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The Role of Neuroticism and Extraversion in the Stress-Anxiety and Stress-Depression Relationships

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Abstract

Though there is a considerable amount of research supporting the association between stressful life events and major depression, there is a paucity of research concerning a range of other life stress constructs, non-depressive disorders, the role of stable personality traits, and gender

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differences. This study addresses these deficits by: (a) focusing on the association between interpersonal and non-interpersonal chronic life stress (CLS) and both depressive and anxiety disorders, (b) examining the roles of neuroticism and low extraversion in these associations, and (c) assessing gender differences. Participants were 603 adolescents from a study examining risk factors for emotional disorders. Depression and social phobia were associated with interpersonal CLS, with neuroticism partially accounting for these associations. Low extraversion partially accounted for the association between social phobia and interpersonal CLS. Depression was also associated with non-interpersonal CLS, but only in females. This study provides preliminary evidence for the importance of personality variables in explaining shared associations between stress and depression. Additionally, the stress-social phobia relationship is highlighted, with no evidence supporting an association between other anxiety disorders and CLS.

Keywords

anxiety; depression; chronic life stress; extraversion; neuroticism; adolescents

The role of life stress in the onset and maintenance of various mental disorders has been studied extensively over the past several decades, with most studies focusing exclusively on major depressive disorder and episodic stressful life events (e.g. Hammen, 2005; Monroe, Slavich, & Georgiades, 2009). Although some research has also addressed associations between depression and chronic life stress (CLS), there is a relative paucity of such research (e.g., Hammen, 2005). Given the overlap between anxiety and depression, it seems reasonable to ask whether findings regarding stress and depression might also hold for anxiety disorders. Yet this question has received even less research attention. In addition, it is unknown whether neuroticism and low extraversion, known to be associated with depressive and anxiety disorders on the one hand, and life stress on the other hand, might partially account for the associations of depressive and/or anxiety disorders with CLS.

We addressed these questions in a large sample of high school juniors using a behavioral high-risk design that over-sampled students at elevated risk for depressive and anxiety disorders. Adolescence is a useful time to study emotional disorders because many disorders have their first onset during this period. This study reports the results of a series of analyses examining the unique associations among depression, anxiety, CLS, and normal personality traits. It also provides indirect effect test findings examining the role of neuroticism and low extraversion as possible third variables in the associations of depression and anxiety with CLS. Finally, gender differences are assessed in the context of all associations.

Depression and Life Stress

Stress-depression research demonstrates the impact of stressful life events in precipitating depressive episodes (e.g., Hammen, 2005; Monroe, 2008; Monroe et al., 2009). Recent reviews estimate that approximately 70% of initial depressive episodes are preceded by a stressor and that severe stressful life events play a causal role in about 20-50% of onsets (Hammen, 2005; Monroe & Harkness, 2005). Although the majority of people with depression report a recent stressful life event, only a minority of people who experience a stressful life event become depressed. This suggests that other variables may moderate, mediate, or act as third variables in the stress-depression relationship.

From a different vantage point, the stress generation model of depression (Hammen, 1991) proposes that the characteristics and behaviors of a depressed person often serve to generate stress. Research supports this model in clinical samples, community samples, and child and adolescent samples (Chun, Cronkike, & Moos, 2004; Daley et al., 1997; Hammen, 1991;

Rudolph et al., 2000). Thus, the stress generation model presents a theoretically relevant explanation of bidirectionality in the association between stress and depression.

As already noted, the majority of studies on stress and depression examine the impact of episodic life stress, or acute life events that take place within a discrete time period. However, research in this area has expanded to also examine CLS, or ongoing difficulties over a longer time course. For example, studies found that CLS predicts the severity of depression during follow-up (Hammen, Brennan, & Shih, 2004; Hammen, Davila, Brown, Ellicott, & Gitlin, 1992). CLS has also been shown to be concurrently associated with depression (e.g., Rudolph et al., 2000), with one large community-based study finding it to be more strongly associated with depression than episodic life stress (McGonagle & Kessler, 1990).

The construct of life stress is often separated into two categories: interpersonal stress (i.e., stress related to conflict or difficulties with family, peers or significant others), and non-interpersonal stress (i.e., stress related to occupational, educational, and health problems; Hammen & Mayol, 1982; Potthoff, Holahan, & Joiner, 1995). Research has shown that episodic interpersonal stress is more likely to precipitate a depressive episode than episodic non-interpersonal stress (Hammen & Mayol, 1982; Kendler, Karkowski, & Prescott, 1998). Episodic interpersonal stress is also the type most associated with stress generation (Hammen, 1991). One study on stress generation found that both types of episodic life stress continued to occur one year after onset of a depressive episode, with interpersonal stress remaining elevated 10 years later, even through times of euthymia (Chun et al., 2004). The present study examined the distinction between interpersonal and non-interpersonal CLS.

