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Longitudinal Study of Stressful Life Events and Daily Stressors Among Adolescents at High Risk for Psychotic Disorders

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Psychosocial stress preceding the onset or recurrence of psychotic symptoms has been identified in patients with schizophrenia; yet there is limited understanding of the effects of stress in typically developing adolescents or those who show behavioral signs of risk for schizophrenia spectrum disorders. This study examined the developmental course of symptom progression as a function of stressful life events and daily hassles in adolescents with schizotypal personality disorder (SPD), other personality disorders, or no Axis II disorder. In this prospective longitudinal study, life events and daily stressors were assessed in adolescents aged 12 to 18 years. Results revealed that adolescents with SPD and other personality disorders reported significantly greater total, independent, and undesirable life events than individuals with no Axis II disorders. Youth with SPD report daily hassles to cause more distress compared to peers. Correlational analyses and hierarchal linear regression was used to evaluate the relationship of life events and daily stressors with psychiatric symptoms measured concurrently and 1 year later. Across diagnostic groups, the incidence of independent and undesirable life events were associated with current prodromal symptoms, while the frequency of daily stressors predicted a significant increment in positive, but not negative, prodromal symptoms over time. Therefore, adolescents who report greater daily stressors exhibit an increase in prodromal symptoms over a 1 year period. Psychosocial stress has been implicated in the etiology of schizophrenia, and these findings suggest the importance of life events and daily hassles as potential risk factors in the onset of psychotic symptoms during adolescence.

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Critical reviews of the association of stressful life events with schizophrenia and other psychotic disorders support clinical observations, in that stressful life events are related to the emergence of psychotic symptoms and possibly contribute to symptom exacerbation.[1–3] This body of evidence supports a stress–diathesis model of schizophrenia, where it is assumed that psychosocial stress is 1 of several risk factors contributing to the onset and relapse of psychotic symptoms.[4–8]

In a landmark study, Brown and Birley[9] compared the cumulative number of life events between periods of stability and symptom exacerbation, and the results suggested that psychotic episodes are often preceded by stressful life events. Day and colleagues[3] replicated these findings by showing that there was a significant increase in the number of stressful life events reported in a 3-week period before the onset of symptoms. Significant increases in life events in the 3 months before the onset of psychosis remained even when the events were restricted to the category of independent life events, ie, events that are outside the control of the patient or independent of the patient's clinical state.[10] Likewise, minor stressors and daily hassles that lie more in the realm of common experience quite often precipitate the recurrence of psychotic symptoms.[11] Furthermore, relatively minor and/or daily stressors may sometimes be a significant predictor of later psychotic symptoms and may even have a stronger influence on symptoms than major life events.[12–14]

The most consistent evidence of the causal role of negative life events in the onset and recurrence of psychopathology comes from events that are severe in nature and whose occurrence is independent, or outside of the control, of the respondent.[15] However, the literature on the effects of stressful life events in schizophrenia is inundated by retrospective reports that may contain recall biases as a result of clinical state of the patient. Some studies have used retrospective designs, while others fail to differentiate between independent and dependent events, thereby compromising the ability to make definitive causal inferences. Nevertheless, prospective studies provide sufficient evidence that psychosocial stress is

important during periods of symptom exacerbation in patients with schizophrenia.[16–19] For example, Ventura et al[20] confirmed using survival analysis that the occurrence of an independent life event was associated with increased risk of relapse in chronic patients.

Limited research has been directed toward life events and daily stressors in individuals at elevated risk for schizophrenia. By studying youth with schizophrenia spectrum disorders, such as those with schizotypal personality disorder (SPD), it may be possible to identify adolescents who are at elevated risk for developing Axis I psychotic disorders. These individuals are characterized by nonspecific mood symptoms, anxiety, irritability, emotional lability, mild positive symptoms (ie magical thinking, suspiciousness, and odd beliefs), social withdrawal, and cognitive and social impairment. Such high-risk individuals exhibit a cluster of subthreshold psychotic symptoms, consistent with a prodromal syndrome, and have a roughly 35% rate of conversion to psychotic disorder over 2 years;[21] however, this figure should be interpreted conservatively within the context of the present study, which does not include symptom duration and worsening as inclusion criteria. In addition, SPD symptoms parallel prodromal or ''prepsychotic'' signs of schizophrenia and are therefore an important developmental target for identifying symptoms mirroring the schizophrenia prodrome. Longitudinal research of adolescents with SPD may provide a prospective view of the etiology of psychotic disorders.

