



Published in final edited form as:

*J Soc Clin Psychol.* 2013 November 1; 32(9): 989–1012. doi:10.1521/jscp.2013.32.9.989.

## Stress generation and exposure in a multi-wave study of adolescents: Transactional processes and sex differences

**Benjamin G. Shapero,**  
Temple University

**Benjamin L. Hankin,** and  
University of Denver

**Andrea L. Barrocas**  
University of Denver

### Abstract

Given considerable overlap among individual difference predictors of stress generation, the current study sought to elucidate which individual factors are uniquely involved in the stress generation process for interpersonal and achievement events among adolescents. Further, we examined transactional processes between stressors and depressive symptoms and explored potential sex differences in the unique prediction of stress generation. At baseline, youth (6<sup>th</sup>–10<sup>th</sup> graders,  $n=350$ , 57% female; 53% White) reported on various individual differences hypothesized to predict prospective increases in stressors. Youth also reported on depressive symptoms and stressors for 4 waves over 5 months. Multi-level modeling showed that different individual difference factors uniquely prospectively predicted increases in dependent (interpersonal and achievement) stressors. Central to this process was interpersonal vulnerabilities and psychopathology. Some of these predictions differed for boys and girls. In addition and in support of a transactional relationship between stressors and depressive symptoms, increases in stressors predicted prospective elevations in depressive symptoms for both boys and girls. This study provides support for the transactional nature of stress and depression in a multi-wave study of adolescence. This study demonstrates that particular individual factors are uniquely associated with the generation of stress, with some associations moderated by gender.

### Introduction

Adolescence is a time of pivotal change in an individual's life, a developmental period including puberty, school transitions, and adjustments in social support (e.g., Rudolph, 2008; Rudolph & Hammen, 1999). Adolescence is also a time of relative storm and stress for some (Hall, 1904) and is a critical period when risk to clinical depression surges (Hankin et al., 1998). The overall number of negative events (Ge et al., 1994), and interpersonal stressors in particular, rises dramatically throughout adolescence (Rudolph & Hammen, 1999). One of the strongest predictors of depression is the exposure to negative life events (Grant & McMahon, 2005). Specifically, understanding the dynamic associations between stress and depression over time, as well as individual difference characteristics that predict this relationship, can explicate potential causes and consequences of this disorder. Based on social-cognitive theories of the relationship between stress and depression (e.g., Coyne, 1976; Hankin & Abramson, 2001), we hypothesized that factors that contribute to

heightened levels of dysfunction in the interpersonal domain would elicit higher levels of generated stress.

Early research on stress and depression has been limited by a uni-directional examination of how stress induces depression. The corpus of early research demonstrates that exposure to negative events predicts depression among youth (Grant & McMahon, 2005) and adults (Monroe, 2008). However, since Hammen's (1991) seminal work on stress generation, various investigations have reported that individuals with depression experience more stressful life events, and numerous articles highlight reciprocal relationships between depression and stress (see Liu & Alloy, 2010 for review). Transactional models of depression have been proposed to elucidate the bi-directional effects between depression and stress over time (e.g., Hankin & Abramson, 2001). To date, few papers have examined this transactional process using longitudinal designs with children and adolescents (e.g., Cole et al., 2006).

Most research on stress generation has investigated and shown that initial depression predicts later dependent stressors (Hammen, 2005). In recent reviews of this theory (Liu & Alloy, 2010), researchers suggest that depression itself may not account for elevated stress alone and that some individuals may select more inherently stressful contexts. More recently, studies have shown that individual differences, including insecure attachment (e.g., Hankin, Kassel, & Abela, 2005b), excessive reassurance seeking (Potthoff, Holahan & Joiner, 1995), co-rumination (Hankin, Stone, & Wright, 2010), dependency (Shih & Eberhart, 2008), and neuroticism (e.g., Wetter & Hankin, 2009), contribute to the generation of stressors. Given that many of these factors are all moderately intercorrelated (e.g. Hankin, Lakdawalla, Carter, Abela, & Adams, 2007), it is unknown which are most important for predicting increases in stressors over time.

It is beneficial to view these differences through the elaborated vulnerability-transactional stress theory (Hankin & Abramson, 2001). Importantly, the focus on environmental influences (e.g., stressors) highlights the necessity to view individuals in the interpersonal domain. Research highlights the importance of interpersonal stressful events in vulnerability-stress models of depression (Liu & Alloy, 2010) and in explicating adolescent depression (Hammen & Rudolph, 2003). Additionally, the stress generation literature consistently highlights interpersonal stress as an outcome of importance (Hammen, 2006). At the same time, achievement stressful events predict increases in adolescent depression as well (e.g., Garber et al., 1995).

## Individual difference predictors of later stress generation

Since Hammen's (1991) seminal work on stress generation a number of individual difference factors have predicted increases in stressful life events. In recent years, a focus on interpersonal factors has been highlighted as strong contributors to this process.

Prior work highlights the importance of interpersonal vulnerabilities as strong predictors of future stressors (e.g., Hammen, 1991; Rudolph, 2008). Co-rumination is an interpersonal process of extensively discussing and self-disclosing emotional problems within a dyadic relationship (Rose, 2002). This interpersonal process has led to increases in interpersonal dependent stressors (Hankin, et al., 2010). Additionally, insecure attachment influences an individual's social information processing. Insecure adolescents perceive and generate expectations and attributions about others in a negatively biased manner compared to their secure counterparts (Dykas & Cassidy, 2011). Insecure attachment has predicted prospective elevations of interpersonal stress (e.g., Hankin et al., 2005b). This study investigated the two dimensions of insecure attachment (Mikulincer & Shaver, 2007): anxious attachment, which describes individuals who fear rejection and abandonment, and avoidant attachment, which

is defined as involving fear of dependence and interpersonal intimacy (Brennan, Clark, & Shaver, 1998).

Different psychological symptoms have also been shown to increase the generation of stressors. As previously stated, initial levels of depression consistently predict later stressors (Hammen, 2005). Furthermore, depressive symptoms frequently co-occur with anxiety symptoms (Clark & Watson, 1991), yet less research has examined whether anxious symptoms predict stressors (Joiner, Wingate, Gencoz, & Gencoz, 2005). Recently, Connolly, Eberhart, Hammen, and Brennan (2010) found that adolescents with pure depression experienced more dependent stress compared to adolescents with pure anxiety. Additionally, externalizing symptoms have been associated with higher levels of stress (Aseltine, Gore, & Gordon, 2000) and have predicted future stressors (Carter, Garber, Ciesla, & Cole, 2006). A recent study examined the potential differences between internalizing and externalizing symptoms in the stress generation model and found that externalizing disorders predicted non-interpersonal dependent stress (Conway et al., 2012). Overall, stress generation may be a consequence of different forms of psychopathology, although such differences have been relatively unexamined.