Anxiety Disorders and Life Stress

There is less research on the associations between stress and anxiety disorders when compared to research on stress and depression. It is hypothesized that highly threatening, uncontrollable, unpredictable life stress can precipitate the onset of some anxiety disorders (Barlow, 2002; Mineka & Zinbarg, 1996, 2006; Monroe, 1990). This is the case in posttraumatic stress disorder, where a traumatic event is required for the diagnosis. In addition, some (but not all) studies report an association between episodic life stress and the onset of panic disorder and agoraphobia (for a review, see Barlow, 2002). Moreover, research has also examined the role of specific stressors in the onset of social phobia (e.g., Mineka & Zinbarg, 1995, 2006).

While there is almost no research on anxiety disorders and stress generation, there is some evidence consistent with this idea. For example, social phobia is associated with increased negative and decreased positive life events (Brown, Juster, Heimberg, & Winning, 1998). It is also associated with disrupted and problematic interpersonal interactions with parents, schoolmates, friends, and partners (for a review, see Alden & Taylor, 2004). When described as such, these problematic relationships serve as sources of interpersonal CLS. In addition, they have been shown to cause great impairment with work and school, which partially constitutes our present construct of non-interpersonal CLS (Wittchen, Stein, & Kessler, 1999). Given this research, analyses examining anxiety in the present study were conducted so as to determine if results applied to all anxiety disorders, or only to cases of social phobia.

Personality Traits

As already noted, the relationship between stress and depression is bidirectional and is affected by the nature of the stress (e.g., interpersonal, non-interpersonal). However, other variables may serve either as diatheses or as protective factors (Hammen, 2005). The present

study assessed two variables hypothesized to act as third variables in the associations between psychopathology and life stress. The variables are neuroticism, described as the propensity to experience negative mood states, and extraversion, characterized by talkativeness, sociability, and outgoingness (Costa & McCrae, 1985; Eysenck & Eysenck, 1975). We hypothesized that neuroticism and low extraversion may act as third variables, partially accounting for the associations between emotional disorders and life stress.

Neuroticism is related to both stress and depression. Several longitudinal studies have shown neuroticism to be a predictor of both subsequent diagnoses and chronicity of major depression (e.g., Clark, Watson, & Mineka, 1994; Hayward, Killen, Kraemer, & Taylor, 2000; Klein, Durbin, & Shankman, 2009). Moreover, neuroticism is cross-sectionally and longitudinally associated with episodic life stress (Kendler, Gardner, & Prescott, 2003; Magnus, Diener, Fujita, & Pavot, 1993; Saudino, Pederson, Lichtenstein, McClearn, & Plomin, 1997).

Some studies have examined the associations among neuroticism, depression, and life stress simultaneously. Kendler and colleagues (2004) found those with high neuroticism were more likely to experience a depressive episode following stressful life events than those with low neuroticism. Ormel and Wolhfarth (1991) found that neuroticism partially mediated the prospective relationship between long term difficulties (a form of CLS) and psychological distress (symptoms of dysphoria, depression, and anxiety).

The literature on extraversion, compared to neuroticism, is mixed. Those with depression report lower concurrent levels of extraversion compared to controls (e.g., Trull & Sher, 1994). Some prospective studies (e.g., Hirschfeld et al., 1989; Krueger et al., 1996) have found that low extraversion predicts first onset of depression, but other studies did not replicate these findings (e.g., Gershuny & Sher, 1998; Kendler, Neale, Kessler, Heath, & Eaves, 1996).

Neuroticism is also hypothesized to represent a core general risk factor for anxiety symptoms and disorders and has been shown to predict their onset (e.g., Clark et al., 1994; Hayward et al., 2000; Watson, Gamez, & Simms, 2005). There is also some evidence that low extraversion is associated with certain anxiety disorders, even after entering comorbid disorders as covariates or excluding those with comorbid depression (see Trull & Sher, 1994). This includes, agoraphobia (Bienvenu et al., 2001), social phobia (Bienvenu et al., 2001), and generalized anxiety disorder (Gomez & Francis, 2003). However, Watson and colleagues (2005) have questioned these results, finding low extraversion to be related only to social phobia.

Gender

Many studies of the stress-depression associations have included only female participants, limiting knowledge of different causal pathways for males and females, as well as explanations for the higher rates of depression in females than males (Hammen, 2005). However, some studies have found that the association between stress and depression was stronger among adolescent girls than adolescent boys (e.g., Schraedley, Gotlib, & Hayward, 1999). Shih (2007) also found that interpersonal stress predicted increases in depressive symptoms in females but not in males. With the focus on CLS in the present study, a further goal was to examine gender differences in the associations between depression, anxiety, personality, and CLS.

Present Study

The present investigation of a large sample of adolescents builds on the stress-psychopathology literature in several ways. First, we examined associations between depression and both interpersonal and non-interpersonal CLS. Second, we tested whether associations of CLS and depression were also found with anxiety disorders. Third, we tested whether two personality variables (neuroticism and low extraversion) associated with depression, anxiety, and life stress are third variables that at least partially account for the association among these constructs. Fourth, we examined gender differences among these associations.

