alternative models of outcome specificity.** We also examined models to evaluate the specificity of our integrated model by using depressive symptoms as the outcome rather than suicide ideation. To do so, we tested two more nested models (one partially mediated, one fully mediated) that were identical to the hypothesized model, except we used T2 depressive symptoms as the endogenous variable instead of T2 suicidal ideation. In the partially mediated model, paths from negative cognitive style, T1 and T2 negative dependent events, the interaction between negative cognitive style and T1 negative dependent events, and the IPT variables were identified. In the fully mediated model, all direct paths to T2 depressive symptoms except for the path from the IPT variables were removed (i.e. constrained to zero). The fit for the partially mediated
model ($\chi^2_{(df=9)} = 36.69, p < .001; \chi^2/df = 3.07, CFI = 0.96, RMSEA = .13$) and the fully mediated model ($\chi^2_{(df=13)} = 27.58, p < .001; \chi^2/df = 2.82, CFI = 0.96, RMSEA = 0.11$) were both poor. A chi-square difference test ($\chi^2 = 9.11, p < .05$) suggested that the fully mediated model fit the data better than the partially mediated model. This fully mediated model is pictured in figure 5 and discussed further.
Figure 5. Results of a structural equation model testing the specificity of our model to suicidal ideation over depressive symptoms

Note. Standardized estimates displayed. T1 = time 1, T2 = time 2, CSQ = Cognitive Style Questionnaire, LEI = Life Events Interview, INQ = Interpersonal Needs Questionnaire, CES-D = Center for Epidemiology Scales - Depression. All solid paths significant at p < .05. Covariance between T1 depressive symptoms and T1 negative cognitive style not pictured for clarity reasons (r = .52, p < .001).
The variables in this model predicted 76% of the variance in T2 depressive symptoms. The combined indirect effect of the exogenous variables on T2 depressive symptoms was also not significant (b = .11, 95% CI -.256 to .321, p = .582). Finally, this model had poorer comparative fit (AIC = 98.69) than the hypothesized model (AIC = 83.27), lending support that our model specifically applies to suicidal ideation and not depressive symptoms.

**Hypothesis 3:** Specificity of depression diathesis activating stressors

Our final subsidiary hypothesis was a moderated model similar to hypothesis 1 that negative dependent but not independent events would interact with cognitive style to predict increased depressive symptoms. Table 3 displays the results of analyses testing the interaction between negative cognitive style and negative dependent events predicting changes in depressive symptoms (i.e., time 2 depressive symptoms were the dependent variable, controlling for time 1 depressive symptoms). The first step of the model predicted 52% of the variance in time 2 depressive symptoms. Time 1 depressive symptoms (b = 0.58, se = 0.60, p < .001) and negative cognitive style (b = 2.48, se = 0.75, p < .01) were significant predictors in this step. The second step in this model, which included the interaction between negative cognitive style and negative dependent events predicted an additional 2% of the variance in time 2 depressive symptoms beyond the predictors in the first step (b = 0.42, s.e. = 0.19, p < .05).
Table 3. Results of regression analyses testing hypothesis 3, prediction of time 2 depressive symptoms.

<table>
<thead>
<tr>
<th>Step</th>
<th>T1 Negative dependent events</th>
<th>T1 Negative independent events</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 depressive symptoms (BSS)</td>
<td>0.58</td>
<td>0.07</td>
</tr>
<tr>
<td>T1 negative cognitive style (CSQ)</td>
<td>2.48</td>
<td>0.75</td>
</tr>
<tr>
<td>T1 negative dep. / ind. events (LEI)</td>
<td>0.04</td>
<td>0.15</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative cognitive style X events</td>
<td>0.42</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Note. CES-D = Center for Epidemiology Scales = Depression, LEI = Life Events Interview, CSQ = Cognitive Style Questionnaire, dep = dependent, ind = independent, *** p < .001, * p < .05
Figure 6 illustrates that the pattern of findings were consistent with our hypothesis that negative cognitive style would only predict depressive symptoms when activated by negative dependent events. As predicted, at high levels of negative dependent events (1 SD above the mean), there was a positive relationship between negative cognitive style and time 2 depressive symptoms (simple slope = 4.29, \( t = 3.64, p < .001 \)). At low levels of negative dependent events, there was no significant relationship between negative cognitive style and time 2 depressive symptoms (simple slope = 0.67, \( t = 0.65, p = .514 \)).

Figure 6. Plot of the relationship between negative cognitive style and time 2 depressive symptoms as a function of high vs. low levels of negative dependent events, controlling for time 1 depressive symptoms.
Table 3 also displays the results of analyses testing the interaction between negative cognitive style and negative independent events predicting changes in depressive symptoms. The first step of the model predicted 52% of the variance in time 2 depressive symptoms. Again, time 1 depressive symptoms (b = 0.62, s.e. = 0.07, p < .001) and negative cognitive style (b = 2.41, s.e. = 0.80, p < .01) were significant predictors in this step. In contrast with the significant stress-diathesis effect for negative dependent events, negative independent events did not interact with negative cognitive style to predict depressive symptoms (b = 0.50, s.e. = 0.27, p = .069). Thus, as predicted, the interaction between negative cognitive style and negative independent events did not significantly predict any additional variance in time 2 depressive symptoms. As it was not significant, this interaction is not plotted or discussed any further. Taken together, these findings provide support for the third hypothesis that within a diathesis-stress framework, high levels of negative dependent, but not independent, events activate negative cognitive style to predict depressive symptoms.
DISCUSSION

The overarching goal of this study was to test a transactional cognitive vulnerability model of suicide. This model contained two component hypothesis: a moderated model and a mediated moderation model. The goal of the first component hypothesis was to examine which types of events are mostly likely to activate a negative cognitive style to predict suicidal ideation. Results supported the hypothesis that negative dependent events (i.e., events that are dependent on one’s behavior) would exhibit stress-diathesis interaction with negative cognitive style to predict suicidal ideation, whereas negative independent events (i.e., events that are fateful) would not. Among individuals with a negative cognitive style, those who had high levels of negative dependent events had higher levels of suicide ideation over time than individuals who did not. As predicted, no such interaction was found between negative cognitive style and negative independent events.

This is the first study to our knowledge to integrate a cognitive-vulnerability/stress –diathesis framework with findings that negative dependent events (which often include interpersonal events) most often precede a suicide attempt (e.g., Heikkinen et al., 1997). These findings are also in line with those of Joiner & Rudd (1995) that negative interpersonal events (a category of dependent event) moderate the relationship between negative cognitive style and suicidal ideation. Moreover, our
findings build upon Alloy and Abramson’s (Abramson et al., 1998) diathesis-stress model to suggest which types of events are the most potent activator of negative cognitive style. These findings suggest several possible avenues for future research. For example, future research could explore whether negative dependent events may also be the most potent activator vulnerabilities in other diathesis-stress models of suicide, such as hopelessness, a component of Beck’s theory (Minkoff, Bergman, Beck, & Beck, 1973).

The goal of the second component hypothesis was to test an integrated conceptual model that proposes a sequence where negative cognitive style, after it is activated by negative dependent events, subsequently produces suicidal ideation through the generation of further negative dependent events and subsequent beliefs of burdensomeness and thwarted belongingness. This model combines the transactional stress generation theory (Hammen, 1991) and cognitive-vulnerability models of suicide with the Interpersonal Theory of Suicide (Joiner, 2005). In the first step, activation of negative cognitive style by negative dependent (or self-produced) events leads to the generation of further negative dependent events. In the second step, events lead individuals to believe they are a burden to others and do not belong to a social group. These beliefs associated with the interpersonal theory of suicide serve as proximal causes of suicidal ideation in our model. Our results also supported this second hypothesis of the integrated conceptual model. To further support our hypothesized model, we tested two other alternative models. One model was a test of the directional sequence of the mediators with the order of the mediators reversed. The other alternative model was a test
of specificity to outcome variables that used depressive symptoms as the endogenous variable rather than suicidal ideation. Neither alternative model fit the data as well as our hypothesized model, supporting both the hypothesized directional sequence of mediation in our model and its specificity to suicide. The findings supporting the specificity of the test of specificity of model to suicide ideation is particularly important because they are consistent with Joiner’s assumption that interpersonal beliefs of thwarted belonging and burdensomeness apply mainly to suicide and not depression.