Extensive research has demonstrated that cognitive vulnerabilities can predict increases in depressive symptoms when combined with stressful life events (Abela & Hankin, 2008). Dysfunctional attitudes (Beck, 1987) are characterized as rigid, automatic schemas of organizing and interpreting experiences in a negative way. Additionally a negative cognitive style (Abramson, Metalsky & Alloy, 1989) refers to the tendency for individuals to make negative interpretations about the causes of negative events (global, stable). Last, rumination (Nolen-Hoeksema, 1991) is an individual's repetitive focus on the meanings and causes of depressive symptoms. Cognitively vulnerable individuals generate more dependent (Kercher & Rapee, 2009) and independent stressors (Flynn, Kecmanovic, & Alloy, 2010). Importantly, cognitive vulnerabilities may be a less proximal predictor of stress as the impact of these styles may only manifest over time. For example, Flynn et al. (2010) found that discontent with social support accounted for the association between rumination and subsequent dependent interpersonal stress.

Temperamental influences, such as negative emotionality (NEM) and positive emotionality (PEM), may also influence the generation of stress. Previous research characterizes NEM as a temperament where individuals tend toward discomfort, fear, anger, and sadness (Compas, Connor-Smith, & Jaser, 2004). High NEM predicts later depressive symptoms as well as the generation of stressful life events among youth (Kercher, Rapee, & Schniering, 2009; Wetter & Hankin, 2009). PEM is an individual difference that describes the degree of being sociable, receptive to reward, and actively involved in one's environment (Rothbart & Bates, 1998). To our knowledge, no research supports a relationship between PEM and stress generation. PEM was included for discriminant validity and to better clarify how particular temperamental factors may relate to the generation of stress. Together with cognitive vulnerabilities, temperamental influences may be a less direct predictor of stress.

In summary, because the majority of these predictors of stress generation have been examined in isolation, it is unknown which factors are uniquely driving this process. It is important to examine each of these factors relative contribution to direct further research on stress generation. We chose specific individual differences factors, not only because they have predicted stressors in prior research, but also because they elicit potential maladaptive consequences on the interpersonal environment.

## Sex differences and adolescence as important developmental contexts

By middle adolescence (i.e. between age 13–15), twice as many girls are depressed than boys, and this sex difference remains stable throughout adulthood (Hankin et al., 2008). Theory and research show that girls are more interpersonally oriented and hold relationships and connectedness with friends in higher esteem than boys, whereas boys are more achievement focused (Rose & Rudolph, 2006). Many theories explaining the emergence of the sex difference in adolescent depression highlight the role of stressors (e.g., Hankin et al., 2008). Guided by these theoretical perspectives, empirical work has investigated sex differences in stressful life events (e.g., Rudolph, 2002; Rudolph & Hammen, 1999). Adolescent girls report more stressors, especially interpersonal negative events, whereas boys experience more achievement related stressors (Rudolph, 2002; Rudolph & Hammen, 1999; Shih, Eberhart, Hammen, & Brennan, 2006).

## Methodological considerations

Developmental methodologists have emphasized the importance of multi-wave, longitudinal designs to capture developmentally sensitive relationships among variables over time (Curran & Willoughby, 2003). Recent studies have begun to use multi-wave designs with three or more assessments (e.g., Hankin et al., 2010; Rudolph et al., 2009). It is important to note a trade-off between more time intensive contextual stress interviews that can more objectively capture stressful events (Hammen, 2005; Monroe 2008) compared to assessments that can more readily be measured over multiple time periods. In order to study the hypothesized transactional processes of stress exposure and generation, a multi-wave study is warranted at this stage of investigation. For this reason, we utilized youth report of stressors using a multi-wave design to advance knowledge on which individual difference factors uniquely predict stress generation. This study can inform future theory development and, subsequently, conceptually refined questions with more rigorous contextual stress interviews.

## Current study

The current study sought to elucidate which specific individual difference risk factors prospectively predict the generation of future stressors, including interpersonal (dependent and independent) and achievement (dependent) events. As the vast majority of achievement events tend to be classified as dependent, we elected *a priori* to include only dependent non-interpersonal stress (achievement stressors). Using a social-cognitive theoretical perspective we highlight that individuals actively shape and respond to their environments. Baseline predictors of stress generation included cognitive vulnerabilities (negative cognitive style, dysfunctional attitudes, and rumination), interpersonal vulnerabilities (co-rumination, anxious attachment, and avoidant attachment), temperamental influences (NEM and PEM), and psychopathological symptoms (depressive symptoms, anxiety symptoms, and conduct problems). Consistent with interpersonal models of stress generation (Hammen, 2006) we hypothesized that interpersonal risk factors (co-rumination and insecure attachment) and psychopathology (e.g., depression) would contribute to the generation of stress more directly, whereas other risk factors (e.g., cognitive vulnerabilities and temperamental influences) were expected to be less directly associated with the generation of stress. We also hypothesized that gender would moderate the prediction of stress generation. Specifically we hypothesized that girls would have higher overall levels of stress and that interpersonally-oriented individual difference factors (e.g., co-rumination and anxious attachment) would predict more dependent interpersonal stressors for girls. Lastly, we examined if these additional stressors predicted increases in depressive symptoms to

evaluate both streams of the dynamic, transactional model (e.g., Hankin & Abramson, 2001).

## Method

### Participants

Participants were youth recruited from five Chicago area schools. Schools were selected to represent ethnic and socio-economic diversity typical of the Chicago area. 467 students were available in the appropriate grades (6<sup>th</sup>–10<sup>th</sup>) and were invited to participate. Parents of 390 youth (83.5%) provided active consent. 356 youth (91%) completed the baseline questionnaire. The 34 students who were willing to participate but did not complete the baseline visit were sick or absent from school and were unable to reschedule. Rates of participation were as follows: wave 2 (N=303), wave 3 (N=308), and wave 4 (N=345).

Youth were 11–17 years old at baseline ( $M = 14.5$ ;  $SD = 1.40$ ); 9% were in 6<sup>th</sup> grade, 9% in 7<sup>th</sup> grade, 9% in 8<sup>th</sup> grade, 27% in 9<sup>th</sup> grade, and 46% in 10<sup>th</sup> grade. 57% were female; 53% White, 21% African-American, 13% were Latino, 6% were Asian or Pacific Islander, and 7% bi- or multi-racial. Self-reported socio-economic status of this sample was consistent with the neighborhoods from which the sample was drawn: the median family income ranged from \$45,000 to \$70,000, although 24% of the sample had incomes less than \$25,000, and 21% had over \$100,000.

### Procedures

Students participated in this study with active parental informed consent. Permission to conduct this investigation was provided by the school districts and their institutional review boards (IRB), school principals, classroom teachers, and university IRB. Trained researchers visited classrooms and briefly described the study to youth, and letters describing the study were sent home to parents. Students, who agreed to participate and had returned active parental consent, read and signed informed assent form after having the opportunity to ask questions about the study.

Participants completed questionnaires at four time points over a 5-month period, with approximately five weeks between each time point. The spacing for the intervals were chosen to provide enhanced, accurate recall of symptoms (see Costello, Erkanli, & Angold, 2006). These four waves took place during a single academic year, and there was no obvious developmental transition (e.g., change of grade) for most youth. Youth were compensated \$10 for their participation at each wave in the study. They completed all individual difference measures at baseline, and stressors and depressive symptoms were assessed at all four time points.

