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Stress Generation and Adolescent Depression: Contribution of Interpersonal Stress Responses

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Abstract

This research examined the proposal that ineffective responses to common interpersonal problems disrupt youths' relationships, which, in turn, contributes to depression during adolescence. Youth (86 girls, 81 boys; M age = 12.41, SD = 1.19) and their primary female caregivers participated in a three-wave longitudinal study. Youth completed a measure assessing interpersonal stress responses; youth and caregivers completed semi-structured interviews assessing youths' life stress and psychopathology. Consistent with the hypothesized model, ineffective stress responses (low levels of effortful engagement, high levels of involuntary engagement and disengagement) predicted the generation of subsequent interpersonal stress, which partially accounted for the association between stress responses and depression over time. Moreover, results revealed that self-generated interpersonal, but not noninterpersonal stress, predicted depression, and that this explanatory model was specific to the prediction of depression but not anxiety. This research builds on interpersonal stress generation models of depression, and highlights the importance of implementing depression-focused intervention programs that promote effective stress responses and adaptive interpersonal relationships during adolescence.

Keywords

depression; stress responses; interpersonal stress generation; adolescence

Stress Generation and Adolescent Depression: Contribution of Interpersonal Stress Responses

Much research has examined the role of life stress in depression (Hammen, 2006). This research originally was driven by the unidirectional theory that stress contributes to the onset and course of depression. In contrast, contemporary theory and research adopt a transactional perspective, which proposes that individuals not only respond to, but also elicit and shape, environmental experiences (Caspi & Shiner, 2006; Sameroff, 2009). Consistent with this view, the stress generation theory of depression (Hammen, 1991, 1992, 2006) posits that depressed and depression-prone individuals generate stress in their relationships, which then promotes or exacerbates their symptoms. However, relatively little is known about which characteristics predict stress generation, particularly during adolescence, a well-established period of depression onset (Hankin & Abramson, 2001). This study aimed to identify one predictor of interpersonal stress generation, namely youths' responses to everyday problems, with the goal of elucidating one process of risk for the development of adolescent depression.

Predictors of Interpersonal Stress Generation

Early research on stress generation focused on depressive symptoms as predictors of subsequent dependent interpersonal stress (i.e., stressors to which youth, at least in part, contribute; Coyne, 1976; Hammen, 1991). Moving beyond the role of symptoms, more

recent research identifies interpersonal behaviors that predict self-generated relationship disturbances. In young adults, maladaptive interpersonal tendencies, such as being unassertive or overly dependent on others (Shih & Eberhart, 2008), excessive reassurance seeking (repeated requests for reassurance about one's self-worth; Potthoff, Holahan, & Joiner, 1995), and ineffective interpersonal problem solving (Davila, Hammen, Burge, Paley, & Daley, 1995) predict subsequent stress and conflict within relationships. During early- to mid-adolescence, negative feedback seeking (the tendency to solicit criticism within close interpersonal relationships), prospectively contributes to elevations in criticism from friends (for girls) and peer rejection (for boys) (Borelli & Prinstein, 2006). Over time, excessive reassurance seeking predicts deterioration in the quality of adolescents' friendships (Prinstein, Borelli, Cheah, Simon, & Aikins, 2005) as well as self-generated interpersonal stress during childhood and early adolescence (Shih et al., 2009). Also during early- to mid-adolescence, co-rumination (the extensive discussion and self-disclosure of emotional problems within a dyadic relationship) predicts dependent interpersonal stress, but not dependent noninterpersonal stress (i.e., self-generated stressors that do not involve relationships) or independent stress (i.e., "fateful" stressors that are not elicited by youth) (Hankin, Stone, & Wright, 2010). Finally, depressive personality traits (e.g., self-criticism, pessimism, skepticism, brooding) predict subsequent self-generated family and peer stress (Rudolph & Klein, 2009).

Role of Stress Responses

One unexamined attribute that also may promote interpersonal stress generation is youths' responses to everyday problems. Whereas effective coping with common social disturbances, such as being teased, insulted, pressured, or having a fight with a friend, likely promotes healthy relationships, ineffective responses might perpetuate or amplify relationship dysfunction. For example, actively resolving conflict through problem-solving efforts can help to maintain strong bonds with peers whereas being unresponsive to conflict may lead to isolation from the peer group. Responding to a verbal dispute by impulsively striking out at a friend may compromise the friendship. Alternatively, becoming emotionally aroused in response to teasing may mark youth as easy targets of more persistent bullying. Thus, although stress responses inherently reflect a *reaction* to problems, they also may *contribute* to, or intensify, subsequent interpersonal stress.

