SHORT COMMUNICATION

Prevalence, Severity and Risk Factors for Depressive Symptoms and Insomnia in College Undergraduates

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Abstract

Although the college years represent a high-risk period for depressive symptoms and insomnia, little research has explored their prevalence, comorbidities and risk factors within this developmental period. Two studies were conducted; the first evaluated the prevalence and comorbidity of depressive symptoms and insomnia in 1338 students (ages 18–23 years) from a large Southwestern University. Mild depressive symptoms were endorsed by 19% of students and 14.5% reported moderate to severe symptoms. Forty-seven percent of students reported mild insomnia and 22.5% endorsed moderate to severe insomnia severity. A second study investigated perceived stress as a potential mediator of the relation between self-reported childhood adversity and concurrent depressive symptoms and insomnia. Undergraduates ($N = 447$) from a Southwestern and Southeastern University reported prior childhood adversity, current perceived stress, insomnia and depressive symptoms. Self-reported childhood adversity predicted higher levels of depressive symptoms and insomnia severity, partially mediated by perceived stress. Results support the high prevalence of depressive symptoms and insomnia among undergraduates. The risk for depressive and insomnia symptoms may be increased among students who experienced greater levels of childhood adversity. Copyright © 2013 John Wiley & Sons, Ltd.

Introduction

The transition period from adolescence to young adulthood carries a heightened risk for depression. During this developmental time period, young adults wage novel academic and social stressors amidst increasing autonomy and independence from parental support. Rates of depression rise dramatically during adolescence (Hankin & Abramson, 2001), and depressive episodes prior to adulthood increase risk for future depressive episodes over the life course. High levels of depressive symptoms may also be an important precursor to the development of major depressive episodes (Kessler, Zhao, Blazer, & Swartz, 1997). Young adults in the transition to college may be at particular risk: studies suggest that 53% of young adults experience some level of depressive symptoms during college (Furr, Westefeld, McConnell, & Jenkins, 2001).

Depression is highly comorbid with insomnia in childhood (Birmaher et al., 1996) and early to middle adulthood (Buysse et al., 2008; Ohayon, 2002). However, few studies have examined this comorbidity within undergraduate populations despite the high prevalence of depressive symptoms and the heightened potential for sleeping problems due to the challenges of varying schedules and shared living spaces in college environments. Buboltz, Brown, and Soper (2001) found that 73% of college students had occasional sleep problems, 15% had poor sleep quality, and 4% had insomnia. Moreover, studies in college populations have found important associations among sleep and overall functioning. A recent study found that 60% of college students were classified as poor sleepers and

also reported significantly more physical and mental health problems (Lund, Reider, Whiting, & Prichard, 2010). In a sample of over 80,000 college students, the American College Health Association (2006) reported that sleep, depression, and stress were among the most significant health issues impairing academic performance. Sleep problems are a common symptom of depression, and untreated insomnia increases risk for recurrent depression (Taylor, 2008), suggesting a complex bidirectional relationship. The elevated risk and negative long-term consequences of depressive symptoms and insomnia in college students illuminate a critical need for research to identify risk factors that contribute to their development during this transitional life stage.

Decades of convergent research find that children exposed to conditions of adversity are at increased risk for maladjustment during childhood and into adulthood. Exposure to major stressors in childhood occurs with considerable frequency; large-scale national studies find that between half and three-quarters of children experience at least one form of adversity, including physical, sexual, or emotional abuse, household violence, parent psychopathology or death, natural disasters and poverty (Edwards, Holden, Felitti, & Anda, 2003; Felitti et al., 1998). Among college students, childhood adversity may represent an important precursor to the development of mental health problems. In particular, negative childhood experiences have been identified as a prominent precursor to the development of depression (Chapman et al., 2004) and insomnia (Koskenvuo, Hublin, Partinen, Paunio, & Koskenvuo, 2010) in adulthood.

