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Stressful Life Events and Depressive Symptoms:

Influences of Gender, Event Severity, and Depression History

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Abstract

Informed by Post's (1992) kindling hypothesis, the study examined the association between depressive symptoms and varying levels of perceived life events as determined by respondents, as well as the moderating role of depression history and gender. Severe life events were significantly associated with current depressive symptoms among never depressed women but not among women with depression history. Such a moderating role of depression history was not observed among men where severe life events were associated with current depressive symptoms in men regardless of depression history. No moderating effects of gender and depression history were obtained for mild and moderate life events, but these events were significantly associated with current depressive symptoms. These results support Post's kindling hypothesis for severe life events but not for mild or moderate life events, and further only in women.

Keywords

Stressful life events; kindling; depressive symptoms; gender differences

The association between stressful life events and depression is well documented (see Hammen, 2005; Kessler, 1997; Paykel, 2003 for review). Research of the association has been strongly influenced by Post's (1992) seminal observations of behavioral kindling and stress sensitization that were informed by animal studies of seizures and cocaine sensitization. On the basis of his subsequent review of 11 studies with human subjects, Post (1992) proposed the "kindling" hypothesis that psychosocial stressors play a greater role when people first experience depression than during recurrences of depression. A wealth of data supports the kindling hypothesis (Mazure, 1998; Monroe and Harkness, 2005; Post, 1992; and Stroud et al., 2008). However, most of the data are limited to evaluations of the role of severe life events in clinical depression (Kendler et al., 2000; Kendler et al., 2001; Lewinsohn et al., 1999; Monroe et al., 1999). Moreover, a recent meta-analytic review (Stroud et al., 2008) showed that, among other findings, the kindling hypothesis was less supported when the study sample included more women than men, providing preliminary evidence for a possible gender difference in kindling.

Major depression is a prevalent disorder (Eaton et al., 2008; Kessler, et al., 2005a, b), and empirical evidence supports the dimensional structure of depression (Ruscio and Ruscio,

2000), suggesting that depression differs quantitatively in severity from dysphoric mood or normal emotional experiences. The kindling hypothesis has been mostly examined for the first onset versus recurrent episodes of major depression, and no data are available regarding whether the kindling hypothesis would retain when current depression is treated as a continuous, dimensional construct as the primary outcome.

Furthermore, there is limited evidence for the role of mildly stressful life events in depression, with some studies suggesting that mild life events may be associated with recurrent depression in particular (Monroe et al., 2006; Ormel et al., 2001). Monroe et al. (2006) examined the role of mild life events in recurrence among patients who had completed a combined therapy for medication and interpersonal psychotherapy and showed that self-focused mild life events that are independent of the respondent's behavior predicted recurrence of depression only for patients with medication maintenance management. Ormel et al. (2001) found that mild stressful life events were more associated with subsyndromal, recurrent depression than first episodes in older adults. Although both studies indicate that the impact of mild life events in recurrent depression may be conditional (only for certain subtype of stress or depression subgroup), nonetheless the findings suggest that mild life events are capable of triggering recurrent depression. However, it is unknown whether the association between mild life events and depressive symptoms assessed on a continuum differ by depression history, consistent with kindling, or by gender.

Although the basic premise of Post's hypothesis has been supported for severe events, it is unclear what processes underlie kindling in depression. Monroe and Harkness (2005) proposed 2 related but distinct explanatory models of the kindling hypothesis: stress sensitization and stress autonomy. Both stress sensitization and stress autonomy models presume that frequency of severe life events decline with recurrent episodes of major depression. Yet, the 2 models differ in regard to the role of mild life events in recurrent depression. According to the stress sensitization model, frequency of mild events increases in recurrent depression because recurrence can occur in the absence of a major stressor but in response to a mild stressor that researchers generally have failed to examine. In other words, people with depression history are more reactive to nonsevere, mild life events than people without depression history, and thus may be more susceptible to depressive mood, when they face a mild stressor despite the absence of a severe stressor. On the other hand, the stress autonomy model posits that frequency of mild life events decreases as well as severe life events in recurrent depression so that subsequent episodes become more autonomous of either severe or mild life stress. This suggests that increased depressive symptoms among people with depression history may be less dependent on the exposure to life events than those without history; instead, susceptibility to increased depressive symptoms among people with history may be more influenced by internal factors (e.g., biological readiness, cognitive vulnerability) than external factors such as life events.