These interesting findings contribute to the literature on suicidology in several ways. First, they provide evidence for a dynamic etiological chain by which the desire to die develops. This is important because although several theories of suicide propose a dynamic process (e.g., Joiner, 2005), no published study yet has actually tested such a model. Second, these findings are the first to our knowledge to integrate multiple models of suicide as well as a transactional cognitive vulnerability perspective of stress generation into one unified conceptual framework. In the present view, many models of suicide are not necessarily incompatible. Such a notion is also in accord with equifinality of suicide: the desire to die and subsequent actions taken to do so may be the result of multiple pathways. Thus, it may be fruitful to conduct future studies that integrate other theories of suicide risk in to this model. One such theory is Beck’s theory of suicide (Beck, Steer, Kovacs, & Garrison, 1985; Beck, Brown, Berchick, Stewart, & Steer, 1990; Minkoff et al., 1973), which posits that the desire to die is the result of hopeless beliefs about the future. Integration of this theory is especially important because it is arguably the best supported of all theories of suicide risk. It may be that hopelessness fits in to the
mediational chain between the distal risk provided by negative cognitive style and the proximal risk provided by the IPT variables.

Our model is compatible with previous theoretical work, such as Maris’ notion of a developmental process of suicide, where the desire to die develops over time through the interaction of multiple factors (Maris, 2002). Negative cognitive style and perceived burdensomeness and thwarted belonging may be two such processes. This model is also compatible with Sandin and colleges’ stress-process model of suicide (Sandin, Chorot, Santed, Valiente, & Joiner, 1998), in which negative appraisals are thought to mediate the relationship between negative events and suicidal ideation. Thwarted belonging and perceived burdensomeness may be two such negative appraisals.

Although the primary goal of this manuscript was to examine predictors of suicidal ideation, we also found support for the subsidiary hypothesis that negative dependent, but not independent, events moderated the relationship between negative cognitive style and depressive symptoms. These interesting findings are relevant to current cognitive-vulnerability-stress models that have not distinguished negative dependent from negative independent events as triggers that interact with vulnerabilities. The present findings suggest that this distinction is not just relevant to stress-diathesis for suicide but also for stress-diathesis for depression. Nevertheless, the specificity of the hypothesized integrated transactional model to suicide was supported by the fact that it the interpersonal beliefs in the IPT model only had paths to suicidal ideation and not to depressive symptoms.
Our model has clinical implications as well. For example, an etiological chain of how suicidal ideation develops from cognitive vulnerability and stress generation can inform intervention efforts. It may be that targeting individuals who are known to generate stress (i.e., have a negative cognitive style) and giving them skills to respond to negative events when they occur in more adaptive manners may prevent them from generating further negative events and thereby prevent them from developing suicidal ideation. Finally, there are several limitations of the present study that should be acknowledged. The foremost limitation is that we used a college student sample. Although our sampling methods produced a group of participants that were at greater risk for suicide than typical college samples, further replication is needed in more diverse clinical samples. Second, our study was conducted with a relatively short follow-up time. Further studies using longer follow-up periods are necessary. Strengths of our study include the use of an interview based life events measure that helped reduce errors typically associated with using self-report measures (e.g., subjectively biased over-reporting of events; Hammen, 2006).
APPENDIX A: MEASURES

Beck Suicide Scale

Directions: Please carefully read each group of statements below. Circle the one statement in each group that best describes how you have been feeling for the past week, including today. Be sure to read all of the statements in each group before making a choice.

| 1 | 0 I have a moderate to strong wish to live. |
|   | 1 I have a weak wish to live. |
|   | 2 I have no wish to live. |
| 2 | 0 I have no wish to die |
|   | 1 I have a weak wish to die |
|   | 2 I have a moderate to strong wish to die. |
| 3 | 0 My reasons for living outweigh my reasons for dying. |
|   | 1 My reasons for living or dying are about equal. |
|   | 2 My reasons for dying outweigh my reasons for living. |
| 4 | 0 I have no desire to kill myself. |
|   | 1 I have a weak desire to kill myself. |
|   | 2 I have a moderate to strong desire to kill myself. |
| 5 | 0 I would try to save my life if I found myself in a life-threatening situation. |
|   | 1 I would take a chance on life or death if I found myself in a life-threatening situation. |
|   | 2 I would not take the steps necessary to avoid death if I found myself in a life-threatening situation. |
| 6 | 0 I have brief periods of thinking about killing myself which pass quickly. |
|   | 1 I have periods of thinking about killing myself which last for moderate amounts of time. |
|   | 2 I have long periods of thinking about killing myself. |
| 7 | 0 I rarely or only occasionally think about killing myself. |
|   | 1 I have frequent thoughts about killing myself. |
|   | 2 I continuously think about killing myself. |
| 8 | 0 I do not accept the idea of killing myself. |
|   | 1 I neither accept nor reject the idea of killing myself. |
|   | 2 I accept the idea of killing myself. |
| 9 | 0 I can keep myself from committing suicide. |
|   | 1 I am unsure that I can keep myself from committing suicide. |
|   | 2 I cannot keep myself from committing suicide. |
| 10 | 0 I would not kill myself because of my family, friends, religion, possible injury from an unsuccessful attempt, etc. |
|   | 1 I am somewhat concerned about killing myself because of my family, friends, religion, possible injury from an unsuccessful attempt, etc. |
|   | 2 I am not or only a little concerned about killing myself because of my family, friends, religion, possible injury from an unsuccessful attempt, etc. |
| 11 | 0 My reasons for wanting to commit suicide are primarily aimed at influencing other people, such as getting even with people, making people happier, making people pay attention to me, etc. |
|   | 1 My reasons for wanting to commit suicide are not only aimed at influencing other people, but also represent a way of solving my problems. |
|   | 2 My reasons for wanting to commit suicide are primarily based upon escaping from my problems. |
| 12 | 0 I have no specific plan about how to kill myself. |
|   | 1 I have considered ways of killing myself, but have not worked out the details. |
|   | 2 I have no specific plan for killing myself |
| 13 | 0 I do not have access to a method or an opportunity to kill myself. |
|   | 1 The method that I would use for committing suicide takes time, and I really do not have a good opportunity to use this method. |
|   | 2 I have access or anticipate having access to the method that I would choose for killing myself and also have or shall have the opportunity to use it. |
| 14 | 0 I do not have the courage or the ability to commit suicide. |
|   | 1 I am unsure that I have the courage or the ability to commit suicide. |
|   | 2 I have the courage and the ability to commit suicide. |
| 15 | 0 I do not expect to make a suicide attempt. |
|   | 1 I am unsure that I shall make a suicide attempt. |
|   | 2 I am sure that I shall make a suicide attempt. |
| 16 | 0 I have made no preparations for committing suicide. |
|   | 1 I have made some preparations for committing suicide. |
|   | 2 I have almost finished or completed my preparations for committing suicide. |
| 17 | 0 I have not written a suicide note. |
|   | 1 I have thought about writing a suicide note or have started to write one, but have not completed it. |
|   | 2 I have completed a suicide note. |
| 18 | 0 I have make no arrangements for what will happen after I have committed suicide. |
|   | 1 I have thought about making some arrangements for what will happen after I have committed suicide. |
|   | 2 I have made definite arrangements for what will happen after I have committed suicide. |
| 19 | 0 I have not hidden my desire to kill myself from people. |
|   | 1 I have held back telling people about wanting to kill myself. |
|   | 2 I have attempted to hide, conceal, or lie about wanting to commit suicide. |
Cognitive Style Questionnaire

Scenarios
1. An important romantic relationship you are involved in breaks up because the other person no longer wants a relationship with you.
2. As an assignment, you give an important talk in class, and the class reacts negatively to your talk.
3. During the first year of working in the career of your choice, you receive a negative evaluation of your job performance.
4. You go to a party with some friends and throughout the whole party people don't act interested in you.
5. You don't look as good as you would like in terms of physical appearance.
6. You take an exam and receive a low grade on it.
7. In an important class, you can't get all the work done that your professor expects of you.
8. You want to be in an intimate, romantic relationship but aren't.
9. Your grade point average (GPA) for the semester is low.
10. A person you'd really like to develop a close friendship with does not want to be friends with you.
11. You are unhappy.
12. You write a paper for a course and get a low grade on it.