Additionally, environmental factors (ie, stressful life events and daily hassles) that have the potential to trigger psychiatric symptoms have received little attention during adolescence, a developmental period of elevated risk for the emergence of psychiatric illness. Research suggests that the typical timeframe for the initial episode of psychosis is during late adolescence or early adulthood.[22] In general, adolescence has been recognized as a developmental period that places unique demands on social, psychological, and occupational functioning, as well as adaptive coping skills. Adolescents have a heightened risk for both exposure to stressful events and increased negative appraisal of stressful experiences.[23–26] Further, adolescence is marked by biological changes that include maturational increases in gonadal and adrenal hormones and alterations in the structure and function of the brain.[27–29] It is likely that biological changes and environmental pressures during adolescence lead to elevated rates of psychiatric illnesses.[30]

Cohen et al[31] found that recent stressful life events increase the symptoms of schizotypal and borderline personality disorders in a community sample between the ages of 10 and 36 years. Furthermore, research on adults with personality disorders suggests that psychosocial events can influence symptom progression. For example, Jovev and Jackson[32] found that a greater occurrence of life events was associated with a decrease in psychosocial functioning in patients with a personality disorder diagnosis other than borderline personality disorder. In contrast, positive events within the domain of romantic relationships improve functioning in individuals with SPD.[33] However, there is an inherent problem in studying the impact of stressful life events in individuals with personality disorders due to the fact that these individuals tend to generate more life events. For example, Daley and colleagues[34] found that late adolescent women with symptoms of cluster A and B personality disorders generate excessive amounts of interpersonal and episodic stress over a 2-year period. Therefore, understanding the prospective relationships between self-reported stress and psychiatric symptoms in high-risk adolescents may have implications for minimizing adult psychopathology.

The current study examines the relation of stressful life events and the developmental course of symptom progression in normal adolescents, adolescents who meet diagnostic criteria for SPD, and a comparison group with other Axis II disorders. The longitudinal assessment of life events and daily hassles in these groups will allow us to determine whether these factors are associated with different patterns of symptom exacerbation in healthy and at-risk adolescents. We hypothesize that stressful life events and daily stressors precipitate increase in psychiatric symptoms in adolescents, particularly those with SPD.

Methods

Participants

Participants were recruited as part of a larger longitudinal study of the biological and behavioral aspects of personality disorder in adolescents. Recruitment of adolescents with personality disorders was conducted through Atlanta area newspaper announcements directed at parents of youth. Announcements described key diagnostic signs of SPD, and a telephone screening interview was administered to all interested respondents, typically a parent or legal guardian. Participants for the nonpsychiatric comparison group were recruited through the Emory University Research Participant Registry that maintains a database of contact information for parents and children within the community. These families have been recruited through announcements in school newsletters, hospital postings, and public forums for participation in ongoing research studies. A telephone screening interview was administered to all respondents. The screening interview obtained information on demographics, psychiatric history, and physical health.

Those who were deemed appropriate based on the screening interview were scheduled for the initial assessment. Individuals with significant substance abuse, chronic or serious medical conditions (diagnosed neurological disorder, hypertension, thyroid disorder, etc.) or

likely Diagnostic and Statistical Manual of Mental Disorder (Fourth Edition) (*DSM-IV*) Axis I disorder were excluded from the study. Participants with learning disorders, attention-deficit, and other disruptive behavior disorders were not excluded, given that these disorders show a high rate of comorbidity with psychosis.[35]

The present study included all participants who were assessed at least 2 times approximately 1 year apart. This report presents data on 130 adolescents, ranging in age from 12 to 18 years (mean = 14.3 y, SD = 1.8 y) at the initial assessment. Written consent or assent was obtained from all participants and a parent, in accordance with the guidelines of the Emory University Human Subjects Review Committee.

