Cognitive Vulnerabilities as Predictors of Stress Generation in Early Adolescence: Pathway to Depressive Symptoms

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Abstract

Although individuals with depression have been found to experience a higher rate of stress in their lives, it remains unclear to what extent other personal characteristics may contribute to stress generation. The current study extended past research by examining the effects of two theoretically and empirically supported cognitive vulnerabilities to depression (negative cognitive style and rumination) as predictors of dependent interpersonal and achievement events, independent events, and relational peer victimization. In a diverse sample of 301 early adolescents (56% female; M_{age} = 12.82 years), we found that negative cognitive style prospectively predicted the experience of dependent interpersonal stress and relational victimization, and that rumination did not predict stress in any of the domains. Furthermore, the occurrence of intervening stress mediated the associations between negative cognitive style and subsequent depressive symptoms. Additionally, whereas negative cognitive style predicted relational victimization among both boys and girls, girls were particularly vulnerable to developing depressive symptoms following the occurrence of relational victimization. Thus, a negative cognitive may contribute to the occurrence of stressful events, which in turn increases depressive symptoms. Girls may be particularly reactive to the effects of relational victimization, representing one pathway through which sex differences in depression may emerge.

Keywords

stress generation; peer victimization; adolescence; cognitive vulnerability; depression

Adolescence is a well-established risk period for depression, such that twenty percent of adolescents report the first onset of depression by age 18 (Hankin et al., 1998; Kessler, Avenevoli, & Merikangas, 2001). Although girls and boys report comparable levels of depressive symptoms during childhood and early adolescence, the female preponderance in depressive symptoms and disorders begins to emerge by age 13 (Hankin & Abramson, 2001; Hyde, Mezulis, & Abramson, 2008). The substantial increase in stress that occurs during this period has consistently been found to predict an increase in depressive symptoms during adolescence (e.g., Ge, Lorenz, Conger, Elder, & Simons, 1994; Mezulis, Funasaki, Charbonneau, & Hyde, 2010), particularly among girls (Hankin, Mermelstein, & Roesch, 2007; Rudolph & Hammen, 1999; Shih, Eberhart, Hammen, & Brennan, 2006). Although stress increases the risk of depression, not all individuals who experience stressful life events subsequently develop depression (Abela & Hankin, 2008; Mazure, 1998). To explain

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the differential vulnerability to depression following stress, cognitive vulnerability-stress models of depression suggest that an underlying cognitive vulnerability to depression is activated by the occurrence of stress, which increases the likelihood of experiencing depression (Ingram, Miranda, & Segal, 2006). Although much research supports the cognitive vulnerability-stress models of depression (for reviews, see Abela & Hankin, 2008; Alloy et al., 2006; Ingram et al., 2006), growing evidence also indicates that individuals are not passive respondents to events, but actively contribute to the occurrence of stress in their lives (Hammen, 1991; Liu & Alloy, 2010).

This process, coined as stress generation, suggests that individuals who are depressed or vulnerable to depression have certain characteristics that contribute to the occurrence of a greater number of stressors, which, in turn, increases the likelihood of depression (Hammen, 1991). Key to this theory is the distinction between independent (fateful) events to which an individual would not be expected to contribute, such as death or natural disasters, and dependent stressors that occur at least in part because of the characteristics or behavior of an individual, such as a bad report card (Hammen, 1991; 2005). Particularly relevant types of dependent stress during adolescence include interpersonal stressors, characterized by conflict and difficulties with another person, and achievement stressors, defined as failure or disappointment towards a goal (Hammen, 2005). Although both independent and dependent stressors may precede the onset of depression, a number of studies have found that dependent stress, particularly interpersonal stress, is most strongly related to depressive symptoms (Kendler, Karkowski, & Prescott, 1999), particularly among girls (Hankin et al., 2007; Mezulis et al., 2010). Because girls place more emphasis on interpersonal relationships than boys (Gore, Aseltine, & Colten, 1993), they may be more vulnerable to the effects of interpersonal stress. In fact, adolescent girls not only report more interpersonal stress (Ge et al., 1994; Rudolph & Hammen, 1999), but also experience greater reactivity to the occurrence of such stress relative to boys (Hankin et al., 2007; Shih et al., 2006). Girls' greater exposure and reactivity to interpersonal stress has been found to partially explain the emerging sex difference in depressive symptoms during adolescence (Hankin et al., 2007; Shih et al., 2006).

In recent years, considerable research has sought to determine pathways through which dependent interpersonal stress is generated (for a recent review, see Liu & Alloy, 2010). Although most of this research has focused on the role of depressive, and more recently anxiety, symptoms as predictors of dependent stress in adolescence (e.g., Uliaszek et al., 2012), more enduring characteristics, such as cognitive vulnerabilities, also have been explored as contributors to stress generation (e.g., Kercher & Rapee, 2009; Safford, Alloy, Abramson, & Crossfield, 2007). Cognitively vulnerable individuals may possess certain characteristics that elicit the type of stress that triggers their vulnerability, which increases the risk for depression (Shih, Abela, & Starrs, 2009).