Adverse experiences in childhood are often conceptualized as exposure to a singular stressor; however, adversity early in life increases risk for additional stressors into adulthood. The continuity between exposure to early adversity and recent stressful life events has been noted by models of *cumulative adversity* and may represent an important factor contributing to the development of depression and sleep problems among at-risk youth (Schilling, Aseltine, & Gore, 2008). For example, exposure to interparental conflict in childhood can negatively impact relationship quality and increase conflict behaviour with romantic partners in young adulthood (Cui, Fincham, & Pasley, 2008). Cumulative stressors may be objective or subjective; experiences of childhood adversity may contribute to biases in how children perceive and process environmental information, leading to a heightened sense of potential threat, selective attention to negative information or misattribution of ambiguous or benign situations as threatening (Luecken, Roubinov, & Tanaka, 2013). Stress during childhood can also result in more negative appraisals of everyday stressors (Glaser, van Os, Portegijs, & Myin-Germeys, 2006). Increased sensitivity to stress following exposure to childhood adversity has been linked to depression and other

mental disorders in adulthood (McLaughlin, Conron, Koenen, & Gilman, 2010). Thus, young adults with a history of childhood adversity may have more intense and negative reactions to novel challenges during college.

In light of the prevalence and public health burden of depression and insomnia, two studies were conducted to investigate sleep and depressive symptomatology in undergraduate students. The first study evaluated the prevalence and comorbidity of clinically significant levels of depressive symptoms and insomnia. A second study examined potential direct and indirect mechanisms through which childhood adversity influences depressive symptoms and insomnia. It was hypothesized that reports of childhood adversity would be associated with higher current depressive symptoms and insomnia severity in young adulthood. A theoretically-informed model examined current perceived stress as a potential mediator of the relation between childhood adversity and co-occurring depressive symptoms and insomnia.

Study 1

Methods

Participants

The participants included 1338 undergraduate students enrolled in introductory psychology classes at a large southwestern public university recruited over the course of two semesters during the 2009–2010 academic year (Table I). Students completed a survey during class and online. Participation was voluntary and survey content was approved by the Institutional Review Board.

Measures

Depression

The Center for Epidemiological Studies Depression Scale (CES-D; $\alpha = .88$; Radloff, 1977) is a 20-item measure that assesses mood and other related depressive symptomatology (e.g. 'I felt lonely', 'I was bothered by things that usually don't bother me') using a response scale of the number of days each item was present over the past week ('0' = rarely or none (less than 1 day) to '3' = all of the time (5–7 days)). An item on the CES-D inquiring about poor sleep was removed to reduce item overlap with analyses involving insomnia; total CES-D scores were pro-rated to reflect this missing sleep item. Scores were prorated by calculating the average score for the scale and multiplying that average by the total number of items on the scale (Strube, 1985). Scores between 16 and 24 indicate mild levels of depressive symptoms, and scores above 24 suggest moderate to severe clinical levels of depressive symptoms (Radloff, 1977).

Table I. Sample descriptives for Study 1 ($N = 1{,}338$) and Study 2 ($N = 447$)

	Study 1	Study 2
Gender	55% Female, 45% Male	64% Female, 36% Male
Age	18–23 ($M = 18.7$, $SD = 1.0$)	18–23 ($M = 19.2$, $SD = 1.3$)
Ethnicity (%)		
Caucasian	67.6	64.9
African American	4.3	4.9
Asian American	8.5	8.1
Hispanic/Latino	15.0	7.6
Other	4.6	4.5
Multiracial	*n/a*	10.0
Depressive symptoms (*M*, *SD*)		
CES-D	13.6 (8.9)	*n/a*
ASR	*n/a*	4.9 (4.1)
Insomnia symptoms (*M*, *SD*)	10.7 (5.4)	8.4 (5.5)
Childhood adversity (*M*, *SD*)	*n/a*	3.3 (2.0)
Perceived stress (*M*, *SD*)	*n/a*	17.4 (6.2)

Insomnia

The Insomnia Severity Index (Bastien, Vallieres, & Morin, 2001; $\alpha = .81$) is a 7-item reliable and valid measure of perceived insomnia severity that highly correlates with objective measures of insomnia. Items assess the severity of insomnia symptoms (e.g. difficulty falling asleep and difficulty staying asleep) and degree to which insomnia symptoms are noticeable, distressing and or/interfering with daily functioning. Each item is rated on a 5-point scale with higher responses representing more severe or problematic insomnia. Items are totaled and classified by the following criterion: 0–7, no clinically significant insomnia; 8–14, mild insomnia; 15–21, moderate severity insomnia; and above 22, clinically severe insomnia.