Questions
A. Think about the cause of this event. Is it something about you or something about other people or circumstances?
B. Is this cause something that leads to failure just in this instance or does this cause also lead to failure in other areas of your life?
C. Will the cause of this event cause this event again in the similar situations in the future?
D. How likely is it that this will lead to other negative things happening to you?
E. To what degree does this mean that you are flawed in some way?
F. How much does this matter to you?
The following questions ask you to think about yourself and other people. Please respond to each question by using your own current beliefs and experiences, NOT what you think is true in general, or what might be true for other people. Please base your responses on how you’ve been feeling recently. Use the rating scale to find the number that best matches how you feel and circle that number. There are no right or wrong answers: we are interested in what you think and feel.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all true for me</td>
<td>Somewhat true for me</td>
<td>Very True for me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

_____ 1. These days the people in my life would be better off if I were gone.
_____ 2. These days the people in my life would be happier without me.
_____ 3. These days I think I have failed the people in my life.
_____ 4. These days I think I am a burden on society.
_____ 5. These days I think I contribute to the well-being of the people in my life.
_____ 6. These days I feel like a burden on the people in my life.
_____ 7. These days I think the people in my life wish they could be rid of me.
_____ 8. These days I think I make things worse for the people in my life.
_____ 9. These days I think I matter to the people in my life.
_____ 10. These days, other people care about me.
_____ 11. These days, I feel like I belong.
_____ 12. These days, I rarely interact with people who care about me.
_____ 13. These days, I am fortunate to have many caring and supportive friends.
_____ 14. These days, I feel disconnected from other people.
_____ 15. These days, I often feel like an outsider in social gatherings.
_____ 16. These days, I feel that there are people I can turn to in times of need.
_____ 17. These days, I am close to other people.
_____ 18. These days, I have at least one satisfying interaction every day.
Events from Life Events Inventory

1. Received negative reaction from family or friends about not doing well in school
2. Received positive reaction from family or friends about doing well in school
3. Did poorly on or failed an exam or major project in an important class (i.e., grade less than C).
4. Failed to achieve an important school-related goal that does not involve grade point average
5. Were very behind (by at least 2 weeks of work) or did not understand a lot of the material
6. Received an "A" on an exam or major project in an important class.
7. Told by someone important that you will succeed at career or school goals
8. Received a scholarship or fellowship or won an award for your achievements at school
9. Significant negative change in financial situation
10. Did not have enough time to do well in school (if in school), personal life, and job (if have job)
11. Significant positive change in financial situation
12. Were very behind at job (by at least 2 weeks of work) or did not understand a lot of the information needed to perform job.
13. Significant fight or argument with coworker or boss that led to a serious consequence
14. At job, boss gave you a written warning or negative formal evaluation on job performance or threatened to fire you.
15. Quit job because of unfortunate situation
16. Laid off or fired from job.
17. Resolution (solving) of significant fight or argument with coworker or boss that previously had a serious consequence
18. At job, boss gave you a raise or you received a promotion due to good work performance, won a significant award for your achievements at work
20. Received negative reaction from family or friends about you being unemployed or having a low-status, non-paying job.
21. You were in charge of doing the housework and others (e.g., family, friends, etc.) criticized the appearance or cleanliness of your home or your cooking.
22. You were in charge of doing the housework and others (e.g., family, friends, etc.) praised the appearance or cleanliness of your home or your cooking.
23. Family member got in serious trouble or experienced serious setback or failure
24. Break-up of or serious threat to parents' marriage
25. Family member had a significant emotional problem or trauma, medical problem, or alcohol or drug-related problem that lasted at least 2 weeks, or any duration if they were hospitalized
26. Family member was hit, kicked or beaten or was a victim of an accident, attack, or violent crime.
27. Significant fight or argument with family member that led to a serious consequence
28. Frequent pressure from parents to do what they wanted you to do, to agree with them
29. Frequently put down or made fun of by family member
30. Family member had a positive outcome to what had been a serious problem
31. Resolution (solving) of significant fight or argument with family member that previously had a serious consequence
32. You or your partner had an abortion, gave child up for adoption, miscarried, or baby died during delivery.
33. Had a desired pregnancy or girlfriend/spouse had a desired pregnancy.
34. Your child got in serious trouble
35. Your child was making poor progress for age level in accomplishing basic developmental tasks or at school
36. Your child frequently exhibited problem behaviors
37. Your child had a significant emotional problem or trauma or a medical problem that lasted at least 2 weeks, or any duration if hospitalized
38. Significant fight or argument with your child that led to a serious consequence
39. Family or friends reacted negatively (insulted; etc.) to your child.
40. Your child had a positive resolution (solving) of what had been a serious problem
41. Resolution (solving) of a significant fight or argument with your child that previously had a serious consequence
42. Death of close family member or close friend.
43. Death of pet to whom you were close or attached
44. Other people pressured you to do something you considered to be very wrong or were very uncomfortable with
45. Got a new pet.
46. Close friend got in serious trouble (with the law; in school; at work; with parents; etc.) or experienced serious setback or failure
47. Close friend had a significant emotional problem or trauma, medical problem, or alcohol or drug-related problem that lasted at least 2 weeks, or any duration if hospitalized
48. Significant fight or argument with close friend other than roommate that led to a serious consequence
49. Frequently put down or made fun of by close friend
50. Re-established contact with a close friend you have not seen or heard from in some time (more than 6 months).
51. Close friend had a positive resolution (solving) of what had been a serious problem
52. Resolution (solving) of significant fight or argument with close friend that previously had a serious consequence
53. Initiation (beginning) of a significant new friendship.
54. Boyfriend/girlfriend/spouse got in serious trouble (with the law; in school; at work; with parents; etc.) or experienced serious setback or failure
55. Boyfriend/girlfriend/spouse had a significant emotional problem or trauma, medical problem, or alcohol or drug-related problem that lasted for at least two weeks, or any duration if hospitalized
56. Received negative reaction (e.g., insulting comment) about boyfriend/girlfriend/spouse from a person who is important to you
57. Significant fight or argument with boyfriend/girlfriend/spouse that led to a serious consequence
58. Boyfriend/girlfriend/spouse was invading your privacy or was too nosy
59. Frequently put down or made fun of by boyfriend/girlfriend/spouse or were getting blamed for problems between you and boyfriend/girlfriend/spouse or for his/her personal problems
60. While you were still involved with boyfriend/girlfriend/spouse, he or she dated and/or had sex with another person behind your back
61. Unwanted final breakup of relationship with boyfriend/girlfriend/spouse.
62. Boyfriend/girlfriend/spouse had a resolution (solving) of what had been a serious problem (won a lawsuit; readmitted to school; rehired at job; etc.).
63. Became engaged to be married or got married.
64. Resolution (solving) of significant fight or argument with boyfriend/girlfriend/spouse that previously had serious consequence
66. Were criticized about physical or sexual attractiveness or sexual performance.
67. Were complimented or praised about physical or sexual attractiveness or sexual performance.
68. Successfully terminated a bad relationship.
69. You and your partner disagreed on use of contraception/protection against sexually transmitted diseases when having sex
70. Pressured or forced by boyfriend/girlfriend/spouse to engage in unwanted sexual activity
71. For at least one month, you had sexual difficulties while sexually active
72. For at least one month, boyfriend/girlfriend/spouse had sexual difficulties while sexually active
73. Roommate was not paying rent or other large bills for which you are both responsible or roommate was frequently in bad shape
74. Significant fight or argument with roommate that led to a serious consequence
75. Put down or made fun of by roommate
76. Resolution (solving) of significant fight or argument with roommate that previously led to a serious consequence
77. Important piece of property was stolen, broken, severely damaged, lost, or falling apart fast
78. Got in minor trouble with the law
79. Got in serious trouble with the law
80. Serious problem due to drug or alcohol use
81. Received frequent peer pressure to use drugs, alcohol, or cigarettes
82. Were frequently teased, criticized, or put down for appearance or others pressured you to change your appearance in a major way
83. Frequent negative side effects from medication
84. Normal sleep schedule was frequently disrupted due to negative conditions
85. Minor illness or injury
86. Witnessed a serious accident or act of violence.
87. Received verbal threats of violence from a stranger or someone you know.
88. Your apartment, house, or room was broken into.
89. You were hit, kicked or beaten or you were a victim of an accident, attack, or violent crime (by boyfriend/girlfriend/spouse, friend, acquaintance, stranger; etc.).
90. Had successful resolution (solving) of serious trouble with the law
91. Achieved desired reduction in cigarette, drug, or alcohol use for at least one month.
92. Achieved desired weight loss or gain.
93. You did something very brave, heroic, kind, or helpful
94. Started a new project or venture
95. Finished an important project, task, or venture that is related to school, work, hobby, etc.
96. You had a lot of responsibilities and/or were involved in many activities
**CES-D**