The cognitive vulnerabilities featured in the hopelessness theory – namely negative inferential or cognitive style and hopelessness – have received the most attention in the stress generation literature. According to hopelessness theory, negative inferential style, characterized by the tendency to attribute negative events to stable and global causes and to infer negative consequences and negative self-characteristics following the occurrence of a stressful event, increases the risk of hopelessness, which, in turn, leads to depression (Abramson, Metalsky, & Alloy, 1989). Joiner, Wingate, and Otamendi (2005b) extended this theory to stress generation, finding that hopelessness predicted increases in interpersonal stress and that this stress partially mediated the relationship between hopelessness and subsequent depressive symptoms. Several studies recently have examined negative cognitive style, a more distal risk factor for depression, as a predictor of stress (Kercher & Rapee, 2009; Safford et al., 2007; Shih et al., 2009). Kercher and Rapee (2009) found that the

composite cognitive vulnerability of negative cognitive style and rumination predicted increases in dependent stress in a sample of young adolescents. Additionally, Safford et al. (2007) found that individuals with both a negative inferential style and dysfunctional attitudes had higher levels of dependent interpersonal stress, but not independent or achievement stressors. To our knowledge, only one study has examined negative inferential style individually as a predictor of stress generation. This study found that children with a more negative inferential style reported significantly more dependent interpersonal stress than children with a more positive inferential style (Shih et al., 2009). However, the children in this study had a depressed parent and might have been more cognitively vulnerable than an unselected sample of children and adolescents would be. Thus, no research to date has investigated the effects of negative cognitive styles in stress generation among community samples of adolescents.

Rumination, which is featured in another well-corroborated cognitive model of depression, is underrepresented in stress generation research (Liu & Alloy, 2010). As formulated by the response styles theory, rumination is the tendency to focus repetitively on depressive mood and its potential causes and consequences (Nolen-Hoeksema, 1991). To date, few studies have examined rumination as a predictor of stress generation in adolescents and young adults. Flynn, Kecmanovic, and Alloy (2010) found that rumination predicted interpersonal and achievement stressors in young adults, but only interpersonal stress predicted subsequent depressive symptoms. Additionally, Hankin, Stone, and Wright (2010) investigated co-rumination, the joint process of rumination in a dyadic relationship, in adolescents. Co-rumination prospectively predicted increases in dependent interpersonal stress, which mediated the relationship between co-rumination and later internalizing symptoms. However, co-rumination, which may be a social manifestation of rumination, is a highly correlated but distinct construct from depressive rumination (Rose, 2002). Thus, it remains unclear if these findings generalize to depressive rumination in early adolescents.

Further, few studies have examined cognitive vulnerabilities as predictors of specific stress domains, such as peer stress (for exceptions, see Joiner, Wingate, Gencoz, & Gencoz, 2005a; McLaughlin & Nolen-Hoeksema, 2012). Given the increasing amount of time spent with peers during adolescence (Hill, Bromell, Tyson, & Flint, 2007), cognitively vulnerable individuals may unintentionally behave in ways that evoke difficulties specifically with peers. Consistent with this notion, hopelessness was found to predict increases in interpersonal rejection from roommates among young adults (Joiner et al., 2005a). Given that peer relationships take on a newfound importance during adolescence (Hill et al., 2007), adolescents may be especially sensitive to disruptions within peer relationships, thereby increasing the likelihood of depression. Although adolescents may experience more peer stress in general than children or adults (Ge et al., 1994), adolescents with certain cognitive vulnerabilities may also experience more salient forms of peer stress, such as peer relational victimization. Relational victimization, defined as social exclusion, gossiping, and reputational threat (Crick, Casas, & Nelson, 2002), has been found to be a particularly damaging form of peer stress during adolescence (e.g., Desjardins & Leadbeater, 2011; Prinstein, Boergers, & Vernberg, 2001). Only recently has research begun to examine relational victimization in stress generation, providing evidence that children with depressive symptoms reported increases in relational victimization (Gibb &Hanley, 2010). However, this finding was specific to girls, suggesting that girls may be particularly vulnerable to the stress generation effect for peer relational victimization. Further, a recent study by McLaughlin and Nolen-Hoeksema (2012) is the first to find that higher levels of rumination predicted increases in peer victimization among adolescents, and that exposure to relational victimization fully mediated the relationship between rumination and internalizing symptoms. However, no study has examined negative cognitive style and peer victimization in a stress generation framework.

Although previous research suggests that negative cognitive style and rumination contribute to the occurrence of dependent stress among adults (e.g., Flynn et al., 2010; Safford et al., 2007), fewer studies have examined these cognitive vulnerabilities in adolescent samples (see Kercher & Rapee, 2009; Shih et al., 2009; McLaughlin & Nolen-Hoeksema, 2012 for exceptions) and no study to date has simultaneously investigated them in the same study. Concurrent examination of these cognitive vulnerabilities as predictors of subsequent stress during adolescence, however, would allow for more specific conclusions regarding which vulnerability confers the greatest risk of generating stress at a time when individuals are vulnerable to the effects of interpersonal stress and at greatest risk for developing depressive symptoms (Hankin & Abramson, 2001). Additionally, examining cognitive vulnerabilities as predictors of particularly salient types of interpersonal stress, such as relational victimization, would enhance our understanding of pathways through which individuals become the target of relational victimization. Thus, identifying whether certain cognitive vulnerabilities contribute to the occurrence of specific types of stress, such as relational victimization, and subsequent depressive symptoms would enhance prevention programs aimed at targeting these processes during this vulnerable period.

