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Temporal Relationships Among Depressive Symptoms, Risky Behavior Engagement, Perceived Control, and Gender in a Sample of Adolescents

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The goals of the study were to examine whether (a) risky behaviors precede depressive symptoms or, conversely, depressive symptoms predict risky behavior engagement; (b) gender moderates the relationship between risky behavior engagement and depressive symptoms; and (c) perceived control strengthens the association between risky behavior engagement and depressive symptoms. At Time 1, 118 adolescents completed self-report measures assessing perceived control, risky behavior engagement, and depressive symptoms. Follow-up assessments occurred every 6 weeks (Times 2–5), and participants completed measures assessing risky behavior engagement and depressive symptoms. Results indicated that neither risky behavior engagement nor depressive symptoms emerged as main effects for the sample as a whole. When examining the relationship between depressive symptoms and risky behavior engagement as a function of gender, boys', but not girls', risky behavior engagement predicted higher levels of depressive symptoms. Irrespective of whether we examined boys or girls, depressive symptoms did not predict risky behavior engagement. With regards to the role of cognitive vulnerability, adolescents with lower levels of perceived control reported higher levels of depressive symptoms following risky behavior engagement. These findings suggest that both gender and cognitive vulnerability factors may potentiate the relationship between risky behavior engagement and subsequent depressive symptoms.

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Adolescence is a peak period of risk and vulnerability, and researchers have found that adolescents experience a higher level of depressive symptoms and report greater engagement in risky behaviors as compared with preadolescent (ages 9–13) and adult (ages 18–65) samples (Fergus, Zimmerman, & Caldwell, 2007; Hasin, Stinson, Ogburn, & Grant, 2007; Lahey et al., 2000). More specifically, Radloff (1991) found that depressive symptoms increase dramatically between 13 and 15 years of age, peak between the ages of 17 and 18, and decline in early adulthood. Risky behavior engagement has shown comparable increases during adolescence (Fergus et al., 2007; Hasin et al., 2007). The examination of subclinical depressive symptomology and risky behavior engagement is important given that they often co-occur during adolescence and may result in psychological and physical health problems that persist throughout adulthood (Achenbach, Howell, McConaughy, & Stranger, 1995; Chung & Elias, 1996). As adolescents may enter a vicious cycle involving risky behavior engagement, short- and long-term negative consequences, and depressive symptomology, research is warranted to better understand the temporal relationship between risky behaviors and depressive symptoms.

DEVELOPMENTAL COURSE OF DEPRESSIVE SYMPTOMS AND RISKY BEHAVIOR ENGAGEMENT

While recent research has shown that there is a significant association between higher levels of depressive symptoms and greater engagement in risky behaviors among adolescents (Hops, Lewinsohn, Andrews, & Roberts, 1990), results have been mixed regarding the temporal unfolding of depressive symptoms and risky behavior engagement. Consequently, our first aim of the present study is to prospectively examine whether depressive symptoms predicted risky behavior engagement or whether risky behavior engagement preceded depressive symptoms.

Whereas some studies have shown that depressive symptoms are present before engaging in risky behaviors (e.g., King, Iacono, & McGue, 2004; Rudolph, Hammen, & Burge, 1994), other research has indicated that risky behavior engagement precedes depressive symptoms (e.g., Capaldi & Stoolmiller, 1999). More specifically, results indicated that higher levels of depressive symptoms at baseline predicted greater risky sexual risk behaviors (e.g., condom nonuse and birth control nonuse) and substance use over a 1-year period in a sample of secondary school students (Lehrer, Shrier, Gortmaker, & Buka, 2006). Similarly, Beyers and Loeber (2003) found that higher levels of depressed mood predicted greater and more varied delinquent behaviors (e.g., vandalism, shoplifting, and weapon use), and Henry et al. (1993) found that higher levels of depressive symptoms prospectively predicted greater substance use (e.g., marijuana use and alcohol use) 4 years after the initial assessment.

In contrast, other longitudinal studies have demonstrated that engaging in risky behaviors may lead to increased levels of depressive symptomology. For example, results from the National Longitudinal Study of Adolescent Health ($n = 13,491$ adolescents from grades 7 to 11) indicated that engagement in sexual risky behavior, substance abuse, and experimental, high-risk behavior patterns prospectively predicted higher levels of depressive symptoms in both boys and girls; however, such symptoms did not prospectively predict involvement in high-risk problem behaviors or experimental risk-taking behavior (Hallfors, Waller, Bauer, Ford, & Halpern, 2005). Similarly, in a 2-year longitudinal study examining risky behavior engagement among adolescents, results indicated that greater engagement in problem behaviors at Time 1 significantly predicted elevated levels of depressive symptoms at Time 2 after controlling for initial level of depressive symptoms (Kiesner, 2002).

EXAMINING GENDER DIFFERENCES

Given the inconsistency of past research regarding the developmental course and onset of depressive symptoms and risky behavior engagement, researchers have begun to examine factors that may influence the initial onset of depressive symptoms and risky behavior engagement. More specifically, there is a large corpus of research discussing the emergence of gender differences regarding the prevalence of depressive symptomology (Twenge & Nolen-Hoeksema, 2002) and engagement in risky behaviors (Eme & Kavanaugh, 1995; Fergus et al., 2007). While research has indicated that risky behavior engagement and depressive symptoms are positively associated during adolescence, there are gender differences in both the level of risky behavior engagement (i.e., boys engage in a greater number and frequency of risky behaviors) and depressive symptoms (i.e., girls report higher levels of depressive symptoms). As there may be different pathways that account for this association in boys and girls, our second goal of the current study is to examine whether the relationship between depressive symptoms and risky behavior engagement varies as a function of gender.