### Measures

**Stressors**—(Adolescent Life Events Questionnaire; ALEQ; Hankin & Abramson, 2002). The ALEQ assesses a broad range of negative life events that typically occur among adolescents, including school/achievement problems, friendship and romantic difficulties, and family problems. Youth were asked to indicate how often (Likert scale ranging from never (0) to always (4)) these negative events occurred over the past 5 weeks. The ALEQ demonstrated good predictive validity in past research (e.g., Hankin, 2008; Hankin et al., 2010). The 57 different negative life events were independently categorized into events occurring in interpersonal (e.g., peers, romantic partners, family) and achievement (e.g. academics, work) domains (Hankin & Abramson, 2002; Hankin et al., 2010) as well as independent versus dependent types of events by the authors with 100% agreement. This resulted in 39 interpersonal events (26 dependent, 13 independent) and 11 achievement

events (all dependent). For the present study interpersonal-dependent, interpersonal-independent, and achievement-dependent, at each of the 4 time points, were used in analyses.

**Negative cognitive styles**—(Adolescent Cognitive Style Questionnaire; ACSQ; Hankin & Abramson, 2002). The ACSQ presents adolescents with negative hypothetical events in the achievement and interpersonal domain and asks the youth to make inferences about the causes (internal-external, stable-unstable, and global-specific) and consequences of the event and characteristics about the self. Each item dimension is rated from 1 to 7 with average item scores ranging from 1 to 7, with higher scores indicating a more negative cognitive style. The ACSQ has demonstrated excellent internal consistency, good test-retest reliability, and good validity (e.g., Hankin, 2008). This measure was given at Time 1 and had an internal reliability of  $\alpha = .95$ .

**Dysfunctional attitudes**—(Children's Dysfunctional Attitudes Scale; CDAS; Lewinsohn et al., 2001). The CDAS is a 9-item scale that assesses adolescents' propensity to endorse dysfunctional attitudes. Moderate test-retest reliability and good validity have been reported (Hankin et al., 2008; Lewinsohn et al., 2001). At time 1, adolescents rated the items on a 5-point Likert scale, with higher scores indicating greater levels of dysfunctional attitudes. Internal reliability in this sample was  $\alpha = .70$ .

**Rumination**—(Children's Response Styles Questionnaire; CRSQ; Abela et al., 2002). The Ruminative Response subscale assessed rumination at Time 1 which includes 10 items describing responses to depressed mood that are self-focused (e.g., "Think about how alone you feel"). For each item, adolescents use a 1–5 Likert scale to rate how often they respond in this way when they are feeling sad. Higher scores indicate a greater tendency for youths to focus on negative self-meaning and implications when feeling sad. Past research with the CRSQ indicated good reliability and validity (Hankin & Abela, 2011). Internal reliability for the Ruminative Response subscale in this sample was  $\alpha = .80$ .

**Co-rumination**—Co-Rumination Questionnaire; Rose, 2002). This measure assesses the extent to which youth typically co-ruminate with same-sex friends. For the present study, the 9-item abbreviated version (those items listed in the appendix of Rose, 2002) was used to assess co-rumination at Time 1. Youth responded to the items using a 5-point Likert scale, and scores were the mean rating of the 9 items. Excellent internal consistency, good test-retest reliability, and validity have been reported (Hankin et al., 2010; Rose et al., 2007). Internal consistency was  $\alpha = .89$ .

**Anxious attachment and avoidant attachment**—(Experiences in Close Relationships Inventory-R; ECR-R; Brennan, Clark, & Shaver, 1998). The ECR-R is a 36-item self-report measure that assesses insecure attachment, specifically attachment-related anxiety and avoidance. This two-dimensional perspective for representing attachment relationships is the most empirically supported and theoretically accepted approach presently used for understanding attachment dynamics (Mikulincer & Shaver, 2007). At time 1, each item was rated on a 1–7 Likert scale. The version used in this study was modified to assess adolescent relationships with parents and close friends. The ECR-R was found to have good construct validity (Fairchild & Finney, 2006), and validity of modifying the ECR to different important relationships has been demonstrated (Fraley et al., 2006). Internal reliability in this sample was  $\alpha = .84$ .

**Positive and negative emotionality**—(Dimensions of Temperament Scale-Revised; DOTS-R; Wills, Windle, & Cleary, 1998). Adolescents completed the DOTS-R at Time 1 to

measure NEM and PEM. The DOTS-R uses a 4-point Likert scale that ranges from “not at all” to “very much”. There are 11 items on the NEM subscale ( $\alpha = .84$ ) and 13 items on the PEM subscale ( $\alpha = .87$ ). Prior research shows reliability and validity of these subscales (Wetter & Hankin, 2009).

**Depressive symptoms**—(Children’s Depression Inventory; CDI; Kovacs, 1985). The CDI is a self-report measure that assesses depressive symptoms in children and adolescents using 27 items at all 4 time points. Each item is rated on a scale from 0–2. Reported scores are means of all items with higher scores indicating more depressive symptoms. The CDI is the most widely used self-report assessment of depressive symptoms in youth and has good reliability and validity (Klein, Dougherty, & Olino, 2005). Internal reliability in this sample was  $\alpha = .90$  at Time 1,  $\alpha = .91$  at Time 2,  $\alpha = .91$  at Time 3, and  $\alpha = .90$  at Time 4.

**Anxious symptoms**—(Mood and Anxiety Symptom Questionnaire; MASQ; Watson et al., 1995). The original MASQ was modified for this study, and only the Anxious Arousal (ANX) subscale was used in this study to assess relatively specific anxious symptoms that do not exceedingly overlap with general negative affect and depressive symptoms. Youth responded to ten items on a Likert scale from 1–5, and reported scores are the average scores of all items (range 1–5). Reliability and validity of the MASQ has been demonstrated in previous studies with adolescents (e.g., Hankin et al., 2008). Youth responded at Time 1 with an internal reliability of  $\alpha = .86$ .

**Conduct problems**—(Strengths and Difficulties Questionnaire; SDQ; Goodman, 2001). The conduct factor (5 items) of the SDQ was used for this study. Items score range from 0–2 and are the average of the items. The SDQ is reliable and valid with normative data available (Goodman, Lamping, & Ploubidis, 2010). The SDQ was given at Time 1 with an internal reliability of  $\alpha = .70$ .

## Results

### Preliminary Analyses

Descriptive statistics and intercorrelations for the main variables at Time 1 are presented in Table 1. As expected, there was considerable correlation among the individual difference factors. This underscores the need to control for the overlap of these highly related variables when investigating their effect on the stress generation process. Using recommended clinical cutoffs for the CDI revealed that 24.3% (CDI cutoff  $>19$ ; Stark & Laurent, 2001) of youth were above cut-scores. Similarly, 15.1% were above cut-scores for the conduct (Goodman, 2001).

### Overview of Statistical Approach

Multi-level modeling (MLM), was used to investigate the main questions: 1) Which baseline individual difference factors predict prospective increases in negative life events? Specifically, we examined models predicting achievement dependent stressors as well as interpersonal dependent and independent events over time (i.e., stress generation) and 2) Is there a transactional association such that stressors, assessed at the previous data wave, predict prospective elevations in depressive symptoms? Additionally, we explored whether sex moderated these transactional strands. MLM is a rigorous approach because it can represent both change within a person over time while also ascertaining how individuals may differ from one another over time (Curran & Willoughby, 2003).