To address gaps in previous research, the current study examined two prominent cognitive vulnerabilities as predictors of life stress, beyond the effects of initial depressive and anxiety symptoms, in a sample of racially and socioeconomically diverse early adolescents. Unlike most community samples used in prior research, the current study utilized a sample that was predominantly African American and Caucasian; thus, it stands apart from previous research of stress generation. First, negative cognitive style and rumination were examined as predictors of independent stressors, both types of dependent stressors (interpersonal and achievement), and relational victimization. Consistent with past research, we hypothesized that negative cognitive style and rumination would significantly predict dependent interpersonal stress and relational victimization, but not independent or dependent achievement-related stress (Kercher & Rapee, 2009; Shih et al., 2009). Second, we examined whether intervening stress mediated the relationship between initial cognitive vulnerabilities and subsequent depressive symptoms. We hypothesized that dependent interpersonal stress and relational victimization would mediate the associations between initial cognitive vulnerabilities and increases in depressive symptoms at follow-up. Third, given past research documenting sex differences in stress generation and stress-reactivity (Hankin et al., 2007; Shih et al., 2006), we investigated sex as a moderator of the relationships between cognitive vulnerabilities and subsequent stress, and as a moderator of the relationships between stress and subsequent depressive symptoms as part of the mediation pathway. Thus, we hypothesized that the stress generation effect would be more prominent for girls, and that sex would moderate the mediating role of stress (dependent interpersonal and relational victimization) in the relationships between negative cognitive style and rumination and subsequent depressive symptoms.

Method

Participants

Sample recruitment—The sample consisted of 301 participants in the Temple University Adolescent Cognition and Emotion Project, a prospective longitudinal study of the development of adolescent depression. African American and Caucasian, male and female adolescents, ages 12-13, and their mothers or primary female caretakers (referred to hereafter as mothers) were recruited from Philadelphia- area middle schools. Two main modes of recruitment were used. With the permission of the Philadelphia School District, mailings were sent to parents of eligible children, who then received follow-up phone calls from project staff to invite participation in the study (approximately 68% of the sample).

Study advertisements were also placed in Philadelphia- area newspapers (approximately 32% of the sample). In order to qualify, the adolescent had to be 12 or 13 years old and self-identify as Caucasian/White, African American/Black or Biracial (adolescents could be Hispanic if they also identified as White or Black). Families were excluded if there was no mother or primary female caretaker able to participate, if the adolescent or mother did not read or speak English well enough to participate, or if the adolescent or mother had severe cognitive impairment, psychosis, or any other medical or psychiatric problem preventing completion of the study assessments. All participants who met inclusion and exclusion criteria were invited to participate in the study, at which time female caregivers and adolescents provided written informed consent and assent, respectively. This study was completed with approval by the Institutional Review Board (IRB) at Temple University.

Study Sample—The current sample included 301 adolescents (M_{age} = 12.82 years; SD = 0.61) who completed a baseline and follow-up assessment, approximately 9 months apart (M = 9.06; SD = 3.50). The sample was 52% African American and 56% female, and 97% of female caregivers were the adolescents' mothers. Participants had a wide range of socioeconomic backgrounds, with 24.90% of participants having less than $30,000 annual family income, 36.20% falling between $30,000 - $59,999, 18.40% falling between $60,000 - $89,999, and 20.50% having above $90,000. Additionally, 49% of the sample was eligible for free lunch.

Procedures

At baseline, adolescents completed self-report questionnaires evaluating current depressive and anxiety symptoms, negative cognitive style, and rumination. At follow-up, approximately nine months later, participants completed self-report questionnaires evaluating current depressive symptoms and the experience of peer victimization since baseline. Adolescents and their mothers also completed a self-report questionnaire measuring all stressful life events that the adolescent had experienced since baseline; adolescents were then interviewed to obtain further information on event occurrences. Adolescents were compensated for their participation at both study visits.

Measures

Depressive symptoms—The Children's Depression Inventory (CDI; Kovacs, 1985) is a 27-item self-report questionnaire measuring depressive symptoms in youth. All items are rated on a 0 to 2 scale and total scores range from 0 to 54, with higher scores indicating greater depressive symptoms. The CDI has been found to be a reliable and valid measure of depressive symptoms in youth (Klein, Dougherty, & Olino, 2005). Internal consistency in this sample was a = .86 at baseline and a = .83 at follow-up.

Anxiety symptoms—The Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997) is a 39-item self-report questionnaire measuring anxiety symptoms in youth. It is composed of scales measuring physical symptoms (tense/restless and somatic/autonomic symptoms), social anxiety (humiliation/rejection and public performance fears), harm avoidance (perfectionism and anxious coping), and separation anxiety (fears of separation from parents). Adolescents rate each item using a 4-point Likert scale, with higher scores indicating higher anxiety levels. The total score of the MASC subscales was used in the current study. The MASC has excellent retest reliability and good convergent and discriminant validity (March et al., 1997). Internal consistency in this sample was a = .86 at baseline.

Negative Cognitive Style—The Adolescent Cognitive Style Questionnaire-Modified (ACSQ-M; Alloy et al., 2012) is a modified version of the ACSQ (Hankin & Abramson,

2002), which measures adolescents' cognitive styles based on their interpretations of the causes and consequences of negative life events. In addition to events in the achievement and interpersonal domains from the ACSQ, the ACSQ-M also contains appearance-related negative life events. Adolescents are presented with 12 hypothetical negative events (4 events per domain) and are asked to make inferences regarding the causes (internal/external, stable/unstable, and global/specific), consequences, and self-worth implications of each event. Each dimension is rated on a 1 to 7 scale, with higher scores indicating a more negative cognitive style. Consistent with previous studies (Alloy et al., 2006), an overall negative composite score was calculated by summing the dimensions of stability, globality, consequences, and self across the achievement, interpersonal, and appearance domains. The ACSQ and ACSQ-M have excellent internal consistency, good retest reliability, and adequate factor structure as measures of negative cognitive style in adolescents (Hankin & Abramson, 2002, Alloy et al., 2012). Internal consistency in this sample for overall negative composite score at baseline was $\alpha = .94$.