In a longitudinal study examining the emergence of gender differences in depression among adolescents, Twenge and Nolen-Hoeksema (2002) found that (a) girls between the ages of 12 and 13 begin to report greater levels of depressive symptoms as compared with boys and (b) such a difference persists throughout adulthood. In an effort to account for this difference, Nolen-Hoeksema and Girgus (1994) suggested that before adolescence girls possess a greater number of risk factors (e.g., pessimistic attributional style and a ruminative response style) and experience a greater frequency of biological and social challenges (e.g., physiological changes in puberty and sexual abuse) as compared with boys. As girls may be at greater risk to develop depressive symptoms at younger ages, one pathway may be that girls

initially experience depressive symptoms and subsequently engage in risky behaviors to escape from painful, negative affective states. Such a view is in line with past research, as females, but not males, were more likely to self-medicate (i.e., using opioids, cocaine, and alcohol) in response to subclinical depressive symptoms (Weiss, Griffin, & Mirin, 1992), and girls reported greater recreational use of prescription tranquilizers following a depressed mood (Kandel & Davies, 1986). Similarly, research examining relational aggression (e.g., spreading rumors, purposefully excluding others from play, and withdrawing friendship) indicated that girls who reported elevated levels of depressive symptoms were more likely to utilize relational aggression to attenuate negative affective states as compared with boys (Crick & Grotpeter, 1995), and depressed girls are more likely than depressed boys to use self-cutting as a way to cope with negative thoughts (Mäkikyrö et al., 2004).

In contrast, past research examining patterns of risky behavior engagement among adolescents suggests that males engage in such behaviors with greater frequency and severity (e.g., Nichols, Graber, Brooks-Gunn, & Botvin, 2006), and, thus, a second pathway may be that risky behavior engagement occurs before the development of depressive symptoms. More specifically, Capaldi (1992) found that males reported risky behavior engagement (e.g., theft, property damage, and violence) in the absence of clinically significant levels of depressive symptoms at the initial assessment. Nevertheless, as persistent engagement in risky behavior resulted in the greater occurrence of parental conflict, peer rejection, and academic difficulties, over time individuals reported greater levels of depressive symptoms. Similarly, Wiesner (2003) found a unidirectional association between higher levels of delinquent behavior (e.g., violence, property damage, and theft) and subsequent increases in depressive symptoms in boys but not girls. Such findings are in line with past cross-sectional and longitudinal studies examining this relationship (e.g., Eme & Kavanaugh, 1995; Wiesner, Kim, & Capaldi, 2005).

UNDERSTANDING THE ROLE OF PERCEIVED CONTROL

While gender may influence whether an individual initially develops depressive symptomology or engages in risky behaviors, not all individuals who experience such symptoms will engage in a greater number of risky behaviors, and, conversely, not everyone who engages in risky behaviors will experience depressive symptoms. In light of these findings, researchers have begun to examine vulnerability factors that underlie both depressive symptoms and risky behavior engagement. Recent research has shown that cognitive vulnerability plays a prominent role in the developmental unfolding of both depressive symptoms and risky behavior engagement (e.g., Weisz, Southam-Gerow, & McCarty, 2001). Thus, the last aim of the study is to examine whether cognitive vulnerability (i.e., perceived control)

moderates the relationship between risky behavior engagement and depressive symptoms.

When adolescents believe that their actions do not exert influence on important outcomes, their sense of personal control is undermined. Given their negative views of the self, world, and future (i.e., the cognitive triad) and feelings of helplessness, individuals who exhibit lower levels of perceived control have a greater likelihood of experiencing depressive symptoms and engaging in risky behaviors (Rolinson & Scherman, 2003; Weisz et al., 2001). Past cross-sectional research among youth samples has consistently found that lower levels of perceived control were associated with higher levels of depressive symptoms (Margaro & Weisz, 2006; Weisz, Sweeney, Proffitt, & Carr, 1993); however, research examining this relationship prospectively has been inconsistent. More specifically, Weisz et al. (2001) found that low levels of perceived control prospectively predicted greater levels of depressive symptoms. Conversely, while Muris, Schouten, Meesters, & Gijsbers, (2003) found that lower levels of perceived control were cross-sectionally associated with higher levels of depressive symptoms, lower levels of perceived control did not predict higher levels of depressive symptoms at the 4-week follow-up.

While there is a substantial amount of research that has examined the relationship between perceived control and depressive symptoms, less research to date has examined the association between perceived control and risky behaviors. In cross-sectional study with adolescents and young adults, Lewis, Ross, and Mirowsky (1999) found that lower levels of perceived control were associated with higher rates of nonmarital pregnancy and school dropout, suggesting that perceived control plays a profound role in important life outcomes. Additionally, Chassin et al. (1981) found that the tendency to experiment with smoking and to smoke regularly was correlated with lower levels of perceived control, and, similarly, Han, Weisz, and Weiss (2001) reported that externalizing symptoms (e.g., disruptive and oppositional behaviors) were significantly associated with lower levels of perceived control.

