

A Prospective Test of the Negative Affect Model of Substance Abuse: Moderating Effects of Social Support

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The authors tested whether dimensions of negative affect—specifically, trait levels of negative emotionality and state levels of depressive symptoms—increased risk for substance abuse onset and whether perceived social support moderated this relation using data from a 5-year prospective study of 496 school-recruited adolescent girls. Initial negative emotionality, but not depressive symptoms, and deficits in parental, but not peer, support predicted future substance abuse onset in a multivariate hazard model. Tests of the interaction between negative affect dimensions and social support suggested that support did not moderate the relation of negative affect to risk for substance abuse onset. Results provide prospective support for the etiological role in the onset of substance abuse of trait-linked negative affect and of parental support.

Keywords: negative affect, emotionality, depression, substance abuse, social support

Adolescent substance abuse is a serious public health problem that is associated with elevated morbidity, mortality, and psychiatric comorbidity (Aarons et al., 1999; Chassin, Ritter, Trim, & King, 2003; P. Cohen, Cohen, & Brooks, 1993; R. L. Collins & Shirley, 2001; Newcomb & Bentler, 1988). Moreover, adolescent substance abuse predicts subsequent adverse consequences, including physical health problems, emotional distress, interpersonal difficulties, family problems, academic problems, and substance dependence (Chassin, Pitts, & Prost, 2002; Nagin & Tremblay, 2001; Newcomb & Bentler, 1988). Identifying the risk factors for substance abuse is important for testing theories of etiology, informing the content of prevention programs, and identifying high-risk groups for targeted interventions. Following Kraemer et al. (1997), a risk factor is a variable that has been shown to prospectively predict onset of some subsequent outcome among individuals who are initially free of the outcome.

Negative Affect and Substance Abuse Onset

One of the more widely accepted etiologic theories is that affective disturbances increase the risk for onset of substance abuse (Cooper, Frone, Russell, & Mudar, 1995; Newcomb & Bentler, 1988; Sher, 1991; Stasiewicz & Maisto, 1993). Individu-

als with affective disturbances are thought to consume psychoactive substances because they improve mood and provide distraction from adverse emotions (McCollam, Burish, Maisto, & Sobell, 1980). The functional nature of this substance use putatively results in frequent consumption, thereby increasing the risk of the use-related negative consequences that characterize substance abuse. The fact that mood disturbances increase markedly during adolescence for girls (Hankin et al., 1998) suggests that negative affect might be an important predictor of substance abuse for this population.

Only a few prospective studies have tested whether affective disturbances predict the onset of substance abuse (Chassin et al., 2003). We focus exclusively on prospective studies because cross-sectional findings cannot be unambiguously interpreted. Research has found that affective disturbances specifically predicted future increases in alcohol abuse symptoms (Chen, Anthony, & Crum, 1999; Stice, Barrera, & Chassin, 1998). However, other studies have found that affective disturbances did not predict future increases in substance abuse symptoms, generally (Curran, White, & Hansell, 2000), or the onset of specific problems, such as alcohol abuse (Clark, Parker, & Lynch, 1999; Costa, Jessor, & Turbin, 1999). The fact that effects tended to be nonsignificant in studies that solely estimated multivariate models suggests that the effects of affective disturbances are relatively small and consequently become nonsignificant when examined within the context of other risk factors.

In the current study, we examined whether two facets of negative affectivity were risk factors for future onset of substance abuse in a community sample of adolescent girls. Specifically, we tested whether elevations in temperamental negative emotionality on the one hand and depressive symptomatology on the other conferred differential risk for the onset of overall substance abuse. The inclusion of both constructs may be informative at the levels of etiology and intervention. To begin with, models have been proposed that emphasize the role of negative affect in substance abuse (Sher, 1991). Although the relation between negative affect and

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adolescent substance abuse has received inconsistent support prospectively, some of the conflict reported in the literature may be due to variations in the type of negative affect assessed (see review by Chassin et al., 2003). Measurement of negative emotionality and depressive symptoms enabled us to test whether it is chronic negative affect or potentially transient peaks of depressive symptoms that serves to increase risk for substance abuse onset. Support for one over the other could have important clinical implications such that support for the former might necessitate altering children's long-standing responses to the environment, perhaps through better coping skills (Compas, 1995). Alternatively, evidence that depressive symptoms confer the majority of risk for substance abuse onset might suggest that it would be more advantageous to treat or prevent depression. More generally, the scarcity of prospective work on substance abuse onset does not allow for a clear understanding of temporal sequencing with certain substance abuse comorbidities, for example, whether the onset of substance abuse follows or precedes symptoms of depression.