A comprehensive contemporary framework (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001) conceptualizes stress responses along two dimensions: (1) effortful coping versus involuntary reactions; and (2) engagement with versus disengagement from stressors (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). Of note, this framework is novel in that it captures the distinction between goal-directed, volitional coping and unplanned, automatic responses to stress. Combining across the two primary dimensions, this framework yields four categories of stress responses: engagement coping (efforts to modify or adapt to stressors; e.g., problem solving and cognitive restructuring), disengagement coping (efforts directed away from stressors; e.g., avoidance and denial), involuntary engagement (automatic responses involving over-engagement with stressors; e.g., heightened arousal and rumination), and involuntary disengagement (automatic responses involving under-engagement with stressors; e.g., emotional numbing and inaction). In contrast to youth who engage in active efforts to resolve or adapt to everyday interpersonal stressors, youth who actively disengage or react involuntarily might intensify relationship discord. Specifically, disengagement coping and involuntary responses might disrupt relationships by leaving disagreements unresolved and creating tension or conflict, thereby causing a persistence or amplification of stress. Accordingly, the first goal of this study was to examine whether ineffective interpersonal stress responses (*less* engagement

coping and *more* disengagement coping and involuntary engagement and disengagement) predict subsequent interpersonal stress during early- to mid-adolescence.

Contribution to Depression

Independent lines of research suggest that both ineffective interpersonal stress responses as well as interpersonal stress generation contribute to depression, perhaps due to the negative affect, diminished self-worth, and feelings of hopelessness and worthlessness that accompany unresolved relationship disturbances (Rudolph, 2009). Specifically, less engagement coping and more disengagement coping and involuntary responses are concurrently and prospectively associated with depressive symptoms across adolescence (Connor-Smith et al., 2000; Flynn & Rudolph, 2007, 2010; Wadsworth & Berger, 2006). In addition, self-generated interpersonal stress predicts depression in early- to mid-adolescents (Little & Garber, 2005; Rudolph, Flynn, Abaied, Groot, & Thompson, 2009) and young adults (Davila et al., 1995; Flynn, Kecmanovic, & Alloy, 2010; Hankin, Kassel, & Abela, 2005; Shih, 2006).

Although stress responses, self-generated interpersonal stress, and depression have been independently linked, few studies directly examine process models wherein dependent interpersonal stress mediates prospective associations between characteristics of depression-prone individuals and depressive symptoms. However, three studies provide support for such models. First, in a two-wave study of young adults, Wave 2 dependent interpersonal stress partially accounted for the association between Wave 1 insecure attachment orientation and Wave 2 depressive symptoms, controlling for Wave 1 stress and symptoms (Hankin et al., 2005). Second, using multi-level modeling over a six-week period, dependent interpersonal stress partially mediated the prospective effect of sociotropy on depressive symptoms in young adult women but not men (Shih, 2006). Third, using hierarchical linear modeling, dependent interpersonal stress accounted for the prospective association between co-rumination and anhedonic depression across four waves during adolescence (Hankin et al., 2010). Moreover, in all of these studies the process models were specific to self-generated interpersonal, as opposed to noninterpersonal, stress. These findings are promising but additional research is warranted to examine alternative predictors of stress generation and subsequent depression, particularly during adolescence. Thus, the second goal of this study was to examine whether self-generated interpersonal (but not noninterpersonal) stress mediates between ineffective interpersonal stress responses and subsequent depression.

Stress Responses, Interpersonal Stress Generation, and Anxiety

Some research suggests that both stress responses and self-generated interpersonal stress also predict anxiety during adolescence. However, much of this research has grouped anxiety and depression into composite internalizing symptom scores; accordingly, the specificity of the associations with depression versus anxiety is unclear. In terms of stress responses, research distinguishing approach coping (strategies directed toward stressors) and avoidance coping (strategies focused on evading or distracting oneself from stressors) generally links youth anxiety with elevated avoidance (Ollendick, Langley, Jones, & Kephart, 2001; Sandler, Tein, & West, 1994). Research using Compas and colleagues' (2001) framework indicates that lower levels of engagement coping (Calvete & Connor-Smith, 2006; Compas et al., 2006; Connor-Smith et al., 2000; Wadsworth, Raviv, Compas, & Connor-Smith, 2005) and higher levels of disengagement coping (Calvete & Connor-Smith, 2006; Wadsworth et al., 2005) and involuntary engagement and disengagement (Connor-Smith et al., 2000; Wadsworth et al., 2005) are concurrently associated with internalizing symptoms in adolescents and young adults. In one prospective study, involuntary engagement predicted anxiety, particularly under conditions of high, but not low, levels of stress (Wolff, Santiago, & Wadsworth, 2009).

Research also suggests that self-generated interpersonal stress predicts anxiety, and two studies revealed that dependent interpersonal stress helps account for the contribution of maladaptive cognitive traits and interpersonal behaviors to anxiety symptoms. In one study, dependent interpersonal stress partially accounted for the effect of prior insecure attachment on anxiety symptoms in young adults (Hankin et al., 2005). In another study, dependent interpersonal stress partially mediated the prospective link between co-rumination and anxiety symptoms across four waves during adolescence (Hankin et al., 2010). Thus, the third goal of the present study was to examine whether self-generated interpersonal stress specifically mediates prospective associations between stress responses and depression, or whether this process model also provides explanatory power for the prediction of anxiety during adolescence.

Alternative Models

When elucidating the associations among stress responses, stress generation, and psychopathology, it is important to consider alternative process models. For instance, experiencing high levels of stress might predispose youth to respond ineffectively, thereby conferring vulnerability to depression or anxiety. Alternatively, internalizing symptoms might cause youth to generate interpersonal stress, to which they then respond ineffectively as a consequence of depression- or anxiety-related impairment. Thus, this study also examined two competing explanatory models to elucidate specific mechanisms of risk among stress responses, interpersonal stress generation, and depression and anxiety during adolescence.