Results

Nineteen percent of students reported mild levels of depressive symptoms, and 14.5% of students reported moderate to severe levels of depressive symptoms. Forty-seven percent reported mild levels, 20% reported moderate levels and 3% of students reported severe levels of insomnia. The correlation between depressive symptoms and insomnia was significant ($r = .40$, $p < .001$). Comorbidities were examined and results are displayed in Table II. Overall, 29% of the sample reported comorbid depressive and insomnia

symptoms. One third of the students with mild depressive symptoms reported moderate to severe insomnia. Forty-eight percent of students with moderate to severe depressive symptoms endorsed comorbid moderate to severe insomnia.

Findings suggest that one third of the college students experience symptoms of depression, and two thirds experience symptoms of insomnia. Furthermore, almost one third of the participants endorsed clinically significant levels of both disorders, providing insight into the level of comorbidity in this population.

Study 2

Method

Participants

The participants ($N = 447$) were undergraduate students recruited from one southeastern and one southwestern university in the United States as part of a larger study of stress and coping in college students. The participants were recruited through online subject pool management systems that allow students to sign up for on-campus research studies. The study was approved by the appropriate institutional review boards and informed consent was obtained prior to participation. The participants were compensated with research credits. Sample characteristics are provided in Table I.

Table II. Comorbidity of depressive and insomnia symptoms in Study 1 (%)

	No depressive symptoms	Mild depressive symptoms	Moderate to severe depressive symptoms	TOTAL
No insomnia	25.7	3.3	1.7	30.7
Mild insomnia	31.7	9.7	5.8	47.2
Moderate insomnia	8.2	5.7	5.0	18.9
Severe insomnia	.6	.6	2.0	3.2
TOTAL	66.2	19.3	14.5	100

Measures

Childhood adversity

The participants responded to 14 items that asked if they had experienced varying types of adversity during childhood. Items were chosen from the Northshore Trauma Checklist (North Shore Long Island Jewish Health System, Inc., 2006) and the Adolescent Perceived Events Schedule (Compas, Davis, Forsythe, & Wagner, 1987) to cover a range of stressors relevant to a young adult sample, including witnessing a natural disaster, financial difficulties, parental divorce, parental bereavement and various types of abuse (e.g. neglect, physical and sexual). Respondents answered yes or no to each item and a sum score was computed.

Perceived stress

The perceptions of stress were collected with the 10-item Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983; $\alpha = .85$). The participants evaluated the extent to which life stressors were overwhelming and unmanageable over the past month on a scale ranging from 0 (never) to 4 (very often; e.g. 'In the past month, how often have you felt that you were unable to control the important things in your life?'). The PSS is a widely-used measure of stress appraisal with strong psychometric properties (Cohen, Kessler, & Underwood, 1995).

Depressive symptoms

Depressive symptoms during the prior 6 months were evaluated with the Depression Scale of the Adult Self Report (ASR; Achenbach & Rescorla, 2003; $\alpha = .77$). The Depression Scale assesses depressive symptoms based on DSM criteria for depressive disorders (e.g. feelings of sadness, lack of enjoyment, appetite disturbance etc.). Items are rated on a 3-point scale ranging from never to very often. Each sub-scale has high test-retest reliability and internal consistency that has been demonstrated in nationally representative samples (Achenbach & Rescorla, 2003). Because depressive symptoms and insomnia are both treated as dependent variables in the model evaluated for Study 2, item overlap was not a statistical concern, thus we did not remove items associated with sleep disturbance from the ASR.

Insomnia

Consistent with Study 1, insomnia was assessed with the Insomnia Severity Index (Bastien et al., 2001; $\alpha = .86$).