Below is a list of the ways you might have felt or behaved. Please mark how often you have felt this way during the past week.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rarely or none of the time (less than 1 day)</td>
<td>Some or a little of the time (1-2 days)</td>
<td>Occasionally or a moderate amount of time (3-4 days)</td>
<td>Most or all of the time (5-7 days)</td>
</tr>
</tbody>
</table>

1. I was bothered by things that usually don’t bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family or friends.
4. I felt I was just as good as other people.
5. I had trouble keeping my mind on what I was doing
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.
9. I thought my life had been a failure.
10. I felt fearful.
11. My sleep was restless.
12. I was happy.
13. I talked less than usual.
15. People were unfriendly.
16. I enjoyed life.
17. I had crying spells
18. I felt sad.
19. I felt that people dislike me.
20. I could not get “going.”
APPENDIX B: COGNITIVE VULNERABILITY TO SUICIDE: REVIEW AND EXPANSION TO AN INTEGRATED, TRANSACTIONAL MODEL

Suicide represents nearly 2% of the total worldwide burden of disease and this number is predicted to increase by over 50% by 2020 (World Health Organization, 2007), possibly due to increases in adverse social phenomena such as joblessness (Andrés, 2006). As a result of this high rate of suicide, there has been considerable research on factors that predict suicide (Nock et al., 2008), with particular attention given to cognitive vulnerability models where negative events activate vulnerabilities to produce suicidal ideation. In contrast to cognitive vulnerability-stress models, research on transactional models of stress generation in depression posit that once a cognitive vulnerability is activated, such vulnerabilities lead individuals to generate further negative events that increases and sustains their depression (See Liu, 2013; Liu & Alloy, 2010 for reviews). Given the conceptual similarities between depression and suicide (e.g., they share many of the same predictors; Shahar, Bareket, Rudd & Joiner, 2006) and that depression is a strong predictor of suicidal thoughts and behaviors (Vandivort & Locke, 1979), it would make sense for a transactional model of depression to be applied to suicide research. Such a transactional perspective, however, has not been applied to suicide.
The purpose of this paper is 1) review the extant literature on cognitive vulnerabilities to suicide and 2) present an integrated transactional cognitive vulnerability model of suicide. We start by reviewing cognitive vulnerabilities to suicide, and then discuss the advent of transactional models of stress generation in the depression literature (e.g., Hammen, 1991; Liu, 2013). After this, we present the integrated transactional model of suicide. The model is atheoretical in the sense that it does not assume that any one cognitively vulnerability model is necessarily superior to others, and can presumably apply to Beck’s (Beck, Kovacs, & Weissman, 1975), Alloy and Abramson’s (Abramson et al., 1998), Joiner’s (Joiner, 2005), or other models. This review thus differs from previous reviews of cognitive vulnerabilities to suicide since it provides an overview of multiple cognitive vulnerability models, not just one, and also because it integrates these models with stress-generation theory in a unifying framework. In addition, the review broadly updates a rapidly growing literature. For example, in just the five years since a review on rumination and suicide was published (Morrison & O’Connor, 2008), the literature on this topic alone has increased by nearly 50%.

Method

Selection of vulnerabilities. Past research has focused on three primary cognitive models of suicide. Two of these models are cognitive vulnerability formulations for depression that have been extended to suicide (Beck’s Hopelessness
Theory and Alloy and Abramson’s Hopelessness Theory\(^1\) and one is unique to suicide (Joiner’s Interpersonal Psychological Theory of Suicide). Depression is typically seen as a major risk factor for suicide and it would seem intuitive to extend a model for depression to suicide. We also discuss three additional cognitive vulnerabilities that have received some initial support as vulnerabilities to suicide. One vulnerability has been primarily studied in relation to depression (rumination) and the others primarily in relation to anxiety (anxiety sensitivity and looming cognitive style).

**Selection of relevant research.** Given that there are separate literatures on suicide risk for adolescents and adults (i.e., studies generally address either adult or adolescent risk factors, but not both), we limited our present review only to studies that used adult (age 18+) populations. For similar reasons, we excluded selected samples of elderly adults (age 65+ or a population explicitly stated as such). Relevant articles were identified by finding all relevant articles that cited the first major publication of the theory (e.g., Abramson et al., 1998; Beck, Kovacs, & Weissman, 1975; Joiner, 2005). In addition, a search was performed in PubMed, Psycinfo, and Google Scholar using relevant keywords for each theory (e.g., hopelessness, interpersonal psychology theory, burdensomeness). This yielded a total of 95 manuscripts across all six theories covered in this review as of the final search on August 20\(^{th}\), 2013.

**Nomenclature of suicide.**

\(^1\) We utilize the names associated with each theory while discussing them together to keep the distinction between Beck’s and Alloy and Abramson’s hopelessness theories clear.
This review utilizes the standardized nomenclature for different aspects of the wide construct of suicide introduced by Silverman, Berman, Sanddal, O’Carroll, & Joiner (2007). *Suicide* is used when discussing suicide in a broad sense or when discussing multiple studies that address different aspects of suicide (e.g., when referring to both suicidal ideation and attempt suicide). *Suicidal ideation* is used to discuss thoughts of, or intent for, suicide. *Attempted suicide* is used to refer to behaviors to take one’s life that do not end in death (e.g., an unsuccessful suicide attempt). *Completed suicide* is used to discuss death by suicide. *History of* is used as a prefix when discussing studies that retrospective assess aspects of suicide. Finally, *parasuicide* is used to refer to the outcome that is measured by Linehan’s Suicide Behaviors Questionnaire (Addis & Linehan, 1989; Osman et al., 2001), as Linehan and colleagues explicitly refer to the construct as such. This is a measure of several different aspects of suicide including past attempts, current ideation, and future expectancies.