In addition, prospective studies have obtained similar results. More specifically, Adalbjarnardottir and Rafnsson (2001) found that lower levels of perceived control at age 14 were a significant predictor of daily smoking and illicit drug use at age 17 for girls but not boys. Similarly, whereas Swenson and Kennedy (1995) indicated that lower levels of perceived control (i.e., not attributing successful outcomes to their own behaviors) were strongly associated with externalizing problems, Rolinson and Scherman (2003) found individuals who reported possessing a poor external locus of control at 18 were more likely to engage in a greater frequency of health-risk behaviors at age 21. Such findings have strong implications for treatment, given that individuals who do not believe that success is contingent upon their own behavior may, consequently, downplay their role and responsibility for improvement throughout the course of therapy (Swenson & Kennedy, 1995).

While lower levels of perceived control are associated with both higher levels of depressive symptoms and greater engagement in risky behaviors, past research examining models of cognitive vulnerability suggest that low levels of perceived control may be more strongly associated with depressive symptoms. More specifically, research examining the hopelessness theory, which closely parallels perceived control, posits that individuals who report stable and global attributions about the causes of negative events will experience feelings of hopelessness, which is a proximal cause of depression (Han et al., 2001). As lower levels of perceived control likely reflect feelings of hopelessness, we would expect that low perceived control would contribute to the development of depressive symptoms following the engagement in risky behaviors.

GOALS OF THE CURRENT STUDY

The present study utilized a multiwave, longitudinal design and an idiographic data analytic approach. The goals of the current study are threefold. First, given the ambiguity regarding the temporal unfolding between depressive symptoms and risky behaviors, we prospectively examined whether depressive symptoms precede risky behavior engagement or whether risky behavior engagement predicts depressive symptoms. Second, as past research suggests that males engage in a greater level of risky behaviors and girls experience higher levels of depressive symptoms relative to boys (e.g., Eme & Kavanaugh, 1995), we examined whether gender moderates the relationship between risky behavior engagement and depressive symptoms. We predicted that due to higher prevalence of depressive symptomology in females, girls would more likely develop depressive symptoms and engage in subsequent risky behaviors as a response to these symptoms. In addition, we predicted that as risky behaviors are more prevalent in boys as compared with girls, boys would express increased levels of depressive symptoms following risky behavior engagement. Last, as perceived control may have a stronger association with depressive symptoms as compared with risky behaviors (Han et al., 2001), we hypothesized that individuals who report lower levels of perceived control were more likely than individuals who possess higher levels of perceived control to report higher levels of depressive symptoms following greater engagement in risky behaviors.

METHOD

Participants

Participants in the current study were recruited from secondary schools in the greater Montreal area. Letters describing the project were sent to the principals of all English-language schools. Seven schools agreed to

participate. Although the project was open to students in all grades (i.e., grades 7–11) at each participating school, only select classes were available to participate. More specifically, as we were based in a number of schools in the greater Montreal area, scheduling conflicts emerged as to when our research assistants could gain access to students. Before the initial assessment, letters of informed consent were sent home to parents describing the aims of the project and requesting consent for their child to participate. In the present study, no student who received parental consent chose not to give personal consent. Both parental and personal consent were required to participate. Consent rates varied between schools from 6% to 38% with a median rate of 21%. It is important to note that for the school with a consent rate of 6%, another research study was being conducted and had started at an earlier time period. We informed students that they could not participate in both studies, and, thus, students who were involved in the other study were told to decline our offer to participate. The final sample included 118 adolescents (46% male and 54% female) between the ages of 12 and 18 (mean = 15.17; *SD* = 1.22). The sample was 78.9% Caucasians, 5.6% Asians, 4.3% African Americans, 2.5% Native Americans, and 8.7% reported other as their ethnicity. Participants' predominant mother tongues were English (83.2%) and French (13.7%); however, 3.1% of participants reported other.

Procedure

During the initial assessment, which occurred on school grounds, students completed a demographics form and the following questionnaires: (1) Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), (2) the Perceived Control Scale for Children (PCS; Weisz, Southam-Gerow, & Sweeney, 1998), and (3) the Risky Behaviors Questionnaire for Adolescents (RBQ-A; Auerbach & Abela, unpublished data). Follow-up assessments occurred every 6 weeks (Times 2–5), and participants completed the CES-D and the RBQ-A.

Measures

CES-D (Radloff, 1977). The CES-D is a 20-item self-report measure that assesses levels of depressive symptoms. Examples of questions include: ''I felt sad,'' ''I felt hopeless about the future,'' and ''I felt lonely.'' Items on the scale ranged from 0 to 3, with higher scores reflecting greater depressive symptomology. While the CES-D was administered every 6 weeks, participants reported how they felt during the past week by using the following scale: rarely (<1 day), some or a little of the time (1–2 days), occasionally or a moderate amount of time (3–4 days), and most or all of the time (5–7 days). The CES-D has been shown across numerous studies to have

strong test–retest reliability and high correlations with other measures of depressive symptoms (Geisser, Roth, & Robinson, 1997). In the current study, the Cronbach's α ranged from .91 to .94 across administrations, which indicates high internal consistency.

PCS (Weisz et al., 1998). The PCS is a 24-item self-report questionnaire measuring beliefs about one's perceived ability to exert control over outcomes in the academic, social, and behavioral domains. Examples of questions include: ''I can get good grades if I really try,'' ''I can make friends with other kids if I really try,'' and ''I cannot stay out of trouble no matter how hard I try.'' Participants are asked to rate items using a Likert scale ranging from 1 = *very false* to 4 = *very true* with higher scores reflecting a greater level of perceived control. The PCS has been shown across numerous studies to have strong test–retest reliability (e.g., Margaro & Weisz, 2006). In the current study, the Cronbach's α was .88, indicating high internal consistency.