Research has suggested that negative emotionality is at least partially rooted in biological factors and is temporally stable (T. A. Brown, Chorpita, & Barlow, 1998; Buss & Plomin, 1984). As such, negative emotionality might be conceptualized as a trait vulnerability to substance abuse problems. There is ample cross-sectional evidence that negative emotionality is related to substance use-related problems in adolescence (Chassin, Curran, Husong, & Colder, 1996; Chassin, Pillow, Curran, Molina, & Barrera, 1993; Cooper et al., 1995); however, it is not clear that these same effects hold prospectively (Chassin et al., 1996).

In contrast, depressive symptomatology is more akin to temporary states of mood dysregulation (T. A. Brown et al., 1998), making it somewhat distinct from a trait vulnerability dimension. Here too the picture is equivocal. For example, Henry, Feehan, and McGee (1993) reported that depression was a unique predictor of subsequent teenage abuse among adolescent boys but not girls. Another study found that internalizing pathology reflecting both depressive and anxious symptoms did predict future increases in substance abuse symptoms (Stice et al., 1998). Again, however, in studies that estimated multivariate models, depressed mood did not predict onset of substance abuse symptoms (Stice, Burton, & Shaw, 2004). When viewed in tandem, research on trait and state measures of affective disturbance appear to suggest that only broadband measures of affective traits are related to substance abuse onset. However, we view this conclusion as provisional because we were unable to locate prospective research that tested multiple affective risk factors for substance abuse onset.

Social Support and Substance Abuse Onset

Another lacuna in the literature is that few studies have investigated factors that moderate the relation between negative affect and future risk for substance abuse. An important step for risk factor research is to explore potential interactive effects between risk factors (Kraemer, Stice, Kazdin, & Kupfer, 2001). A vulnerability-buffering conceptualization would suggest that high levels of perceived social support might reduce the risk for substance abuse onset conferred by negative affect (S. Cohen & Wills, 1985). Theoretically, individuals with significant negative affect would be less likely to turn to a maladaptive coping strategy, such as substance abuse, if they possess adequate social support. It has

been suggested that the presence of supportive family and peers helps to reduce negative affect because if individuals are accepted and valued in their social environment, they may be more likely to feel greater esteem, confidence, and efficacy (Pierce, Frone, Russell, Cooper, & Mudar, 2000). In addition, the perception that one can turn to family or friends for emotional or practical assistance may reduce feelings of depression because it might decrease the extent to which individuals ruminate about problems (Wills & Cleary, 1996).

In addition to potentially moderating the effects of negative affect on risk for substance abuse onset, it has been asserted that deficits in social support might directly increase the risk for substance abuse onset (i.e., show a main effect; Baumrind, 1991; Windle, 1992). Theoretically, deficits in parental support may result in a disruption in children's identification with their parents, which in turn may interfere with the internalization of parental and societal mores, including proscriptions against abuse of illicit substances. Parents who provide little social support to their adolescents may also exhibit deficits in parental monitoring, which may increase the risk that the adolescents will affiliate with peers who use substances, an established risk factor for abuse onset (Chassin et al., 2003; Ellickson, Tucker, Klein, & Saner, 2004). Furthermore, adolescents may initiate substance use or consume these substances at excessive levels to gain greater social acceptance in their peer group, as most adolescents consider some amount of substance use to be normative (Suls & Green, 2003).