While most studies supporting the kindling hypothesis largely used objectively rated contextual threats to determine the severity of life stress, the current study examines the kindling phenomenon, using respondent-rated (subjective) impact of stressful life events. Although some researchers have criticized the use of subjective ratings of the impact of a life event due to concerns related to confounding of perceived stress with phenomena of interest under study such as depressive symptoms (Dohrenwend, 2000; Dohrenwend et al., 1990), others have argued the significance of measuring subjective perceptions in assessing life stress (Lazarus and Folkman, 1984). A meta-analysis regarding gender differences in major and minor life events (Davis et al., 1999) showed that women are more likely than men to make negative appraisals of stressful life events, suggesting that the relationship between life stress and depression may differ by gender due to gender differences in their perception of event severity rather than its severity objectively defined. Moreover, objective

and subjective ratings of life stress may assess rather different concepts, and no study of which we are aware has examined the differential role of stressful life events by depression history that was based on respondent determined event severity.

The present study aims to examine whether the association of stressful life events and depressive symptoms differs depending on perceived severity of the event (mild, moderate, severe), prior history of depression (present, absent), and gender. Consistent with extant data on kindling, we predicted that severe life events would be associated with greater depressive symptoms for never depressed individuals compared with formerly depressed individuals. As suggested by the results of Stroud and colleagues' meta-analysis (2008), we further hypothesized that kindling pertaining to severe events would be observed in men more than in women. Two competing hypotheses were tested regarding mild life events: (1) mild life events are more strongly associated with depressive symptoms among formerly depressed compared with never depressed individuals, consistent with stress sensitization; and (2) mild life events are more strongly associated with depressive symptoms among never depressed individuals, consistent with stress autonomy model. We also tested gender differences in these competing models and analyzed events of moderate severity but offered no hypotheses given a lack of research on gender differences pertaining to mild events and an absence of data on events of moderate severity.

METHODS

Participants

Participants were 322 undergraduates from a large Midwestern university. The mean age was 19.1 years ($SD = 1.9$). About 55.3% of the participants were men ($N = 178$). Approximately 73.9% were European American, 9.6% Asian/Pacific Islander, 2.8% Hispanic, 1.9% African American, and 0.3% Native Americans. No significant gender differences were found for the mean age, $t(320) = 1.28$, $p = 0.20$, and the proportion of the racial/ethnic groups participating in the study, chi square (7) = 6.45, $p = 0.49$.

Measures

Current Depressive Symptoms—The Beck Depression Inventory, Second Edition (BDI-II; Beck et al., 1996), a 21-item self-report measure, asks respondents to rate each item on a 4-point scale from 0 to 3 and the items are summed to provide a continuous measure. The coefficient alpha () in the present sample is 0.91.

Lifetime History of Depression—The Inventory to Diagnose Depression, Lifetime Version (IDDL; Zimmerman and Coryell, 1987), a 22-item self-report measure, assesses lifetime history of depression. The IDDL contains items reflecting clinical symptoms in the DSM-IV Major Depressive Disorder (MDD) criteria. Each item is comprised of 5 statements on a 0 to 4 response scale (0-no symptom, 1-subclinical symptom, 2 or more-symptom present). Respondents are asked to choose 1 statement among 5 that best describes the way they felt during the week in their lifetime when they felt most depressed, and if present, whether the symptom lasted more than 2 weeks. Participants meeting the DSM-IV diagnostic criteria for major depressive episode in their lifetime were classified into the formerly depressed group. The IDDL has good reliability (Sato et al., 1996; Zimmerman and Coryell, 1987) and validity (Sakado et al., 1996). Summing the items yields $\alpha = 0.92$ in the current sample, supporting reliability.