Sex and Age Differences

Given the emerging sex difference in depression that emerges during early- to mid-adolescence, as reflected in greater surges of depression in girls than in boys (Hankin & Abramson, 2001; Hankin, Wetter, & Cheely, 2008), it is important to consider whether explanatory models differ across sex and age. Specifically, some research reveals that interpersonal (Brendgen, Wanner, Morin, & Vitaro, 2005; Prinstein & Aikins, 2004), and more specifically dependent interpersonal (Hankin, Mermelstein, & Roesch, 2007; Rudolph et al., 2009), stress makes a stronger prospective contribution to depression in girls than in boys during the progression through adolescence. Thus, separate multi-group comparison analyses were conducted to examine whether sex and age moderated the proposed paths among stress responses, dependent interpersonal stress, and depression.

Method

Participants

Participants included 167 youth (86 girls, 81 boys; M age = 12.41, SD = 1.19, range = 9.6 to 14.8 years) at Wave 1 [W_1] and their primary female caregivers (88.6% biological mothers; 1.8% stepmothers; 4.2% adoptive mothers; 5.4% other) involved in a longitudinal study examining depression during adolescence. Youth and caregivers were recruited from several towns in the Midwest. Participants were predominantly white (77.8%); the remainder were African-American (12.6%) or from a different ethnic group (9.6%). Families reported a range of income levels (16.7% below 30,000, 48.7% \$30–59,999, 21.6% \$60,000–89,999, and 13.0% over \$90,000).

Youth were selected for the longitudinal study based on school-wide screenings with the Children's Depression Inventory (Kovacs, 1981). The screening sample (N = 1985) represented approximately 80% of potential participants. Youth with a range of CDI scores were targeted from the screening sample, over-sampling slightly for youth with severe symptoms (15.8% of the screening sample and 20.3% of targeted youth, and 24.1% of

recruited youth had scores > 18). Beyond oversampling, targeted youth ($N = 468$; M CDI = 8.17, $SD = 8.91$, range = 0 to 52) were called at random to determine eligibility and to recruit for participation. Eligibility requirements included having a maternal caregiver in the home and accessibility (within one hour) to the university laboratory. Exclusionary criteria included having a non-English speaking female guardian or a severe developmental disability that would interfere with participation. Of the families who were targeted, nonparticipants were busy or not interested ($N = 229$), had moved or were unreachable ($N = 40$), were chronically rescheduled ($N = 5$), or did not meet eligibility criteria ($N = 27$). Participants and nonparticipants did not differ in sex $\chi^2(1) = .39$, *ns*, ethnicity (white vs. minority) $\chi^2(1) = .02$, *ns*, or CDI screening scores $t(280) = 1.11$, *ns*. Participants ($M = 12.41$) were slightly younger than nonparticipants ($M = 12.65$), $t(275) = 2.28$, $p < .05$.

Of the original 167 families, 156 (93.4%) had complete data at Wave 2 (W_2) and 158 (94.6%) had complete data at Wave 3 (W_3). Youth without data at W_2 or W_3 did not differ from those with complete data in terms of sex $\chi^2(1) = .96$, *ns*, age, $t(165) = .78$, *ns*, ethnicity (white vs. minority), $\chi^2(1) = .61$, *ns*, W_1 depression, $t(165) = .14$, *ns*, W_1 anxiety, $t(165) = .96$, *ns*, W_1 dependent interpersonal stress, $t(165) = .77$, *ns*, or W_1 dependent noninterpersonal stress, $t(165) = .32$, *ns*.

Procedures

To recruit participants, phone calls were made to primary female caregivers. Interested youth and caregivers participated in three annual assessments, each spaced one year apart (W_1 , W_2 , and W_3). Caregivers provided written consent and youth provided written assent for participation. At each wave, youth completed the Responses to Stress Questionnaire, and youth and caregivers completed semi-structured diagnostic and life stress interviews. A clinical psychology faculty member and post-doctoral student, several psychology graduate students, and a post BA-level research assistant conducted the diagnostic interviews. Trained graduate students, advanced undergraduate students, and a post BA-level research assistant conducted the life stress interviews. To avoid biases, different interviewers conducted the diagnostic and life stress interviews. At each assessment, caregivers were compensated monetarily and youth were given a gift certificate for their participation.

Measures

Stress responses—Youth completed the Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000), which distinguishes between effortful coping versus involuntary responses and engagement versus disengagement. The social stress version of the RSQ asks youth to indicate how many of nine common stressors (e.g., being around kids who are rude, not having as many friends as desired, being left out, being socially pressured) had occurred within the previous year. Youth rated on a 4-point scale how much they engaged in 57 different responses to the constellation of interpersonal stressors they endorsed. The 57 items are evenly distributed across 19 subscales which, in turn, contribute to 4 higher-order factors. This overarching factor structure was supported using confirmatory factor analysis during the original measure development (Connor-Smith et al., 2000). Additionally, convergent validity and retest reliability for the four factors have been established (Connor-Smith et al., 2000). Strong internal consistency and cross-wave stability were found in the present sample for each subscale: engagement coping ($\alpha = .88$; $r = .66$), disengagement coping ($\alpha = .81$; $r = .50$), involuntary engagement ($\alpha = .90$; $r = .57$), and involuntary disengagement ($\alpha = .89$; $r = .52$).