Although we were unable to locate prospective studies that have tested whether social support moderates the relation between initial negative affect and future risk for substance abuse onset, several studies tested for main effects between initial perceived social support and subsequent substance abuse. Deficits in parental support predicted future increases in substance abuse symptoms in two studies (Stice et al., 1998; Windle, 1992). It was noteworthy that Windle found prospective effects for parental but not peer support in the prediction of substance use problems. There are several possible explanations for this pattern of findings. First, parents may play a more pronounced role because adolescents rely on them to provide more types of support (e.g., emotional, instrumental, and tangible) relative to the types of support expected from peers. Second, adolescents may be better able to tolerate transient deficits in peer support because friendship networks are more fluid during adolescence, but they might be more deeply affected by a lack of parental support because of the more permanent nature of this relationship (W. A. Collins & Laursen, 1992). Third, adolescents might receive two fundamentally different forms of peer support, given the ubiquity of adolescent substance experimentation and use (Johnston, O'Malley, & Bachman, 2000; Suls & Green, 2003). For adolescents embedded in drug-using peer groups, peer support might lead to the initiation of or an increase in drug use (Sher, 1991), but for those in nonusing peer groups, peer support might be related to less drug use. When the two groups are combined, the effect or correlation might appear to be zero. Therefore, we tested whether perceived support from parents and peers showed main effects in the prediction of substance abuse onset and whether these variables moderated the prospective effects of negative affect. Although we did not collect information about peers' substance use/abuse behaviors, we focused on both parental and peer support in an effort to replicate the

finding that only the former is a risk factor for substance abuse during adolescence.

In sum, the aims of this study were to test for main effects of negative affect—specifically, trait levels of negative affectivity and state levels of depressed mood—and perceived support in the prediction of substance abuse onset. We also tested whether the main effects of negative affect are buffered, or attenuated, among individuals with high levels of perceived social support. To our knowledge, this is the first prospective test of the hypothesis that social support might moderate the relation between negative affect and future risk for substance abuse onset. More generally, few prospective studies have examined potential risk factors for substance abuse onset. These analyses are important because they provide a prospective test of etiologic theory and may suggest ways to improve substance abuse prevention programs and identify high-risk groups. We focused on adolescent girls because these data were drawn from a longitudinal study of the risk factors for eating pathology, which predominantly affects females. Nonetheless, we felt this was an appropriate sample because girls show marked increases in negative affect and substance abuse during adolescence (Hankin et al., 1998; Langerbucher & Chung, 1995).

Method

Participants

Participants were 496 adolescent girls from four public (82%) and four private (18%) middle schools in a metropolitan area of the southwestern United States. Adolescents ranged in age from 12 to 14 ($M = 13$) at baseline. The sample included 2% Asian/Pacific Islanders, 7% African Americans, 68% Caucasians, 18% Latinas, 1% Native Americans, and 4% who specified other or mixed racial heritage. Average parental education (a proxy for socioeconomic status) was 29% high school graduate or less; 23% some college; 33% college graduate; and 15% graduate degree, which was similar to census data for comparably aged adults in the county (34% high school graduate or less, 25% some college, 26% college graduate, and 15% graduate degree; Stice, Burton, & Shaw, 2004).

Procedures

The study was described to parents and participants as an investigation of adolescent mental and physical health. An active parental consent procedure was used to recruit participants. An informed consent letter describing the study and a stamped, self-addressed return envelope were sent to parents of eligible girls (a second mailing was sent to nonresponders). Adolescent assent was secured immediately before data collection took place. This resulted in an average participation rate of 56%, which was similar to that of other school-recruited longitudinal studies that required active consent and involved structured interviews (e.g., 61% for Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). The ethnic composition of the sample was representative of the ethnic composition of the schools from which we sampled (2% Asian/Pacific Islanders, 8% African Americans, 65% Caucasians, 21% Hispanics, and 4% other or mixed). Moreover, the 1-year prevalence rates of major depression (4.2%), bulimia nervosa (0.4%), and substance abuse (8.9%; Stice, Presnell, & Bearman, 2001) were similar to the prevalence rates from epidemiological studies (Lewinsohn et al., 1993; Newman et al., 1996).

Girls completed a questionnaire and participated in a structured interview at baseline (Time [T] 1) and at four annual follow-ups (T2, T3, T4, and T5). Female assessors with a bachelor's, master's, or doctoral degree in psychology conducted all interviews. Assessors attended 24 hr of training, wherein they learned interview skills, reviewed diagnostic criteria for

relevant *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., or *DSM-IV*; American Psychiatric Association, 1994) disorders, observed simulated interviews, and role-played interviews. Assessors had to demonstrate an interrater agreement for diagnoses ($\kappa > .80$) with experts using tape-recorded interviews before collecting data. In addition, a randomly selected 5% of the participants were reinterviewed by a blinded assessor to monitor interrater agreement, and a randomly selected 5% of the participants completed a second interview by the same assessor to monitor test-retest reliability (both κ s $> .80$). Assessments took place during regular school hours or immediately after school on the school campus or at participants' houses. Girls received a \$15 gift certificate to a local book and music store to compensate them for participating in the study.