Rumination—The Children's Response Styles Questionnaire (CRSQ; Abela, Vanderbilt, & Rochon, 2004) is a 25-item self-report questionnaire measuring children's cognitive responses to their sad or depressed mood. The CRSQ measures response styles on three subscales: rumination, distraction, and problem-solving. Items are rated on a scale of 1 to 4, with higher scores within a subscale indicating a greater tendency to employ that response style when experiencing depressed mood. The current study used only the rumination subscale. The CRSQ has shown good validity and moderate internal consistency in previous studies (Abela et al., 2004). Internal consistency for the rumination subscale at baseline in this sample was $\alpha = .85$.

Relational Peer Victimization—The Social Experience Questionnaire - Self Report (SEQ-S; Crick & Grotpeter, 1996) is a 10-item questionnaire measuring the frequency with which youths are victimized by their peers. The SEQ-S is divided into three subscales of peer acts: peer relational victimization, peer overt victimization, and receipt of prosocial acts from peers. Items are rated on a 0 to 5 scale with higher scores indicating greater levels of peer victimization or prosocial behavior. The current study used the relational victimization subscale (e.g., others left you out). The SEQ-S has previously demonstrated support for the measure's factorial structure, adequate internal consistency, and good convergent validity (Crick & Grotpeter, 1996). Internal consistency for the relational victimization subscale in this sample was $\alpha = .69$ at follow-up.

Life Events—The Adolescent Life Events Questionnaire (ALEQ; Hankin & Abramson, 2002) is a self-report questionnaire designed to assess 63 negative life events that typically occur during adolescence, including familial, peer, and achievement events. Adolescents and their mothers completed separate versions of the ALEQ and indicated all events that occurred in the adolescent's life since baseline. Following completion of the ALEQ, adolescents completed the Life Events Interview (LEI; Safford et al., 2007), during which trained interviewers determined whether events endorsed on the ALEQ by adolescents and/ or their mothers met a priori definitional criteria and occurred during the outlined time period. Interviewers used a priori probes specific to each event to aid in determining event eligibility. Events not meeting the stringent criteria were disqualified, thus combating potential reporter bias.

A priori ratings for all 63 events on dependence (e.g. fight with friend) and independence (e.g. a close family member died) were provided by four clinical Ph.D. students ($\kappa = .76$). Any discrepancies were discussed before a consensus rating was made, resulting in a total of 42 dependent and 21 independent events. Events were further categorized as either interpersonal (e.g. romantic break up) or achievement (e.g. fails a test), resulting in 47

interpersonal (31 dependent; 16 independent) and 10 achievement events (all 10 were categorized as dependent). All events judged as neither interpersonal nor achievement-based were rated as "other" (6 events). Because cognitive vulnerabilities were not expected to contribute to independent events regardless of event type, all events categorized as independent were summed to create an "independent" stress variable (21 events; "a close family member died"). The present study analyzed independent, dependent interpersonal, and dependent achievement stressors. All qualifying events based on the LEI were totaled in each category, with higher scores indicating more exposure to stressors. Thus, scores are counts of the total number of types of stressors that occurred, rather than frequency of events. Reliability and validity have been demonstrated for the ALEQ (e.g., Hankin, 2008; Hankin et al., 2010) and for the LEI (e.g., Safford et al., 2007).

Results

Descriptive Analyses

Correlations for all primary study variables are reported in Table 1. As expected, negative cognitive style and rumination were significantly positively correlated with each other, and both were significantly positively correlated with symptoms of anxiety and depression at baseline and follow-up. Further, all stressors were significantly positively correlated with each other, and with symptoms of depression at both time points. Only dependent interpersonal events and relational victimization were correlated with baseline anxiety symptoms as well as with both negative cognitive style and rumination.

Descriptive statistics for the overall sample and by sex are presented in Table 2. Analyses also were conducted to determine if primary outcome variables and demographics (sex, race, and socioeconomic status, as indexed by eligibility for free lunch) were associated (t-tests and effect sizes also reported in Table 2). Girls reported significantly higher levels of dependent interpersonal stress and independent stress, but not more achievement stress or relational victimization than boys. African American adolescents reported more achievement-related stress ($t = 2.25$, $p = .03$) and independent stress ($t = −3.26$, $p = .001$) than Caucasian adolescents, but not more dependent interpersonal stress ($t = −.41$, $p = .69$) or relational victimization ($t = −.11$, $p = .91$). Additionally, lower SES was significantly related to achievement-related ($t = 3.28$, $p = .001$) stressors. Given these findings, sex, race, and SES were included as covariates in all analyses in which they were significantly associated with stressors serving as the outcome variable (Miller & Chapman, 2001).

Other study variables also were examined to determine if there were any demographic differences. There were no significant sex differences on rumination or negative cognitive style or any symptoms of depression and anxiety at baseline. However, the expected sex difference in depressive symptoms emerged at follow-up, with girls reporting significantly more depressive symptoms than boys. There were no racial or SES differences on cognitive vulnerability measures or symptoms.

In terms of the distribution of stress variables, dependent interpersonal, achievement, and independent stressors were normally distributed variables. Twenty-five participants (8.3%) reported no independent stressors, 24 (8.0%) reported no achievement stressors, and only 12 (4.0%) reported no dependent interpersonal stressors. There was a high preponderance of adolescents reporting the absence of relational victimization (46.2%). However this rate of relational victimization is comparable to previous studies (Bond, Carlin, Thomas, Rubin, & Patton, 2001) with 54.8% of adolescents reporting at least one occurrence of relational victimization over the follow-up period.