**Beck’s Hopelessness Theory**

According to Beck’s cognitive formulation (Beck, Kovacs, & Weissman, 1975), hopelessness -- or a person’s general negative expectancies for the future -- is the main component of depression that predicts suicide. An individual’s trait hopeless schema (i.e., negative views of the self, world, and future), when activated by stress, generates state hopelessness, a feeling that one’s situation is intolerable and will not change. This leads to a preoccupation with suicide and an inability to “disengage from suicide relevant cues” (Wenzel & Beck, 2008, p. 195), which leads to suicidal ideation. Once this suicidal ideation reaches a threshold of tolerance, an individual will attempt suicide (Wenzel &
Beck’s model is typically assessed using the Beck Hopelessness Scale (BHS; Beck, Weissman, Lester, & Trexler, 1974), a 20 item true/false self report measure that includes items such as “when I think about the future, I feel hopeless and dejected”.

To date, Beck’s theory is the only one of the cognitive vulnerability models of suicide that has been tested as a predictor of the full range of suicide variables: suicidal ideation, suicide attempts, and completed suicide. Studies document the relationship between hopelessness and suicidal ideation retrospectively (Safren & Heimberg, 1999), cross-sectionally (Chochinov, Wilson, Enns, & Lander, 1998; Joiner & Rudd, 1996; Schlebusch & Wessels, 1988), and prospectively (Kim, Jayathilake, & Meltzer, 2003; Kuo, Gallo, & Eaton, 2004; Miranda, Valderrama, Tsypes, Gadol, & Gallagher, 2013; O’Connor, Fraser, Whyte, Machale, & Masterton, 2008). The relationship between hopelessness and suicidal ideation is moderated by optimistic explanatory style (Hirsch & Conner, 2006), dispositional optimism (Bryan, Ray-Sannerud, Morrow, & Etienne, 2013), and positive self appraisals (Johnson, Gooding, Wood, & Tarrier, 2010). That is, hopelessness is less closely related to suicidal ideation when individuals have optimistic explanatory styles or positive self appraisals.

Research has confirmed that higher levels of hopelessness differentiate those who have from those who have not attempted suicide (Borges, Saltijeral, Bimbela, & Mondragón, 2000; Rifai, George, Stack, Mann, & Reynolds, 1994; Schneider, Philipp, & Müller, 2001; Wetzel, 1976), those have had one past suicide attempt from those who have multiple attempts (Forman, Berk, Henriques, Brown, & Beck, 2004; Rudd, Joiner, & Rajab, 1996), and those who will and will not attempt suicide prospectively (Klonsky,
There are numerous studies that show hopelessness prospectively predicts death by suicide. Such studies are impressive and difficult to conduct because they require large samples (as completed suicide is a low-base rate occurrence, even in at-risk populations) and long periods of time (as completed suicide can occur several years after the baseline assessment of hopelessness). Hopelessness predicts death by suicide in followup periods of five (Beck, Brown, Berchick, Stewart, & Steer, 1990), ten (Beck, Steer, Kovacs, & Garrison, 1985), and twenty (Brown, Beck, Steer, & Grisham, 2000) years. Several other studies replicate these findings (Drake & Cotton, 1986; Keller & Wolfersdorf, 1993; Krupinski et al., 1998; Kuo et al., 2004; Niméus, Träskman-Bendz, & Alsén, 1997; Schneider et al., 2001). Several studies that examine death by suicide use a cutoff score on the BHS to create a high vs. low risk dichotomy. Some studies use a cutoff score of eight to determine high risk status (Brown et al., 2000; Keller & Wolfersdorf, 1993) while others use a cutoff score of nine (Beck et al., 1990; Niméus et al., 1997). Regardless of cutoff used, studies typically demonstrate sensitivity (i.e., true positives) of around 90% but report problems with low specificity (i.e., true negatives). Indeed, a meta-analysis finds a pooled specificity of only 0.42 (McMillian, Gilbody, Beresford, & Neilly, 2007). Thus, there is need for further research to further refine the appropriate cut off point as well as refine the BHS itself to increase specificity.

Support for Beck’s this theory is found in patients suffering from diverse psychopathology including schizophrenia (Drake & Cotton, 1986; Kim et al., 2003).
psychosis (Klonsky et al., 2012), and bipolar disorder (Schneider et al., 2001). Hopelessness predicts a history of suicidal ideation in non-US samples, including samples from Mexico (Borges et al., 2000) and Hong Kong (Cheung, Law, Chan, Liu, & Yip, 2006). Finally, Rudd et al., (1996) find that hopelessness differentiates single from multiple suicide attemptors in an active duty Army sample.

There is empirical evidence that hopelessness mediates the relationship between more distal risk factors for suicide and suicidal ideation/ attempts. This includes problem solving deficits (Dixon, Heppner, Rudd, 1994), childhood maltreatment (Meadows & Kaslow, 2002), rumination (Smith, Alloy, & Abramson, 2006), cognitive biases (Beevers & Miller, 2004), childhood sexual abuse (Spokes, Wenzel, Stirman, Brown, & Beck, 2009), certainty of the absence of positive events in the future (Sargalska, Miranda, & Marroquín, 2011), and acculturative stress (Polanco-Roman & Miranda, 2013). Thus, a variety of distal factors can contribute to hopelessness, and hopelessness may be a common proximal risk factor for suicide.

Several studies find that the relationship between depression and suicide is fully accounted for by hopelessness (Beck, Steer, Beck, & Newman, 1993; Beck, Kovacs, & Weissman, 1975; Chochinov et al., 1998; Dyer & Kreitman, 1984; Wetzel, Margulies, Davis, & Karam, 1980). These findings could also imply that the relationship between depression and suicide is actually mediated by hopelessness, thus there is a need for tests of mediated models involving these variables. There is an even greater needed for studies in samples of hopeless individuals that have not yet progressed to develop depression or suicidal ideation. Once individuals experience depression and severe suicidal ideation, it
is difficult to disentangle the temporal precedence of hopelessness, depression, and suicidal ideation (Shahar, et al., 2006).

Several studies provide support for factors that account for the relationship between hopelessness and suicide. This includes history of non-suicidal self injury (Andover & Gibb, 2010), specific future positive expectancies (O’Connor et al., 2008), and suicide intent (Suominen, Isometsa, Ostamo, & Lonnqvist, 2004). However, it might be that these factors account for the relationship between hopelessness and suicide because they are more proximal predictors of suicide that could actually be caused by hopelessness. This suggests that these variables are possible mediators of the relationship between hopelessness and suicide.

Some studies show that hopelessness does not predict parasuicide (i.e., Linehan’s multi-faceted construct) while controlling for social desirability (Linehan & Nielsen, 1989; 1983), while others do not demonstrate such an effect (Cole, 1988; Petrie & Chamberlain, 1983). Others find that hopelessness and social desirability interact to predict suicidal ideation (Holden, Mendonca, & Serin, 1989; Ivanoff & Jang, 1991). The final consensus is that the ability for hopelessness to predict suicide varies with levels of social desirability (Ivanoff & Jang, 1991). Moreover, although social desirability does not necessarily override the predictive ability of hopelessness, “prediction accuracy is enhanced by including social desirability assessment” (Strosahl, Linehan, & Chiles, 1984, p. 499).

Two studies (Beck, Steer, & Trexler, 1989; Beck & Steer, 1989) find that among alcoholics, lack of precautions for suicide (e.g., giving a gun to someone for safe
keeping) are stronger predictors of suicidal ideation than hopelessness. Beck et al. (1989) suggested two possibilities to account for this. First, hopelessness may predict alcoholism itself (i.e., alcoholism mediates the relationship between hopelessness and suicide), and second hopelessness may more strongly related to premeditated rather than impulsive suicide attempts (which are more common among alcoholics; Koller, Preuß, Bottlender, Wenzel, & Soyka, 2002). Consistent with the latter possibility, individuals who make impulsive suicide attempts show less hopelessness than those who make premeditated attempts (Spokas, Wenzel, Brown, & Beck, 2012). In contrast, however; one study found that hopelessness differentiated alcoholics who made a suicide attempt from a matched control group of alcoholics (Hewitt, Norton, Flett, Callander, & Cowan, 1998).