Measures

Negative emotionality. Buss and Plomin's (1984) Emotionality Scale was used to assess temperamental negative affectivity. Participants indicate their level of agreement with statements regarding their tendency to become affectively distressed (sample item: *I frequently get distressed*) on a 5-point response format ranging from 1 = *never true of me* to 5 = *always true of me*. Items were averaged to create a scale score. This scale has acceptable internal consistency (Cronbach's $\alpha = .82$), 10-month test-retest reliability ($r = .69$), and predictive validity (Buss & Plomin, 1984; Stice, 2001). This scale had a Cronbach's alpha of .79 at T1.

Depressive symptoms. An adapted version of the Schedule for Affective Disorders and Schizophrenia for School-Age Children (K-SADS; Puig-Antich & Chambers, 1983), a structured psychiatric interview, assessed diagnostic criteria for *DSM-IV* major depression. Severity ratings for each symptom were averaged to form a continuous depressive symptom composite ($M = .85$ at T1). The K-SADS generally has good test-retest reliability (r s = .63–1.00), interrater reliability (r s = .73–1.00), and internal consistency (α s = .68–.84) and discriminates between depressed and nondepressed individuals (Lewinsohn et al., 1993). The symptom composite had a Cronbach's alpha of .85 at T1.

Perceived social support. Perceived social support was measured with 12 items from the Network of Relationships Inventory (Furman & Buhrmester, 1985). Items assessed companionship, guidance, intimacy, affection, admiration, and reliable alliance from parents (e.g., *My parent(s) treated me with respect and admiration*) and peers (e.g., *I shared my private feelings with my friends*). Response options ranged from 1 = *strongly disagree* to 5 = *strongly agree*. Items were averaged to form a perceived parental support scale and a perceived peer support scale. Research has provided evidence that these measures possess internal consistency (mean $\alpha = .89$), 1-month test-retest reliability (mean $r = .92$), and predictive validity (Burton, Stice, & Seeley, 2004; Furman, 1996; Furman & Buhrmester, 1985). The Cronbach's alphas were .87 for the perceived parent support scale and .86 for the perceived peer support scale at T1.

Substance abuse. *DSM-IV* (American Psychiatric Association, 1994) symptoms of general substance abuse were assessed with a scale adapted from Stice et al. (1998). Two considerations led us to measure in single composite substance abuse symptoms that included both alcohol and illicit drug use. First, research has suggested that 86%–90% of adolescent substance abusers in treatment meet abuse criteria for two or more substances (S. A. Brown, D'Amico, McCarthy, & Tapert, 2001; Maisto, Pollock, Lynch, Martin, & Ammerman, 2001). Second, we felt that asking the adolescents to complete the substance abuse items separately for each type of substance represented too great of a respondent burden. Accordingly, this eight-item scale was specifically developed to assess substance use-related negative consequences in adolescents. For example, items assessing obligation impairment inquired about negative consequences in both the school and the work environment. Items focused on obligation impairment, health problems, physically hazardous behavior, legal problems, and social difficulties resulting from substance use that occurred over the past year (e.g., got arrested because of substance use, had an accident or injury because of substance use, lost a job or got kicked out of school because of

Table 1
Proportions of Sample Initiating Substance Abuse During 5 Years of Study

Domain	Year 1		Year 2		Year 3		Year 4		Year 5	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Abuse reported	28	5.7	33	6.7	38	7.7	53	10.8	45	9.1
Abuse not reported	465	94.3	460	93.3	455	92.3	440	89.2	448	90.9
Total	493	100	493	100	493	100	493	100	493	100

substance use). Following *DSM-IV* criteria, girls reporting recurrent instances (at least two) of any of the symptoms were diagnosed with substance abuse. Separate diagnoses were made at each of the five assessments. These items possess adequate internal consistency ($\alpha = .85$) and convergent validity (Stice et al., 1998). Pilot testing ($N = 62$) revealed a 1-month test-retest coefficient of .78 for the substance abuse symptom composite. More generally, self-reports of substance use appear to be the most valid measure of substance abuse (Winters, Stinchfield, Henly, & Schwartz, 1991).