Prospective Analyses

To examine whether negative cognitive style and rumination predicted negative life stressors at follow-up, controlling for initial levels of depressive and anxiety symptoms, multiple hierarchical linear regressions were conducted. In these analyses, each type of stress (independent, dependent interpersonal, dependent achievement, and relational peer victimization) served as the dependent variable. To examine the unique effects of negative cognitive style and rumination on the generation of stress beyond the effects of symptoms, initial levels of depressive and anxiety symptoms were entered in Step 1 of the regression. In addition, any demographic variables (race, sex, or SES) associated with the outcome variable and time elapsed between the baseline and follow-up assessments were also entered in Step 1. Negative cognitive style and rumination were entered simultaneously in Step 2 of each regression analysis.[1]

As hypothesized, negative cognitive style significantly predicted dependent interpersonal stress and relational peer victimization at follow-up, but did not predict independent or dependent achievement-related stress (Table 2). Contrary to study hypotheses, rumination did not significantly predict any type of stress, including dependent interpersonal, achievement, independent, or relational victimization stress.[2] Furthermore, sex and race did not moderate the effects of negative cognitive style or rumination on reported stress at follow-up.[3]

Mediation Analyses

To investigate the hypothesis that the occurrence of life stress mediated associations between cognitive vulnerabilities and prospective increases in depressive symptoms, we conducted mediation analyses using a bootstrapping approach, with N = 5000 bootstrap resamples and a 95% confidence interval, to assess the indirect effects of cognitive vulnerabilities on depressive symptoms via life events (Preacher & Hayes, 2008). Mediation tests were only conducted when there was evidence of a significant direct relationship between cognitive vulnerabilities and subsequent stressors; thus, only dependent interpersonal stress and relational victimization were examined as potential mediators of the relation between negative cognitive style and depressive symptoms. Bootstrapping is a nonparametric resampling procedure that approximates the sampling distribution of a statistic from the available data. Sampling distributions of indirect effects are generated by taking a sample, with replacement, of size N from the full dataset and calculating the indirect effects in the resamples (Preacher & Hayes, 2008).

To meet criteria for significant mediation of the relationship between negative cognitive style and depressive symptoms, the following conditions must be met: (1) negative cognitive style must predict depressive symptoms; (2) negative cognitive style must predict dependent interpersonal life events and/or relational victimization; (3) dependent interpersonal events and/or relational victimization must predict depressive symptoms; (4) the relation between negative cognitive style and increases in depressive symptoms must be reduced when the stressors are included in the model (i.e., a significant indirect effect; Preacher, Rucker, & Hayes, 2007). Additionally, to determine whether sex differences occurred in the mediation analyses (i.e., whether the pathways from cognitive vulnerabilities to depressive symptoms via stressors were stronger for girls versus boys), we conducted moderated mediation

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[1]A negative binomial regression was also conducted for relational victimization given its non-normal distribution and large percentage of values of zero.
[2]The results for the negative binomial regression were consistent with those presented in the hierarchical linear regressions. Results available by request from the first author.
[3]We also examined the interactive effects of negative cognitive style and rumination on stress generation. However, these findings were not significant and thus, were not included in the main text.

analyses (Preacher et al., 2007). Thus, to meet criteria for moderated mediation, the indirect pathway between negative cognitive style and depressive symptoms via dependent interpersonal events or relational victimization must be stronger among girls compared to boys (Preacher et al., 2007). In all analyses, initial depressive and anxiety symptoms, sex, and time elapsed between baseline and follow-up assessments were controlled.

Consistent with our hypotheses, intervening life stressors significantly mediated the relationships between baseline negative cognitive style and prospective increases in depressive symptoms at follow-up (Table 4). More specifically, and as expected, all conditions of mediation were met such that 1) negative cognitive style predicted increases in depressive symptoms directly, 2) negative cognitive style significantly predicted both dependent interpersonal stress and relational victimization, and 3) both types of stress significantly predicted depressive symptoms at follow-up. Further, the indirect effects of negative cognitive style on depressive symptoms via relational victimization and dependent interpersonal stress was significant, indicating that the inclusion of dependent interpersonal stress and relational victimization in the model reduced the effect of negative cognitive style on depressive symptoms (Table 4). This suggests that both stressors uniquely mediated the relationship between negative cognitive style and prospective increases in depressive symptoms at follow-up. Additionally, sex moderated the indirect effect of negative cognitive style on follow-up depressive symptoms via relational victimization only. This relationship was such that the conditional indirect pathway between negative cognitive style and depressive symptoms via relational victimization was significantly stronger among girls than boys (Table 5). Thus, girls experienced greater increases in depressive symptoms than boys following relational victimization events. Sex did not moderate the indirect effect of negative cognitive style on depressive symptoms via dependent interpersonal stress.[4]

Discussion

The present study was the first prospective study to simultaneously examine both negative cognitive style and rumination as predictors of stress in a sample of early adolescents. It is also the first study to investigate both cognitive vulnerabilities as predictors of subtypes of stress domains, including independent, dependent interpersonal, and achievement events, as well as peer relational victimization. Overall, we found that negative cognitive style predicted higher levels of dependent, but not independent, stressors at follow-up. More specifically, and consistent with hypotheses, we found that negative cognitive style predicted higher levels of dependent interpersonal events and relational victimization, but not dependent achievement or independent stress. In contrast with our hypotheses and with previous research, rumination was not significantly associated with any stress domains (e.g., Flynn et al., 2010). Also, intervening dependent interpersonal stress and relational victimization mediated the association between negative cognitive style and prospective increases in depressive symptoms over the follow-up period. Further, girls experienced greater increases in depressive symptoms compared to boys following experiences of relational victimization, representing one pathway by which negative cognitive style may put early adolescent girls at risk for depression.