We first conducted individual analyses with each variable to predict the different dependent variables of stress. These results, with each independent variable entered on its own without

covarying the influence of the other variables, are reported in Table 2. Then, we entered all individual difference predictors that were found to be significant, after correcting for multiple analyses (i.e.,  $p$  value  $< .004$ ), together simultaneously in level 2 in order to control for the overlap among these between subjects factors (Table 3). Also important for the present study to test which baseline individual difference factors predict *prospective increases* in stress over time (which is essential for testing the stress generation hypothesis), we used lagged analyses in MLM. In essence, stressor scores at time T served as the dependent variable in the MLM analysis and time T-1 stressor scores were included in the level 1 model. This approach provides for a stringent examination of the stress generation hypothesis because the baseline individual difference factors are predicting prospective increases in stressors after controlling for the prior wave's stress level.

### Individual difference predictors of stress generation

For all stress types examined, girls reported significantly more stressors than boys. Specifically, over time girls reported more dependent interpersonal (girls:  $M = 44.65$ ,  $SE = .66$ ; boys:  $M = 41.82$ ,  $SE = .75$ ;  $t = 2.76$ ,  $p < .01$ ), dependent achievement (girls:  $M = 20.81$ ,  $SE = .35$ ; boys:  $M = 19.5$ ,  $SE = .39$ ;  $t = 2.47$ ,  $p = .01$ ), and independent interpersonal events (girls:  $M = 18.05$ ,  $SE = .32$ ; boys:  $M = 17.22$ ,  $SE = .28$ ;  $t = 1.98$ ,  $p = .05$ ). Additionally, age was associated with dependent interpersonal stressors ( $t = 6.96$ ,  $p < .001$ ), independent interpersonal stressors ( $t = 3.07$ ,  $p < .01$ ), and dependent achievement stressors ( $t = 5.12$ ,  $p < .001$ ), such that older adolescents reported significantly more of each type of events than early adolescents. Table 3 presents the findings, after controlling for age, gender, and all of the baseline individual difference factors predicting prospective increases in stressors over time for dependent achievement (left column), independent interpersonal (middle column), and dependent interpersonal (right column), respectively. Results in Table 3 are presented for the entire sample, as there were few instances of gender moderation.

For dependent achievement events, baseline depressive, anxiety and conduct symptoms as well as age predicted increases in these stressors over time after controlling for prior wave levels. Gender significantly moderated the effect of negative cognitive style predicting dependent achievement events ( $b = -4.56$ ,  $SE = 2.09$ ,  $t = -2.18$ ,  $p < .05$ ), yet decomposition of this effect was not significant within each gender separately for either girls ( $b = -2.13$ ,  $SE = 1.79$ ,  $t = -1.62$ ) or boys ( $b = 2.92$ ,  $SE = 1.57$ ,  $t = 1.62$ ). For independent interpersonal stress generation, only conduct problems predicted increases in these independent events. Finally, for dependent interpersonal stress generation, baseline co-rumination, avoidant attachment, all psychopathology symptoms, and age predicted increases in these stressors over time after controlling for prior wave levels. Gender significantly moderated the effect of negative cognitive style ( $b = -8.03$ ,  $SE = 3.84$ ,  $t = -2.09$ ,  $p < .05$ ) and anxious attachment ( $b = 2.46$ ,  $SE = 1.20$ ,  $t = 1.99$ ,  $p < .05$ ) predicting dependent interpersonal events. Decomposition of this interaction revealed that negative cognitive style significantly predicted dependent interpersonal stressors for boys ( $b = 7.30$ ,  $SE = 3.45$ ,  $t = 2.16$ ,  $p < .05$ ) but not girls ( $b = .77$ ,  $SE = 2.78$ ,  $t = .27$ ), whereas anxious attachment was significant for girls ( $b = 1.73$ ,  $SE = .74$ ,  $t = 2.34$ ,  $p < .05$ ) but not boys ( $b = -1.04$ ,  $SE = 1.11$ ,  $t = -.93$ ).

### Transactional effects: Prior stressors predict prospective increases in depressive symptoms

Given that various baseline factors predicted increases in stressors, we examined the final question that there would be a bi-directional association, consistent with transactional models of depression (e.g., Hankin & Abramson, 2001), such that stressors, assessed at the prior wave, would predict prospective elevations in depressive symptoms. To test this hypothesis, MLM was used in which CDI scores at Time T were the outcome at Level 1 with prior wave of CDI and stressors, both at Time T-1, also entered at Level 1 to enable a



conservative test that previous stressors would predict prospective fluctuations in depressive symptoms over time. Level 1 model was:  $y_{it} = \beta_{0j} + \beta_{1j} (\text{Stressors}_{t-1i}) + \beta_2(\text{Symptoms}_{t-1i}) + r_{ij}$ .

Results of these MLM analyses consistently showed that stressors, assessed at the previous waves, predicted increases in depressive symptoms for all types of stressors for the whole sample. For the whole sample, achievement stressors ( $b=.24$ ,  $SE=.028$ ,  $t=8.34$ ,  $p < .001$ ), interpersonal independent stressors ( $b=.015$ ,  $SE=.002$ ,  $t=6.09$ ,  $p < .001$ ), and interpersonal dependent stressors ( $b=.007$ ,  $SE=.0009$ ,  $t=7.55$ ,  $p < .001$ ) all predicted prospective fluctuations in depressive symptoms after controlling for prior depressive symptoms. These associations were not moderated by gender.

## Discussion

Stress has long been associated with depression, but the preponderance of research has generally focused on uni-directional pathways. Stress exposure literature highlights that stress contributes to depression ( $S \rightarrow D$ ; Grant & McMahon, 2005); stress generation literature posits that depressed individuals produce more stressful life events ( $D \rightarrow S$ ; Hammen, 1991). Despite prior theory linking these two strands of influence, this is the first study to empirically examine both sides of this dynamic, bi-directional process together in a transactional model linking stress and depression ( $S \rightarrow D \rightarrow S$ ) over time and which individual difference factors initiate this cycle. Results indicate that the relation between stress and depression constitutes a transactional process. Higher levels of depressive symptoms led to increases in dependent stressors, and increases in all stressors led to prospective fluctuations in depressive symptoms for both boys and girls. These findings highlight the importance of understanding the dynamic association between stress and depression, including the various individual differences factors that predispose youth to this downward, transactional cycle.

Consistent with previous research that has examined individual difference factors in isolation; the majority of individual difference factors predicted the generation of additional stressors over time. Of note, we first examined each factor individually to ascertain if each individually predicted the generation of stress, and more specifically what type of stress (Table 2). Baseline interpersonal vulnerabilities, psychopathology, temperament, and some cognitive vulnerabilities predicted dependent stress (achievement and interpersonal) over time. It is important to note that this is the first study to show that low PEM predicted prospective increases in dependent stress. Additionally, relatively few studies have shown that negative cognitive styles and anxiety symptoms predict increases in stress. Few of the individual difference risk factors prospectively predicted additional interpersonal independent events after adjusting for prior wave level and demographic factors. This provide further support for the distinction between independent and dependent events and the importance of delineating stressor dependence in the stress generation processes.