Research indicates that response biases can exist in the endorsement of stress responses such that individuals consistently report high or low levels across different response types (Connor-Smith et al., 2000). Consistent with previous research (Connor-Smith et al., 2000;

Flynn & Rudolph, 2007, 2010; Sontag, Graber, Brooks-Gunn, & Warren, 2008), to correct for these base-rate differences in the endorsement of responses to stress, proportion scores were calculated as the total score for each factor divided by the total score on the RSQ. This ipsative scaling method eliminates variance that is independent from the content of the items, thereby minimizing response bias (Chan, 2003; Cunningham, Cunningham, & Green, 1977). Higher proportion scores reflect more predominant stress responses relative to the other factors such that general profiles of stress response repertoires can be examined across participants.

Life stress—Interviewers administered the Youth Life Stress Interview (Rudolph & Flynn, 2007) separately to youth and caregivers. This semi-structured interview was adapted from the Child Episodic Life Stress Interview (Rudolph & Hammen, 1999; Rudolph et al., 2000) and uses the contextual threat method (Brown & Harris, 1978) to determine the occurrence and impact of stressful episodic events that youth experienced during the previous year. Interviewers first made an open-ended query about youths' experience of any type of stressful events during that time. Next, standardized probes were used to gather information about specific stressful experiences in several life domains (e.g., peer and family relationships, school, health). Following the endorsement of a stressful event, detailed questions were asked to obtain information regarding the timing, duration, and context of the event, as well as its objective consequences. The interviewer then created a narrative summary of each stressful event, which was presented to a team of coders. Coders had no prior knowledge of youths' experience of psychopathology or their subjective responses to the events. The total number of reported events ranged from 1 to 22 ($M = 6.79$, $SD = 3.71$) at W_1 , from 0 to 26 ($M = 6.00$, $SD = 4.32$) at W_2 , and from 0 to 18 ($M = 5.89$, $SD = 3.73$) at W_3 .

Information was integrated across youth and caregivers to assign three ratings to each event. First, events were assigned an objective stress or impact rating for typical youth under similar conditions on a scale from 1 (*No Negative Stress*) to 5 (*Severe Negative Stress*); because events with ratings of 1 were considered not to involve any objective stress, they were excluded from analyses. Second, events were categorized as interpersonal (i.e., events that involved a significant interaction between the youth and another person or that directly affected the relationship between the youth and another person) versus noninterpersonal (i.e., all other events). A sample interpersonal event with an impact rating of 1.5 was ending friendships with a group of immaturely behaving peers; a sample interpersonal event with an impact rating of 4 was having a physical fight that resulted in a serious head injury in a peer. A sample noninterpersonal event with an impact rating of 1.5 included getting a school detention; a sample noninterpersonal event with an impact rating of 5 included getting sent to a juvenile detention center. Third, the extent to which events were self-generated, or dependent on the youth's contribution were rated on a scale from 1 (*Completely Independent*) to 5 (*Completely Dependent*). Consistent with previous research, events with dependence ratings of 3 and above were considered dependent (Daley et al., 1997; Davila et al., 1995; Rudolph et al., 2009).

Two composite scores (dependent interpersonal stress and dependent noninterpersonal stress) were computed by summing the objective stress ratings across relevant events within each wave. Two independent coding teams rated 160 events to assess the reliability of the three types of ratings. High reliability was found for objective stress ($ICC = .90$), dependence ($ICC = .96$), and the categorization of event content (Cohen's $\kappa = .92$).

Psychopathology—Interviewers administered the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Epidemiologic Version-5 (K-SADS-E; Orvaschel, 1995) separately to youth and their caregivers to assess youths' current (i.e., within the past

month) symptoms of depression and anxiety. All ratings were determined in consultation with a clinical psychology faculty member or post-doctoral student. Information was integrated across youth and caregivers, and a best-estimate approach was used to assign consensual diagnoses (Klein, Ouimette, Kelly, Ferro, & Riso, 1994).

Diagnostic and Statistical Manual of Mental Disorders criteria (DSM-IV-TR; American Psychiatric Association, 2000) were used to assign ratings of symptoms on a 5-point scale: 0 = *No symptoms*, 1 = *Mild symptoms*, 2 = *Moderate symptoms*, 3 = *Diagnosis with mild to moderate impairment*, and 4 = *Diagnosis with severe impairment*. Ratings took into account the number, severity, frequency, duration, and resulting impairment associated with symptoms of each type of depressive disorder (i.e., major depressive episodes, dysthymia, depressive disorder NOS) and anxiety disorder (i.e., generalized anxiety disorder, panic disorder, agoraphobia, social phobia, separation anxiety, post-traumatic stress disorder, obsessive-compulsive disorder, anxiety disorder NOS). Ratings were assigned for both diagnosable episodes and subthreshold symptoms such that higher scores reflect the occurrence of more severe symptoms within a single diagnostic category or the presence of symptoms from multiple categories of depression and anxiety (for similar rating approaches, see Davila et al., 1995; Hammen, Shih, & Brennan, 2004; Rudolph et al., 2000, 2009). Thus, these scores represent composite indexes of several different markers of depression and anxiety severity during the preceding month.