RBQ-A (Auerbach & Abela, unpublished data). The RBQ-A is a 20-item self-report measure that was created to assess the frequency of engagement in the following types of risky behaviors in the past month: (1) unsafe sexual practices, (2) aggressive and/or violent behaviors, (3) rule breaking, (4) dangerous, destructive, and/or illegal behaviors, (5) self-injurious behaviors, and (6) alcohol and/or drug use. Examples of questions include ''Have you had unsafe sex,'' ''Have you destroyed property (other than your own),'' and ''Have you used illegal drugs.'' Respondents reported the frequency of their engagement of the aforementioned behaviors using the following scale: never, one time per month, two to four times per month, two to three times per week, and four times or more per week. In the current study, Cronbach's αs ranged from .84 to .86, indicating high internal consistency.

RESULTS

Descriptive Data

Means, standard deviations, and intercorrelations between all Time 1 measures are included in Table 1, and descriptive statistics for repeated measures (i.e., depressive symptoms and risky behaviors) during the follow-up period are provided in Table 2. First, whereas individuals who engaged in a greater number of risky behaviors reported a higher level of depressive symptoms, individuals with higher levels of perceived control reported lower levels of depressive symptoms. Second, individuals with lower levels of perceived control were associated with greater engagement in risky behaviors. Last, while depressive symptoms and perceived control were not significantly associated to age, greater risky behavior engagement was associated with older as compared with younger adolescents.

TABLE 1
Means, Standard Deviations, and Pearson Correlations for Depressive Symptoms, Perceived Control, Risky Behaviors, and Age at the Initial Assessment ($n = 118$)

Variables	*Initial Depressive Symptoms*	*Perceived Control*	*Initial Risky Behavior Engagement*	*Age*
1. Initial depressive symptoms	—			
2. Perceived control	– .48***	—		
3. Initial risky behavior engagement	.29***	– .25**	—	
4. Age	.04	.04	.20*	—
Mean	13.84	37.38	8.60	15.17
Standard deviation	10.44	9.71	8.60	15.17
Low	0	24	0	12
High	47	65	50	18

Note. Depressive Symptoms = Center for Epidemiologic Studies Depression Scale (Radloff, 1977); Perceived Control = Perceived Control Scale (Weisz, Southam-Gerow, & Sweeney, 1998); Risky Behaviors = Risky Behavior Questionnaire for Adolescents (Auerbach & Abela, unpublished data).
*$p \leq .05$; **$p < .01$; ***$p < .001$.

Examining the Temporal Relationship Between Depressive Symptoms and Risky Behavior Engagement

In order to determine whether (a) depressive symptoms preceded risky behavior engagement and/or (b) risky behavior engagement predicted depressive symptoms, we utilized idiographic, multilevel modeling. Analyses

TABLE 2
Means, Standard Deviations, and Range for Depressive Symptoms and Risky Behavior Engagement During the Follow-Up Period

	Total Mean	*Standard Deviation*	*Boys' Mean*	*Girls' Mean*	*Low*	*High*
Depressive Symptoms						
Follow-up #1	13.37	9.95	10.84	14.67	0	47
Follow-up #2	11.83	11.19	9.21	12.92	0	48
Follow-up #3	10.38	10.77	7.55	11.97	0	50
Follow-up #4	15.23	11.47	7.85	15.94	0	46
Risky Behaviors						
Follow-up #1	7.58	8.12	8.38	6.51	0	50
Follow-up #2	6.40	7.59	7.27	5.55	0	47
Follow-up #3	6.03	7.75	5.66	5.73	0	40
Follow-up #4	7.18	6.58	5.25	7.13	0	26

Note. Depressive Symptoms = Center for Epidemiologic Studies Depression Scale (Radloff, 1977); Risky Behaviors = Risky Behavior Questionnaire for Adolescents (Auerbach & Abela, unpublished data).

were conducted for the sample as whole, and we utilized an autoregressive covariance structure and a random intercept for each of the analyses. When examining whether depressive symptoms predicted risky behavior engagement over the follow-up period after controlling for initial risky behavior engagement, the results were not significant, $b = .05$; $t(292) = 1.37$, *ns*. Similarly, when analyzing whether risky behavior engagement predicted depressive symptoms during the follow-up interval after controlling for initial depressive symptoms, the finding was not significant, $b = .14$; $t(292) = 1.62$, *ns*. In light of these findings, we examined whether gender moderated the relationship between risky behavior engagement and depressive symptoms.

Preliminary Gender Analyses

In order to examine preliminary gender differences, we compared the boys' and girls' mean levels of depressive symptoms, risky behaviors, and perceived control using independent sample *t*-tests with gender as the grouping variable. First, when examining average level of depressive symptoms, girls reported significantly greater depressive symptoms as compared with boys at the third, $t(100) = -2.39$, $p < .05$, and fourth, $t(67) = -2.24$, $p < .05$, follow-up assessment. Additionally, the gender difference approached significance during the first follow-up assessment, $t(111) = -1.79$, $p = .08$. However, there were no significant statistical differences between boys' and girls' level of depressive symptoms at the initial, $t(115) = -0.39$, *ns*, and second follow-up, $t(99) = -1.57$, *ns*, assessment. These finding are partially in line with our hypothesis given that (a) girls reported a higher levels of depressive symptoms and (b) boys did not report higher levels of depressive symptoms during any of the assessments. While girls did not experience significantly greater mean levels of depressive symptoms at each assessment, they did, however, report higher mean levels as compared with boys (see Table 2).