We hypothesized that both depressive and anxiety disorders would be related to CLS and that these associations could be partially accounted for by higher levels of neuroticism and/or lower levels of extraversion. Because some research has shown that, among anxiety disorders, only social phobia is related to low extraversion (e.g., Watson et al., 2005), we also tested anxiety disorders with social phobia cases removed and social phobia alone, to determine if any associations between anxiety disorders and other variables are solely accounted for by the social phobia cases in our sample.

Method

Participants

The present study utilized a subset of data from the NU/UCLA Youth Emotion Project, a large two-site longitudinal prospective study designed to identify risk factors for depressive and anxiety disorders in adolescents (Sutton et al., 2009; Zinbarg et al., 2009). Because neuroticism is thought to be a risk factor for both depressive and anxiety disorders (e.g., Clark et al., 1994), participants with scores in the upper tertile on a neuroticism measure were oversampled. This behavioral high risk design was intended to overcome statistical power problems associated with the low base rates of individual disorders in community samples. Based on this method of over-selection, 1,269 high school juniors were invited to participate in this study. Of the 1,269 invited students, 668 provided informed assent (and parental consent) prior to their enrollment in the present study. Of these 668 cases, 627 completed baseline assessments. The present analyses included 603 participants; 24 participants were excluded because of failure to complete some portion of the baseline assessments used in this study.

Participants came from two large high schools in suburban Chicago and suburban Los Angeles. There were 293 participants drawn from the Northwestern University site and 310 participants from the University of California, Los Angeles site. The ethnic makeup of the total sample was as follows: Caucasian, $n = 302$ (48%); Hispanic/Latin American, $n = 96$ (16%); African-American, $n = 82$ (13 %); more than one ethnicity, $n = 82$ (13%); other, $n = 34$ (5%); Asian-American, $n = 27$ (5%); Pacific Islander, $n = 4$ (1%). Socio-economic status variables were computed for a subset of the sample (see DeSantis et al., 2007). Parental education was coded from 1 (8^{th} grade education or less) to 7 (graduate school), with a mean 5.12 ($SD = 1.73$). Seven percent of the sample had at least one parent receiving public aid and 60% of participants lived with both parents.

The participants in the study ranged in age at time of baseline diagnostic assessment from 15 to 18 years, with a mean age of 16.9 ($SD = 0.38$). The participants included 185 males (31%) and 418 females (69%). This gender difference in participation occurred for two reasons: (a) females tend to score significantly higher on neuroticism (Costa, Terracciano, & McCrae, 2001) and (b) females were more likely to agree to participate in our study if invited.

Measures

Structured Clinical Interview for DSM-IV, Research Version (*SCID*; First, Spitzer, Gibbon, & Willisma, 2002)—All interviewers completed extensive training, including matching gold standard ratings of audio recordings of interviews, role-playing, and live observations. Each SCID diagnosis was presented at consensus meetings led by doctoral-level supervisors. Interrater reliability for categorical DSM-IV diagnoses was assessed by having trained interviewers observe live SCIDs on a subset of 69 cases. Cohen's (1960) kappa was acceptable to good when aggregated across all disorders (κ = .82), as well as for the individual disorders, including major depressive disorder (κ = .83), social phobia (κ = .65), generalized anxiety disorder (κ = .85), and obsessive compulsive disorder (κ = .85). Kappa estimates were available for only those disorders, as they were the only ones rated frequently enough (at least five cases) in the subset of cases selected for ratings of inter-rater reliability.

In accordance with past research examining the relationship between stress and psychopathology, our depression and anxiety variables only included participants who, at some point in their life, met full DSM-IV criteria for any disorder (e.g., Kendler et al., 2004, 2008; Watson et al., 2005). Thus, the depression variable consisted of a dichotomous, present/absent coding of lifetime (past and current) diagnoses of major depressive disorder, n = 121, and dysthymia, n = 9. In total, depression was coded as being present for 125 participants. The anxiety disorders variable consisted of lifetime diagnoses of the following disorders: social phobia, n = 58; post-traumatic stress disorder, n = 5; obsessive-compulsive disorder, n = 17; generalized anxiety disorder, n = 17; specific phobia, n = 57; and panic disorder, n = 7. A number of individuals had more than one disorder and so in total, 113 participants were included in the anxiety variable. The remainder of participants did not meet criteria for either a unipolar depressive or anxiety disorder. Fifty-seven participants met our criteria for both a depressive and anxiety disorder.[1] Twenty-nine participants with social phobia also met our criteria for depression. Both past and current diagnoses were included for three reasons. First, this study was driven by the theory that stress and psychopathology have a dynamic, bidirectional relationship and, because stress was assessed only over the previous year, it was theoretically relevant to assess past and current diagnoses. Second, this study also hypothesized an integral role for personality, which remains relatively stable over time. Third, doing so increased the number of cases included and thus increased the power of the study.