Data analytic plan

Regressions and path analysis were tested using structural equation modelling (SEM) in Mplus 6.0 (Muthén & Muthén, 2006). Missing data were accounted for with full information maximum likelihood. MODEL INDIRECT was used to estimate the direct and indirect effects of childhood adversity on concurrent depressive symptoms and insomnia through perceived stress. The indirect effect provides the total mediated effect between the specified variables. If the direct effect (e.g. the path relating childhood adversity to depression or insomnia) is no longer significant after the indirect effect is accounted for, complete mediation can be assumed; however, if the direct effect remains significant after accounting for the mediators, partial mediation can be concluded (MacKinnon, 2008). Estimates of standard errors and significance were computed with percentile bootstrapping, a resampling method utilized when the distribution of the effects is unknown (MacKinnon, 2008). Overall, fit was tested with χ^2, standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA) and comparative fit index (CFI). Model fit was examined using recommendations by Hu and Bentler (1999).

Results

Preliminary analyses

Zero-order correlations are displayed in Table III. All variables were normally distributed. Gender, age and ethnicity were explored as possible covariates. Women self-reported significantly higher levels of depressive symptoms [$t(445) = -4.64$, $p < .01$], insomnia [$t(389) = -2.40$, $p = .02$], childhood adversity [$t(410) = -2.52$, $p = .01$] and perceived stress [$t(408) = -2.59$, $p = .01$] as compared with men. Compared with Caucasians, non-Caucasian young adults reported higher levels of insomnia [$t(387) = 2.03$, $p = .04$]. Age and ethnicity were not significantly correlated with any variable of interest ($p's > .32$). Therefore, the final model of the influence of childhood adversity on sleep and depression was analysed with gender included to adjust for possible confounder effects on the relevant paths.

Differences in the variables of interest between the two universities were also explored. The model was examined in the full sample and then stacked by university site to provide parameter estimates for the entire sample and then separately by university. Equality constraints were specified for each path. A chi-square

Table III. Correlations between Study 2 variables ($N = 447$)

	1	2	3	4	5	6
1. Gender[a]	—					
2. Ethnicity[b]	−.06	—				
3. Childhood adversity	.12*	−.01	—			
4. Perceived stress	.13*	−.05	.18**	—		
5. Depressive symptoms	.20**	−.05	.28**	.54**	—	
6. Insomnia	.12*	−.11*	.25**	.37**	.55**	—

[a]0 = Male, 1 = Female; [b]0 = Caucasian 1 = Non-Caucasian
*$p \leq .05$, **$p \leq .01$

difference test was not significant [x^2 (1) = .63, p = .99], confirming that the relations are not moderated by school. Therefore, the universities were combined for all analyses.

Primary analyses

First, the regressions of childhood adversity on insomnia and depressive symptoms were tested. Childhood adversity was significantly associated with elevated depressive symptoms (B = .52, SE = .10, $p < .01$) and insomnia symptoms (B = .66, SE = .14, $p < .01$). Next, perceived stress was evaluated as a mediator of the relation of adversity to depressive and insomnia symptoms. The path relating childhood adversity to perceived stress was significant (B = .56, SE = .18, $p < .01$), as were the paths relating perceived stress to depressive symptoms (B = .33, SE = .03, $p < .01$) and perceived stress to insomnia symptoms (B = .31, SE = .05, $p < .01$). The overall model provided a good fit to the data [$\chi^2(1)$ = 1.254, $p > .05$, CFI = .99, RMSEA = .02, SRMR = .01, Akaike Information Criterion (AIC) = 9721.10; Figure 1]. Results suggested that perceived stress significantly mediated the relation of childhood adversity to depressive symptoms [indirect effect = .18, SE = .06, $p < .05$, 95% CI (.07–.31)]. The indirect effect from childhood adversity to insomnia through perceived stress was also significant [indirect effect = .17, SE = .07, $p = .01$, 95% CI (.06, .32)]. The direct effect of childhood adversity on depression symptoms (B = .17, SE = .05, $p < .01$) and insomnia symptoms (B = .18, SE = .06, $p < .01$) remained significant after accounting for perceived stress, suggesting partial mediation.