Procedures

Diagnoses were determined through the administration of structured clinical interviews. The battery of diagnostic measures included the Structured Interview for *DSM-IV* Personality Disorders (SIDP-IV),[36] the Structured Clinical Interview for Axis I *DSM-IV* Disorders (SCID), [37] an interview with the parent, and the Structured Interview for Prodromal Symptoms (SIPS).[38] The SIDP-IV was administered to provide a comprehensive assessment of the symptoms of *DSM-IV* Axis II disorders. The SCID was used to identify participants with mood and psychotic disorders, and the structured interview provides a comprehensive assessment of the symptom criteria for *DSM-IV* Axis I disorders. Lastly, the SIPS was used to assess prodromal symptomatology. Largely due to their young age, some subjects were unable to provide adequate information on symptom onset or worsening and/or duration. Past studies utilizing the SIPS involved samples that were on average 2 years older than the present sample. Therefore, only symptom severity on the SIPS was used as inclusion criteria. The Scale of Prodromal Symptoms (SOPS) on the SIPS rates the severity of 19 symptoms ranging from healthy to pathological. Symptoms are classified into positive (unusual thoughts/ideas, suspiciousness, grandiosity, perceptual abnormalities, conceptual disorganization), negative (social isolation, avolition, decreased expression of emotion, decreased experience of emotion, decreased ideational richness, deteriorated role function), disorganized (odd behavior, bizarre thinking, trouble with focus and attention, impairment in personal hygiene or social attention), and general (sleep disturbance, dysphoric mood, motor disturbance, impaired stress tolerance) categories. This instrument has been shown to yield reliable ratings of prodromal symptoms and predicts risk for conversion to Axis I psychotic disorders.[38,39]

Self-reported daily stress (Daily Stress Inventory [DSI])[40] and life events (Psychiatric Epidemiology Research Interview [PERI]) [41] were measured at the initial assessment and at each follow-up assessment. The DSI and PERI were in the form of a checklist that was completed directly by the subjects. The DSI, a 58-item measure of relatively common daily hassles, was used to measure stressful experiences in the previous and current day. The occurrence of an event is recorded, and the participant is instructed to indicate the level of distress caused by each event on a 7-point Likert scale ranging from ''occurred but was not very stressful'' to ''caused me to panic.'' Therefore, 2 measures are provided by the DSI, including the frequency of daily stressors endorsed as having occurred and the average distress caused by each event. The distress measure was generated by dividing the sum of the distress ratings by the number of events endorsed as having occurred. The PERI includes 102 events that involve significant life changes. Of these, 15 are classified as independent (ie, those not readily attributable to the respondent's symptoms). These 15 items and an additional 53 items that were relevant to adolescents and involve significant life changes associated with social, academic, and living environment were administered to the participants. Also, 15 items were classified as desirable and 42 items were classified as undesirable according to ratings by Dohrenwend and colleagues.[42] Participants were instructed to identify any events that may have occurred within the past year. In addition, parents were asked to complete the same paper and pencil version of the measure. By obtaining parental reports of life events experienced by the participants, it was possible to determine the agreement between responses on the PERI. The agreement between parent and child report was limited ($r = 0.31$, $P < .01$ at initial; $r = 0.29$, $P < .01$ at follow-up); however, this is comparable with past research on the consistency of parent and child reports of life event frequency,[43] as well as the inter-rater reliability for the global PERI.[44] Notably, agreement between parent and child reports was highest for ratings of independent life events. In addition, although the period of one year is lengthy for subjects to recall some kinds of events, the relation found here between life events and baseline symptoms nonetheless suggests reliability in the life events scores.

The measures were administered in the following order to participants, and the order of administration of the measures was the same for all participants across each assessment. First, the DSI and the PERI were administered to the participants followed by the SIDP-IV, SCID, and SIPS. Parents completed the PERI and other scales while they waited for their child, and the average total time for the assessment was approximately 3 h. The interview was conducted at the Emory University Psychological Center by trained examiners, by either a licensed clinical psychologist or an advanced-level psychology doctoral student. Training of interviewers was conducted over a 2-month period, and inter-rater reliabilities exceeded the minimum study criterion of kappa ≥ 80. Through the course of the study, all interviews were

videotaped so that inter-rater reliability could be monitored. Videotapes were reviewed by a licensed clinical psychologist and/or psychiatrist to confirm diagnostic reliability.

Data Analysis

Positive, negative, disorganized, and general prodromal symptoms were calculated from the SIPS for all subjects. The cumulative number of stressful life events was computed from the PERI as well as composite scores based on categories of life events, independent and dependent events, and the desirability of the event. Furthermore, a composite score for the DSI was computed by aggregating the frequency and severity of daily stressors. The analyses of diagnostic group differences were conducted with analysis of variance (ANOVA) in which life events and daily stressors were the dependent measures. Correlational analyses were conducted to examine inter-relations among the measures.