Results

Preliminary Analyses

Of the initial 496 participants, between 6 and 10 did not provide data at least once during the follow-up assessment (1%–2%), but only 3 did not provide any follow-up data (1%). Attrition analyses verified that girls who provided complete data did not differ significantly from girls with missing data in terms of demographic factors or any of the variables examined in this report, suggesting that attrition should not bias parameter estimates. Our central analyses were conducted on the 493 girls with complete or near-complete data.

Descriptive Statistics

Table 1 reports the proportion of girls in the sample whose self-reports indicated that they met criteria for substance abuse at each assessment point. At T1, 28 (5.7%) of the 496 adolescents met criteria for substance abuse. The corresponding rates of substance abuse were 6.7% at T2, 7.7% at T3, 10.8% at T4, and 9.1% at T5, indicating a nearly linear increase in the rate of substance abuse among adolescent girls. By T5, 24.1% ($n = 119$) of the sample had reported substance abuse problems at some point in the prior 5 years.

Annual rates of substance abuse that hover around 8% fall below the rates of abuse found in clinical samples, yet approximate epidemiological norms (Chassin et al., 2003). Overall, 42% ($n = 206$) of the entire sample reported seeing a mental health professional at least once during the period of study. Of the girls reporting substance abuse onset by their T5 assessment, 64% ($n = 76$) reported having sought or received mental health services at least once since enrolling in the study. Thus, although the findings from this investigation may not generalize completely to more impaired, clinical samples, it is not the case that the community samples did not include impaired individuals who sought psychiatric treatment.

Table 2 provides the correlations between negative emotionality, depressive symptoms, perceived parental support, and perceived peer support at T1, along with the means, standard devia-

tions, and skew coefficients for these variables. The fact that negative emotionality and depressive symptoms were only moderately correlated ($r = .46$) suggests that these two measures can be thought of as measuring related, but distinctive, facets of negative affectivity. Likewise, the fact that the parent and peer support measures were only weakly correlated ($r = .24$) supports our decision to consider these two facets of perceived support separately. It was also interesting that participants reported perceiving significantly higher support from peers than from parents, $t(492) = -4.21, p < .001$.

Predicting the Onset of Substance Abuse

We estimated Cox proportional hazard models (Cox, 1970) to test whether T1 negative emotionality, depressive symptoms, parental support, and peer support increased the risk for onset of substance abuse over 4 subsequent years among adolescent girls who did not meet criteria for substance abuse at T1. Using Hosmer and Lemeshow's (2000) recommended model-building strategies, we first conducted univariate models to gain a clear understanding of the main effects of each risk factor. As outlined above, we viewed each of our risk factors as clinically relevant antecedents to the initiation of substance abuse in adolescence. On completion of the univariate analyses, we estimated a multivariate model to investigate the unique effect of all of the independent variables, controlling for the effects of the other variables.¹

The univariate hazard models tested whether T1 independent variables predicted risk for future onset of substance abuse. The odds ratios and 95% confidence intervals for the univariate relations between the T1 independent variables and the risk for onset of substance abuse are presented in the top half of Table 3. All four T1 predictors conferred risk. Specifically, both elevated negative emotionality and depressive symptoms increased the risk for subsequent onset of substance abuse. Similarly, deficits in both parental and peer support increased the risk for the onset of substance abuse.

The multivariate model tested whether each of the four T1 independent variables showed unique relations to future onset of substance abuse, while statistically controlling for the effects of the other three independent variables. The odds ratios and 95% con-

¹ Following procedures outlined by Hosmer and Lemeshow (2000), we conducted our multivariate models in two ways: (a) We tested all of the T1 predictors irrespective of the univariate results (this enabled closer evaluation of potential suppressor effects) and (b) we tested only risk factors with significant ($p < .025$) univariate effects. The results of the two approaches were virtually identical; thus, we report on Option 1 to facilitate presentation of all effects.