Second, boys reported a significantly greater number of risky behaviors at the initial assessment, $t(116) = 2.14$, $p < .05$, and this difference approached significance in the second follow-up, $t(99) = 1.66$, $p = .10$. At the same time, there were not significant differences during the first, $t(111) = 1.34$, *ns*, third, $t(100) = 0.17$, *ns*, and fourth, $t(67) = -1.11$, *ns*, follow-up assessments. Again, these findings are partially in line with our hypothesis, as boys reported greater risky behavior engagement at a number of assessments (see Table 2). Unfortunately, boys who reported the greatest risky behavior engagement were also the most likely to cease participation throughout the course of our study, given disciplinary problems in school, expulsion, and truancy. Consequently, this likely contributed to the decreasing mean level of risky behavior engagement in subsequent follow-ups for boys (see Table 2).

Last, with regards to perceived control, boys (mean = 38.08) reported a higher average as compared with girls (mean = 36.85); however, the difference was not statistically significant, $t(116) = 0.31$, *ns*. Such a finding was in

line with our hypothesis, as we did not expect a mean level difference with regard to our measure of cognitive vulnerability.

Examining the Role Gender Plays in the Temporal Relationship Between Depressive Symptoms and Risky Behavior Engagement

As our preliminary gender analyses suggested that girls generally reported higher levels of depressive symptoms as compared with boys and boys typically reported greater risky behavior engagement as compared with girls, we examined whether gender affected whether (a) depressive symptoms preceded risky behavior engagement and/or (b) risky behavior engagement predicted depressive symptoms. We utilized idiographic, multilevel modeling, and analyses were conducted separately for boys and girls. For each analysis an autoregressive covariance structure and a random intercept were included in the model.

In contrast to our hypothesis, irrespective of whether we examined boys, $b = .12$; $t(126) = 1.95$, *ns*, or girls, $b = .003$; $t(165) = 0.10$, *ns*, depressive symptoms did not significantly predict risky behavior engagement over the follow-up period after controlling for initial risky behavior engagement. In line with our hypothesis, boys, but not girls, $b = .07$; $t(176) = 0.45$, *ns*, who reported greater risky behavior engagement predicted higher levels of depressive symptoms after controlling for initial depressive symptoms, $b = .19$; $t(133) = 2.15$, $p < .05$.

Examining the Role of Perceived Control: Overview of the Idiographic Multilevel Model Data Analytic Approach

To test our hypothesis that individuals possessing lower levels of perceived control would report greater increases in depressive symptoms following increased engagement in risky behaviors than individuals possessing higher levels of perceived control, we utilized multilevel modeling. Our dependent variable was within-subject fluctuations in depressive symptoms during the follow-up interval (i.e., Times 2–5). As follow-up depressive symptom scores are a within-subject variable, such scores were centered at each participant's mean such that scores reflect upwards or downwards fluctuations in an individual's level of depressive symptoms compared with his or her mean level of symptoms. Our primary predictors of the follow-up depressive symptom scores were perceived control and fluctuations in risky behavior engagement during the follow-up interval (i.e., Times 2–5). Before analyses, the perceived control scores, a between-subject variable, were standardized. As follow-up risky behavior scores are a within-subject predictor, scores were centered at each participant's mean before analyses such that scores reflect upwards or downwards fluctuations in an individual's reported risky behavior engagement as compared with his or her mean engagement.

When fitting hierarchical linear models, one must specify appropriate mean and covariance structures. It is important to note that mean and covariance structures are not independent of one another. Rather, an appropriate covariance structure is essential in order to obtain valid inferences for the parameters in the mean structure. Overparametrization of the covariance structure can lead to inefficient estimation and poor assessment of standard errors (Altham, 1984). On the other hand, too much restriction of the covariance structure can lead to invalid inferences when the assumed structure does not hold (Altham, 1984). Commonly used covariance structures in studies in which multiple responses are obtained from the same individual over time (and consequently within-subject residuals over time are likely to be correlated) include heterogeneous autoregressive, autoregressive, banded Toeplitz, and compound symmetry. In order to select one of these covariance structures for our analyses, we fitted models utilizing each structure and chose the best fit based on Akaike information criterion and Schwarz Bayesian criterion.

Statistical Analysis of the Contemporaneous Model

In our first set of analyses, we were interested in examining the effects of the perceived control scores and follow-up risky behavior scores on individual's follow-up depressive symptom scores. Preliminary analyses indicated that none of the reported associations were moderated by either age, $b = .15$; $t(232) = 1.49$, *ns*, or gender, $b = .16$; $t(232) = 0.67$, *ns*, and, thus, analyses are presented for the entire sample as a whole. Consequently, in line with Diggle, Liang, and Zeger's (1994) recommendation that one use a "saturated" model for the mean structure while searching for an appropriate covariance structure, we chose a mean structure that included the perceived control and follow-up risky behavior scores. Three additional effects were also included in this initial mean structure. First, in order to control for individual differences in baseline levels of depressive symptoms, participant's initial depressive symptom scores were included in the model. Second, in order to account for individual variability in the average level of depressive symptom scores at his/her mean level of depressive symptom scores, a random effect for intercept was included in the model. Last, given that follow-up risky behavior scores are a within-subject predictor whose effect is expected to vary from participant to participant, a random effect for slope was included in the model.