Hierarchical regression analyses were conducted to determine whether measures of stress at the initial assessment (time 1) were predictive of negative and positive symptoms at follow-up (time 2). For the regression equations, positive and negative symptoms at time 1 were entered in the first block. Life events and daily stressors measured at time 1 were entered in the second block as predictor variables, and the magnitude of R^2 change was used to test for significance. This analytic approach tests the hypothesis that stressful life events will predict time 2 symptoms, when controlling for initial symptoms at time 1.

Results

Diagnostic Groups

Based on the results of the assessments, 52 participants did not meet criteria for any Axis I or II disorder (no disorder—NC group), 36 met criteria for schizotypal personality disorder (SPD group, and 42 met criteria for 1 or more Axis II disorders that did not include SPD (other disorder—OPD group). No participants met criteria for a *DSM-IV* Axis I disorder at the initial assessment. Noteworthy, subjects diagnosed with SPD also met criteria for Attenuated Positive Symptom Syndrome (APS) according to diagnosis procedures described by Miller and colleagues.[39] The APS is defined by the presence of regularly occurring moderate to severe positive symptoms. Although all subjects met the APS criteria for symptom severity, the duration criteria could not be established for all participants and was not considered as a central focus in the present study. Demographic and diagnostic information for the participants are presented in Table 1.

No sex differences were found between the 3 groups, with $\chi^2(2)=2.86$, $P = 0.24$. In addition, no significant age difference [$F(2)=0.59$, $P = .55$] was found between the SPD (mean = 14.22, SD = 1.73), OPD (mean = 14.50, SD=1.70), and NC groups (mean = 14.10, SD = 1.93). Approximately 59% of the entire sample was Caucasian, 35% African American, and 3% Asian American, and the groups were comparable based on ethnic composition. The diagnostic groups were comparable on age, ethnic composition, and sex ratio. The SPD group had a higher number of comorbid Axis II diagnoses than the OPD group, $\chi^2(1) = 12.99$, $P < .001$. The most common secondary diagnosis associated with SPD was avoidant ($n=15$), schizoid ($n=13$), paranoid (n = 10), and borderline and obsessive-compulsive personality disorder ($n = 7$).

Table 1. Subject Demographic Information

	Schizotypal Personality Disorder ($n = 36$)	Other Personality Disorder ($n = 42$)	No Personality Disorder ($n = 52$)
Age (M = 14.3, SD = 1.8)			
Mean	14.2	14.5	14.1
SD	1.7	1.7	1.9
Sex, *n* (%)			
Males	24 (67)	20 (48)	29 (56)
Females	12 (33)	22 (52)	23 (44)
Race, *n* (%)			
Caucasian	27 (75)	23 (55)	27 (52)
African American	7 (19)	15 (36)	24 (46)
Asian	1 (3)	3 (7)	0
Other	1 (3)	1 (2%)	1 (2)
Personality disorder comorbidity (%)	69	29	0
Medication status, *n* (%)			
Stimulant	13 (36)	7 (17)	6 (12)
Antidepressant	12 (33)	4 (10)	6 (12)
Antipsychotic	5 (14)	2 (5)	5 (10)

Note: PD, personality disorder; SPD, schizotypal personality disorder; OD, other personality disorder; NC, no personality disorder.

Life Events

Univariate ANOVA showed significant omnibus group differences for total life events as reported by the adolescents, $F(2,124) = 3.52$, $P = .03$. Follow-up independent samples *t* tests revealed that adolescents with SPD and OPD report significantly more life events at initial assessment when compared with individuals with no personality disorder. No diagnostic group differences in life events were observed at follow-up.

A comparison of the frequency of life events across various domains (school, relationships, family, social, etc.) among the groups is provided in Table 2. Univariate ANOVA showed significant omnibus group differences for self-reported life events that are within the context of crime and legal matters, $F(2,124) = 6.36$, $P < .01$ and health-related issues, $F(2,124) = 6.01$, $P < .01$.