Stressful Life Events—The Life Experiences Survey (Sarason et al., 1978) assesses 60 life events in various domains including interpersonal, achievement, financial, legal, and adjustment events. Respondents were asked to check any event that they had experienced

within the past year and then to subjectively rate the positive or negative impact of each event on a 7-point scale from extremely negative to extremely positive. Negative life events only were analyzed in the current report and categorized into 3 groups: mild (those rated “somewhat negative”), moderate (“moderately negative”), and severe (“extremely negative”).

Data Analyses

The data were analyzed using hierarchical multiple regression analyses with depressive symptoms as the dependent variable. Separate regression models corresponding to the association of mild, moderate, and severe events with current depressive symptoms were examined. Tests of the normality assumption of the dependent variable and multicollinearity among independent variables were performed prior to the regression analyses. No assumption was violated. In each model, interactions of stressful life events with depression history and gender were also examined. These interaction effects were tested after examining main effects of any component of the interactions being investigated (Cohen and Cohen, 1983). All continuous predictor variables were centered prior to forming interaction terms (Aiken and West, 1991; Holmbeck, 2002). Post hoc tests for significant interactions were conducted to examine whether each regression line for the different groups was statistically significant from zero (Aiken and West, 1991; Holmbeck, 2002).

RESULTS

Preliminary Analyses

Descriptive data show that 19.6% ($N = 63$ out of 322) of the participants reported having a lifetime history of depression. Significantly more women than men reported such a history (26.4% of women vs. 14.1% of men), chi square (1) = 7.57, $p < 0.01$. In addition, women ($M = 12.99$, $SD = 9.00$) reported higher scores on the BDI-II than men ($M = 9.00$, $SD = 7.83$), $t(320) = -4.25$, $p < 0.001$. Women reported having experienced more mild events, $t(320) = -3.10$, $p < 0.01$, as well as severe events, $t(320) = -2.11$, $p < 0.05$, than did men. The number of moderately severe events did not differ between men and women, $t(320) = -1.36$, $p = 0.17$.

Severely Stressful Life Events

Consistent with kindling, we hypothesized that severe life events are more strongly associated with current depressive symptoms among never depressed than formerly depressed individuals. As shown in Table 1, there is a statistically significant 2-way interaction between the number of severe events and depression history. Post hoc tests revealed that the number of severe events was positively associated with current depressive symptoms among the never depressed group, $t(1) = 4.50$, $p < 0.001$, but not among the formerly depressed group, $t(1) = 0.49$, $p = 0.60$. As seen in Figure 1, formerly depressed individuals are more depressed than never depressed individuals regardless of the number of severe life events. The results support that the association of severe life events with depressive symptoms is weaker among individuals who have depression history compared with individuals who do not, consistent with the kindling hypothesis.

In the examination of gender differences, the 2-way interaction between severe life events and gender was not significant. However, the 3-way interaction of severe events, depression history, and gender was statistically significant. Post hoc tests of the 3-way interaction supports that kindling is observed among women in this sample, but not among men. As illustrated in Figure 2, the number of severe events was significantly related to depressive symptoms among never depressed men, $t(1) = 2.43$, $p < 0.05$, as well as among formerly depressed men, $t(1) = 2.02$, $p < 0.05$. However, among women, no significant association

between severe events and depressive symptoms was observed for formerly depressed women, $t(1) = -65$, $p = 0.51$, whereas there was a significant association among never depressed women, $t(1) = 3.97$, $p < 0.001$.

Mildly Stressful Life Events

Table 1 shows that mild life events were significantly associated with depressive symptoms (i.e., main effect), supporting that mild events are relevant to depressive symptoms. Tests of hypotheses that the number of mild life events are either more strongly (stress sensitization) or less strongly (stress autonomy) associated with depressive symptoms among formerly depressed individuals compared with those with no depression history were not supported insofar as there was not a statistically significant interaction between mild life events and depression history. The test of the interaction between mild life events and gender was also statistically nonsignificant.

Moderately Stressful Life Events

Analyses of moderate life events were exploratory given an absence of data or theory on which to base hypotheses. The number of moderate life events was positively associated with depressive symptoms, supporting that such events are relevant to current depression severity. Tests of interactions between moderate events with either gender or depression history were not statistically significant. These results are comparable to the pattern of findings for mild life events.