**Alloy and Abramson’s Hopelessness Theory**

According to Alloy and Abramson’s model, individuals who make global and stable attributions for negative events and believe these attributions will have negative implications for the future are said to have a *negative cognitive style* and are more prone to suicide than those who do not (Abramson et al., 1998). According to the stress-diathesis components of the model, negative events activate the negative cognitive style to produce suicidal ideation. Research has shown that negative cognitive style interacts with achievement events (Priester & Clum, 1992), interpersonal events (Joiner & Rudd, 1995), and both types of events combined (Hirsch, Wolford, LaLonde, Brunk, & Parker-Morris, 2009) to predict suicidal ideation. A related cognitive style, the enhancing attributional style (i.e., global and stable attributions for positive events) has been found
to moderate the relationship between depressive symptoms and suicidal ideation (Kleiman, Miller, & Riskind, 2012).

Alloy and Abramson’s theory is logically (and explicitly) compatible with Beck’s theory in that once the diathesis (negative cognitive style) is activated by stress, hopelessness develops, which leads to subsequent suicidal ideation and behavior. In other words, hopelessness mediates the relationship between negative cognitive style and suicide. Tests of this model, however, have yielded mixed findings: Abramson et al., (1998) found support for the model, while Joiner & Rudd (1995) did not. Both studies tested if hopelessness mediated the direct effect of negative cognitive style on suicide. As Alloy and Abramson’s theory is a diathesis-stress model, the most accurate test would be a model where hopelessness mediates the effect that the interaction between negative cognitive style and negative events has on suicide (i.e., a mediated moderation model). It should be noted that Joiner & Rudd (1995) did test such a model and failed to find support. However, this study did not actually test a mediated moderation model, but rather tested the mediated effects of the interaction between negative cognitive style and negative life events on suicidal ideation. A full test of a mediated moderation model would include the main effects of negative cognitive style and negative life events (Muller, Judd, & Yzerbyt, 2005). Hirsch & Conner, (2006) examined the relationship between the theories from a different perspective and found that an optimistic explanatory style (i.e., low levels of negative cognitive style) interacts with hopelessness to predict suicidal ideation. This suggests that hopelessness and negative cognitive style represent two separate dimensions of suicide risk.
Relative to the other key theories, there is far less research on Alloy and Abramson’s theory. One reason for this might be that the measurement of this theory is quite burdensome for participants. The Cognitive Style Questionnaire (CSQ; Haeffel et al., 2008) involves writing the cause for 12 hypothetical negative events (e.g., “you want to be in a romantic relationship but aren’t”) and then rating the cause on seven relevant dimensions (e.g., internal vs. external, stable vs. global). Shorter, less burdensome measures have been created that could encourage more future research, including the CSQ Short Form (CSQ-SF; Meins et al., 2012) and the Depressive Attributions Questionnaire (DAQ; Kleim, Gonzalo, & Ehlers, 2011), which contains only 16 items. There are three other areas that warrant future attention. First, more research is needed that tests mediators of negative cognitive style (especially hopelessness) using mediated moderation models. This allows for assessment of mechanisms of the actual diathesis-stress relationship. Second, research on moderators/protective factors of the risk conferred by negative cognitive style is needed, as there are no studies addressing this. Third, studies are needed to assess the prediction of actual death by suicide.

**Joiner’s Interpersonal Psychological Theory of Suicide**

Joiner’s Interpersonal Psychological Theory of Suicide (IPT) is the third major cognitive theory. Within IPT, perceived burdensomeness (PB; being a burden on others) and thwarted belongingness (TB; not belonging to a social group) create the desire to die. Suicide attempts require the acquired capacity for the pain of suicide, which arises through exposure to “painful and provocative events” such as failed suicide attempts or physical injuries from sports. Although Joiner has not explicitly described IPT as
diathesis-stress model, the development of PB and TB are possibly the end result of a diathesis stress process. Not all individuals who experience the same negative life events believe they are burdensome and do not belong nor do they develop the desire to die, suggesting an underlying diathesis or cognitive vulnerability.

Before discussing support for the theory, the measurement of IPT variables warrants discussion. PB and TB are measured using the Interpersonal Needs Questionnaire (INQ). Various versions have been used but the most current accepted version (Van Orden, Cukrowicz, Witte, & Joiner, 2012) contains 12 items such as “These days I think I am a burden on society”. The acquired capability is measured with the Acquired Capability for Suicide Scale (ACSS; Bender, Gordon, Bresin, & Joiner, 2011), contains 20 items such as “The pain involved in dying frightens me”. While the validity of the measures for IPT appear to be strong, many studies cited as supporting IPT do not actually use these measures. Since such studies use composites of items from other measures created for different purposes, caution is warranted in interpreting the studies. This is especially true in a study by Christensen, Batterham, Soubelet, & Mackinnon (2013) that measured PB using items from a measure of rumination, another cognitive vulnerability to suicide (see below). Thus, it is difficult to fully label this study as a test of IPT.

There is a growing body of support for IPT. PB/TB directly predict suicidal ideation (Garza & Pettit, 2010; Kanzler, Bryan, McGearly, & Morrow, 2012; Lamis & Lester, 2013; Van Orden, Lynam, Hollar, & Joiner, 2006; Simlot, Mcfarland, & Lester, 2013; Zhang, Lester, Zhao, & Zhou, 2013) and suicide attempt history (Conner, Britton,
Sworts, & Joiner, 2007). They also interact to predict suicidal ideation (Joiner et al., 2009; study 1; Van Orden, et al., 2008; study 1) and future likelihood of suicide attempts (Joiner et al., 2009; study 2). PB and TB mediate the relationship between distal risk factors and suicidal ideation such as body mass index (Dutton, Bodell, Smith, & Joiner, 2013), perfectionism (Rasmussen, Slish, Wingate, Davidson, & Grant, 2012), alcohol use (Lamis & Malone, 2011), self-forgiveness (Nsamenang, Webb, Cukrowicz, & Hirsch, 2013), autonomy needs (Hill & Pettit, 2013), and variations in campus connectedness between semesters (Van Orden, Witte, James, et al., 2008). PB and TB are common themes in suicide notes (Cox et al., 2011; Gunn, Lester, Haines, & Williams, 2012, Joiner et al., 2002; study 1). There is some inconsistency, however; in that one study finds higher PB in a suicide note predicted more lethal suicide methods (Joiner et al., 2002; study 2) while another finds that it predicts less lethal suicide methods (Pettit et al., 2002). This may be a cultural difference, however, as Joiner et al. used an American sample and Pettit et al. used a Chinese sample.

Compared to the research on PB/TB, there is less research on the acquired capability for suicide. Research has shown that individuals who have attempted suicide have greater exposure to painful and provocative events such as a car accident or a previous suicide attempt (Witte, Didie, Menard, & Phillips, 2012) and higher levels of acquired capability (Smith, Cukrowicz, Poindexter, Hobson, & Cohen, 2010) than individuals with no suicide history or only a history of suicidal ideation. The acquired capability interacts with the desire to die predict history of suicide attempts (Anestis & Joiner, 2011) and clinician ratings of suicide risk (Van Orden, et al., 2008; study 3). It
can also be acquired vicariously by working in professions that inflict pain on others (e.g., being a dentist or performing euthanasia as a veterinarian; Cornette et al., 2009; Witte, Correia, & Angarano, 2013).