Validity of the depression scores was established through significant correlations with self-reported symptoms on the Children's Depression Inventory (CDI; Kovacs, 1981) and the Youth Depression Inventory (YDI; Rudolph, 2002) ($r_s = .46$ to $.57$, $p_s < .001$). Validity of the anxiety scores was established through significant correlations with self-reported symptoms on the Revised Child Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978) ($r_s = .35$ to $.42$, $p_s < .001$). Moreover, these continuous scores are consistent with contemporary conceptualizations, derived in part from taxometric analyses, that view depression (Fergusson, Horwood, Ridder, & Beautrais, 2005; Hankin, Fraley, Lahey, & Waldman, 2005; Haslam, 2003) and anxiety (Haslam, 2003; Kollman, Brown, Liverant, & Hofmann, 2006; Ruscio, Borkovec, & Ruscio, 2001) as best represented by continuous dimensions rather than discrete categories. Based on independent coding of audiotapes of 42 interviews, strong inter-rater reliability was found for the past month depression ratings (one-way random-effects intraclass correlation coefficient [ICC] = $.97$) and the past month anxiety ratings (one-way random-effects ICC = $.86$).

Across the three waves of the study, 13.8% of youth (15.1% of girls; 12.3% of boys) experienced a diagnostic-level depressive episode (i.e., a rating of 3 or 4) and an additional 21.0% (20.9% of girls; 21.0% of boys) experienced mild or moderate depressive symptoms (i.e., a rating of 1 or 2) within the past month. For anxiety, 20.4% (23.3% of girls; 17.3% of boys) of youth experienced a diagnostic-level episode of an anxiety disorder, and an additional 40.1% (36.1% of girls; 44.4% of boys) experienced mild or moderate anxiety symptoms within the past month. At the diagnostic level, 6.0% (4.7% of girls; 7.4% of boys) of youth experienced comorbid depression and anxiety disorders. Thus, a reasonable percentage of participants experienced depressive and anxiety symptoms during the study.

Results

Overview of Analyses

First, correlation analyses were conducted to examine the pattern of associations among stress responses, dependent stress, and psychopathology. Second, structural equation modeling (SEM) analyses were conducted with Amos Version 17.0 (Arbuckle, 2008) to examine the hypothesized process model. To avoid bias associated with examining

mediation at concurrent time points (Maxwell & Cole, 2007), a model was constructed that included W_1 stress responses, dependent stress scores that reflected stress occurring during the two years between W_1 and W_3 (i.e., the sum of the scores obtained at W_2 and W_3 ; W_{2-3}), and W_3 (past month) depression. The specificity of mediation by dependent interpersonal stress was investigated with a parallel model including W_{2-3} dependent noninterpersonal stress, and the specificity to psychopathology type was investigated with a parallel model predicting W_3 anxiety. The models also adjusted for W_1 life stress and psychopathology, thereby providing a conservative test of mediation.

Correlation Analyses

Table 1 displays the intercorrelations among the measures. As reflected in the table, W_1 engagement coping and involuntary engagement and disengagement were associated in the expected ways with dependent stress and psychopathology across waves with a few exceptions. However, W_1 disengagement coping was not associated with dependent interpersonal stress at any wave, and was inconsistently and weakly associated with dependent noninterpersonal stress and psychopathology across the three waves. Engagement coping was significantly and highly correlated in a negative direction with involuntary engagement and disengagement; involuntary engagement and disengagement were significantly and moderately correlated in a positive direction. In light of this pattern of associations (moderate to large intercorrelations among engagement coping and involuntary responses; similar associations between these three types of responses and both dependent stress and psychopathology), these stress responses served as indicators of a latent construct in subsequent analyses; disengagement coping was excluded from analyses due to its weak associations with stress and psychopathology.

Test of the Proposed Process Model

SEM analyses were conducted to examine whether W_{2-3} dependent interpersonal stress mediated the association between W_1 stress responses and W_3 (past month) depression, adjusting for W_1 dependent interpersonal stress and W_1 (past month) depression. W_1 stress responses were represented by a latent variable composed of *less* engagement coping and *more* involuntary engagement and disengagement. Dependent interpersonal stress (at W_1 and W_{2-3}) and depression (at W_1 and W_3) were represented by observed variables. Paths were included from W_1 stress responses to W_{2-3} dependent interpersonal stress, and from W_{2-3} dependent interpersonal stress to W_3 depression (see Figure 1). The direct path from W_1 stress responses to W_3 depression was included, as were the stability paths from W_1 to W_{2-3} dependent interpersonal stress, and from W_1 to W_3 depression. Based on information provided by the modification indices, the W_1 variables were allowed to covary.