Table 2. Life Event Frequencies by Content Area in the No PD (n = 51), SPD (n = 35), and Other PD (n = 41) Groups

	No PD		SPD		Other PD			
	Mean	SD	Mean	SD	Mean	SD	F	Pairwise Differences
School	2.12	1.26	2.60	1.40	2.41	1.30	1.48	
Relationships	0.67	0.86	0.57	0.78	0.83	0.95	0.87	
Children	0.02	0.14	0.06	0.24	0.05	0.31	0.322	
Employment	0.39	0.53	0.34	0.59	0.39	0.67	0.08	
Family	2.90	1.98	3.03	1.98	3.29	2.16	0.42	
Residence	1.18	0.93	1.06	1.00	1.02	0.85	0.35	
Crime	1.00	1.18	2.29	2.41	2.41	2.66	6.37**	1 < 2 = 3
Social	5.53	2.64	6.60	3.51	6.78	3.00	2.33	
Miscellaneous	0.22	0.42	0.40	0.50	0.37	0.62	1.64	
Health	1.88	1.37	2.71	1.27	1.76	1.24	6.01**	2 > 1 = 3
Abuse	0.29	0.67	0.69	1.00	0.46	0.78	2.52	
Total	32.10	13.47	40.00	16.01	39.10	17.32	3.53*	1 < 2 = 3
Independent	3.17	2.17	4.59	2.32	3.37	1.93	4.20*	2 > 1 = 3
Dependent	11.68	4.89	13.74	6.42	15.10	6.60	4.25*	3 > 1
Desirable	5.45	2.20	5.21	2.10	6.27	2.46	2.37	
Undesirable	7.64	4.31	11.94	6.24	10.34	5.39	7.31**	1 < 2 = 3

Note: Abbreviations are explained in the first footnote to table 1. For the pairwise differences, 1 = No PD, 2 = SPD, 3 = Other PD.
*$P < .05$.
**$P < .01$.

Follow-up tests were conducted to evaluate pairwise differences among the means. Because the variances among the 3 groups on life events related to crime were not homogeneous, post hoc comparisons using the Dunnett's C tests were conducted. The SPD and OPD groups reported a significantly greater number of life events associated with criminal and legal activity compared to the individuals with no personality disorder. Frequently endorsed events included being assaulted or robbed by someone, involvement in a lawsuit, losing a driver's license, and being arrested and sent to jail. The Bonferroni procedure was used to control for type I error across the pairwise comparisons associated with health matters. The results of this analysis indicate that the adolescents with SPD experience significantly greater health-related events in comparison to the OPD and NC groups. Some examples of health-related issues included the presence of physical illness in the individual or close family member, injury, or the inability to get treatment for an illness or injury.

Importantly, significant group differences for self-reported independent, $F(2,124) = 4.20$, $p = 0.02$, dependent, $F(2,124) = 4.25$, $p = 0.02$, and undesirable, $F(2,124) = 7.31$, $p < 0.01$, life events were observed at the initial assessment. Cumulative desirable life events did not significantly differ among the diagnostic groups. Results from post hoc pairwise comparisons are shown in Table 2.

Daily Stressors

One hundred twenty-eight participants completed the DSI. One subject diagnosed with SPD and 1 subject diagnosed with no personality disorder failed to complete the DSI. Across the entire sample, adolescents on average reported approximately 20 (mean = 19.76, SD = 12.98) events had occurred over a 24-hour period and were perceived as being stressful. "Thought about unfinished work" was the most frequently reported daily stressor by 71.0% of the participants. Adolescent sample of 65.6% "Thought about the future" and reported this event as evoking stress. Lastly, a majority of the participants reported subjective stress from having their sleep disturbed (64.8%), being interrupted (61.7%), or feeling unorganized (60.9%). A comparison of the occurrence of daily stressors reported over the past 24 hours among the diagnostic groups is shown in Table 3. A chi-square test indicated that the groups did not differ from one another on the proportion of individuals reporting the most frequently identified daily stressors.

No diagnostic group differences were observed on total number of self-reported daily stress items at the initial or follow-up interviews, even though there was a trend for elevated self-reported daily stressors in the SPD group. However, there was a difference between the 3 groups in the average level of distress caused by the daily stress items ($F = 4.771$, $df = 2$, $P = .010$). Post hoc Tukey tests

Table 3. Comparison of the Occurrence of the Most Frequently Reported Daily Stressors over the Past 24 Hours among the Three Groups