Expanding upon previous research, after controlling for the overlap among the baseline predictors of later stressors, many of the previously significant predictors no longer predicted future stress (see Table 3). Even after controlling for the overlap among factors, anxiety symptoms, depressive symptoms, and conduct problems predicted higher levels of achievement and interpersonal dependent stressors. Additionally, consistent with our hypotheses, findings suggest that interpersonal vulnerabilities (co-rumination and avoidant attachment) were important proximal predictors of increases in stress and may be driving the stress generation process. This suggests that not only depressive symptoms, but also other forms of psychopathology affect an individual's context and may contribute to stressors. Importantly, although the effects are weaker than when included individually, the

consistency of psychopathology and interpersonal variables predicting increases in stress after controlling for the overlap of other factors helps elucidate their importance.

Consistent with the social-cognitive framework (e.g., Coyne, 1976; Hankin & Abramson, 2001) and the importance of the social context in the stress generation process (Hammen, 1991), these findings support our hypothesis that factors that proximally contribute to heightened levels of dysfunction in the interpersonal domain would elicit higher levels of stress. Although research has begun to look at the effects of various forms of psychopathology on stress generation (Conway, Hammen, Brennan, 2012), further research is needed. Finally, after controlling for the overlap of other significant predictors, both cognitive vulnerability and temperament variables did not predict increases in stress over time. We postulate that these factors, although influencing increases in stress individually, may less directly impact the social context of an adolescent.

Moreover, individual differences predicting dependent stress generation varied as a function of adolescent gender. Specifically, baseline negative cognitive style for boys, whereas baseline anxious attachment for girls, predicted greater dependent interpersonal stressors. Although there were not many significant sex moderation findings, these two particular findings can be understood by placing them within the broader literature on sex differences in social/emotional development and psychopathology. Girls are more interpersonally focused, and boys are more achievement focused (Rose & Rudolph, 2006). Additionally, girls tend to be more interpersonally sensitive, worry about their relationships, and seek support from friends in response to stress. Consistent with these perspectives, we found that girls who are more anxiously attached exhibited prospective increases in dependent interpersonal stress. On the other hand, boys tend to maintain their privacy and cope with stress with avoidance and withdrawal (Rose & Rudolph, 2006). Generally consistent with this, we found that more pessimistic boys (i.e., those with more negative cognitive style) tended to incur more dependent interpersonal stressors. Finally, boys tended to have higher levels of achievement events while girls had higher levels of interpersonal dependent events.

Consistent with prior literature, higher levels of stressors predicted prospective elevations in depressive symptoms at the following wave controlling for prior wave of depression. To our knowledge only one other multi-wave study longitudinally established a transactional association between stress and depression (Cole et al., 2006). Cole et al. (2006) demonstrated a longitudinal, bidirectional association between stressful events and depressive symptoms, but they did not include individual differences that could explain why some individuals are likely to generate more stressors, and in turn, experience increases in depressive symptoms over time. Our study suggests that several different individual differences, beside depressive symptoms, may initiate this transactional cycle.

The majority of prior studies examining the stress generation hypothesis have found that particular individual characteristics, predict dependent, but not independent, events. Yet contrary to our hypotheses results indicated that some individual factors (conduct problems and gender) predicted increases in independent interpersonal stressors. Overall, there were fewer factors predicting independent stressors and the effect sizes appeared smaller for predicting independent versus dependent stressors. Consistent with these findings, Harkness and Stewart (2009) found that adolescents with a depressive disorder reported higher levels of dependent interpersonal, dependent non-interpersonal, and independent events 12 months later. To speculate, some adolescents may choose more unstable friends or social contexts (e.g., Prinstein, 2007). In fact, Cassidy, Aikins, and Chernoff (2003) found that certain factors, such as self-perceptions, influenced adolescents' choice of peers. Further research is needed to elucidate increases in independent events evident currently.

Findings from this study need to be interpreted with various strengths and limitations in mind. The prospective longitudinal design of this study offered a rigorous test of the stress generation process. This study built on prior study designs that may not have been precise enough to examine these dynamic developmental processes (Curran & Willoughby, 2003). Further, we used a non-selected community sample of adolescents that was demographically representative of the community and thus provides a good basis for generalizing our results. This design allowed the examination of change across time of increases in stress as well as the transactional association with depressive symptoms in order to amalgamate the stress exposure and stress generation theories.

Despite these strengths, this study was limited by a self-report checklist of negative life events and measure of depressive symptoms. Although children are accurate informants about their own thoughts and feelings (Boyle et al., 1996), self-report checklists may be biased by over-reporting or confounded by various factors, such as personality and depression level and thus interpretation of the data should take this into account. The use of investigator-based contextual stress interviews (e.g., Hammen, 2005; Monroe, 2008) could be used in future studies. Nonetheless, use of self-reported stressors via reliable, valid questionnaire seems reasonable at this stage of investigation since self-report checklists of stressors are reasonably valid and may not significantly differ from information obtained via stress interviews (Lewinsohn, Rohde, & Gau, 2003; Wagner, Abela, & Brozina, 2006). Second, the spacing for the intervals was chosen to provide enhanced recall of stress and symptoms, yet this may not have allowed time for the occurrence of major life events and subsequent increases in depressive symptoms. Last, although many studies use only one informant, future work should replicate these findings with other informants (e.g., parents, peers).

In sum, this study builds on prior research and provides strong support for the transactional nature of stress and depression in a multi-wave study of adolescence. Additionally, this study demonstrates that particular individual difference factors are uniquely associated with stress over time. Of note, interpersonal vulnerabilities and psychopathology may be particularly relevant factors in the stress generation process. The transactional nature of dependent stressors and depressive symptoms may be of particular importance for clinical intervention as the effects of individual characteristics or behaviors may be effective targets in a therapeutic context. Future research would benefit from continuing to integrate social/emotional development and developmental psychopathology literatures to more fully understand the transactional relations among stress, depression, and various individual differences in order to elucidate possible mechanisms of risk during the pivotal developmental context of adolescence.

## Acknowledgments

This work was supported, in part, by NIMH grants R03 MH 066845 and R01 MH077195 to Benjamin L. Hankin.

## References

- Abela JRZ, Brozina K, Haigh EP. An examination of the response styles theory of depression in third- and seventh-grade children: A short-term longitudinal study. *Journal of Abnormal Child Psychology*. 2002; 30:515–527. [PubMed: 12403154]
- Abela, JRZ.; Hankin, BL. Cognitive vulnerability to depression in children and adolescence: A developmental psychopathology approach. In: Abela, JRZ.; Hankin, BL., editors. *Handbook of Child and Adolescent Depression*. NY: Guilford Press; 2008.
- Abela JRZ, Hankin BL. Rumination as a vulnerability factor to depression during the transition from early to middle adolescence: A multiwave longitudinal study. *Journal of Abnormal Psychology*. 2011; 120:259–271. [PubMed: 21553940]