DISCUSSION

The aims of the study were to examine the association of depressive symptoms with varying levels of stressful life events as determined by respondents, and to examine depression history and gender as moderators. The findings support Post's kindling hypothesis for severe life events but not for mild- or moderate life events. Moreover, further examination showed that kindling was only observed among women. Specifically, women's current depressive symptoms were not associated with the number of severe life events for those with depression history but were positively associated with such events among those without depression history, whereas among men severe life events were associated with current depressive symptoms regardless of depression history. Unlike the findings for severe events, gender and depression history did not moderate the relationship of current depressive symptoms with mild- and moderate events.

Gender Differences in Kindling in Severe Life Events

Using meta-analysis, Stroud et al. (2008) concluded that the kindling hypothesis was less supported in studies containing more women, suggesting that kindling may be more relevant to depression among men, inconsistent with the present findings. However, there is precedent for the current findings as the meta-analysis did not include 2 seminal studies testing the kindling hypothesis in women in which Post's premise was supported (Kendler et al., 2000; Kendler et al., 2001). Moreover, the extent to which the results of a meta-analysis containing clinical samples and samples of varying ages, factors that may also affect kindling (Stroud et al., 2008), may be compared with our study of a college population is unclear.

What underlies the gender difference in kindling is unclear. It is possible that women with depression history may be less influenced by external factors such as severe life events than women without depression history. Instead, more internal factors such as cognitive process or other genetic markers may affect women's recurrent symptoms. On the contrary, our data support that severe life events may affect depressive symptoms among men with depression

history as much as men without history, suggesting that men may experience less cognitive or generic scar from their prior experience of depression. Future research using multiple factors including behavioral, genetic, and/or cognitive makers may answer this possibility.

Examination of Mild- and Moderate Life Events

The data show that mild- and moderate events are positively related to increased depressive symptoms, illustrating that nonsevere events may play a role in promoting depressive symptoms. Results showed that mild life events are associated with depressive symptoms among both never depressed and formerly depressed men and women. This suggests that the perception of even mild life stressors may promote depressive symptoms. Given the lack of data in regards to the role of mild life events in depressive symptoms, this finding provides preliminary evidence for clinicians to attend to perceived minor stressors in treating both the first onset and recurrence of depression. The data did not suggest that depression history moderated the association between mild life events and depressive symptoms, and so results are not consistent with the stress sensitization or stress autonomy hypotheses identified by Monroe and Harkness (2005). These conclusions also apply to moderate events.

Limitations

Depression history and stressful life events were based on retrospective self-report measures, which may lower reliability of the data. The severity of stressful life events were based on subjective ratings that may be vulnerable to confounding by depressive symptoms. Although the algorithm that we used to categorize stressful life events into mild-, moderate-, and severe categories is face valid, data on the reliability and construct validity of our approach are not available. We used a predominantly white, college student sample, with unclear generalizability to clinical populations, other age groups, and other racial/ethnic groups. Relatedly, the homogeneity of the sample does not allow for the examination of other factors (i.e., age, race/ethnicity, clinical status) that may affect kindling.

CONCLUSIONS

From a developmental perspective, a better understanding of the role of life stress in depression among the college-attending age group has significant importance. This is a transition period from adolescence to adulthood (Arnett, 2000). As Arnett distinguished the age group of 18 to 25 as “emerging adulthood” from adolescence or young adulthood, this age group may face different types of life events and new challenges (e.g., leaving home for the first time) as compared with adolescents who live with their parents. More importantly, “emerging adults” with lifetime history of depression include a high risk group with early onset, and this population also includes a good number of nondepressed, healthy counterparts. Statistics show that 87.6% of population of age 18 to 24 in the United States earned high school diploma and 68.6% of recent high school graduates enrolled college in 2005, the year of data (Snyder et al., 2008). The data are from students attending a public university in the Midwest where students are diverse economically and scholastically. Accordingly, the results may be relevant to a large segment of emerging adults in the Midwestern United States. The results are novel as we are aware of no study that has reported the tests of 3-way interactions of gender, depression history, and stressful life events with varying levels of perceived severity. Unlike previous work of kindling in which objective ratings of event severity of life events were used, our study attempts to view the same phenomena in a different angle with subjective ratings of event severity and also continuous levels of depressive symptoms rather than diagnosis-based clinical depression.