Life Stress Interview (*LSI*; Hammen et al., 1987)—Life stress was evaluated using a semi-structured interview that assessed CLS and episodic life stress. The CLS portion of the interview assessed the level of ongoing objective stress experienced by each participant in 10 adolescent-relevant domains over the past year. This included four interpersonal (close friendship, social life, romantic relationships, and family) and six non-interpersonal (neighborhood, school, work, finances, personal health, and health of close family members) domains. The interviewer used suggested general probes to elicit relevant objective information. Ratings ranged in half-point intervals from 1 (minimal stress) to 5 (most stress), with specific behavioral anchors for each point on the scale.

All interviewers completed extensive training, including matching gold standard ratings of audio recordings of interviews, role-playing, and live observations. Time 1 reliability for the present study, completed by both sites, was assessed by rating 76 intersite and intrasite audio

[1]Previous analyses separated comorbidity as an additional independent variable, examining the unique effects of comorbidity above and beyond the main effects of depression and anxiety. None of these results were significant and they were subsequently dropped from the paper in the revision process.

recorded interviews. Intraclass correlation coefficients (ICCs) ranged from .57 for health-other to .91 for neighborhood, with an average across all domains of .73. The ICCs averaged across the interpersonal and non-interpersonal domains were .71 and .74, respectively.

Eysenck Personality Questionnaire-Revised, Neuroticism Scale (*EPQ-R N*; Eysenck & Eysenck, 1975)—The Neuroticism Scale of the EPQ-R was used as the initial screening questionnaire for the present study. This consisted of 22 items in a yes-no format.[2] Scores on this scale ranged from 0 to 22, with higher scores indicative of higher levels of neuroticism. Coefficient alpha in the present study was .79. The extensive construct validity for this instrument was reported in the EPQ-R manual (Eysenck & Eysenck, 1975).

International Personality Item Pool-NEO-PI-R Neuroticism Scale (*IPIP-N*; Goldberg, 1999)—The IPIP-N consisted of 60 items rated on a 1 to 5 Likert Scale. This scale was developed to closely correspond with the neuroticism scale from the NEO-PI-R (Costa & McCrae, 1985). Goldberg (1999) reported that the total score from the two scales correlated .93 with one another. Coefficient alpha was .95 and the average inter-item correlation for the measure was .23.

Big Five Mini-Markers Scale (Saucier, 1994)—This 40-item measure consisted of an 8-item scale for each of the Big 5 personality traits: extraversion, agreeableness, conscientiousness, neuroticism, and openness/intellect. The neuroticism and extraversion scales were the only scales used in the present analyses. Each item was rated on a nine point Likert scale ranging from extremely inaccurate to extremely accurate. Saucier (1994) reported coefficient alphas of .76 for the neuroticism scale and .85 for the extraversion scale. Coefficient alphas for the present sample were .80, for both the neuroticism and extraversion scales.

Neuroticism Composite—Neuroticism was measured by three separate self-report questionnaires (EPQ-R N, IPIP-N and Big Five Mini-Markers N scale) to yield a composite score; this enhanced the construct validity and reliability of the index.[3] Each scale was converted to a *z* score and averaged to form this composite. The coefficient alpha was .82.

Procedures

A mass screening of possible participants was completed during school hours. Assenting students completed the EPQ-R N and received $10. Those scoring in the top, middle, and bottom third were considered high-, middle-, and low-scorers, respectively. In the present sample, 58% were high-scorers, 23% were middle-scorers, and 19% were low-scorers. SCID and LSI interviews were conducted in-person after regular school hours and lasted approximately 1.5 to 3 hours. Questionnaire measures were usually completed immediately after the interviews. Participants received $45 for handing in the consent forms for the full study and completing both the interview and questionnaire measures.

[2]The original EPQ Neuroticism Scale consists of 24 items. The item referring to suicidality was omitted based on recommendations from the Institutional Review Board. The item, “Do you worry about your health” was also omitted from scoring because it failed to load on any factor in preliminary analyses.

[3]Originally, we had included the Behavioral Inhibition Scale (BIS; Carver & White,1994) in our neuroticism composite, as was done by other researchers using the same dataset (e.g., Zinbarg et al., 2009). While the measure was originally intended to be a measure of anxiety, other research has shown that it is actually closely aligned with neuroticism (particularly the anxiety facet of neuroticism). All analyses have been completed both with and without the BIS and results are nearly identical. All analyses here are reported without the BIS included in the neuroticism composite.

Analytic Strategy and Preliminary Analyses

We first examined the zero-order correlations among all variables. Next, using multiple regression, we examined the unique associations of depression and anxiety with CLS and the personality variables. If results demonstrated significant effects for anxiety, we repeated the analysis twice more, once with social phobia cases removed (anxiety minus social phobia) and then again examining only social phobia cases. This allowed us to determine if the original result could be attributed to anxiety disorders in general or social phobia cases specifically. Finally, we used indirect effect tests to see if significant associations between psychopathology variables and CLS can be accounted for by their associations with neuroticism and extraversion.