Other than controlling for depressive symptoms, the role of psychopathology has received little attention in studies of IPT. Two studies address the relationship between IPT variables and psychopathology. Davidson, Wingate, Grant, Judah, & Mills (2011) find that TB mediates the relationship between social anxiety symptoms and suicidal ideation and both TB and PB mediate the relationship between depressive symptoms and suicidal ideation. These findings are cross sectional, thus the results can only imply, but not test, mediation. In a recent study, Kleiman, Liu, and Riskind (2013) find that changes in PB and TB over time mediate the relationship between depressive symptoms and suicidal ideation. These studies suggest that the IPT variables may be proximal causes of suicide that mediate the effect of psychopathology.

Several studies examine predictors of the IPT components without directly examining suicide variables. PB and TB are predicted by time spent volunteering after a natural disaster (Gordon, Bresin, Dombeck, Routledge, & Wonderlich, 2011), low distress tolerance and high negative urgency (Anestis, Bagge, Tull, & Joiner, 2011), and low levels of hope (Davidson, Wingate, Rasmussen, & Slish, 2009). The acquired capability is predicted by high distress tolerance and male gender (Anestis, Bender, Selby, Ribeiro, & Joiner, 2011), negative urgency (Anestis et al., 2012), low anxiety sensitivity for physical concerns (Fink, et al., 2012), and painful and provocative events (Bender et al., 2011; Franklin, Hessel, & Prinstein, 2011; Van Orden, et al., 2008; study
2). The relationship between painful and provocative events and the acquired capability is mediated by pain tolerance (Franklin et al., 2011) and impulsivity (Bender et al., 2011) and moderated by distress tolerance (Anestis & Joiner, 2012).

A small number of studies examine protective factors (i.e., moderators) of the IPT-suicidal relationship. Rasmussen & Wingate (2011) find that dispositional optimism buffers the relationships between PB/TB and suicidal ideation. Tucker et al. (2013) find that affiliative humor (humor that enhances relationships) and self-defeating humor (self-deprecating humor that gains approval from others) buffer the relationships between PB/TB and suicidal ideation but self-enhancing (using humor to cope with stress) and aggressive (humor directed towards hurting others) humor do not.

Selby et al. (2010) highlight the importance of IPT to the military, especially the acquired capability component, which is a result of increased pain tolerance. Soldiers are exposed to a variety of facts that can directly increase pain such as the physical pain associated with training or injuries and indirectly by injuring others or gaining a sense of invincibility (by not being injured). Several studies assess IPT in the military. Higher levels of acquired capability are observed among individuals in the military compared to individuals in the community (Bryan, Morrow, Anestis, & Joiner, 2010) and among individuals in the military who died by suicide compared to matched controls (Nademin et al., 2008). Combat exposure (Bryan, Cukrowicz, West, & Morrow, 2010; Bryan & Cukrowicz, 2011) and combat related trauma (Bryan & Anestis, 2011) predicted the acquired capacity. While it might be expected then that the acquired capability mediates the relationship between combat exposure and suicide attempts, however Bryan,
Hernandez, Allison, & Clemans (2013) did not find support for this model. It may be that the acquired capability does mediate the relationship between combat exposure and suicide, but only for individuals high in PB/TB. Suggestive of this possibility, the acquired capability interacts with high levels of PB to predict suicide attempt history (Bryan, et al., 2010) and parasuicide (Bryan, Clemans, & Hernandez, 2012). Finally, Monteith, Menefee, Pettit, Leopoulos, & Vincent (2013) found that PB and TB interact to predict current suicidal ideation in an active duty sample.

Although the “youngest” of the theories, the rate of research accrual on IPT has been impressive. The size of the literature notwithstanding, there are several areas that still require attention. First, there is no study predicting completed suicide (although this is also true of Alloy and Abramson’s theory). Second, as stated earlier, there is little research on how the IPT variables relate to or predict psychopathology variables. For example, like hopelessness, although they are especially potent predictors of suicide, PB and TB may also predict depression.

**Additional cognitive vulnerabilities to suicide**

**Rumination**

Rumination is self-focused thought on the causes and consequences of depressive symptomology and negative events (Nolen-Hoeksema, 1991). There are two types of rumination: brooding, maladaptive dwelling on the negative consequences of an event and reflecting, adaptive contemplation of the causes of the event (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Brooding, but not reflecting, predicts suicidal ideation
differentiates those with and without a suicide attempt history (Crane, Barnhofer, & Williams, 2007; Grassia & Gibb, 2009). In contrast, Surrence et al. (2009) find that among individuals with a previous suicide attempt, reflecting is associated with higher levels of suicidal ideation, possibly because it impairs already reduced problem solving abilities. Studies that measure rumination as a unitary construct still find that it predicts suicidal ideation (Eshun, 2000; Simon et al., 2007; Smith et al., 2006). Brooding mediates the relationship between more distal risk factors for suicide and suicidal ideation such as negative life events (Chan, Miranda, & Surrence, 2009), self criticism (O’Connor & Noyce, 2008), cognitive inflexibility (Miranda et al., 2013) and suicide attempt history (Kraniak, Miranda, & Wheller, 2013). The relationship between rumination and suicidal ideation is mediated by hopelessness (Miranda et al., 2013; Smith et al., 2006) and depressive symptoms (Chan et al., 2009; Miranda & Nolen-Hoeksema, 2007).

**Anxiety sensitivity**

Anxiety sensitivity (AS) is a fear of anxiety related sensations due to the expectations of their harmful consequences (Reiss & McNally, 1989). AS consists of three factors: fear of physical concerns (e.g., increased heart rate), fear of cognitive concerns (e.g., losing control), and fear of social concerns (e.g., someone noticing anxiety). One study finds support for the unitary AS construct and all factors predicting suicidal ideation (Schmidt, Woolaway-Bickel, & Bates, 2001), but others do not find support for the unitary construct (Capron, Blumenthal, et al., 2012; Capron, Gonzalez, et al., 2012; Capron, Gonzalez, et al., 2012).
Several others examine the individual components: high AS cognitive (Capron, Gonzalez, Parent, Zvolensky, & Schmidt, 2012; Capron, Norr, Macatee, & Schmidt, 2012), low AS social (Capron et al., 2012, study 1), and low AS physical independently predict suicidal ideation (Capron, Cougle, Ribeiro, Joiner, & Schmidt, 2012; Capron, Kotov, & Schmidt, 2013). Although not initially intuitive, low AS physical may be related to suicide because individuals who do not fear physical symptoms may be more likely to engage in activities that increase the acquired capacity to kill oneself.

**Looming Cognitive Style**

Looming cognitive style (LCS) has been primarily studied in relation to anxiety but has recently been applied to suicide. Individuals with a looming cognitive style imagine the causes and consequences of negative events as rapidly approaching and dynamically increased in threat (Riskind, Williams, Gessner, Chrosniak, & Cortina, 2000). LCS interacts with impulsivity and with increased time perception (i.e., estimating 20 seconds have passed in a 10 second period) to predict suicidal ideation cross-sectionally (Schaefer, Esposito-Smythers, & Riskind, 2012) and with baseline suicidal ideation to predict increased ideation six weeks later (Riskind & Kleiman, 2013). Although there are only two studies on looming cognitive style in suicide, it appears that looming cognitive style functions primarily as a moderator of other suicide risk factors.

**Clinical Implications**
All six cognitive vulnerability theories possess implications for clinical intervention. To date, the most explicit research on clinical interventions has been conducted on the three major cognitive vulnerability theories, with the most research dedicated to interventions based on Beck’s theory. A prominent feature of any Cognitive Behavioral intervention is to reduce hopelessness and increase hope (see Tarrier, Taylor, & Gooding, 2008 for a review and meta-analysis). Although there is no suicide intervention that directly applies to Alloy and Abramson’s model, it could be thought that interventions to increase optimism (e.g., Riskind, Sarampote, & Mercier, 1996) may alter cognitive styles to reduce suicide risk. From the IPT perspective, clinicians are informed to emphasize belongingness with a suicidal client, by using phrases such as “we’re in this together” (Joiner & Van Orden, 2008, p. 87) and address perceived burdensomeness by challenging the belief “I’m worth more to my friends alive than dead”. Although the acquired capability for suicide is difficult to modify, Stellrecht et al. (2006) recommends addressing modifiable predictors of the acquired capability, such as emotion regulation and distress tolerance.