Table 2
Correlations Between the Predictor Variables at Time 1, Along With the Means, Standard Deviations, Variance, and Skew Coefficients

Independent variables	1	2	3	4	<i>M</i>	<i>SD</i>	Variance	Skew
1. Negative emotionality	—	.46	-.33	-.22	2.80	0.66	.44	0.40
2. Depressive symptoms		—	-.39	-.29	3.10	0.37	.14	1.68
3. Perceived parental support			—	.24	4.06	0.86	.69	-1.14
4. Perceived peer support				—	4.25	0.77	.61	-1.42

Note. Absolute correlations greater than .20 are significant at $p < .01$.

fidence intervals for the multivariate relations between the T1 independent variables and the risk for onset of substance abuse are presented in the bottom half of Table 3. Negative emotionality and parental support showed significant unique relations to onset of substance abuse in the multivariate model; depressive symptoms and peer support were not significant predictors in the multivariate model.

We next tested for interactive effects between each measure of negative affect and each measure of social support using cross-product terms in Cox proportional hazard models. In these models, the T1 main effect for negative affect and social support were entered on the first step (e.g., negative emotionality, parental support) and the Negative Affect $\times$ Social Support interaction term (e.g., cross-product of Negative Emotionality $\times$ Parental Support) was entered on the second step. The main effect variables were mean-centered before computing the cross-product terms used to test for the interactions to avoid unnecessary collinearity (Aiken & West, 1991). Before running these models, we confirmed that we had sufficient power to detect significant interactions; on the basis of a sample of 493 and a two-tailed test of the null hypothesis at an alpha of .05, our power to detect a small interaction effect (2% of variance explained) was .837 (J. Cohen, 1988). Separate models were tested for interactions between negative emotionality and parental support, negative emotionality and peer support, depressive symptoms and parental support, and depressive symptoms and peer support. However, not one of the four

cross-product terms approached statistical significance (all $ps > .40$) in models predicting substance abuse onset.

Discussion

Our results provided mixed support for the negative affect model of substance abuse onset (Cooper et al., 1995; Newcomb & Bentler, 1988). In univariate hazard models, Year 1 levels of trait-linked negative emotionality and state-linked depressive symptomatology each increased the risk for the onset of substance abuse across 4 subsequent years. However, in a multivariate model that also included parental and peer social support, only adolescents' negative emotionality uniquely predicted substance abuse onset; the effects of prior depressive symptoms became nonsignificant.

These findings are consonant with evidence that adolescents who are at risk for substance abuse problems are those who are temperamentally prone to experience certain aspects of negative affect (Chassin & Ritter, 2001). That the effect of girls' prior depressive symptoms on substance abuse onset became nonsignificant in a multivariate model may have resulted because of collinearity between negative emotionality and depressive symptoms. This pattern of effect suggests that the unique predictive effects of depressive symptomatology at one point in time appear to have been overlapping and small in magnitude relative to traitlike vulnerabilities of negative affect. Consistent with this interpretation, prior studies that have estimated multivariate models have found that depressive symptoms are unrelated or marginally related to the onset of substance abuse problems (Clark, Parker, & Lynch, 1999; Costa, Jessor, & Turbin, 1999). This pattern of findings might be interpreted as suggesting that depressive symptoms that result from temperamental negative affectivity are more important in increasing risk for substance abuse onset than are depressive symptoms not linked to this temperamental trait; perhaps they are due to transient life stressors, which do not increase risk for substance abuse onset because they resolve naturally.

Theoretically, why else might trait-linked aspects of negative affect offer a more potent prediction of substance abuse onset than depressive symptoms? Conceivably, the characterological nature of negative emotionality might make some individuals prone to more frequent, intense, and, possibly, more protracted periods of emotional distress (Shiner & Caspi, 2003). If predisposed to use substances to relieve the effects of distress (Cooper et al., 1995), adolescents in frequent and intense states of emotional distress may transition to more consequential forms of substance use (Labouvie, Pandina, White, & Johnson, 1990). By comparison,

Table 3
Odds Ratios and Confidence Intervals From the Univariate and Multivariate Hazards Models Predicting Onset of Substance Abuse

Model	OR	95% CI
Univariate		
Negative emotionality	1.34***	1.12–1.60
Depressive symptoms	1.16*	1.03–1.38
Parent support	0.74***	0.63–0.88
Peer support	0.84*	0.71–0.99
Multivariate		
Negative emotionality	1.23*	1.00–1.51
Depressive symptoms	0.98	0.80–1.21
Parent support	0.80**	0.67–0.96
Peer support	0.93	0.78–1.09

Note. OR = odds ratio; CI = confidence interval. All predictors were standardized for comparative purposes.