Descriptive statistics for the sample are displayed in Table 1. Correlational analyses indicated that most variables were significantly correlated, ranging from small to medium effect sizes (Cohen, 1992).[4] Therefore, tests of multicollinearity were completed (Cohen, Cohen, West, & Aiken, 2003). Tolerance and variance inflation factor statistics did not reveal any problems (and are available upon request from the first author). However, before any continuous variables (extraversion, interpersonal CLS, and non-interpersonal CLS) were entered into a regression equation, each was centered by subtracting the mean value from each score to reduce multicollinearity with product terms (Cohen et al., 2003).

Results

Gender differences

We completed a series of analyses to assess gender differences. T-tests and descriptive statistics are displayed in Table 2. Males and females did not differ in levels of interpersonal or non-interpersonal CLS. However, males were significantly less neurotic (Cohen's $d = .28$) and less extraverted than females (Cohen's $d = .30$). Second, gender was entered as a moderator in hierarchical regression analyses examining the relationships among depressive and anxiety disorders, interpersonal and non-interpersonal CLS, and the personality traits of neuroticism and extraversion. The only significant moderator effect is displayed in Table 3. This result demonstrated that the association between depression and non-interpersonal CLS was only significant in females. The simple main effects for the association between non-interpersonal CLS and depression were significant in females ($B = 0.30$, $SE\ B = 0.04$, $\beta = .32$, $p < .001$), but not in males ($B = 0.04$, $SE\ B = 0.08$, $\beta = .04$, *ns*).

Unique Associations of Depression and Anxiety with CLS

Zero-order correlations indicated that all variables were significantly associated, with two exceptions: (a) depression with low extraversion and (b) anxiety minus social phobia with both non-interpersonal CLS and low extraversion (See Table 1). These analyses supported past research linking low extraversion only to social phobia and not to the other anxiety disorders, although they did not support research showing a relationship between depression and low extraversion. To ensure that the non-significant finding between low extraversion and anxiety minus social phobia was not due simply to a lack of power, we tested the difference between this correlation and the correlation between low extraversion and social phobia. Results supported that the correlation between extraversion and social phobia was

[4]It is possible that those correlations involving the dichotomous depressive and anxiety disorder variables are attenuated due to our use of Pearson correlations. While polychoric correlations are used to adjust for dichotomous variable distributions, and thus yield higher correlation estimates than Pearson correlations, they do assume that the underlying variable is continuous and normally distributed (Nunnally & Bernstein, 1994). We were reluctant to accept such assumptions and provide only the Pearson correlations in these analyses.

significantly stronger than the correlation between extraversion and anxiety minus social phobia (difference $r = -.34$, $t = -5.89$, $p < .001$).

We then used multiple regression to test the remaining associations. The disorders were entered simultaneously as the independent variables to eliminate the possibility that the zero-order correlation between a disorder and a dependent variable was not due to participants who met criteria for both depression and anxiety. In other words, because depression and anxiety were significantly correlated, a significant correlation between depression and a dependent variable could be accounted for by a significant relationship between anxiety and the same dependent variable. Therefore, entering both variables assures that the unique relationships were tested for both disorders.

We first analyzed the relationships between the disorders and CLS (Table 4). When entered simultaneously, both depression and anxiety were uniquely associated with interpersonal CLS. Further analyses were done to assess whether there was support for an association between interpersonal CLS and anxiety disorders when the social phobia cases were removed. In the first analysis, with anxiety minus social phobia and depression as the independent variables, only depression remained significant. In the second analysis, with depression and social phobia as the independent variables, both depression and social phobia were significant. Thus, a significant elevation in level of interpersonal CLS was supported for those with social phobia, but not for those who have an anxiety disorder other than social phobia. Non-interpersonal CLS was uniquely associated with depression, but not with anxiety.

Unique Effects of Depression and Anxiety with Personality

In the next set of analyses, we examined associations between emotional disorders and personality (Table 4). Depression and anxiety were entered into the regression equation simultaneously as independent variables. Although we did not believe that the emotional disorder variables precede personality traits in time, it was necessary to enter the traits as dependent variables and the psychopathology variables as independent variables to examine their unique effects. Both depression and anxiety were significantly related to neuroticism. When anxiety minus social phobia and depression were entered as independent variables, with neuroticism as the dependent variable, both depression and anxiety minus social phobia were significant predictors. Similarly, when social phobia and depression were entered as independent variables predicting neuroticism, both were significant predictors. This suggested that the association between anxiety and neuroticism in the present sample was not entirely accounted for by social phobia cases. Because depression was not significantly associated with low extraversion in the correlational analyses, no further analyses were needed to examine the unique effects of depression and anxiety.