The final results with respect to the fixed-effects component of the model are presented in Table 3. The ARH parameter was not significant ($r = -0.23$, *ns*); however, it was retained in order to provide a more stringent examination of our hypothesis. The random intercept ($r = 55.69$, $p < .001$) was significant and, thus, retained in the model. The random slope was not significant, and, consequently, it was removed from the model before reestimation. Of primary importance, a significant two-way, cross-level interaction emerged between perceived control and follow-up risky behavior

TABLE 3
Fluctuations in Follow-Up Depressive Symptoms: Estimates of the Fixed Effects Component for the Contemporaneous Model

Predictor	*Parameter Estimate (b)*	*Standard Error*	*t Value*	*Degrees of Freedom*
Gender	3.79	1.49	2.55*	111
Initial depressive symptoms	5.92	0.84	7.07***	111
Follow-up risky behaviors	0.09	0.10	0.85	234
Perceived control	1.02	0.83	1.23	111
Follow-Up Risky Behaviors × Perceived Control	0.23	0.11	1.97*	234

Note. Depressive Symptoms = Center for Epidemiologic Studies Depression Scale (Radloff, 1977); Risky Behaviors = Risky Behavior Questionnaire for Adolescents (Auerbach & Abela, unpublished data); Perceived Control = Perceived Control Scale (Weisz, Southam-Gerow, & Sweeney, 1998).

*$p \leq .05$; ***$p < .001$.

scores. Predicted follow-up depressive symptom scores for individuals with low or high perceived control scores (± 1.5 between-subject standard deviations) who were engaging in a low or high number of risky behaviors (± 1.5 within-subject standard deviations) were estimated using the fixed effects model (see Figure 1). Analyses were conducted for each perceived control condition examining whether the slope of the relationship between follow-up risky behaviors and perceived control significantly differed from 0. While the follow-up risky behavior scores was associated with increases in follow-up depressive symptom scores for individuals possessing low levels of perceived control, $b = .43$; $t(234) = 2.26$, $p < .05$, it was not significantly associated for individual who reported high levels of perceived control, $b = -.25$; $t(234) = -1.18$, *ns*. Further, the slope for these two groups significantly differed, $b = .68$; $t(234) = 1.97$, $p < .05$.

Statistical Analysis of the Reverse Model

As depressive symptoms and risky behaviors were assessed contemporaneously, the above analyses cannot ascertain with certainty the direction of the effect.[1] More specifically, they cannot determine whether low perceived

[1] When examining the time-lagged relationship between fluctuations in risky behaviors and follow-up depressive symptoms (e.g., the association between elevations in risky behavior scores at Time $n - 1$ interacting with perceived control to predict elevations in depressive symptom scores at Time n), the two-way, cross-level interaction was not significant, $b = .09$, $t(151) = 0.76$, *ns*. Additionally, we estimated a time-lagged model examining whether depressive symptom scores at Time $n - 1$ interacted with perceived control to predict higher levels of risky behavior scores at Time n (i.e., the reverse model). Again, the two-way, cross-level interaction was not significant, $b = .02$,

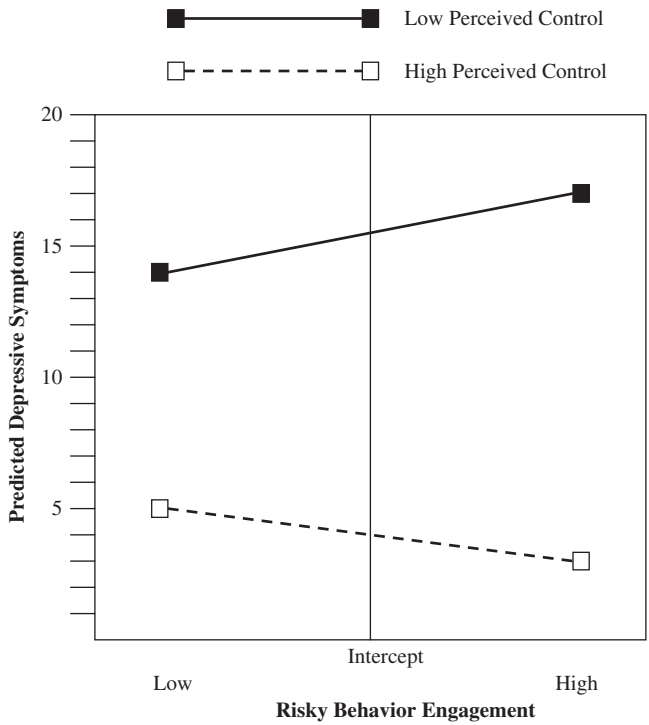

FIGURE 1 Predicted depressive symptoms scores as a function of perceived control and risky behavior engagement.

control scores interacted with the occurrence of risky behaviors to predict increases in depressive symptoms or whether low perceived control scores interacted with increases in depressive symptoms to predict risky behavior engagement. Given this interpretational ambiguity, we conducted additional analyses examining the reverse model using the same data analytic approach used in our first set of analyses with the exception (1) our dependent variable being fluctuations in follow-up risky behavior scores during the course of the study rather than fluctuations in depressive symptom scores (2) and our within-subject predictor variable being fluctuations in follow-up depressive symptom scores during the course of the study rather than fluctuations in follow-up risky behaviors.