Results revealed that this model provided an excellent fit to the data, $\chi^2(9) = 15.55$, *ns*, $\chi^2/df = 1.73$, CFI = .99, IFI = .99, RMSEA = .07. Figure 1 displays standardized path coefficients. As anticipated, the path between W_1 stress responses and W_{2-3} dependent interpersonal stress, and the path between W_{2-3} dependent interpersonal stress and W_3 depression were both positive and significant. Several indicators were examined to test mediation (Baron & Kenny, 1986; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shrout & Bolger, 2002). First, consistent with mediation, the direct path from W_1 stress responses to W_3 depression was reduced to nonsignificance after including W_{2-3} dependent interpersonal stress. Second, the indirect effect of W_1 stress responses on W_3 depression was significant (IE = .05, $Z = 2.14$, $p < .05$; Sobel 1982, 1986). Third, following Shrout and Bolger (2002), the strength of mediation was quantified by calculating the effect proportion (indirect effect/total effect). This analysis indicated that 28% of the total effect of W_1 stress responses on W_3 depressive symptoms was accounted for by W_{2-3} dependent interpersonal stress. Finally, examination of the squared multiple correlations (i.e., proportion of variance in W_3

depression explained by the predictors in the model) indicated that the model accounted for 42% of the variance in depression (a large effect size; Cohen, 1992). Taken together, these indicators suggest that W_{2-3} dependent interpersonal stress mediated the association between W_1 stress responses and W_3 depression.

A series of multi-group comparison analyses was conducted to investigate whether the obtained mediation results differed across sex or age. First, the three paths of interest were constrained to be equal across girls and boys; each path was then individually unconstrained in sequence. Examination of the chi-square difference tests revealed no significant differences in the three paths across girls and boys, $\Delta\chi^2(1) < 2.79$, *ns*. Second, the three paths of interest were constrained to be equal across younger and older participants (based on a median split); each path was then individually unconstrained in sequence. Examination of the chi-square difference tests revealed that there were no significant differences in the three paths across younger and older participants, $\Delta\chi^2(1) < 1.81$, *ns*.

Examination of Specificity

Mediation by noninterpersonal stress—To investigate the specificity of mediation by dependent interpersonal stress, a parallel model was constructed in which W_1 and W_{2-3} dependent noninterpersonal stress replaced W_1 and W_{2-3} dependent interpersonal stress, respectively. Although the path from W_1 stress responses to W_{2-3} dependent noninterpersonal stress was positive and significant ($\beta = .31$, $p < .01$), the path from W_{2-3} dependent noninterpersonal stress to W_3 depression was nonsignificant ($\beta = -.01$, *ns*), thereby precluding examination of mediation.

Prediction of anxiety—To investigate the specificity of this explanatory model to depression, parallel models were constructed in which W_1 and W_3 (past month) anxiety replaced W_1 and W_3 (past month) depression, respectively. Although the direct effect of W_1 stress responses on W_3 anxiety was significant ($\beta = .14$, $p < .05$), neither W_{2-3} dependent interpersonal stress nor W_{2-3} dependent noninterpersonal stress emerged as significant predictors of W_3 anxiety (β s $< .08$, *ns*), adjusting for prior levels of stress and psychopathology, thereby precluding examination of mediation.

Alternative directions of effect—To investigate alternative directions of effect among stress responses, dependent interpersonal stress, and depression and anxiety, a series of parallel models was constructed; within each set of parallel models, one included depression whereas the other included anxiety. First, parallel models were constructed to examine whether W_2 stress responses mediated the associations between W_1 dependent interpersonal stress and W_3 depression and/or W_3 anxiety. In the first model, paths were included from W_1 dependent interpersonal stress to W_2 stress responses, and from W_2 stress responses to W_3 depression; the direct path from W_1 dependent interpersonal stress to W_3 depression also was included. In the second model, paths were included from W_1 dependent interpersonal stress to W_2 stress responses, and from W_2 stress responses to W_3 anxiety; the direct path from W_1 dependent interpersonal stress to W_3 anxiety also was included. Both models included the stability paths from W_1 to W_2 stress responses and from W_1 to W_3 depression or anxiety, respectively. Results revealed that W_1 dependent interpersonal stress did not predict W_2 stress responses, adjusting for W_1 stress responses ($\beta = -.03$, *ns*), thereby precluding examination of W_2 stress responses as a mediator between W_1 dependent interpersonal stress and W_3 depression or W_3 anxiety.

Second, parallel models were constructed to examine whether W_{2-3} dependent interpersonal stress served as a mediator between W_1 depression and/or W_1 anxiety and W_3 stress responses. In the first model, paths were included from W_1 depression to W_{2-3} dependent

interpersonal stress, and from W_{2-3} dependent interpersonal stress to W_3 stress responses; the direct path from W_1 depression to W_3 stress responses also was included. In the second model, paths were included from W_1 anxiety to W_{2-3} dependent interpersonal stress, and from W_{2-3} dependent interpersonal stress to W_3 stress responses; the direct path from W_1 anxiety to W_3 stress responses also was included. Both models included the stability paths from W_1 to W_3 stress responses and from W_1 to W_{2-3} dependent interpersonal stress. Although W_1 depression significantly predicted W_{2-3} dependent interpersonal stress ($\beta = .19, p < .01$), and W_1 anxiety marginally predicted W_{2-3} dependent interpersonal stress ($\beta = .12, p < .10$), W_{2-3} dependent interpersonal stress did not contribute to W_3 stress responses in either model ($|\beta|s < .06, ns$), thereby precluding examination of W_{2-3} dependent interpersonal stress as a mediator between W_1 depression and/or W_1 anxiety and W_3 stress responses.