Indirect Effect Tests

The most commonly used indirect effect tests lack accuracy and power because they assume a normal distribution for the effect and neglect to use standard errors to construct confidence intervals (MacKinnon, Lockwood, & Williams, 2004; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Shrout & Bolger, 2002). A superior method is the product of coefficients test, based on path analysis. To test the significance of an indirect effect, path coefficients (in the case of the present study, unstandardized beta weights) were used to find critical values based on the product of two normal variables, which have a non-normal distribution. The result was an asymmetrical confidence interval around the product of coefficients ($\alpha\beta$). If the confidence interval (CI) did not include zero, the intervening variable effect was significant. While this technique provided a superior test of significance for an indirect effect, it did not give any indication of the strength of such an effect. Thus,

for this purpose, we took the squared zero-order correlation between the diagnostic variable and the life stress variable (the total effect) and subtracted the squared semi-partial correlation between the two variables, after accounting for the personality variable (the direct effect). This proportion of variance was then divided by the squared zero-order correlation, resulting in an estimate of the proportion of variance of the total effect explained by the personality variable (Zinbarg et al., 2009).

Indirect effects were examined for five relationships. In the first two analyses, neuroticism was examined as a third variable in the relationship between depression and interpersonal CLS, separately for males and females. This was done because gender has been shown to moderate the relationship between depression and neuroticism in our sample (see Zinbarg et al., 2009). Neuroticism partially accounted for the relationship between depression and interpersonal CLS for both males ($\alpha\beta$ = .15, CI = .07-.24; proportion of variance common to depression and interpersonal CLS explained by neuroticism = 85.50%) and females ($\alpha\beta$ = .06, CI = .03-.10; proportion of variance common to depression and interpersonal CLS explained by neuroticism = 37.10%). Next, we examined neuroticism as a third variable in the relationship between depression and non-interpersonal CLS in females. We did this because depression and non-interpersonal CLS were significantly related only in females. This test failed to produce evidence that neuroticism significantly accounted for this association ($\alpha\beta$ = .004, CI = -.01-.02; proportion of variance common to depression and non-interpersonal CLS explained by neuroticism = 14.66%). Next, we conducted analyses to determine if neuroticism accounted for the association between social phobia and interpersonal CLS. Neuroticism partially accounted for the association between social phobia and interpersonal CLS ($\alpha\beta$ = .14, CI = .09-.20; proportion of variance common to social phobia and interpersonal CLS explained by neuroticism = 74.28%). In the final analysis, extraversion partially accounted for the association between social phobia and interpersonal CLS ($\alpha\beta$ = .09, CI = .03-.16; proportion of variance common to social phobia and interpersonal CLS explained by explained by extraversion = 49.85%).

Discussion

The present study supported previous research linking stress to depression and provided further insight into the association between stress and anxiety. Furthermore, findings suggested that the association between depression and non-interpersonal CLS was moderated by gender and that this association was not accounted for by neuroticism. However, the associations among depression and social phobia with interpersonal CLS were at least partially accounted for by neuroticism. Low extraversion partially explained the association between social phobia and interpersonal CLS.

Depressive Disorders

The significant relationship between depression and interpersonal CLS (r = .32) is consistent with past studies supporting both etiological and stress generation models of depression (see Hammen, 1991, 2005; Monroe et al., 2009; Rudolph et al., 2000). This association was partially accounted for by neuroticism, offering preliminary support for the hypothesis that neuroticism is a third variable that results in a vulnerability for both the onset of a depressive episode and the occurrence of interpersonal CLS. Because neuroticism remains relatively stable regardless of present emotional state (Ormel, Oldehinkel, & Vollebergh, 2004), this could be a potential explanation of why those with remitted depression continue to experience increased levels of interpersonal stress (e.g., Chun et al., 2004). Of course, there are many other possible explanations. For example, as described by diathesis-stress models, high levels of neuroticism might interact with life stress to precipitate a depressive episode (e.g., Kendler et al., 2004). Alternatively, in accordance with the stress generation model,

neuroticism might serve as a vulnerability to depression which then causes elevated levels of interpersonal CLS. Clearly, longitudinal research is necessary to answer such questions.

Results indicated that the association between depression and non-interpersonal life stress was only significant in females and this association was not accounted for by neuroticism. This might be one possible explanation for why non-interpersonal life stress has been less consistently related to depression (e.g., Chun et al., 2004; Kendler et al., 1998). In other words, the relationship may have appeared weak in samples that included both males and females. Interestingly, neuroticism accounted for an overwhelming majority (85.50 %) of the association between depression and interpersonal CLS in males, but only a large minority (37.10%) in females. In the context of an etiological model of stress and depression, these findings could mean that females are particularly sensitive to CLS, regardless of their level of neuroticism. Alternatively, in a stress generation framework, depressive symptoms may be more likely to interfere with both interpersonal (peer, romantic, and family relationships) and non-interpersonal areas (school, work, etc.) in females compared to males. This highlights the importance of examining interpersonal and non-interpersonal stress separately for males and females.