$t(151) = 0.42$, *ns*. While time-lagged models are a powerful method to examined time-ordered relationships between risky behavior engagement and depressive symptoms, the self-report measures utilized in the present study may not be sensitive enough to detect such differences. More specifically, the depressive symptom measure examines symptoms over the preceding week; however, our initial and subsequent follow-up assessments are spaced 6 weeks apart. Thus, it is likely that risky behaviors at Time $n - 1$ may have not be significantly associated with depressive symptoms at Time n.

TABLE 4
Fluctuations in Follow-Up Risky Behaviors: Estimates of the Fixed Effects Component for the Reverse Model

Predictor	*Parameter Estimate (b)*	*Standard Error*	*t-Value*	*Degrees of Freedom*
Gender	1.00	0.80	1.24	112
Initial risky behaviors	5.96	0.39	15.27***	112
Follow-up depressive symptoms	0.03	0.03	0.86	237
Perceived control	− 0.64	0.41	− 1.57	112
Follow-Up Depressive Symptoms × Perceived Control	0.03	0.04	0.87	237

Note. Risky Behaviors = Risky Behavior Questionnaire for Adolescents (Auerbach & Abela, unpublished data); Depressive Symptoms = Center for Epidemiologic Studies Depression Scale (Radloff, 1977); Perceived Control = Perceived Control Scale (Weisz, Southam-Gerow, & Sweeney, 1998).

***$p < .001$.

When examining the effects of perceived control and follow-up depressive symptom scores, on an individual's follow-up risky behavior scores over the follow-up period, the ARH parameter ($r = 0.36$, $p \leq .01$) and random intercept ($r = 11.65$, $p < .001$) were significant, and, thus, they were retained in the model. The random slope, however, was not significant and was removed from the model before reestimation. When examining the fixed effects component of the reverse model, the two-way, cross-level interaction between Perceived Control × Follow-Up Depressive Symptom scores was not significant, $b = .03$, $t(237) = 0.87$, *ns* (see Table 4). As the reverse model is not significant, it suggests that our contemporaneous model outlined above is unidirectional.

DISCUSSION

The present study examined whether (a) risky behaviors precede depressive symptoms or, conversely, depressive symptoms predict risky behavior engagement; (b) gender moderates the relationship between risky behavior engagement and depressive symptoms; and (c) perceived control strengthens the association between risky behavior engagement and depressive symptoms. Several important findings emerged. First, greater risky behavior engagement was cross-sectionally associated with higher levels of depressive symptoms. At the same time, neither depressive symptoms nor risky behavior engagement emerged as main effects in our prospective, idiographic analyses for our sample as a whole. More specifically, risky behavior engagement did not predict fluctuations in depressive symptoms, and, conversely, depressive symptoms did not predict changes in risky behavior

engagement. In light of these findings, we explored whether gender moderated the relationship between depressive symptoms and risky behavior engagement.

Second, past research has indicated that there is a pronounced gender difference regarding the prevalence of depressive symptoms (e.g., Twenge & Nolen-Hoeksema, 2002) and risky behavior engagement (e.g., Fergus et al., 2007). When looking at a comparison of means with respect to depressive symptoms and risky behavior engagement throughout the course of the study, we received mixed results. More specifically, girls reported higher levels of depressive symptoms during only a portion of the assessments. Similar inconsistencies were obtained when examining mean gender differences in risky behavior engagement. Despite these mixed results, these findings are not inconsistent with past research given that underlying vulnerability factors likely contribute to these gender differences among symptomology and risky behavior engagement. For example, Nolen-Hoeksema's (1991) response style theory suggests that girls as opposed to boys have a tendency to ruminate in response to depressive symptoms, which amplifies the severity and duration of such symptoms. In contrast, boys are more likely to either distract or problem solve, which is hypothesized to decrease the severity and duration of depressive symptoms. As our preliminary gender analyses indicated that girls generally reported higher levels of depressive symptoms and boys typically reported greater engagement in risky behaviors, we examined whether gender moderated the relationship between depressive symptoms and risky behavior engagement through separate analyses for boys and girls.

In line with our hypothesis, boys, but not girls, who reported greater risky behavior engagement predicted higher levels of depressive symptoms. Such findings are in line with past research that has typically examined specific (e.g., smoking or substance use) or narrow clusters of behaviors (e.g., delinquent behaviors including fighting, stealing, and vandalizing) (e.g., Eme & Kavanaugh, 1995; Wiesner et al., 2005). However, our study expands upon past research by examining broad-based engagement. Such research is warranted given that individuals who engage in a specific type of risky behavior are more likely to utilize additional risky behaviors over time (Allen, Leadbeater, & Aber, 1994), and adolescence is a period of experimentation when individuals may utilize a multitude of risky behaviors depending on factors such as experimentation, social benefits, and peer pressure (Allen, Porter, & McFarland, 2006; Caffray & Schneider, 2000). In a study examining patterns of risky behavior engagement among adolescents, Shrier, Emans, Woods, and DuRant (1996) found that individuals who had unsafe sexual experiences (e.g., higher number of sexual partners and recent condom nonuse) were more likely to do so when using alcohol and drugs. Additionally, Borges, Cherpitel, Medina-Mora, and Mondragon (2004) and Zhang, Welte, and Wieczorek (2002) found that antisocial behaviors

including aggressiveness in early adolescence were associated with both substance abuse and illicit drug use. At the same time, given that there are advantages to examining broad- and specific-engagement in risky behaviors, future research would benefit from examining both, as it will likely improve our understanding of the emergence of gender differences in depression.