Our finding that negative cognitive style predicted dependent interpersonal stressors and relational victimization, but not independent stressors, was consistent with previous research evaluating stress generation (Kercher & Rapee, 2009; Safford et al., 2007; Shih et al., 2009), but extends this work to younger adolescents. There are several ways in which negative cognitive styles may contribute to more stressful events in individuals' lives, particularly in interpersonal relationships. First, making negative inferences for the causes and implications

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[4]These results are available upon request by the first author.

of negative events may result in behaviors that are not well-received by peers, such as excessive reassurance-seeking (e.g., Shih et al., 2009). This tendency to make negative inferences for life events may also prevent the development of positive peer relationships. In addition, Joiner et al. (2005b) demonstrated that individuals with negative cognitive styles are more likely to experience hopelessness, and that hopelessness in itself may generate interpersonal stress when it is expressed behaviorally. Thus, it is possible that early adolescents who had more negative cognitive styles were also more likely to exhibit hopelessness, which, in turn, made them more likely to experience negative interpersonal interactions with their peers or to be the targets of relational victimization.

Our study was also one of the first to evaluate rumination as a predictor of stress among early adolescents. Although previous studies have found support for rumination as a predictor of dependent stress and relational victimization (Kercher & Rapee, 2009; Flynn et al., 2010; McLaughlin & Nolen-Hoeksema, 2012), the current study found that rumination was not predictive of any type of stress. There are several reasons why the current findings may be discrepant from past research. First, whereas Flynn et al. (2010) found that rumination predicted higher levels of interpersonal and achievement stressors in young adults, the current study involved a sample of early adolescents. It may be that prior to the consolidation of rumination during later adolescence (Hankin, 2008), rumination tends to take place more as a reaction to life stressors among early adolescents (e.g., Rood, Roelofs, Bogels, & Meester, 2012) as opposed to conferring risk for the occurrence of new life events that are dependent on the adolescents' behavior. Additionally, it is possible that in the current sample, rumination did not interfere with interpersonal processes or behaviors, such as ineffective communication strategies, that contribute to interpersonal stress generation (McLaughlin & Nolen-Hoeksema, 2012). Further, because rumination is the tendency to focus on dysphoric mood, stress generation may be more likely to occur when sad mood is more frequent or severe. Thus, the slightly lower levels of depressive symptoms in the current study may have limited the contribution of rumination to stress generation. Finally, other forms of rumination, such as co-rumination (Hankin et al., 2010), a different type of cognitive vulnerability that is an interpersonal process, might be more likely to generate dependent interpersonal stress during adolescence than depressive rumination.

Of importance, the current study also found that both dependent interpersonal stress and relational victimization uniquely mediated the relationship between negative cognitive style and subsequent depressive symptoms, controlling for initial symptoms. This suggests that negative cognitive styles may contribute to the generation of interpersonal stressors, and more severe forms of peer stress such as relational victimization, which then increase adolescents' susceptibility to experiencing depressive symptoms (e.g., Safford et al., 2007). This stress generation may be particularly harmful given research documenting that adolescents with more negative cognitive styles are the most likely to experience depression following life stressors (e.g., Alloy et al., 2006). Thus, given that negative cognitive style is itself a vulnerability for depression, adolescents with a negative cognitive style may be doubly at risk for depression – both because a negative cognitive style increases reactivity to stress and increases the likelihood of experiencing these stressors that may trigger depression.

Notably, several sex differences emerged in the current study. Consistent with several previous studies documenting that girls experience more negative stressors during adolescence than boys (Ge et al., 1994; Hankin & Abramson, 2001), we found that girls reported higher levels of both dependent interpersonal and independent stressors. However, girls and boys did not differ on negative cognitive style or rumination, consistent with previous literature that has posited that cognitive vulnerabilities continue to coalesce during early adolescence and that sex differences in these vulnerabilities may emerge only in later

adolescence (Abela & Hankin, 2008; Hankin, 2008). In contrast with some previous studies (Shih et al., 2006; 2009), there were no sex differences in the impact of cognitive vulnerabilities on any stressors reported at follow-up. Some of these sex differences in the effects of vulnerabilities on stress may emerge only in later adolescence (e.g., Safford et al., 2007). Indeed, some studies of negative cognitive style and rumination also have not found sex differences in stress generation among early adolescents (Kercher & Rapee, 2009; Shih et al., 2009).

Our results did indicate, however, that there was a sex difference in the indirect effect of negative cognitive style on depressive symptoms via relational victimization, such that girls were more likely than boys to experience increases in depressive symptoms following relational victimization. Thus, although girls with a negative cognitive style were not more likely than boys to experience peer victimization, they were more reactive to the effects of victimization in terms of depressive symptoms. However, girls with a negative cognitive style were not more reactive to dependent interpersonal events than boys, suggesting that early adolescent girls may be more reactive than boys only to more severe forms of interpersonal stress such as relational victimization.

The present study contributes to the existing literature by suggesting the potential utility of identifying adolescents with cognitive vulnerabilities to depression, specifically a negative cognitive style. In addition to being vulnerable to depression because of their reactivity to stress, these individuals may indirectly contribute to their experience of stress, which may further increase their risk of experiencing depression. Given research suggesting that cognitive vulnerabilities consolidate through the adolescent years and become more stable or trait-like characteristics by later adolescence (e.g., Cole et al., 2008; Hankin, 2008), identifying such individuals early while their cognitive styles are still malleable may help to prevent the generation of stress, as well as the likelihood of developing depression during this time. Our results suggest that resiliency-building programs such as the Penn Resiliency Program (Brunwasser, Gillham, & Kim, 2009), which address cognitive vulnerabilities to depression, should also consider incorporating interpersonal skills training. Doing so may help adolescents who are vulnerable to depression more effectively manage interpersonal stressors, which may serve to both limit the occurrence of stressors and temper the experience of stressful interpersonal events when they do occur. These efforts may be particularly useful for girls given the sex differences in vulnerabilities, exposure and reactivity to stressors, and depressive symptoms that emerge throughout adolescence.