It appears that neuroticism plays a role in the association between depression and interpersonal stress ($r = .32$), whereas the evidence failed to support a role for neuroticism in the association between depression and non-interpersonal stress ($r = .08$). This is in spite of there being significant zero-order correlations among depression, neuroticism, and non-interpersonal CLS. Neuroticism also had a significantly stronger relationship with interpersonal CLS compared to non-interpersonal CLS (difference = .24, $t = 6.04$, $p < .001$). This is in accordance with past research suggesting that neuroticism tends to more strongly predict interpersonal than non-interpersonal life stress (Kendler et al., 2003). A possible explanation for this finding is suggested by a closer look at the individual CLS domains. Concerning the non-interpersonal CLS domains, high neuroticism in an adolescent is unlikely to affect family finances, quality of neighborhood, or the health of family members. Conversely, the interpersonal domains may be largely affected by levels of neuroticism. Adolescents prone to negative moods such as anger, anxiety, and sadness might have a hard time keeping friends or romantic partners, participating in social events, and getting along with family members.

Anxiety Disorders

A primary goal of the present study was to examine whether the associations between stress and depression would also generalize to anxiety disorders. Results did not support a significant association between CLS and anxiety disorders in general. However, social phobia was significantly related to interpersonal CLS above and beyond depression ($\beta = .14$). Both low extraversion and neuroticism partially accounted for this small, yet significant, association, with neuroticism making a larger contribution than low extraversion. These results highlight some similarities and differences in the stress-depression and stress-anxiety (more specifically, stress-social phobia) associations. Heightened interpersonal CLS, which is partially explained by heightened neuroticism, appears to be something shared by both depression and social phobia. These cross-sectional results provide good reason to examine anxiety disorders in future longitudinal studies examining stress and depression. For social phobia, unlike depression, low extraversion appeared to play a role in the association with interpersonal CLS. Low extraversion may be particularly potent in a high school setting, where compulsory social activities exist (e.g., school, family obligations).

Social phobia was significantly related to low extraversion ($r = -.33$), while a composite of the remaining anxiety disorders was not ($r = .01$), with the former correlation being

significantly larger than the latter correlation. This is consistent with research that suggests low extraversion is specifically related to social anxiety (e.g., Watson et al., 2005). Another potential explanation is that the measure of extraversion in this study (Big Five Mini-Markers Scale) largely measures sociability (e.g., bold, talkative), but not positive affectivity (e.g., joyful, enthusiastic; see Watson, Clark, & Tellegen, 1988; Watson et al., 2005). This may explain why extraversion had a unique relationship to social phobia, a disorder where sociability is the primary focus. It is also possible that the sociability dimension of extraversion may be less associated with depression than the positive affectivity dimension, accounting for the lack of association between depression and extraversion in this study. In other words, studies that have shown depression to be negatively related to extraversion may have used measures that tapped positive affectivity and thus the anhedonic features of depression to a greater extent.

Limitations

Several limitations should be noted. First, and most importantly, the results were cross-sectional and thus do not imply a causal direction. More stringent analyses of etiological or stress-generation models require longitudinal results. However, initial tests with cross-sectional data can still lead to important insights. For example, not finding evidence for neuroticism partially accounting for the association between depression and non-interpersonal CLS suggests it is unlikely that the association would exist in a prospective study. Another limitation is the potential problem of overlapping content between measures of personality and the measures of depression and anxiety. However, other analyses completed on these cross-sectional data have demonstrated that a general neuroticism factor is related to depressive and anxiety disorders and symptoms, even after accounting for overlapping item content (Uliaszek et al., 2009; Zinbarg et al., 2009).

Additional limitations stem from the nature of our sample. For example, there were low frequencies of most individual anxiety disorders (other than social phobia), especially panic disorder and posttraumatic stress disorder, which have previously been linked to life stress (Barlow, 2002). Although our results concerning social phobia are consistent with past research (e.g., Watson et al., 2005), removing these cases resulted in a significant decrement in the size of the anxiety minus social phobia variable, thus reducing the power of our regression analyses. Additionally, because our sample consisted only of adolescents it is not known if similar results would be found in adults. Moreover, our sample was overselected for those high in neuroticism. Thus, it is possible that more differences would have emerged between those meeting our criteria for anxiety or depression and those who did not.

Finally, it is well known that conventional analyses of partial variance tend to underadjust for the effects of the latent variables being covaried due to the inevitable unreliability of the indicator measures. One consequence of such underadjustment is an inflation in Type I error rates (Zinbarg, Suzuki, Uliaszek & Lewis, 2009). At the same time, it is important to remember that whereas analyses of partial variance do not eliminate such bias, they do often reduce bias relative to the zero-order associations.