In summary, the results of this study provide evidence for gender differences in the kindling hypothesis of depression as pertains to severe life events. Results indicate that such events

are associated with depressive symptoms, which may suggest that prevention and treatment efforts for depression geared to this population may need to account for life stresses across the continuum of severity. The data also do not support that kindling is observed at lower levels of stressful events. The stress autonomy and stress sensitization models of depression in young adults were tested, and the results are not supportive of these hypotheses, however further research is needed on these rarely tested ideas.

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REFERENCES

- Aiken, LS.; West, SG., editors. *Multiple Regression: Testing and Interpreting Interactions*. Newbury Park (CA): Sage; 1991.
- Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *Am Psychol*. 2000; 55:469–480. [PubMed: 10842426]
- Beck, AT.; Steer, RA.; Brown, GK., editors. *Manual for Beck Depression Inventory-II*. San Antonio (TX): Psychological Corporation; 1996.
- Cohen, J.; Cohen, P., editors. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Hillsdale (NJ): Erlbaum; 1983.
- Davis MC, Mathews KA, Twamley EW. Is life more difficult on mars or venus? A meta-analytic review of sex differences in major and minor life events. *Ann Behav Med*. 1999; 21:83–97. [PubMed: 18425659]
- Dohrenwend BP. The role of adversity and stress in psychopathology: Some evidence and its implications for theory and research. *J Health Soc Behav*. 2000; 41:1–19. [PubMed: 10750319]
- Dohrenwend BP, Link BG, Kern R, ShROUT PE, Markowitz J. Measuring life events: The problem of variability within event categories. *Stress Med*. 1990; 6:179–188.
- Eaton WW, Shao H, Nestadt G, Lee BH, Bienvenu OJ, Zandi P. Population-based study of first onset and chronicity in major depressive disorder. *Arch Gen Psychiatry*. 2008; 65:513–520. [PubMed: 18458203]
- Hammen C. Stress and depression. *Annu Rev Clin Psychol*. 2005; 1:293–319. [PubMed: 17716090]
- Holmbeck GN. Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations. *J Pediatr Psychol*. 2002; 27:87–96. [PubMed: 11726683]
- Kendler KS, Thornton KM, Gardner CO. Stressful life events and previous episodes in the etiology of major depression in women: An evaluation of the “kindling” hypothesis. *Am J Psychiatry*. 2000; 157:1243–1251. [PubMed: 10910786]
- Kendler KS, Thornton LM, Gardner CO. Genetic risk, number of previous depressive episodes and stressful life events in predicting onset of major depression. *Am J Psychiatry*. 2001; 157:1243–1251. [PubMed: 10910786]
- Kessler RC. The effects of stressful life events on depression. *Annu Rev Psychol*. 1997; 48:191–214. [PubMed: 9046559]
- Kessler RC, Berglund PA, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication (NCS-R). *Arch Gen Psychiatry*. 2005a; 62:593–602.
- Kessler RC, Chiu WT, Demler O, Merikangas KR, Walters EE. Prevalence, severity and comorbidity of twelve-month DSM-IV disorders in the National Comorbidity Survey Replication (NCS-R). *Arch Gen Psychiatry*. 2005b; 62:617–627. [PubMed: 15939839]
- Lazarus, RS.; Folkman, S., editors. *Stress, Appraisal and Coping*. New York (NY): Springer; 1984.
- Lewinsohn PM, Allen NB, Seeley JR, Gotlib JH. First onset versus recurrence of depression: Differential processes of psychosocial risk. *J Abnorm Psychol*. 1999; 108:483–489. [PubMed: 10466272]
- Mazure CM. Life stressors as risk factors in depression. *Clin Psychol Sci Pract*. 1998; 5:291–313.