* $p < .05$. ** $p < .01$. *** $p < .001$.

general population studies have revealed that depressive symptoms tend to be largely transitory in nature (Lewinsohn, Petit, Joiner, & Seeley, 2003). Accordingly, in the present study, the aspect of girls' depressive symptoms that did not overlap with the measure of negative emotionality may have reflected the more fluctuating elements of depressed mood. We note that in studies where prospective effects of depression have been demonstrated (Windle & Windle, 2001), it was the more persistent and severe aspects of depressive symptoms that conferred risk for future substance use behavior.

Our findings also provided support for the general assertion that deficits in social support increase the risk for the onset of substance abuse (Baumrind, 1991; Stice et al., 1998; Windle, 1992). In particular, there was evidence from the univariate models that adolescents who perceived low levels of both parental and peer support showed an increased risk for subsequent onset of substance abuse. However, echoing Windle's findings, only deficits in parental social support, and not peer support, predicted the onset of substance abuse in our multivariate model.

This pattern of results is consistent with the suggestion that children may be more deeply affected by deficits in parental support (Baumrind, 1991) and that parental support more than peer social support shows stronger relations to behaviors with more demonstrable or significant consequences. The initiation of substance abuse is a significant event and may be significantly more likely to occur if adolescents experience deficits in their parents' provision of instrumental and emotional support. Accordingly, youth who feel emotionally disconnected from their parents may be more likely to abuse substances as a means of coping with this perceived deficit in their relationships with their parents. Granted, this does not preclude the possibility that this effect may have emerged because youth prone to externalizing, who are at risk for substance abuse, drive away parents because of their problem behavior (Patterson, Forgatch, Yoerger, & Stoolmiller, 1998). By contrast, however, deficits in peer support may be less damaging because of the changes that often occur in friendship networks during adolescence. That is, adolescents might realize that with time they may be able to locate peers who provide support, but that this is much more difficult with parent figures.

The greater predictive validity for parental support versus peer support was particularly noteworthy because adolescents actually reported perceiving greater overall support from the latter. The fact that parental support had greater predictive validity than peer support seems incompatible with the assertion that parental socialization effects give way to genetic and peer influence effects beyond the earliest years of socioemotional development (Harris, 1998). Instead, this pattern of findings seems more consistent with the assertion that parents continue to exert a potent effect on adolescent development (W. A. Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000).²

Contrary to expectation and some prior cross-sectional research (S. Cohen & Wills, 1985; Leavy, 1983), our findings did not provide support for the vulnerability-buffering model as it relates to the onset of substance abuse behavior. Specifically, there was no evidence that the increased risk of substance abuse onset conferred by negative emotionality or by depressed symptomatology decreased as a function of higher levels of perceived social support from either parents or peers. These results seem to suggest that regardless of how supportive adolescents' parents and peers are, it

may be more difficult to repair through social support the effects of temperamental negative affectivity, which is putatively rooted in biological predispositions (Buss & Plomin, 1984; Davidson, Gray, Lazarus, Rothbart, & Ekman, 1995). Despite general theoretical and clinical support (G. W. Brown & Harris, 1978; S. Cohen & Wills, 1985; Leavy, 1983), in prospective research little evidence has been marshaled for the buffering role of social support in the development of psychopathology generally (Burton et al., 2004) or of substance abuse specifically. Although the nonsignificant effects observed here might be otherwise explained—for example, by insufficient power, limits of self-reports, and narrow measurement of social support (e.g., enacted support or network density rather than perceived support)—a review of the literature provides very little prospective evidence of the buffering role of social support (Burton et al., 2004). These findings continue this trend.

Limitations

Although the prospective design provides some assurance that the direction of effects was as hypothesized and the large community-recruited sample augments the generalizability of the results, it is important to consider the limitations of this study. First, because this study focused exclusively on adolescent girls, the results should not be generalized to adolescent boys. Moreover, our findings may not generalize to more impaired, clinical populations. It is possible that the risk factors for substance abuse onset reported here may differ from the risk factors that predict more severe substance abuse or dependence that results in inpatient psychiatric treatment. Although we noted earlier that a substantial percentage (64%) of the girls reporting onset of substance abuse problems sought some form of treatment while in the study, it is possible that known developmental (e.g., age of onset), clinical (e.g., patterns of comorbidity, clinical depression), and psychosocial (e.g., early trauma) differences between community and clinical samples (Chassin & Ritter, 2001) might yield differential patterns of risk.