This study had several strengths, including the use of a prospective design during a phase of adolescence when sex differences in cognitive vulnerabilities, stress, and depression are beginning to emerge. We also used a life stress interview and objective event dependency ratings to enhance the accuracy of our life event data beyond that possible from self-report methods, and we also evaluated relational victimization, a stressor particularly salient during adolescence. We used a conservative analytic approach in controlling for initial symptoms of both depression and anxiety, given that previous research has shown both types of symptoms to be relevant to stress generation (Hammen, 1991; Uliaszek et al., 2012). Finally, this study examined a large sample of demographically diverse adolescents, which strengthens the generalizability of our findings.

Nevertheless, several limitations of our study should be noted. First, although we employed a longitudinal design, we only had one wave of follow-up, which precluded our ability to employ a more conservative test of mediation (Cole & Maxwell, 2003) as well as a test of the direction of effects or of causation. Future research should evaluate these questions more precisely with multi-wave designs. Second, as with many studies assessing emotional experiences, the current study assessed symptoms of depression and anxiety using self-

report measures (e.g. Liu & Alloy, 2010). However, depressive symptoms in adolescence have been found to predict the onset of major depression in adulthood (van Lang et al., 2007); thus, depressive symptoms are important to identify in addition to diagnoses. Future work could expand on these findings by using diagnostic interviews to assess symptoms and to determine whether these results extend to high-risk or clinical populations. Third, we only included the total number of types of events endorsed in each stress domain, and not the frequency of each event, which limits our ability to draw conclusions regarding the effect of cognitive vulnerabilities on more chronic stress. Additionally, we focused on cognitive vulnerabilities to depression, but it is possible that cognitive vulnerabilities to anxiety may also play a role in the generation of certain types of stressors (e.g., Riskind, Black, & Shahar, 2010), which could be a target of future work.

In conclusion, our results suggest that negative cognitive style may contribute to the generation of dependent stressors (specifically negative interpersonal events and relational victimization) during adolescence, and that these stressors can help to explain why these cognitive vulnerabilities make adolescents susceptible to experiencing depression during this period. Future work should further elucidate the causal relationships between these variables using multi-wave study designs across multiple developmental stages of adolescence. In the meantime, prevention programs should consider the interplay between cognitive vulnerabilities and stressors when designing programs to reduce the dramatic increase in rates of depression that occurs during adolescence.

Acknowledgments

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Table 1

Bivariate Correlations Between Primary Study Variables

	Measure	1	2	3	4	5	6	7	8	9
1	Time 1 ACSQ	-	0.33 ***	0 19 ***	0.24 ***	.05	.21 ***	.05	.15 **	.22 ***
2	Time 1 CRSQ		-	.46 ***	.41 ***	.07	.16 **	.04	.11 *	.35 ***
3	Time 1 CDI			-	.27 ***	.14 *	.23 ***	.24 ***	.24 ***	.61 ***
4	Time 1 MASC				-	−.02	.13 *	−.06	.12 *	22 ***
5	Time 2 Indep					-	.46 ***	.41 ***	.28 ***	.29 ***
6	Time 2 Dep Int						-	.52 ***	.45 ***	.46 ***
7	Time 2 Ach							-	.21 ***	.33 ***
8	Time 2 Rel Vic								-	.48 ***
9	Time 2 CDI									-

Note: Time 1 = Baseline; Time 2 = Follow-up; ACSQ = Adolescent Cognitive Style Questionnaire; CRSQ = Children's Response Style Questionnaire; CDI = Children's Depression Inventory; MASC = Multidimensional Anxiety Scale for Children; Indep = Independent; Dep Int = Dependent Interpersonal; Ach = Achievement; Rel Vic = Relational Victimization.

***
$p < .001$

**
$p < .01$

*
$p < .05$

Table 2

Descriptive statistics by sex

Measure	Overall Sample		Boys		Girls		Sex Difference	Cohen's d
	M	SD	M	SD	M	SD	t	d
Time 1								
CDI	6.67	6.03	5.94	4.80	7.26	6.82	1.90	.22
MASC	40.06	13.68	38.53	13.49	41.28	13.74	1.74	.20
ACSQ	114.30	39.24	118.17	40.35	111.19	38.17	1.54	.18
CRSQ	24.16	7.29	23.32	6.14	24.83	8.04	1.85	.21
Time 2								
Indep	3.10	2.35	2.80	2.08	3.34	2.52	2.05 [*]	.23
Dep Int	6.83	4.42	6.00	3.93	7.50	4.68	3.03 [**]	.35
Ach	3.35	1.96	3.33	1.83	3.36	2.06	0.14	.02
Rel Vic	2.42	3.72	2.02	3.49	2.74	3.87	1.71	.20
CDI	5.32	5.02	4.53	4.01	5.96	5.63	2.57 [**]	.29

Note: Time 1 = Baseline; Time 2 = Follow-up; CDI = Children's Depression Inventory; MASC = Multidimensional Anxiety Scale for Children; ACSQ= Adolescent Cognitive Style Questionnaire; CRSQ = Children's Response Style Questionnaire; Indep = Independent; Dep Int = Dependent Interpersonal; Ach = Achievement; Rel Vic = Relational Victimization.