- Abramson LY, Metalsky GI, Alloy LB. Hopelessness depression: A theory-based subtype of depression. *Psychological Review*. 1989; 96:358–372.
- Asetline RH, Gore S, Gordon J. Life stress, anger, and anxiety, and delinquency: An empirical test of general strain theory. *Journal of Health and Social Behavior*. 2000; 41:256–275. [PubMed: 11011504]
- Beck AT. Cognitive models of depression. *Journal of Cognitive Psychotherapy*. 1987; 1:5–37.
- Boyle MH, Offord DR, Racine YA, Szatmari P, Sanford M, Fleming JE. Interviews versus checklists: Adequacy for classifying childhood psychiatric disorder based on adolescent reports. *International Journal of Methods in Psychiatric Research*. 1996; 6:309–319.
- Brennan, KA.; Clark, CL.; Shaver, PR. Self-report measurement of adult attachment: An integrative overview. In: Simpson, JA.; Rhodes, WS., editors. *Attachment theory and close relationships*. New York: Guilford Press; 1998. p. 46-76.
- Carter JS, Garber J, Ciesla JA, Cole DA. Modeling relations between hassles and internalizing and externalizing symptoms in adolescents: A four-year prospective study. *Journal of Abnormal Psychology*. 2006; 115:428–442. [PubMed: 16866584]
- Cassidy J, Aikins JW, Chernoff JJ. Children's peer selection: Experimental examination of the role of self-perceptions. *Developmental Psychology*. 2003; 39:495–508. [PubMed: 12760518]
- Cole DA, Nolen-Hoeksema S, Girgus J, Gilda P. Stress exposure and stress generation in child and adolescent depression: A latent trait-state-error approach to longitudinal analysis. *Journal of Abnormal Psychology*. 2006; 115:40–51. [PubMed: 16492094]
- Connolly NP, Eberhart NK, Hammen CL, Brennan PA. Specificity of stress generation: A comparison of adolescents with depressive, anxiety, and comorbid diagnoses. *International Journal of Cognitive Therapy*. 2010; 3:368–379. [PubMed: 22724042]
- Conway CC, Hammen C, Brennan PA. Expanding stress generation theory: Test of a transdiagnostic model. *Journal of Abnormal Psychology*. 2012; 121:754–766. [PubMed: 22428789]
- Compas BE, Connor-Smith J, Jaser SS. Temperament, stress reactivity, and coping: Implications for depression in childhood and adolescence. *Journal of Clinical Child and Adolescent Psychology*. 2004; 33:21–31. [PubMed: 15028538]
- Costello EJ, Erkanli A, Angold A. Is there an epidemic of child or adolescent depression. *Journal of Child Psychology and Psychiatry*. 2006; 47:1263–1271. [PubMed: 17176381]
- Coyne JC. Toward an interactional description of depression. *Psychiatry*. 1976; 39:28–40. [PubMed: 1257353]
- Curran PJ, Willoughby MT. Implications of latent trajectory models for the study of developmental psychopathology. *Development & Psychopathology*. 2003; 15:581–612. [PubMed: 14582933]
- Dykas MJ, Cassidy J. Attachment and the processing of social information across the life span: Theory and evidence. *Psychological Bulletin*. 2011; 137:19–46. [PubMed: 21219056]
- Fairchild AJ, Finney SJ. Investigating validity evidence for the experiences in close relationships-revised questionnaire. *Educational and Psychological Measurement*. 2006; 66:116–135.
- Flynn M, Kecmanovic J, Alloy LB. An examination of integrated cognitive-interpersonal vulnerability to depression: The role of rumination, perceived social support, and interpersonal stress generation. *Cognitive Therapy and Research*. 2010; 34:456–466.
- Fraley RC, Niedenthal PM, Marks M, Brumbaugh C, Vicary A. Adult attachment and the perception of emotional expressions: Probing the hyperactivating strategies underlying anxious attachment. *Journal of Personality*. 2006; 74:1163–1190. [PubMed: 16787432]
- Garber J, Braafladt N, Weiss B. Affect regulation in depressed and non-depressed children and young adolescents. *Developmental and Psychology*. 1995; 7:93–115.
- Ge X, Lorenz FO, Conger RD, Elder GH, Simons RL. Trajectories of stressful life events and depressive symptoms during adolescence. *Developmental Psychology*. 1994; 30:467–483.
- Goodman R. Psychometric properties of the Strengths and Difficulties Questionnaire (SDQ). *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40:1337–1345. [PubMed: 11699809]
- Goodman A, Lamping DL, Ploubidis GB. When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the Strengths and Difficulties

- Questionnaire (SDQ): Data from British parents, teachers and children. *Journal of Abnormal Child Psychology*. 2010; 38(8):1179–1191. [PubMed: 20623175]
- Grant, KE.; McMahon, SD. Conceptualizing the role of stressors in the development of psychopathology. In: Hankin, BL.; Abela, JRZ., editors. *Development of psychopathology: A vulnerability-stress perspective*. Thousand Oaks, CA: Sage Publications; 2005. p. 3-31.
- Hall, GS. *Adolescence: Its psychology and its relations to physiology, anthropology, sociology, sex, crime, religion, and education*. Vol. I & II. NY: Appleton & Company; 1904.
- Hammen C. Generation of stress in the course of unipolar depression. *Journal of Abnormal Psychology*. 1991; 100:555–561. [PubMed: 1757669]
- Hammen C. Stress and depression. *Annual Review of Clinical Psychology*. 2005; 1:293–319.
- Hammen C. Stress generation in depression: Reflections on origins, research, and future directions. *Journal of Clinical Psychology*. 2006; 62:1065–1082. [PubMed: 16810666]
- Hammen, C.; Rudolph, KD. Childhood mood disorders. In: Mash, EJ.; Barkley, RA., editors. *Childhood psychopathology*. 2. NY: Guilford Press; 2003. p. 233-278.
- Hankin BL. Cognitive vulnerability-stress model of depression during adolescence: Investigating symptom specificity in a multi-wave prospective study. *Journal of Abnormal Child Psychology*. 2008; 36:999–1014. [PubMed: 18437551]
- Hankin BL, Abramson LY. Development of gender differences in depression: An elaborated cognitive vulnerability-transactional stress theory. *Psychological Bulletin*. 2001; 127:773–796. [PubMed: 11726071]
- Hankin BL, Abramson LY. Measuring cognitive vulnerability to depression in adolescence: Reliability, validity and gender differences. *Journal of Clinical Child & Adolescent Psychology*. 2002; 31:491–504. [PubMed: 12402568]
- Hankin BL, Abramson LY, Moffitt TE, Silva PA, McGee R, Angell KE. Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology*. 1998; 107:128–140. [PubMed: 9505045]
- Hankin BL, Kassel JD, Abela JRZ. Adult attachment dimensions and specificity of emotional distress symptoms: Prospective investigations of cognitive risk and interpersonal stress generation as mediating mechanisms. *Personality and Social Psych Bulletin*. 2005b; 31:136–151.
- Hankin BL, Lakdawalla Z, Carter IL, Abela JRZ, Adams P. Are neuroticism, cognitive vulnerabilities and self-esteem overlapping or distinct risks for depression? Evidence from confirmatory factor analyses. *Journal of Social & Clinical Psychology*. 2007; 26:29–63.
- Hankin BL, Stone LB, Wright PA. Co-rumination, interpersonal stress generation, and internalizing symptoms: Sex differences and transactional influences in a multi-wave study of adolescents. *Development and Psychopathology*. 2010; 22:217–235. [PubMed: 20102657]
- Joiner TE, Wingate LR, Gencoz T, Gencoz F. Stress generation in depression: Three studies on its resilience, possible mechanism, and symptom specificity. *Journal of Social and Clinical Psychology*. 2005; 24:236–253.
- Kercher A, Rapee RM. A test of a cognitive diathesis-stress generation pathway in early adolescent depression. *Journal of Abnormal Child Psychology*. 2009; 37:845–855. [PubMed: 19291388]
- Kercher A, Rapee RM, Schniering CA. Neuroticism, life events and negative thoughts in the development of depression in adolescent girls. *Journal of Abnormal Child Psychology*. 2009; 37:903–915. [PubMed: 19437113]
- Klein DN, Dougherty LR, Olino TM. Toward guidelines for evidence-based assessment of depression in children and adolescents. *Journal of Clinical Child and Adolescent Psychology*. 2005; 34:412–432. [PubMed: 16026212]
- Kovacs M. The Children's Depression Inventory (CDI). *Psychopharm Bulletin*. 1985; 21:995–8.
- Lewinsohn PM, Joiner TE, Rohde P. Evaluation of cognitive diathesis-stress models in predicting major depressive disorder in adolescents. *Journal of Abnormal Psychology*. 2001; 110:203–215. [PubMed: 11368074]
- Lewinsohn PM, Rohde P, Gau JM. Comparability of self-report checklist and interview data in the assessment of stressful life events in young adults. *Psychological Reports*. 2003; 93:459–471. [PubMed: 14650673]