Discussion

This study examined a model in which ineffective responses to everyday social problems contributed to the generation of interpersonal stress, which accounted for the prospective link between stress responses and depression. It was hypothesized that ineffective responses to common social difficulties would undermine youths' relationships by leaving disturbances unresolved, thereby conferring vulnerability to depression during adolescence. Consistent with hypotheses, less engagement coping and more involuntary reactions to stress predicted subsequent self-generated interpersonal stress and, in turn, depression. These stress responses also predicted noninterpersonal stress, but only interpersonal stress mediated the association between stress responses and depression. Although the indirect effect of stress responses on depression was modest, this study provided a conservative test of mediation by adjusting for prior levels of *both* dependent interpersonal stress and depression in a multi-wave design. To our knowledge, only two other studies of stress generation during adolescence (Hankin et al., 2010; Rudolph et al., 2009) employed this stringent approach.

This study was novel in its examination of stress responses as a predictor of interpersonal stress generation. Failure to deal effectively with relatively common peer problems suggests unsuccessful mastery of a key developmental task. That is, as youth transition into adolescence they become increasingly reliant on peers (e.g., Steinberg & Silverberg, 1986), a process that underscores the importance of resilient peer networks during adolescence. When youth are unable to respond effectively to common social challenges, they may become vulnerable to long-term relationship disturbances, such as victimization, chronic rejection, and poor quality friendships. In this manner, youth may amplify the amount of stress they encounter in their relationships and strain their social networks. In turn, interpersonal stress likely compromises youths' sense of connection and social mastery, potentially leading to declines in self-worth, heightened negative affect, and other symptoms of depression. Notably, analyses revealed that this process model was specific to the prediction of depression but not anxiety.

This study also explored feasible alternative process models that might link stress responses, stress generation, and psychopathology. Inconsistent with alternative models, self-generated interpersonal stress did not predict stress responses over time. Moreover, although depression (significantly) and anxiety (marginally) predicted subsequent self-generated interpersonal stress, self-generated interpersonal stress did not make a prospective contribution to stress responses. These results can be attributed in part to the stability of stress responses over time, and support the notion that stress responses might represent a persistent characteristic of depression-prone individuals that emerges early in development and reflects temperamentally based reactivity (Compas, Connor-Smith, & Jaser, 2004). One

goal for future research will be to examine the development of response profiles across childhood to explore intrapersonal attributes and environmental experiences that influence youths' responses to interpersonal stress.

Four findings emerged that were contrary to expectations. First, disengagement coping, which is comprised of avoidance, denial, and wishful thinking, was not associated with self-generated interpersonal stress at any wave. This pattern of results is consistent with one study in which disengagement coping was largely unassociated with interpersonal stress, both concurrently and over time (Agoston & Rudolph, 2011), yet inconsistent with a second study that revealed a positive concurrent association between these variables (Sontag & Graber, 2010). Perhaps these predominantly intrapersonal coping strategies are not systematically reflected in meaningful aspects of youths' interpersonal behavior such that they do not create subsequent stress. Alternatively, youth who avoid and deny everyday problems also may be less likely to acknowledge these experiences during an interview-based assessment of life stress. One interesting avenue for future research will be to examine peer reports of stress responses, as peers may provide a unique perspective of youths' tendency to actively disengage in response to relationship discord.

Second, self-generated interpersonal stress did not prospectively predict anxiety, whereas prior research reveals links between dependent interpersonal stress and anxiety (Hankin et al., 2005; Hankin et al., 2010). Given that prior research used self-report questionnaires to assess stress and anxiety, this discrepancy may be due to the fact that the present study used dual informant semi-structured interview assessments of stress and psychopathology, perhaps reducing the impact of shared measurement variance and better capturing the distinction between anxiety and depression. Moreover, one study assessed stress and anxiety at the same wave (Hankin et al., 2005), perhaps increasing the strength of association.

Third, ineffective interpersonal stress responses predicted self-generated noninterpersonal stress (e.g., failing an exam due to insufficient preparation, receiving a detention at school). The failure to adequately resolve everyday social problems might distract youth and interfere with their efforts to engage in academic material, or may cause them to behave impulsively or disruptively. Alternatively, responses to stress may generalize across contexts such that the repertoires assessed in this study would be reflected in similar reactions to noninterpersonal problems; these responses may therefore create dependent noninterpersonal stress. Notably, this finding is consistent with other research indicating that depressed and depression-prone individuals also generate noninterpersonal stress (Flynn et al., 2010; Rudolph et al., 2009), and suggests that promoting adaptive interpersonal stress responses also may improve responses to noninterpersonal stress.

Fourth, sex and age did not significantly moderate any of the paths in our process model. The absence of statistically significant sex differences may be due in part to the age range of this sample, which included some youth who had not yet reached the developmental stage at which sex differences in depression and associated interpersonal risks intensify. However, the multi-group comparison analysis revealed a pattern consistent with theory and prior research in that the magnitude of each key path in the process model was higher in girls than in boys, and all three of the paths were significant in girls whereas only one path was significant in boys. Unfortunately, our sample size precluded multi-group comparisons that grouped youth simultaneously on sex and age; future research with larger samples that allow such comparisons is needed to further explore sex differences in our process model.