[***] $p < .001$

[**] $p < .01$

[*] $p < .05$

Table 3

Cognitive Vulnerabilities Predicting Stress at Follow-up

Step	Variable	Dependent Interpersonal				Achievement			
		β	t	ΔR²	f²	β	t	ΔR²	f²
Step 1	T1 CDI	0.17	2.76**	0.09	0.10	0.25	3.73***	0.10	0.11
	T1 MASC	0.03	0.41			−0.12	−1.72		
	Days in Study	0.13	2.36*			0.07	1.09		
	Sex	0.18	3.24***			0.02	0.36		
	SES					0.11	1.74		
	Race					0.07	1.11		
Step 2	CRSQ	−0.01	−0.19	0.04	0.04	−0.02	−0.26	<.01	<.01
	ACSQ	0.2	3.34***			0.06	0.89		

Step	Variable	Independent				Relational Victimization			
		β	t	ΔR²	f²	β	t	ΔR²	f²
Step 1	T1 CDI	0.1	1.46	0.10	0.11	0.22	3.51***	0.08	.08
	T1 MASC	−0.07	−1.00			0.06	0.08		
	Days in Study	0.2	3.2**			0.14	2.41*		
	Sex	0.14	2.32*						
	Race	0.15	2.52*						
Step 2	CRSQ	−0.01	0.14	<.01	<.01	−0.07	0.95	0.02	.02
	ACSQ	0.05	0.72			0.14	2.27*		

Note: T1= Time 1; CDI = Children's Depression Inventory; MASC = Multidimensional Anxiety Scale for Children; Days in Study= Number of days elapsed between baseline and follow-up; SES= Socioeconomic Status; ACSQ= Adolescent Cognitive Style Questionnaire; CRSQ = Children's Response Style Questionnaire. Sex is coded with male (0) and female (1). Race is coded with African American (0) and Caucasian (1).

***
 $p < .001$

**
 $p < .01$

*
 $p < .05$

Table 4

Life Stressors as Mediators of Associations between Initial Cognitive Vulnerability and Depressive Symptoms at Follow-up

ACSQ as a Predictor of CDI at Follow-up		
Predictor	B	t
T1 CDI	0.56	11.75
T1 MASC	0.04	0.80
Days in Study	0.10	2.09
Sex	0.10	2.05
ACSQ	0.13	2.63[**]

Model R^2 = .40, F = 39.32, p < .001

ACSQ as a Predictor of Dep Int Stress		
Predictor	B	t
T1 CDI	0.12	2.88[**]
T1 MASC	<.01	0.38
Days in Study	0.01	2.32[*]
Sex	1.58	3.19[**]
ACSQ	0.02	3 40[***]

Model R^2 = .13, F = 8.41, p < .001

ACSQ as a Predictor of Rel Vic		
Predictor	B	t
T1 CDI	0.12	3.20[**]
T1 MASC	0.01	0.57
Days in Study	<.01	2.48[*]
Sex	0.69	1.63
ACSQ	0.01	2.32[*]

Model R^2 = .31, F = 6.27, p < .0001.

ACSQ and Stress as Predictors of CDI at Follow-up		
Predictor	B	t
T1 CDI	0.40	11.08[***]
T1 MASC	0.01	0.6
Days in Study	<.01	0.81
Sex	0.33	0.78
ACSQ	0.01	1.13
Dep Int Stress	0.25	4 83[***]
Rel Vic	0.33	5.36[***]

ACSQ as a Predictor of CDI at Follow-up

Model R-sq = .73, F = 48.01, p < .0001.

Indirect Effect of ACSQ on CDI at Follow-up via Stress

Focal Predictor	Effect	SE	CI (lower)	CI (upper)
Dep Int	0.006	0.002	0.003	0.010
Rel Vic	0.004	0.002	0.001	0.008

Note: N=5000 bootstrap samples. Significant indirect effects indicate mediation. T1= Time 1; CDI = Children's Depression Inventory; MASC = Multidimensional Anxiety Scale for Children; Days in Study= Number of days elapsed between baseline and follow-up; ACSQ= Adolescent Cognitive Style Questionnaire; Dep Int = Dependent Interpersonal; Rel Vic = Relational Victimization. Sex is coded with male (0) and female (1).

***
p < .001

**
p < .01

*
p < .05

Table 5

Moderated mediation analyses with gender moderating the relationship between negative cognitive style and depressive symptoms at follow-up via relational victimization

ACSQ as a Predictor of Rel Vic (*a path*)

Predictor	Effect	t
T1 CDI	.12	3.39 **
T1 MASC	.01	.73
Days in Study	<.01	2.32 *
ACSQ	.01	2.11 **

Interaction between Sex and Rel Vic Predicting CDI at Follow-up (*b path*)

Predictor	Effect	t
T1 CDI	.41	11 14 ***
T1 MASC	.01	.76
Days in Study	<.01	1.29
Sex	−.01	.37
Rel Vic	.27	3.58 ***
ACSQ	.01	1.47
Sex × Rel Vic	.29	2.50 *

Conditional Indirect Effect of ACSQ on CDI at Follow-up via Rel Vic by Sex (c' *path*)

	Indirect Effect	SE	Z	CI (lower)	CI (upper)
Male	0.003	0.002	1.68	−0.0002	0.0076
Female	0.007	0.003	2.02 *	0.0001	0.0149

Note: N=5000 bootstrap samples. T1= Time 1; CDI = Children's Depression Inventory; MASC = Multidimensional Anxiety Scale Children; Days in Study= Number of days elapsed between baseline and follow-up; ACSQ= Adolescent Cognitive Style Questionnaire; Rel Vic = Relational Victimization. Sex is coded with male (0) and female (1).

***
p < .001

**
p < .01

*
p < .05