- Liu RT, Alloy LB. Stress generation in depression: A systematic review of the empirical literature and recommendations for future study. *Clinical Psychology Review*. 2010; 30:582–593. [PubMed: 20478648]
- Mikulincer, M.; Shaver, P. *Attachment in adulthood: Structure, dynamics, and change*. NY: Guilford; 2007.
- Monroe SM. Modern approaches to conceptualizing and measuring human life stress. *Annual Review of Clinical Psychology*. 2008; 4:33–52.
- Nolen-Hoeksema S. Responses to depression and their effects on the duration of the depressive episode. *Journal of Abnormal Psychology*. 1991; 100:569–582. [PubMed: 1757671]
- Potthoff JG, Holahan CJ, Joiner TE. Reassurance seeking, stress generation, and depressive symptoms: An integrative model. *Journal of Personality and Social Psychology*. 1995; 68:664–670. [PubMed: 7738769]
- Prinstein MJ. Moderators of peer contagion: A longitudinal examination of depression socialization between adolescents and their best friends. *Journal of Clinical Child and Adolescent Psychology*. 2007; 36:159–170. [PubMed: 17484689]
- Rose AJ. Co-Rumination in the friendships of girls and boys. *Child Development*. 2002; 73:1830–1843. [PubMed: 12487497]
- Rose AJ, Carlson W, Waller EM. Prospective associations of co-rumination with friendship and emotional adjustment: Considering the socioemotional trade-offs of co-rumination. *Developmental Psychology*. 2007; 43:1019–1031. [PubMed: 17605532]
- Rose AJ, Rudolph KD. A review of sex differences in peer relationship processes: Potential trade-offs for the emotional and behavioral development of girls and boys. *Psychological Bulletin*. 2006; 132:98–131. [PubMed: 16435959]
- Rothbart, MK.; Bates, JE. Temperament. In: Damon, W.; Eisenberg, N., editors. *Handbook of child psychology*. NJ: John Wiley & Sons Inc; 1998.
- Rudolph KD. Gender differences in emotional responses to interpersonal stress during adolescence. *Journal of Adolescent Health*. 2002; 30:3–13. [PubMed: 11943569]
- Rudolph KD. Developmental influences on interpersonal stress generation in depressed youth. *Journal of Abnormal Psychology*. 2008; 117:673–679. [PubMed: 18729618]
- Rudolph KD, Hammen C. Age and gender as determinants of stress exposure, generation, and reaction in youngsters: A transactional perspective. *Child Development*. 1999; 70:660–677. [PubMed: 10368914]
- Shih JH, Eberhart NK. Understanding the impact of prior depression on stress generation: Examining the roles of current depressive symptoms and interpersonal behaviours. *British Journal of Psychology*. 2008; 99:413–426. [PubMed: 17908367]
- Shih JH, Eberhart NK, Hammen CL, Brennan PA. Differential exposure and reactivity to interpersonal stress predict sex differences in adolescent depression. *Journal of Clinical Child and Adolescent Psychology*. 2006; 35:103–115. [PubMed: 16390306]
- Stark KD, Laurent J. Joint factor analysis of the Children's Depression Inventory and the Revised Children's Manifest Anxiety Scale. *Journal of Clinical Child Psychology*. 2001; 30:552–567. [PubMed: 11708242]
- Wagner C, Abela JRZ, Brozina K. A comparison of stress measures in children and adolescents: A self-report checklist versus an objectively rated interview. *Journal of Psychopathology and Behavioral Assessment*. 2006; 28:251–261.
- Watson D, Weber K, Assenheimer JS, Clark LA, Strauss ME, McCormick RA. Testing a tripartite model: I. Evaluating the convergent and discriminant validity of anxiety and depression scales. *Journal of Abnormal Psychology*. 1995; 104:3–14. [PubMed: 7897050]
- Wetter E, Hankin BL. Mediation pathways through which positive and negative emotionality contribute to symptoms of depression: A prospective study of adolescents. *Journal of Abnormal Child Psychology*. 2009; 37:507–520. [PubMed: 19184402]
- Wills TA, Windle M, Cleary SD. Temperament and novelty-seeking in adolescent substance use: Convergence of dimensions of temperament with constructs from Cloninger's Theory. *Journal of Personality and Social Psychology*. 1998; 74:387–406. [PubMed: 9491584]

Table 1

Descriptive Statistics and Correlations Among Variables at Time 1.

| Measure                        | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8      | 9      | 10     | 11     | 12     | 13     | 14   |
|--------------------------------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|------|
| 1. Negative Cognitive Style    | 1       |         |         |         |         |         |         |        |        |        |        |        |        |      |
| 2. Dysfunctional Attitudes     | .24***  | 1       |         |         |         |         |         |        |        |        |        |        |        |      |
| 3. Rumination                  | .11*    | .20***  | 1       |         |         |         |         |        |        |        |        |        |        |      |
| 4. Co-Rumination               | .13*    | -0.01   | 0.01    | 1       |         |         |         |        |        |        |        |        |        |      |
| 5. Anxious Attachment          | .48***  | .27***  | .33***  | -0.04   | 1       |         |         |        |        |        |        |        |        |      |
| 6. Avoidant Attachment         | .28***  | .21***  | .18***  | -.21*** | .62***  | 1       |         |        |        |        |        |        |        |      |
| 7. Positive Emotionality       | -.27*** | -.18*** | -.19*** | .21***  | -.33*** | -.45*** | 1       |        |        |        |        |        |        |      |
| 8. Neg. Emotionality           | .35***  | 0.09    | .34***  | -0.01   | .46***  | .35***  | -.41*** | 1      |        |        |        |        |        |      |
| 9. Depressive Symptoms         | .43***  | .28***  | .30***  | -0.04   | .57***  | .51***  | -.47*** | .58*** | 1      |        |        |        |        |      |
| 10. Anxiety Symptoms           | .42***  | 0.08    | .23***  | .10*    | .48***  | .40***  | -.32*** | .56*** | .63*** | 1      |        |        |        |      |
| 11. Conduct Problems           | .31***  | .14**   | .16**   | -.11*   | .38***  | .36***  | -.37*** | .37*** | .45*** | .37*** | 1      |        |        |      |
| 12. Dependent Achieve Stress   | .24***  | 0.07    | .12*    | 0.07    | .31***  | .30***  | -.16**  | .27*** | .35*** | .35*** | .28*** | 1      |        |      |
| 13. Dependent Interp. Stress   | .24***  | -0.01   | .19***  | 0.06    | .33***  | .32***  | -.18*** | .32*** | .33*** | .43*** | .33*** | .66*** | 1      |      |
| 14. Independent Interp. Stress | .19***  | 0.03    | .10*    | 0.05    | .26***  | .24***  | -.19*** | .26*** | .26*** | .33*** | .29*** | .54*** | .83*** | 1    |
| Mean                           | 3.17    | 24.4    | 14      | 2.93    | 2.97    | 3.48    | 3       | 2.26   | 12.8   | 2.2    | 0.51   | 20.77  | 48.9   | 19.7 |
| Standard Deviation             | 1.12    | 5.79    | 5.88    | 0.76    | 1.07    | 0.94    | 0.51    | 0.52   | 8.63   | 0.75   | 0.38   | 8.37   | 21.5   | 9.33 |