The model evaluated above hypothesized concurrent relations between depression and insomnia. However, given the complexity of temporal relations between depression and insomnia, two alternative models were tested: first evaluating whether depression was better modelled as a predictor of insomnia, and second evaluating if insomnia was better modelled as a predictor of depression. A model in which depression was a mediator between perceived stress and insomnia provided an acceptable fit to the data [$\chi^2(3)$ = 10.23, $p = .024$, CFI = .98, RMSEA = .07, SRMR = .03, AIC = 9726.08]. The second alternative model, in which insomnia was a mediator between perceived stress and depression, was a poor fit to the data [$\chi^2(3)$ = 90.80, $p < .01$, CFI = .74, RMSEA = .26, SRMR = .08, AIC = 9806.65]. The AIC (fit index) was used to compare the non-nested models, with lower AIC values indicating superior fit (Schreiber, Stage, King, Nora, & Barlow, 2006). Both alternative models had higher AIC values as compared with the original model (AIC = 4.98 and AIC = 85.55, respectively), suggesting depressive symptoms and insomnia are more appropriately modelled as concurrent outcomes.

Discussion

Despite prior research that has identified young adulthood as a critical period for the initial onset of insomnia and depression (Kessler et al., 1997), research on their prevalence and comorbidity during college is scarce. Results from Study 1 indicated that approximately one third of students experienced mild to severe levels of depressive symptoms and one quarter experienced mild to severe levels of insomnia. Further, 29% of the students reported concurrent clinically significant depressive symptoms and mild to severe insomnia. These striking prevalence rates are consistent with other studies that have reported elevated levels of depressive symptoms or insomnia separately (Buboltz et al., 2001; Furr et al., 2001; Lund et al., 2010) and provide new insight into the comorbidity in college students. Overall, the findings suggest that depression
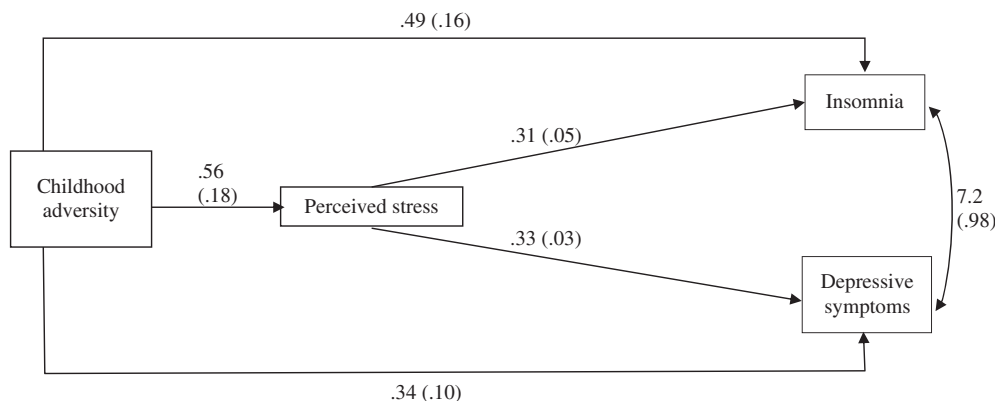

Figure 1 Study 2 final path model*[†]; * Unstandardized path coefficients and standard errors (indicated in parentheses) are reported; [†] All paths are significant ($p < .01$)

and insomnia are prevalent issues in college students and highlight the necessity of further research into the risk factors and perpetuating mechanisms that influence the development of these disorders. Results of Study 2 supported direct associations between childhood adversity and both depression and insomnia in undergraduate students. A path model suggested that perceived stress may partially explain the relation between childhood adversity and symptoms of depression and insomnia among college students.

Research has consistently identified childhood adversity as robust predictor of poor mental health outcomes later in life (Edwards et al., 2003). Studies of the long-term influence of childhood adversity rarely target the early adulthood period, despite its developmental significance. In particular, the increases in varying responsibilities that characterize young adulthood may pose notable challenges to psychological adjustment, particularly among those with a history of childhood adversity. The link between childhood adversity and depression in college student samples has been supported in other studies (Turner & Butler, 2003), but the relation between adversity and insomnia in college students has been less substantiated in the literature (Hanson & Chen, 2010). In the present study, young adults with a history of childhood adversity reported elevated rates of both depressive symptoms and insomnia.