There have also been interventions that target the other three cognitive vulnerabilities to suicide (rumination, anxiety sensitivity, and looming cognitive style), albeit with the goal of reducing other problematic outcomes (e.g., depression and anxiety). Thus research is needed to examine whether these interventions are also appropriate to prevent suicide. Interventions that target to rumination to reduce depression include behavioral activation i.e., avoiding rumination by engaging in pleasurable activities (Watkins, et al., 2007). Interoceptive exposure is found to be
effective at reducing anxiety sensitivity in highly anxious individuals (Keough & Schmidt, 2012). Finally, interventions that target looming cognitive encourage anxious individuals to slow down the perceived arrival of threat cues (Riskind, Rector, & Taylor, 2012).

**An integrated transactional diathesis-stress model of suicide risk**

There are two goals to this final section: 1) to unify existing cognitive vulnerability theories of suicide into an integrated mediational model and 2) to introduce a transactional (i.e., stress generation) aspect to this integrated model. This etiological chain explains how the desire to die develops from distal vulnerability to the most proximal causes of suicidal ideation.

**Integrated diathesis stress model**

An important feature of all six theories discussed in this review is that they are either implicitly or explicitly diathesis-stress (or stress-vulnerability) models. They assume that cognitive vulnerabilities create the onset of suicidal ideation after the occurrence of stressful life events. Likewise, stressful life events would increase the likelihood of suicide. However, this would primarily be true for those who are high in the cognitive vulnerability. We propose that these theories may represent a mediational chain ranging from distal (e.g., negative cognitive style, rumination, anxiety sensitivity, and looming cognitive style) to medial (e.g., hopelessness) to proximal (e.g., perceived burdensomeness and thwarted belonging) causes of suicide. For example, hopelessness is preceded by negative cognitive style (Hankin, Fraley, & Abela, 2005) and rumination (Miranda et al., 2013; Smith et al., 2006) and it may be that the IPT variables are
preceded by hopelessness. Many of the items on the INQ (e.g., “these days I think I matter to the people in my life”) could be considered specific hopeless beliefs. Thus, once individuals with a negative cognitive style or ruminative response style experience negative life events and generate hopelessness, they may progress to the desire to die through developing beliefs that they are a burden to others or do not belong to a social group. This is a relatively novel idea that shifts the research focus from comparing the theories to establish scientific dominance to instead attempting to integrate seemingly compatible findings. One question that this model leaves unanswered, however, is what role negative events have after the activation of a cognitive vulnerability. We propose that negative events both activate distal cognitive vulnerabilities (e.g., negative cognitive style) and then mediate the effects of these cognitive vulnerabilities on suicidal ideation. This proposition is informed by the transactional stress generation theory.

**Advent of Transactional Cognitive Models**

Recent calls to revise cognitive vulnerability models have come from researchers studying stress generation (Eberhart, Auerbach, Bigda-Peyton, & Abela, 2011). Stress generation research has shown that depressed individuals not only experience more stressful events but also actively generate them (Hammen, 1991; see Liu & Alloy, 2010; Liu, 2013 for reviews). This is particularly true for “dependent” events that are contingent on the person’s own behavior (e.g., an argument with a spouse) rather than “independent” or “fateful” events that occur regardless of behavior (e.g., a family member getting into a car accident). This stress generation effect has been found in individuals with full depression diagnoses (Harkness & Luther, 2001) and subclinical
depressive symptoms (Gibb, Beevers, Andover, & Holleran, 2006) in time periods from one week (Gibb et al., 2006) to one year (Hammen, 1991).

Modifications to the original stress generation model suggest that those who are cognitively vulnerable to depression (but not depressed), not just those who are currently depressed generate stressful life events (e.g., Joiner, Wingate, & Otamendi, 2005; Safford, Alloy, Abramson, & Crossfield, 2007). According to these models, negative life events activate cognitive vulnerabilities and produce depression as well as generate further negative events (Hankin & Abramson, 2001). Subsequently, events generated by cognitive vulnerability may contribute to the perpetuation of depression and generate further events.

As cognitive vulnerabilities predict both stress generation and suicide, it may be that the vulnerability-suicide relationship is mediated by the generation of stressful events. That is, while dispositional cognitive vulnerabilities may be a distal cause of suicide, the events that are generated by these vulnerabilities lead to the most proximal cause of suicide. This transactional model has been applied to negative cognitive style (Liu, Choi, Boland, Mastin, & Alloy, 2013; Safford, et al., 2007), hopelessness (Joiner, et al., 2005), rumination (McLaughlin & Nolen-Hoeksema, 2012), and anxiety sensitivity and looming cognitive style (Riskind, Kleiman, Weingarden, & Danvers, in press). Figure 1 presents this model.
In this model, first, individuals who are high in cognitive vulnerability are at higher risk for suicidal ideation. As previously mentioned, the model is *atheoretical* in the sense that it could apply to any stable, trait-like vulnerability (e.g., negative cognitive style, rumination). In the second step, negative life events occur that activate the vulnerability through stress-diathesis interaction. This leads to the third step where generation of negative events occurs, leading to more medial risk factors, such as hopelessness. In the fourth step, stress generation continues to contribute to the development of more specific hopeless beliefs, i.e., perceived burdensomeness and thwarted belongingness finally leading to suicidal ideation.

This model assumes that stressful events play two roles, one as stress that moderates the impact of cognitive vulnerability, and one as a mediator of the effects of the vulnerability on suicide. That is, events first activate cognitive vulnerabilities (diathesis-stress model) that cause further events to be generated (transactional model), leading to increased suicidal ideation. It also assumes that dependent stressful events,
which are most involved in stress generation, are the primary mediators. We propose that
the effects of this process on suicide will primarily occur through the generation of
dependent rather than the occurrence of independent events. Indeed, independent events
are found to precede suicide attempts while those that were independent do not
(Heikkinen et al., 1997). It should be noted that this does not preclude the possibility of
independent events activating a cognitive vulnerability (e.g., someone may feel hopeless
after a family member gets into a car accident).

The proposed model does not specify any risk factor as the single diathesis, but
rather allows for any of a number of cognitive vulnerability factors in be placed into the
model. It seems plausible that the risk for suicide could be caused by different
vulnerabilities for different people or that for some, risk for suicide may be conferred by
the synergy of multiple vulnerabilities. This model mirrors newer transdiagnostic models
that do not specify specific risk factors but rather focus on mechanisms for non-specific
risk factors (e.g., Nolen-Hoeksema & Watkins, 2011). In summary, this model expands
the existing diathesis-stress models of suicide to explain the pathways through which
cognitive vulnerabilities, once activated by stress, create the desire to die. It is a new and
novel contribution to the suicide literature in that no previous model has addressed this
transactional stress-generation process through which suicidal ideation develops.

References for appendix

Abramson, L Y, Alloy, L B, Hogan, M. E., Whitehouse, W. G., Cornette, M., Akhavan,
487.


83


symptoms and suicidal ideation and behaviors in outpatients with bipolar disorder. *Journal of Affective Disorders, 97*, 91–99.


REFERENCES


BIOGRAPHY

Evan M. Kleiman graduated from Council Rock High School, Newtown, Pennsylvania in 2004. He received his Bachelor of Arts in psychology from Temple University in 2008. He received his Master of Arts in Psychology from George Mason University in 2010. He is currently on his clinical internship at Temple University.