Conclusions and Future Directions

The present study suggested that personality plays an important role in the association between CLS and the emotional disorders. Neuroticism was shown to partially account for the relationship between depression and interpersonal CLS, as well as that between social phobia and interpersonal CLS. Extraversion was also shown to partially account for the latter relationship. These results highlight the importance of studying normal personality traits in the context of stress-psychopathology research. The knowledge that stable personality traits partially explain the associations between psychopathology and CLS

provides clinicians with additional treatment targets independent of depressive and anxiety symptomatology. Reduction of symptoms may not completely alleviate interpersonal challenges; a focus on basic social skills and stable character patterns might be an important supplement to treatment as usual. Although this study replicated past results suggesting interrelationships among depression, anxiety, personality traits, and stress, our analyses extended these results by using multiple regression to isolate specific relationships while accounting for overlap among other variables. Like some past research (see Schraedley et al., 1999; Shih, 2007), the present study found a gender difference such that only females showed a significant relationship between depression and non-interpersonal CLS. Finally, non-interpersonal CLS emerged as an important construct, showing different relationships with males versus females and also with depression versus anxiety. Future studies should examine these associations in a longitudinal design, preferably with ample time to allow changes in CLS. These studies might also address the question of gender differences in the anxiety-stress associations. Despite an overlap in depression and anxiety disorders, our findings suggest gender differences in associations with CLS only in those with depression. Furthermore, the inclusion of additional third variables and potential intervening variables might provide insight into the complex associations between emotional disorders, life stress, and personality.

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Table 1

Descriptive Statistics and Intercorrelations for Depression, Anxiety, Anxiety minus Social Phobia (Anx-SP), Social Phobia, Interpersonal-CLS (IP-CLS), Non-Interpersonal CLS (NI-CLS), Neuroticism, and Extraversion (N = 603)

	M (SD)	Depression	Anxiety	Anx-SP	Social Phobia	IP-CLS	NI-CLS	Extraversion
Depression	—	—						
Anxiety	—	.26***	—					
Anx-SP	—	.11**	n/a	—				
Social Phobia	—	.24***	.63***	n/a	—			
I-CLS	2.38 (0.47)	.32***	.22***	.09*	.21***	—		
NI-CLS	2.20 (0.38)	.25***	.11**	.07	.09*	.48***	—	
Extraversion	5.72 (1.34)	-.08	-.23***	.01	-.33***	-.21***	-.12*	—
Neuroticism	0.0 (0.82)	.27***	.34***	.16***	.24***	.32***	.08*	-.37***

Note. Anx-SP = Anxiety minus Social Phobia; I-CLS = interpersonal CLS; NI-CLS = non-interpersonal CLS.

* $p < .05$,

** $p < .01$,

*** $p < .001$

Table 2

T-Tests, Means and Standard Deviations for Males and Females on Interpersonal CLS (IP-CLS), Non-Interpersonal CLS (NI-CLS), Neuroticism, and Extraversion (N = 603)

	Males *M*(*SD*) *n* = 185	Females *M*(*SD*) *n* = 418	*t*
IP-CLS	2.35(0.45)	2.39(0.48)	1.00
NI-CLS	2.19(0.37)	2.21(.38)	0.40
Neuroticism	-0.17(0.86)	0.07(0.85)	3.08**
Extraversion	5.44(1.22)	5.83(1.37)	3.35***

*Note. p < .05,

** p < .01,

*** p < .001

Table 3

Summary of Hierarchical Regression Analysis for Gender Moderation Analysis of Depression Predicting Non-Interpersonal CLS (N = 603)

Variable	*B*	*SE B*	β
Step 1			
Gender	0.004	0.03	.01
Depression	0.24	0.04	.25***
Step 2			
Gender	0.05	0.04	.06
Depression	0.30	0.04	.32***
Gender × Depression	-0.26	0.09	-.15**

Note. R^2 = .06 for Step 1; ΔR^2 = .02 for Step 2 ($p < .01$).

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Gender was coded as 0 = female, 1 = male.

Table 4

Simultaneous Regression Analyses for Depression and Anxiety and their Associations with Interpersonal CLS (IP-CLS), Non-Interpersonal CLS (NI-CLS), and Neuroticism (N = 603)

Dependent Variable	*B*	*SE B*	β	R^2
IP-CLS				
Depression	0.32	0.05	.28***	.12***
Anxiety	0.16	0.05	.15***	
Depression	0.36	0.05	.31***	.10***
Anx-SP	0.09	0.06	.06	
Depression	0.33	0,05	.28***	.12***
Social Phobia	0.24	0.07	.14***	
NI-CLS				
Depression	0.22	0.04	.24**	.07***
Anxiety	0.05	0.04	.05	
Neuroticism				
Depression	0.39	0.08	.19***	.15***
Anxiety	0.61	0.08	.29***	
Depression	0.51	0.08	.25***	.09***
Anx-SP	0.36	0.11	.13***	
Depression	0.42	0.08	.21***	.13***
Social Phobia	0.73	0.12	.25***	

Note. In all regression analyses, depression is one independent variable and anxiety, anxiety minus social phobia (Anx-SP), or social phobia is the second independent variable.

* $p < .05$,

** $p < .01$,

*** $p < .001$.