- Monroe SM, Harkness KL. Life stress, the “kindling” hypothesis and the recurrence of depression: Considerations from a life stress perspective. *Psychol Rev.* 2005; 112:417–445. [PubMed: 15783292]
- Monroe SM, Rohde P, Seeley JR, Lewinsohn PM. Life events and depression in adolescence: Relationship loss as a prospective risk factor for first onset of major depressive disorder. *J Abnorm Psychol.* 1999; 108:606–614. [PubMed: 10609425]
- Monroe SM, Torres LD, Guillaumot J, Harkness KL, Roberts JE, Frank E, Kupfer D. Life stress and the long-term treatment course of recurrent depression: III. Nonsevere life events predict recurrence for medicated patients over 3 years. *J Consult Clin Psychol.* 2006; 74:112–120. [PubMed: 16551148]
- Ormel J, Oldehinkel AJ, Brilman EI. The interplay and etiological continuity of neuroticism, difficulties and life events in the etiology of major and subsyndromal, first and recurrent depressive episodes in later life. *Am J Psychiatry.* 2001; 158:885–891. [PubMed: 11384895]
- Paykel ES. Life events and affective disorders. *Acta Psychiatr Scand.* 2003; 108:61–66. [PubMed: 12807378]
- Post RM. Transduction of psychosocial stress into the neurobiology of recurrent affective disorder. *Am J Psychiatry.* 1992; 149:999–1010. [PubMed: 1353322]
- Ruscio J, Ruscio AM. Informing the continuity controversy: A taxometric analysis of depression. *J Abnorm Psychol.* 2000; 109:473–487. [PubMed: 11016117]
- Sakado K, Sata T, Uehara T, Sato S, Kameda K. Discriminant validity of the inventory to diagnose depression, lifetime version. *Acta Psychiatr Scand.* 1996; 93:257–260. [PubMed: 8712024]
- Sarason IG, Johnson JH, Siegel JM. Assessing the impact of life changes: Development of the Life Experiences Survey. *J Consult Clin Psychol.* 1978; 46:932–946. [PubMed: 701572]
- Sato T, Uehara T, Sakado K, Sato S, Nishioka K, Kasahara Y. The test-retest reliability of the inventory to diagnose depression, lifetime version. *Psychopathology.* 1996; 29:154–158. [PubMed: 8817734]
- Snyder, TD.; Dillow, SA.; Hoffman, CM. Washington (DC): National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education; 2008. *Digest of Education Statistics 2007 (NCES 2008–022).*
- Stroud CB, Davila J, Moyer A. The relationship between stress and depression in first onsets versus recurrences: A meta-analytic review. *J Abnorm Psychol.* 2008; 117:206–213. [PubMed: 18266498]
- Zimmerman M, Coryell W. The inventory to diagnose depression, lifetime version. *Acta Psychiatr Scand.* 1987; 75:495–499. [PubMed: 3604734]