	No PD (n = 51), % (n)	SPD (n = 35), % (n)	Other PD (n = 42), % (n)	Chi-Squared	P
Thought about unfinished work	70 (36)	71 (25)	71 (30)	0.01	.99
Was unorganized	58 (30)	65 (23)	59 (25)	0.47	.79
Was interrupted while talking	66 (34)	48 (17)	66 (28)	3.52	.17
Had your sleep disturbed	64 (33)	62 (22)	66 (28)	0.12	.94
Thought about the future	58 (30)	74 (26)	66 (28)	2.23	.33
Misplaced something	50 (26)	65 (23)	54 (23)	1.89	.39
Forgot something	54 (28)	60 (21)	52 (22)	0.46	.79
Was misunderstood	49 (25)	62 (22)	47 (20)	2.15	.34
Argued with another person	60 (31)	45 (16)	50 (21)	2.14	.34
Were interrupted while relaxing	50 (26)	48 (17)	57 (24)	0.63	.73
Hurried to meet deadline	49 (25)	40 (14)	52 (22)	1.24	.54
Was interrupted during task/activity	50 (26)	54 (19)	54 (23)	0.16	.92

Note: Abbreviations are explained in the first footnote to table 1.

indicated that the SPD group (mean = 2.99, SD = 1.20) described the daily events as causing more distress than the OPD (mean = 2.36, SD = 1.30, P = .046) and NC (mean = 2.21, SD = 1.06, P = .011) groups. The items that caused the most distress across the entire sample of adolescents included ''Had car trouble'' (mean = 4.84, caused much stress), ''Someone spoiled your completed task'' (mean = 3.88, caused some stress), ''Argued with spouse/girlfriend/boyfriend'' (3.65, caused a little to some stress), ''Someone broke a promise/appointment'' (mean = 3.64, caused a little to some stress), ''Was embarrassed'' (mean = 3.51, caused a little to some stress). For the SPD group, the items that caused the most distress included ''Had car trouble'' (mean = 5.75, caused very much stress), ''Spoke or performed in public'' (mean = 4.50, caused some to much stress), ''Experienced unwanted physical contact (crowded, pushed)'' (mean = 4.40, caused some stress), ''Had problem with kid(s)'' (mean = 4.40, caused some stress), and ''Was embarrassed'' (mean = 4.33, caused some stress).

Correlation and Regression Analyses

The above analysis indicates that adolescents with SPD experience a greater number of total, independent, and undesirable life events, as well as a more events pertaining to legal and health-related issues than individuals with no personality disorder. Furthermore, although individuals with SPD report similar daily stressors, they perceive these incidences as being more intense and producing greater stress than individuals with other personality problems and individuals with no personality disorder. A series of correlational analyses were performed to examine the relationships between life events, frequency of daily stress, and prodromal symptoms as measured by the SOPS. These relationships between measures at the initial assessment across the entire sample are given in Table 4.

Table 4. Associations of Life Stress and Daily Stressors and Prodromal Symptoms at the Initial Assessment

Measure	Positive Symptoms	Negative Symptoms	Disorganized Symptoms	General Symptoms
Total life events	.25**	.20*	.23*	.22*
Independent life events	.32**	.23*	.26**	.30**
Dependent life events	.18	.17	.17	.15
Desirable life events	.03	−.03	.01	−.02
Undesirable life events	.36**	.33**	.34**	.34**
Frequency of daily stress	.23**	.12	.23**	.23**
Distress of daily stress	.29**	.25**	.40**	.32**

*$P < .05$.
**$P < .01$.

Table 5. Results of Regression Analyses to Test the Relation of Stressors at Initial Assessment and Symptom Severity at Follow-up for Total Sample

Block II Predictor	Block I (Initial Symptoms)[a]				Block II			
	R^2	*df*	*F*	*P*	R^2 change	*df*	*F* change	*P*
Negative symptoms								
Frequency of DSI	.38	1, 86	52.9	.00**	.00	1, 85	0.17	.68
Total life events	.38	1, 85	52.0	.00**	.00	1, 84	0.31	.58
Positive symptoms								
Frequency of DSI	.45	1, 87	71.5	.00**	.03	1, 86	5.50	.02*
Total life events	.46	1, 86	72.5	.00**	.02	1, 85	2.67	.10***

Note: DSI, Daily Stress Inventory.
*$P < .05$.
**$P < .01$.
***$P < .10$ (statistical trend).
[a]Baseline symptom rating corresponding to dependent variable.