Second, despite the fact that adolescents appear to be the most valid reporters of their own emotional disturbances and substance abuse behaviors (Cantwell, Lewinsohn, Rohde, & Seeley, 1997; Edelbrock, Costello, Dulcan, Kalas, & Conover, 1985), reporter and method bias may have artificially inflated the magnitude of correlations between constructs; as such, it would have been preferable if we had collected collateral data from parents (Maisto & Connors, 1992). In addition, the sole reliance on self-reported data also precluded the possibility of distinguishing perceived support from enacted support. Fortunately, perceived support has been found to correlate with enacted support (e.g., the correlation between perceived parental support and parent report of support provided was .81 after dissatisfying for unreliability; McCaskill & Lakey, 2000). Nonetheless, it would have been preferable if we

² A potential caveat worth noting here pertains to the limited variability in the adolescents' reports of parental support and, in particular, peer support (see Table 1). It is possible that the predictive superiority of the parental support data over the peer support data may have been due to a lack of relative variability in the latter. However, we view this explanation as unlikely given that the means for both scales were comparably high and that these data had similar standard deviations and variances.

had collected data on enacted support from parents or had collected direct observational data.

Third, as with all results from longitudinal studies, it is always possible that some third variable explains the observed prospective relations. For example, some researchers (Loeber, Stouthamer-Loeber, & White, 1999) have argued that negative affectivity has only a weak relationship to substance abuse in adolescence relative to trait measures of hostility and aggression. Given the high co-occurrence of negative emotionality and hostility, it has not been established that negative affectivity has a unique relationship to substance abuse relative to other aspects of personality. In addition to including trait measures of hostility and aggression, it would be useful if future randomized prevention trials manipulated negative affect to experimentally test whether a decrease in negative affect produces a consequent reduction in substance abuse.

A final, related issue concerns the possibility of co-occurring externalizing problems, in particular problems with aggression and delinquency that may interact with or operate independently of both negative affect and children's social support experiences. The co-occurrence of negative affect, antisocial problems, and substance abuse is well documented (Chassin & Ritter, 2001). Had measures of aggression and delinquency been available to use as baseline measures of risk, it is possible that even trait levels of negative affect might not have provided unique prediction of substance abuse onset in the multivariate models. In addition, the availability of externalizing data would have allowed us to examine the interaction of antisocial and affective traits to see how combinations of such problems relate to youths' tendencies to ignore, repel, or attract social support.

Directions for Future Research

As with any findings from a single study, it will be important to attempt to replicate these findings in an independent study. Nonetheless, it was somewhat comforting that the main effects for negative affect and perceived support did replicate those observed in the handful of previous prospective studies that examined the predictors of substance abuse during adolescence. It would be particularly useful if future studies directly assessed enacted support, as well as perceived support, in an effort to provide some evidence that it is not solely the perception of support that has predictive validity. As noted above, future research should also examine the effects of co-occurring internalizing and externalizing behavior on social support and substance abuse behavior. Finally, whereas the prospective design is an improvement over cross-sectional data, it does not rule out third-variable explanations for the relations. Randomized prevention and treatment trials that directly manipulate negative emotionality and/or parental support represent a rigorous way to experimentally test the hypothesized relations.

Conclusions and Implications

In sum, results provide support for the assertion that negative affect, specifically trait-linked negative emotionality, increases the risk for substance abuse onset during adolescence. Our results also suggest that deficits in perceived parental support constituted a risk factor for subsequent onset of substance abuse. Therefore, substance abuse prevention programs might be more effective if they

focus both on redressing the effects of negative emotionality and on improving parental support. Although difficult to redress, interventions designed to enhance coping strategies (e.g., affect regulation or the skills needed to tolerate emotional distress) might provide one avenue of protection. Alternatively, efforts to promote parental support through more effective monitoring have successfully deflected antisocial trajectories (Patterson, Reid, & Dishion, 1992) and could offer similar potential with substance abuse. More generally, it is hoped that these findings will stimulate other researchers to investigate the precise processes by which risk factors operate to increase the risk for onset of psychiatric disorders.

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