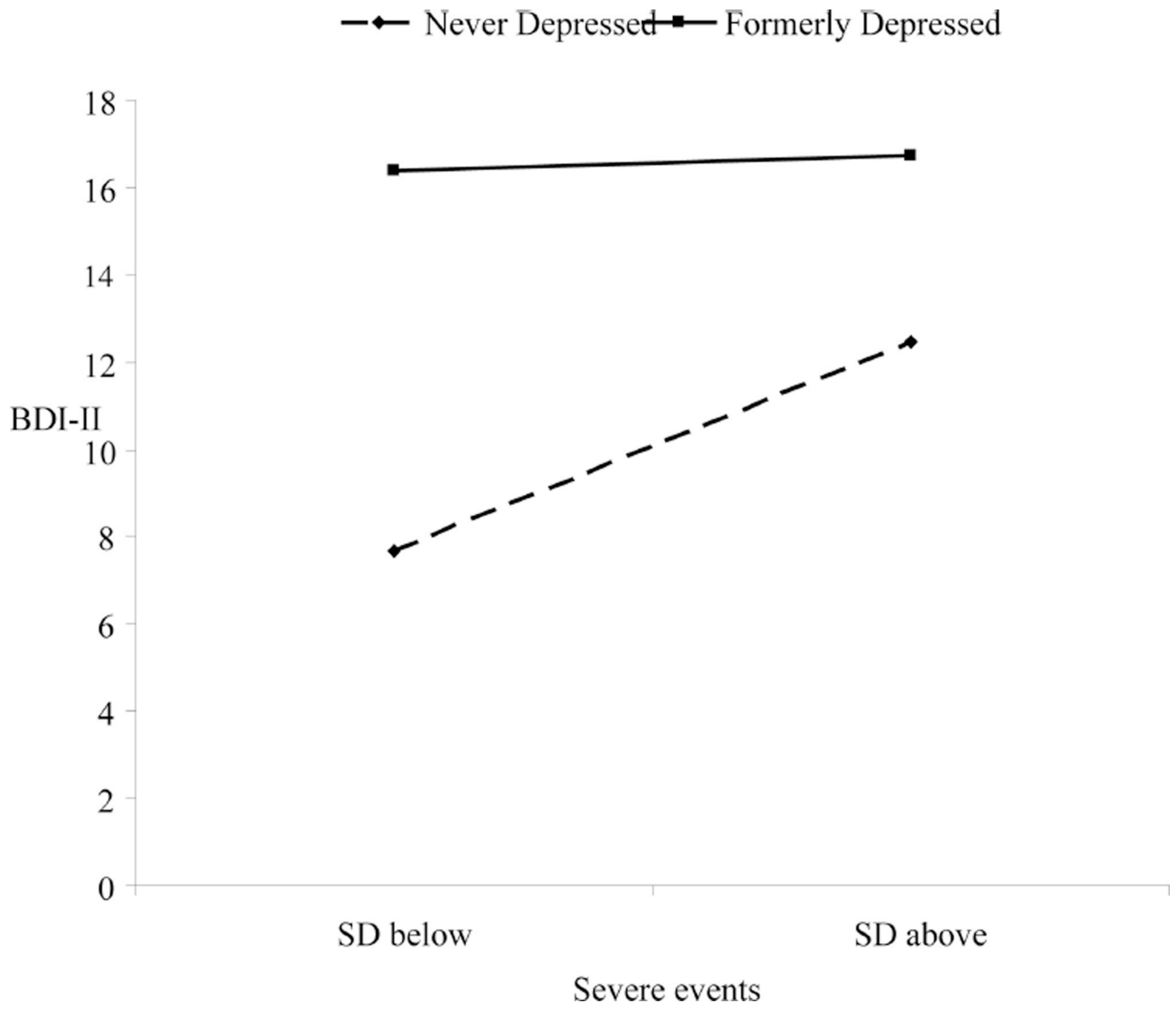


FIGURE 1. Plot of interaction between the number of severe events and depressive symptoms for never depressed and formerly depressed individuals.