In contrast to our hypothesis, depressive symptoms did not significantly predict risky behavior engagement over the follow-up period for either boys or girls. Past research suggests that, as compared with boys, girls are more likely to utilize self-harm behaviors in response to depressive symptoms (e.g., Mäkikyrö et al., 2004; Weiss et al., 1992). While the present study assessed a broad array of risky behaviors, we did not examine the complete range of self-harm and/or self-medication behaviors (e.g., cutting and burning) that are typically associated with girls' maladaptive responses to depressive symptoms. Despite the present findings, additional research is needed in order to understand gender differences regarding responses to depressive symptoms, especially as it relates to distinguishing nonsuicidal and suicidal self-harm behaviors.

Last, whereas lower levels of perceived control predicted higher levels of depressive symptoms following risky behavior engagement, higher levels of perceived control did not interact with such engagement to predict significant change in symptomology over time. Thus, individuals who feel that they do not exert control over important outcomes in their lives experience elevated levels of depressive symptoms following engagement in risky behaviors. Such findings are in line with Capaldi's Dual-Failure Model (1992), which posits that risky behavior engagement initiates a chain reaction of failures in various life domains (e.g., academic, achievement, and familial relationships) and fosters an inability to adapt to normal developmental failures. Coupled with the feelings of powerlessness and helplessness that underlie an individual's lack of perceived control, these failures then contribute to the development of depressive symptomology. In identifying an individual difference variable that more clearly delineates the temporal unfolding of risky behavior engagement and subsequent depressive symptoms, the present findings are an expansion of past research.

Conversely, when examining the reverse model, depressive symptoms did not interact with perceived control to predict changes in risky behavior engagement, suggesting that the model may be unique and unidirectional. One possibility for these findings is that Kaplan and Lin (2000) posit that intrapersonal characteristics may determine whether risky behaviors precede or proceed depressive symptoms. In examining the role of a deviant identity, the self-perception that one deviates from ''referent standards that others regards as normative,'' results indicated that individuals possessing a deviant as compared with a nondeviant identity were more likely to engage in deviant behaviors (i.e., risky behaviors) following negative self-feelings (i.e., depressive symptoms) (Kaplan & Lin, 2000, p. 155). These results

suggest that deviant identity individuals who experience self-rejecting feelings may engage in deviant behaviors as a means to address, and potentially escape, their negative self-feelings. However, individuals who utilize risky behaviors as a coping style have the potential of falling into an ''avoidance trap.'' More specifically, in the short term, risky behaviors are negatively reinforced because of the temporary relief they provide. Consequently, individuals may be apt to use such behaviors again in the future as a coping technique instead of addressing the issues that triggered the depressive symptoms. Nevertheless, risky behaviors have the potential to result in negative consequences. Many may initially escape negative consequences and only experience such consequences with prolonged engagement in such behaviors. Prolonged engagement in risky behaviors, however, is likely to be associated with a disproportionately increased probability of adverse consequences (e.g., drug/alcohol addictions and incarcerations). Negative consequences, once they occur, are apt to exacerbate depressive symptoms, leading to the establishment of a transactional relationship between such symptoms and risky behaviors. As additional interpersonal vulnerability factors likely play a pivotal role in moderating the relationship between depressive symptoms and risky behavior engagement, future research would benefit from continuing to examine these factors.

Several limitations of the current study should be noted. First, we utilized self-report measures to assess perceived control, risky behavior engagement, and depressive symptoms. Given that self-report measures are prone to response bias (e.g., social desirability) and retrospective recall bias, future research would benefit from utilizing more sophisticated assessment techniques such as semi-structured interviews (e.g., Kiddie-Schedule for Affective Disorders and Schizophrenia) in order to obtain more reliable and valid measurements of participants' thoughts, behaviors, and emotions. Further, as self-report measures cannot assess clinically significant depressive episodes, the use of semi-structured clinical interviews would allow us to examine whether our model also predicts the onset and/or the recurrence of depression. Second, as the sample was predominantly Caucasian, the homogeneity of our participants' race may reduce the generalizability of our findings. Thus, future research should reexamine our hypotheses in more culturally diverse, community-based samples. Third, as consent rates varied between schools from 6% to 38%, it would be interesting to examine whether demographic information differed between adolescents who participated as compared with those who did not. In doing so, we could ensure that a representative cross-section of individuals was utilized. Fourth, our sample ranged in age from 12 to 18, and as our study included 118 participants, we do not possess sufficient power to conduct analyses for each age group. Future research would benefit from examining age-related differences, especially as it relates to age by gender differentiation. Last, the present study utilized a multiwave, longitudinal design that observed 30 weeks

of an adolescent's life. Given that adolescence is a peak period of vulnerability for depression (Hankin, Mermelstein, & Roesch, 2007), future research would benefit from examining longer periods of an individual's life, as it would likely provide a deeper understanding of the developmental unfolding of risky behavior engagement and subsequent depressive symptomology.

In sum, the results of the current study provide insight into the relationship between risky behavior engagement, perceived control, and depressive symptoms among adolescents. These findings suggest that cognitive vulnerability factors may potentiate the relationship between risky behavior engagement and subsequent depressive symptoms. While it is true that adolescence is a peak period of vulnerability, it is also a time that is governed by opportunity, growth, and second chances. By targeting adolescents who possess low levels of perceived control, and greater cognitive vulnerability in general, clinicians may develop more effective intervention and treatment programs in order to prevent youth from entering a vicious cycle of risky behavior engagement, short- and long-term negative consequences, and depressive symptomology.

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