Conclusions, Limitations, and Clinical Implications

In sum, this study adds to a growing body of evidence in support of the interpersonal stress generation theory of depression (Hammen, 2006), and extends this theory to a well-

established developmental period of vulnerability to depression onset, the transition into adolescence, and to a new predictor of stress generation. Specifically, this research was the first to demonstrate that ineffective responses to everyday social problems serve as one characteristic of depression-prone youth that generates interpersonal stress and, in turn, leads to depression. Strengths of this research include its sophisticated dual-informant interview-based assessments of life stress and psychopathology in a three-wave prospective design. Moreover, the analytic approach was conservative in that it adjusted for baseline levels of both dependent stress and psychopathology.

Study limitations also warrant attention. First, although results reached statistical significance, effect sizes were generally small-to-medium (Cohen, 1992); notably, the effects were larger when the models did not adjust for earlier levels of stress and psychopathology, as in much of the prior research on stress generation. Relatedly, the size of the indirect effect of stress responses on depression was modest, suggesting that mechanisms beyond interpersonal stress generation (e.g., uncontrolled emotional arousal, diminished sense of self-efficacy) also may account for the contribution of ineffective stress responses to adolescent depression. Second, stress responses were assessed via self-report and thus reflect youths' perceived reactions to common social challenges. It will be important to replicate these findings using multiple informants and methods (e.g., parent, peer, or teacher reports; behavioral observations) to assess stress responses. Third, an examination of the goodness-of-fit of stress responses was beyond the scope of this study. Whereas engagement coping was viewed as effective and involuntary engagement and disengagement responses were viewed as ineffective in the context of peer stressors, the efficacy of coping may vary according to specific contextual demands (Clarke, 2006; Lazarus & Folkman, 1984). For example, the perceived efficacy of youths' responses to peer problems varies according to the type of stress (i.e., physical, verbal, or relational; Dirks, Treat, & Weersing, 2007) and according to who evaluates the response selection (i.e., teachers or peers; Dirks, Treat, & Weersing, 2010). Finally, given that this sample was not ethnically diverse, it will be important to replicate the process model across youth from a variety of cultural backgrounds.

This research can help to inform clinical practice with depressed and anxious adolescents. Given that the tendency to respond to stress with less engagement coping and more involuntary reactions predicted both depression and anxiety, intervention programs may be targeted toward promoting effective stress responses that match the demands of particular social stressors. Moreover, efforts can be directed toward ensuring that youths' responses to everyday stressors do not create a snowball effect that triggers increasing levels of disturbances in their relationships over time and thus heightened risk for depression.

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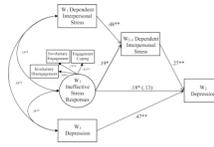


Figure 1. Structural equation model of the interpersonal stress generation process linking ineffective interpersonal stress responses to depressive symptoms over time. Coefficients without parentheses indicate total effects; coefficient in parentheses indicates the direct effect.

Table 1

Intercorrelations Among the Variables

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. W ₁ Engagement Coping	---															
2. W ₁ Disengagement Coping	-.54**	---														
3. W ₁ Involuntary Engagement	-.80**	.07	---													
4. W ₁ Involuntary Disengagement	-.82**	.35**	.46**	---												
5. W ₁ Dependent Interpersonal Stress	-.27**	.10	.30**	.15 [^]	---											
6. W ₂ Dependent Interpersonal Stress	-.25**	.05	.25**	.23**	.38**	---										
7. W ₃ Dependent Interpersonal Stress	-.19*	.00	.24**	.15 [^]	.48**	.42**	---									
8. W ₁ Dependent Noninterpersonal Stress	-.08	.06	.08	.04	.41**	.12	.17*	---								
9. W ₂ Dependent Noninterpersonal Stress	-.22**	.14 [^]	.16*	.18*	.31**	.32**	.16*	.24**	---							
10. W ₃ Dependent Noninterpersonal Stress	-.27**	.17*	.24**	.19*	.47**	.35**	.52**	.22**	.36**	---						
11. W ₁ Depression	-.33**	.16*	.28**	.26**	.23**	.26**	.20*	-.06	.23**	.14 [^]	---					
12. W ₂ Depression	-.40**	.13 [^]	.30**	.44**	.19*	.43**	.28**	-.12	.13	.18*	.67**	---				
13. W ₃ Depression	-.35**	.17*	.27**	.32**	.16*	.38**	.36**	-.12	.04	.23**	.58**	.81**	---			
14. W ₁ Anxiety	-.31**	.14 [^]	.29**	.21**	.03	.13	.10	-.06	.11	-.00	.38**	.31**	.22**	---		
15. W ₂ Anxiety	-.35**	.14 [^]	.31**	.26**	.09	.15 [^]	.14 [^]	-.10	.22**	.05	.42**	.37**	.28**	.90**	---	
16. W ₃ Anxiety	-.36**	.15 [^]	.33**	.28**	.04	.13	.10	-.11	.18*	.05	.39**	.41**	.38**	.73**	.83**	---

Note.

[^] $p < .10$.

* $p < .05$.

** $p < .01$