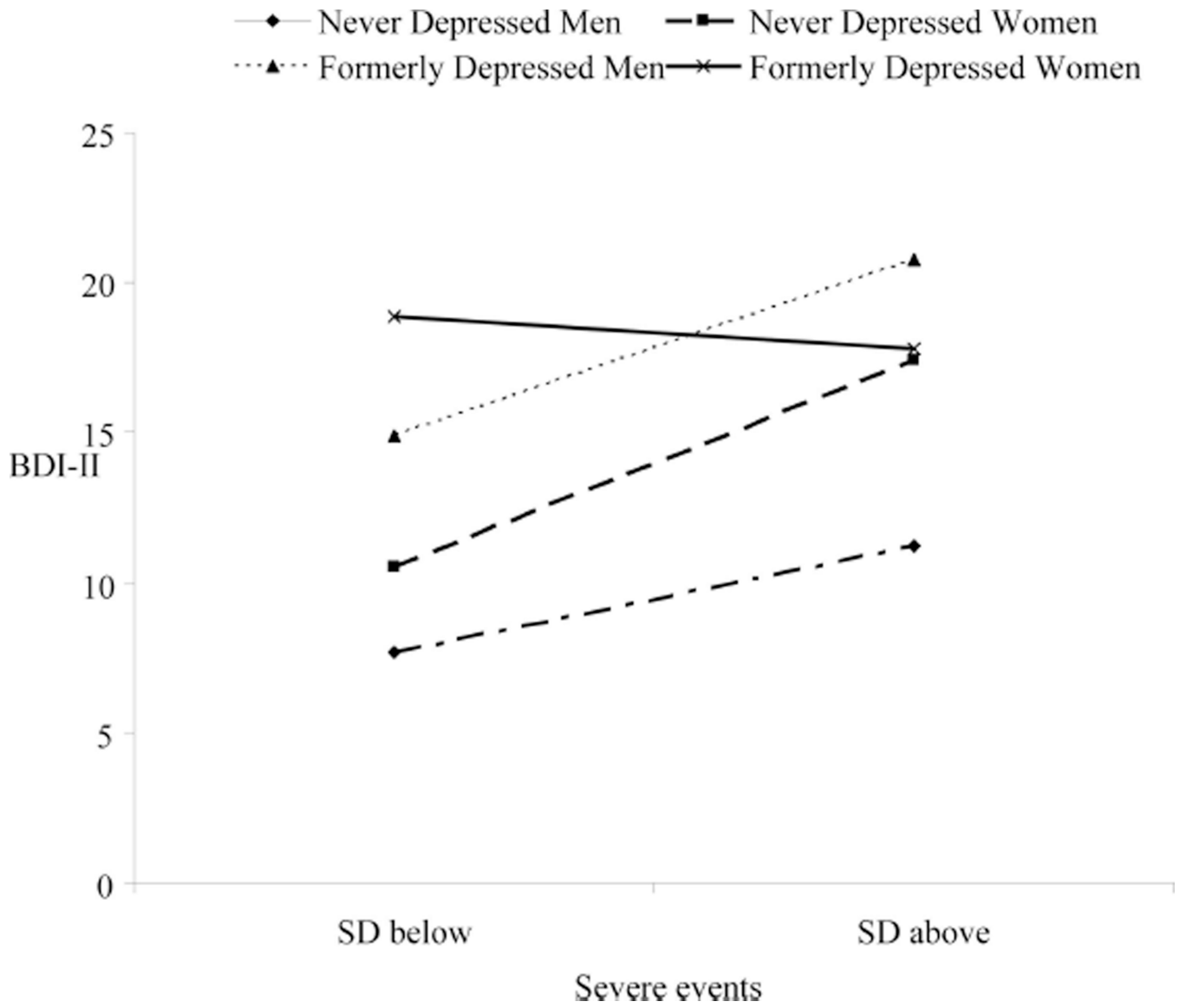


FIGURE 2. Plot of interaction between the number of severe events and depressive symptoms by depression history status and gender.

TABLE 1

Three Hierarchical Multiple Regression Models Testing Effects of Mild, Moderate, and Severe Life Events and Their Interactions With Depression History and Gender in Current Depressive Symptoms

Step	R^2	F	p
Model 1: Mild events			
Step 1	0.20	26.25	<0.001
Mild events	0.61 *		
Depression history	7.91 **		
Gender	2.64 ***		
Step 2	0.00	0.56	n.s.
Depression history × gender	-0.94		
Mild events × depression history	-0.05		
Mild events × gender	-0.61		
Step 3	0.00	0.03	n.s.
Mild events × depression history × gender	-0.23		
Model 2: Moderate events			
Step 1	0.22	29.98	<0.001
Moderate events	1.07 **		
Depression history	7.49 **		
Gender	2.80 ***		
Step 2	0.01	0.36	n.s.
Depression history × gender	-1.56		
Moderate events × depression history	-0.49		
Moderate events × gender	0.15		
Step 3	0.00	2.00	n.s.
Moderate events × depression history × gender	2.18		
Model 3: Severe events			
Step 1	0.22	29.09	<0.001
Severe events	0.90 **		
Depression history	6.84 **		
Gender	2.76 ***		
Step 2	0.02	2.12	n.s.
Depression history × gender	-1.32		
Severe events × depression history	-1.24 *		
Severe events × gender	0.07		
Step 3	0.02	6.36	<0.05
Severe events × depression history × gender	-2.89 *		

Degree of freedom for F in the step 1 = 3, 318, step 2 = 3, 315, and step 3 = 1, 314 in each model.

* $p < 0.05$,

** $p < 0.001$,

 $p < 0.01$.