Hierarchical regression analyses were conducted with prodromal symptoms at follow-up as the dependent variables. For these regression equations, symptoms at the initial assessment were entered in the first block, and the frequency of daily stressors and total life events in the second block. As shown in Table 5, self-reported daily stressors predicted a significant increment of the variance for later positive symptoms (R^2 change = .03, P = .02). Independent life events were not predictive of an increase in positive or negative symptoms over time. However, self-reported undesirable life events predicted time 2 positive symptoms (R^2 change = .03, P = .03) after controlling for time 1 symptoms. Regression analyses conducted separately for the diagnostic groups did not identify any stress measures as significant predictors of subsequent symptoms.

A post hoc regression analysis was performed to examine whether self-reported total life events and the frequency of daily stressors interacted with a personality disorder diagnosis to predict functioning. Hierarchical regression analyses were conducted by entering diagnostic status into step 1, self-reported daily stressors and life events into step 2, and the interaction terms into step 3. The interactions between diagnostic status and life events and daily stressors were not significant predictors of positive, negative, disorganized, or general symptoms. This indicates that the relations of life events and daily stressors with symptoms do not vary as a function of baseline personality disorder diagnosis.

Discussion

This study examined diagnostic group differences in stressful life events and daily stress, and the relation of psychosocial stress with the progression of symptoms in adolescents. Results indicate that total life events were more frequent in adolescents with SPD compared with healthy controls, and independent life events were more frequent in the SPD group compared with peers. Furthermore, across all adolescents the findings indicate that the frequency of self-reported daily stress is associated with concurrent prodromal symptoms and are predictive of increased positive symptoms over time.

This report also characterizes some of the qualitative features of frequently reported psychosocial stressors during adolescence. In general, most adolescents report a large number of daily experiences that are potentially perceived as stressful. For example, across this sample of adolescents, an average of approximately 20 daily hassles was reported. Many of these stressors (eg, "Was interrupted while talking" and "Was unorganized") were experienced by a large percentage of the participants and were perceived as having relatively minimal impact on psychological functioning (ie, "caused very little stress"). Daily events that produced the most subjective stress during adolescence were those that were unexpected and rarely occurred, like having car problems, or included a significant interpersonal event. Most adolescents reported significant distress from being rejected by others, arguing with a partner, or feeling negatively appraised. Importantly, adolescents with SPD find these experiences to be more distressful than peers. This is consistent among adults with cluster A personality disorders who tend to report higher levels of perceived stress compared to individuals with cluster B and C personality disorders.[45]

In addition, the present findings are concordant with empirical investigations of the impact of life stress on functioning in patients with schizophrenia. Previous findings have shown that dependent life events (ie, events that are influenced by the clinical state of the patient) and daily hassles predict subsequent psychotic symptoms, particularly events that occur within 90 days before symptom exacerbation.[5] Our findings indicate that among adolescents, some of whom were at high risk for psychotic disorder, the frequency of daily hassles in

a 24 h period at baseline predicts an increase in positive prodromal symptoms one year later. However, the experience of life events and daily stressors do not appear to be tied to the SPD syndrome in predicting subsequent functioning given that the relations of stress with symptoms do not vary by diagnostic status.

Considerable attention has been given to recent stressful life event experiences and the role they play in a number of psychiatric conditions.[46,47]. For example, empirical findings support the relationship of stressful life events with depressive symptoms and provide evidence of the magnitude of the effect of environmental stressors in the etiology of depression.[48,49]. Therefore, stress effects may not be specific to SPD and may be one of the many factors associated with transition to psychosis. Future research will be needed to identify the specific role of psychosocial stress and the underlying mechanisms associated with symptom exacerbation in a variety of psychiatric disorders. To further emphasize the importance of psychosocial stress in adolescents at high risk for psychosis, it will be important to determine whether psychosocial stress is specific to prodromal symptoms, or whether psychosocial stress leads to elevations in other psychiatric symptoms. Although a post hoc analysis in the current sample did not find that life events were related to depressive symptoms as measured by the Beck Depression Inventory, future studies will be important in addressing the impact of stress in high-risk adolescents. It is possible that the higher rates of life events we observed in the SPD group were due to these individuals having more cormorbid diagnoses than the OPD group. Therefore, it cannot be concluded that differences in life events between groups with personality disorder is due to an SPD syndrome.