\*  $p < 0.05$ ,

\*\*  $p < 0.01$ ,

\*\*\*  $p < 0.001$

**Table 2**  
Individual Differences predicting prospective stress generation: Individual effects without covarying other influences

| Predictor                            | Achievement Stress |      |          | Independent Interpersonal |      |         | Dependent Interpersonal |      |          |
|--------------------------------------|--------------------|------|----------|---------------------------|------|---------|-------------------------|------|----------|
|                                      | Coefficient        | SE   | T        | Coefficient               | SE   | T       | Coefficient             | SE   | T        |
| Cognitive Vulnerability              |                    |      |          |                           |      |         |                         |      |          |
| Negative Cognitive Style             | 6.59               | 1.01 | 6.49***  | 0.24                      | 1.11 | 0.22    | 15.58                   | 1.71 | 8.13***  |
| Dysfunctional Attitudes              | 0.12               | 0.05 | 2.37*    | 0.02                      | 0.04 | 0.49    | 0.20                    | 0.10 | 2.01*    |
| Rumination                           | 0.11               | 0.05 | 2.25*    | 0.06                      | 0.04 | 1.33    | 0.16                    | 0.09 | 1.61     |
| Interpersonal Vulnerability          |                    |      |          |                           |      |         |                         |      |          |
| Co-Rumination                        | 0.91               | 0.39 | 2.35*    | 0.57                      | 0.35 | 1.56    | 2.40                    | 0.75 | 3.18***  |
| Anxious Attachment                   | 2.07               | 0.25 | 8.03***  | 0.44                      | 0.33 | 1.34    | 4.09                    | 0.50 | 8.17***  |
| Avoidant Attachment                  | 2.25               | 0.29 | 7.55***  | 0.41                      | 0.35 | 1.18    | 4.27                    | 0.58 | 7.37***  |
| Temperament                          |                    |      |          |                           |      |         |                         |      |          |
| Positive Emotionality (Extroversion) | -2.08              | 0.57 | -3.62*** | -0.10                     | 0.55 | -0.19   | -4.12                   | 1.11 | -3.71*** |
| Negative Emotionality (Neuroticism)  | 3.47               | 0.54 | 6.35***  | 0.10                      | 0.61 | 0.16    | 7.02                    | 1.05 | 6.64***  |
| Psychopathology                      |                    |      |          |                           |      |         |                         |      |          |
| Depressive Symptoms                  | 8.16               | 0.83 | 9.73***  | 1.95                      | 1.12 | 1.74    | 15.70                   | 1.63 | 9.61***  |
| Anxiety Symptoms                     | 3.29               | 0.36 | 9.08***  | 0.62                      | 0.42 | 1.45    | 6.89                    | 0.69 | 9.94***  |
| Conduct Problems                     | 5.03               | 0.73 | 6.84***  | 2.39                      | 0.70 | 3.40*** | 9.14                    | 1.44 | 6.35***  |
| Demographics                         |                    |      |          |                           |      |         |                         |      |          |
| Age                                  | 1.06               | 0.20 | 5.32***  | 0.11                      | 0.53 | 0.58    | 2.49                    | 0.37 | 6.58***  |
| Gender                               | -2.33              | 0.59 | -3.95*** | 1.33                      | 0.53 | 2.51*   | 4.27                    | 1.15 | 3.69***  |

\*  $p < 0.05$ ,

\*\*  $p < 0.01$ ,

\*\*\*  $p < 0.001$



**Table 3**  
Individual Differences predicting prospective stress generation: After controlling for individual-variable significant effects

| Predictor                            | Achievement Stress |      |          | Independent Interpersonal |      |        | Dependent Interpersonal |      |         |
|--------------------------------------|--------------------|------|----------|---------------------------|------|--------|-------------------------|------|---------|
|                                      | Coefficient        | SE   | T        | Coefficient               | SE   | T      | Coefficient             | SE   | T       |
| Cognitive Vulnerability              |                    |      |          |                           |      |        |                         |      |         |
| Negative Cognitive Style             | 0.24               | 1.19 | 0.17     | --                        | --   | --     | 3.07                    | 2.28 | 1.35    |
| Dysfunctional Attitudes              | --                 | --   | --       | --                        | --   | --     | --                      | --   | --      |
| Rumination                           | --                 | --   | --       | --                        | --   | --     | --                      | --   | --      |
| Interpersonal Vulnerability          |                    |      |          |                           |      |        |                         |      |         |
| Co-Rumination                        | --                 | --   | --       | --                        | --   | --     | 2.25                    | 0.75 | 3.00**  |
| Anxious Attachment                   | 0.58               | 0.35 | 1.68     | --                        | --   | --     | 0.93                    | 0.67 | 1.39    |
| Avoidant Attachment                  | 0.68               | 0.36 | 1.87     | --                        | --   | --     | 1.54                    | 0.72 | 2.14*   |
| Temperament                          |                    |      |          |                           |      |        |                         |      |         |
| Positive Emotionality (Extroversion) | 0.67               | 0.59 | 0.42     | --                        | --   | --     | -1.22                   | 1.14 | -1.07   |
| Negative Emotionality (Neuroticism)  | 0.53               | 0.62 | 0.85     | --                        | --   | --     | 0.47                    | 1.24 | 0.38    |
| Psychopathology                      |                    |      |          |                           |      |        |                         |      |         |
| Depressive Symptoms                  | 3.46               | 1.19 | 2.90***  | --                        | --   | --     | 5.35                    | 2.18 | 2.45**  |
| Anxiety Symptoms                     | 1.03               | 0.45 | 2.25*    | --                        | --   | --     | 2.45                    | 0.88 | 2.78**  |
| Conduct Problems                     | 2.72               | 0.77 | 3.54***  | 2.02                      | 0.71 | 2.83** | 3.88                    | 1.46 | 2.65**  |
| Demographics                         |                    |      |          |                           |      |        |                         |      |         |
| Age                                  | 0.52               | 0.20 | 2.63**   | --                        | --   | --     | 1.18                    | 0.38 | 3.05**  |
| Gender                               | -2.46              | 0.53 | -4.59*** | 1.31                      | 0.53 | 2.49** | 3.37                    | 1.09 | 3.07*** |

\*  $p < 0.05$ ,\*\*  $p < 0.01$ ,\*\*\*  $p < 0.001$