The negative consequences of adverse childhood experiences may persist into adulthood through continued experiences of objective and perceived stress later in life. Exposure to early adverse conditions has been associated with higher self-reported stress (McLaughlin et al., 2010) and more negative responses to life stressors in adulthood (Glaser et al., 2006). Results of the current study provide further support; higher levels of perceived stress were observed among young adults reporting a history of adverse events in childhood. Prior research has also observed a positive relation between stress and disturbed sleep (Vgontzas et al., 2008); and in the current study, greater perceived stress was associated with higher levels of depressive symptoms and insomnia and partially mediated the impact of early adversity on depressive symptoms and insomnia. Among individuals navigating the challenges of early adulthood, a backdrop of early adversity may serve as a significant vulnerability factor, increasing the risk for poor mental and physical health outcomes. Overall, results contribute to the growing literature of the potential mechanisms through which early life stress exerts an impact on health across the lifespan and highlights the importance of examining such processes during the developmental transition from adolescence to early adulthood.

There are limitations with the present study. Data were collected among young adults (age 18–23 years) pursuing a college education, and results may not generalize to young adults in other environments or older students. Childhood adversity was assessed retrospectively. However, we used a measure of salient negative life events, with limited subjective or appraisal components (e.g. parents divorced), as the affective component of the childhood adversity was not the focus of this study. The accuracy of retrospective reports of discrete childhood stressors has demonstrated consistency across childhood and adolescence (Cournoyer & Rohner, 1996), is at higher risk of false negatives than false positives (Hardt & Rutter, 2004) and tends to be underestimated rather than over reported (Furgusson, Horwood, & Boden, 2011). The present study assessed exposure to childhood adversities; future studies may extend this area of research by examining subjective measures of severity or duration. We did not assess recent experiences of adversity, which may be an important source of current perceived stress. Insomnia symptoms were assessed by self-report: studies that confirm these findings with actigraph or other objective measures of sleep will be important. Other individual-level factors not explored in the current study may contribute to the experience of insomnia or depressive symptoms. For example, behavioural pathways such as substance use or the use of psychotherapeutic medications may link childhood adversity to insomnia or depression in college students; future research into such mechanisms is warranted. Finally, the data were cross-sectional, precluding conclusions of causality. Although longitudinal data that involve measures of change over time provide stronger evidence for causal relations among variables (Maxwell & Cole, 2007), cross-sectional analyses supported by strong theoretical and empirical evidence for temporal ordering of variables also provide important information relevant to understanding mechanistic pathways, especially in the context of alternative models (MacKinnon, 2008). In this study, alternative models in which depressive symptoms and insomnia were treated as sequential outcomes provided poorer fit to the data. Recent studies indicate that jointly treating mood and sleep symptoms leads to improved treatment outcomes (e.g. Manber et al., 2008) and provide further support for modelling insomnia and depressive symptoms as concurrent, correlated outcomes. Our proposed path model draws on recent theoretical and empirical research and contributes to our understanding of the prevalence, risk factors and perpetuating mechanisms of depressive symptoms and insomnia in young adults.

Conclusions

The current findings indicate a high prevalence of depressive symptoms and insomnia among college students, and identified childhood adversity as a risk factor for elevated depressive symptoms and insomnia. Childhood adversity was also significantly associated

with elevated current perceived stress. A path model found support for the theory that elevated stress may represent a mechanism linking childhood adversity to symptoms of depression and insomnia. Academic and social stressors have been identified as significant risk factors for the development of depression and insomnia in college (Lund et al., 2010); the ill-effects of these stressors may be particularly relevant among college students who were exposed to childhood adversity. Results of the current study suggest that stress perceptions may represent important targets of intervention aimed at reducing depressive symptoms and insomnia among young adults reporting adverse childhood environments.

Acknowledgments

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