Similar to previous studies with adults, adolescents with SPD and OPD more frequently report incidences of crime and legal matters. Pagano et al[33] found that adults with SPD have higher rates of crime and legal events compared to those with cluster C traits. The authors attribute these findings to the higher likelihood of patients within the schizophrenia spectrum to commit violent acts. Our findings suggest that even during adolescence, individuals at risk for developing a schizophrenia spectrum disorder report a higher frequency of crime and legal events, and they may be more likely to be involved within the juvenile courts. Therefore, professionals working with troubled youth within the juvenile system should be more attentive to prodromal symptoms to provide accurate assessment and preventive treatment.

Adolescents with SPD report a greater frequency of health-related issues, including personal illness or physical illness or death of a family member. In previous studies of individuals with personality disorders, negative life events pertaining to interpersonal relationships or crime-legal matters were significant predictors of a subsequent suicide attempt.[50] Therefore, certain types of life events may have a stronger relationship with subsequent functioning in high-risk individuals. It the current sample of adolescents, however, the frequency of daily stress remained as the only significant predictor of increases in symptoms over a 1-year period. Future studies investigating the unique risk of specific types of life events among high-risk adolescents are warranted.

Researchers have suggested that inherent methodological problems in the study of life events have compromised the ability to make definitive causal interferences about the effects of life events on functioning.[1,51,52] In particular, data gathered by life events questionnaires are retrospective and may contain recall biases that may make it difficult to discern the direction of influence, such as whether the increase in stressful life events was a result of increasing symptoms. The current methodological design helps to limit confounds in that the prediction of subsequent symptoms from baseline life event assessments reduces the potential of present symptoms interfering with the memory, framing, or reporting of past events. Also, by categorizing events as independent or dependent on the clinical status of the patient, we attempted to limit some of the methodological problems in the study of life events. For example, it is difficult to differentiate whether the occurrence of personal illness was a result the exacerbation of psychiatric symptoms in high-risk adolescents. It may be likely that the greater health and related problems reported by the adolescents in the SPD group are related to increases in psychiatric symptoms. Upon further evaluation of the data, it appears that a greater percentage of individuals with SPD experienced a physical illness in a close family member, an event that is independent of the patient's clinical symptoms. Therefore, even though one of the weaknesses of the present study was the predominant use of life event questionnaires, differentiating between independent and dependent life events was fruitful in identifying relations between psychosocial stress and psychiatric symptoms. Findings suggest that adolescents with SPD report more independent events that are moderately associated with prodromal symptoms on the same occasion.

Some additional methodological limitations in the use of self-report measures in the current study should be noted. Although the DSI used in the present study attempted to quantify the distress caused by daily hassles, it is likely that any individual struggling with psychiatric symptom, regardless of diagnosis, will experience events as being more distressful. Likewise, a significant limitation of the DSI is that many of the events on the scale could be construed as psychiatric symptoms. For instance, several items on the DSI (eg, being unorganized or having your sleep disturbed), are diagnostic criteria in a number of psychiatric conditions. In addition, unlike the PERI, the DSI does not differentiate items in terms of their independence from symptoms that the individual

may be experiencing. Therefore, future studies utilizing contextual interview-based measures, which have been shown to possess higher reliability and validity, will be important in determining the causal influence of stressful life events on psychological functioning.

Until further replications, the present relationship between stressful life events and daily stressors in individuals at high risk for schizophrenia spectrum disorders should be interpreted cautiously. First, although the present study employed a prospective design, self-report measures of life events still contain a degree of retrospective recall that can be biased based on an individual's psychiatric symptoms, subjective appraisal, negative affect, and personal perceptions. Secondly, given the high comorbidity between Axis I and Axis II psychopathology in adolescents, [53] it is important to note that the groups with personality disorder in the present study have limited Axis I psychopathology. Therefore, stress susceptibility in this unique sample may not be generalized to a more heterogeneous sample of adolescents with severe psychopathology. Finally, information regarding the psychiatric treatment of the subjects was not systematically recorded throughout the course of the study. This limitation within the context of a naturalistic longitudinal design makes it difficult to determine whether changes in symptoms was a result of treatment factors, thereby making it more difficult to examine the relationships between life events and symptoms over time.

Aside from these limitations, this study provides evidence of a prospective association between measures of stress and prodromal symptoms in adolescents. Provided that adolescents with SPD differ in their appraisal of stress compared to typical adolescents, understanding how these perceptions differ in individuals with SPD may elucidate the mechanisms by which life events and daily stress influence the development of psychotic symptoms in young adulthood.

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