Research Article

SOCIAL ANXIETY AND INSOMNIA: THE MEDIATING ROLE OF DEPRESSIVE SYMPTOMS

Julia D. Buckner, M.S., Rebecca A. Bernert, M.S., Kiara R. Cromer, M.S., Thomas E. Joiner, Ph.D., and Norman B. Schmidt, Ph.D.

Anxiety is commonly associated with insomnia. Given that social anxiety disorder is one of the most prevalent anxiety disorders, socially anxious individuals may be particularly vulnerable to insomnia. However, there is currently very little empirical work on this relationship. This study used bivariate correlations to examine whether social anxiety was related to insomnia in an undergraduate sample (n = 176) using the Social Interaction Anxiety Scale and the Insomnia Severity Index. Further, we utilized responses from the Beck Depression Inventory to investigate the role of depressive symptoms in the association between social anxiety and insomnia. Hierarchical linear regressions were used to examine the moderational and mediational role of depressive symptoms in the link between social anxiety and insomnia. To increase generalizability to clinical samples, analyses were repeated on a subset of the sample with clinically significant social anxiety symptoms (n = 23) compared to a matched control group (n = 23). Consistent with expectation, social anxiety was associated with increased insomnia symptoms. Specifically, social anxiety was correlated with sleep dissatisfaction, sleep-related functional impairment, perception of a sleep problem to others, and distress about sleep problems. Importantly, depressive symptoms mediated the relationship between social anxiety and insomnia, thereby at least partially accounting for insomnia among socially anxious individuals. Our data support the contention that social anxiety is associated with insomnia and suggest that depression may play a vital role in this co-occurrence.

Key words: social anxiety; social phobia; insomnia; sleep; depression

INTRODUCTION

Anxiety is commonly associated with nonrestorative sleep complaints or insomnia, as well as excessive daytime sleepiness, nightmares, and poor self-reported sleep quality [Benca et al., 1992; Hasler et al., 2005; Ohayon, 2005; Overbeek et al., 2005; Ross et al., 1989; Spoormaker and van den Bout, 2005; Udde, 1994]. Up to 30–40% of the population reports experiencing occasional or transient symptoms of insomnia, and among the 10–15% with a diagnosis of chronic insomnia, anxiety disorders are the most common comorbid psychiatric condition [Ford and Kamerow, 1989; Roth and Roehrs, 2003; Walsh, 2004]. Social anxiety is the most common anxiety condition [Kessler et al., 2005a], yet the prevalence and nature of sleep disturbances among socially anxious individuals have received very little attention. Social anxiety is associated with impairment across a number of domains of functioning, including education, employment, roman-
tic relationships, and peer relationships [Schneier et al., 1994]. Sleep quality impairments could serve as another significant area of suffering for individuals with social anxiety, and may furthermore serve to increase anxiety symptomatology. Research suggests that a history of sleep disturbances, such as insomnia, constitutes a significant risk factor for the development of anxiety disorders [Breslau et al., 1996]. Compared with those without a history of insomnia, those with a history of insomnia show a nearly twofold relative risk estimate for the later emergence of anxiety disorders, such as generalized anxiety disorder (GAD), panic disorder, specific phobias, and obsessive–compulsive disorder (OCD). Examining sleep among socially anxious individuals could thus enhance our understanding of the nature, course, and treatment of social anxiety.

One possible explanation for sleep impairment experienced by anxious individuals is that anxiety and depression are commonly comorbid [Kessler et al., 2005a]. Sleep disturbances are considered a cardinal symptom of depression [American Psychiatric Association, 2000], and at least one recent epidemiological report indicates that the presence of specific sleep disturbances, such as insomnia, predicts a 9- and 17-fold increased risk for experiencing clinically significant depression and anxiety, respectively [Taylor et al., 2005]. Sleep problems have also been identified as a risk factor for the onset of depression [Breslau et al., 1996; Ford and Kamerow, 1989] and as a prodromal feature of recurrent depressive episodes [Perlis et al., 1997]. Thus, when examining the link between social anxiety and insomnia, the role of depressive symptoms must be investigated to determine whether sleep disturbances are related to social anxiety above and beyond co-occurring depression.

Despite the high rates of sleep disturbance among generally anxious individuals, we know of only two studies that have specifically evaluated the relationship between social anxiety and self-reported sleep disturbances. In the first [Brown et al., 1994], patients with Diagnostic Statistical Manual-III-R social phobia did not differ from normal controls on any measure of sleep architecture. However, it appears as though all participants in this study were patients at a Social Phobia Program, suggesting that all patients exhibited social anxiety symptomatology thereby obfuscating interpretation of findings. In the second investigation [Stein et al., 1993], 30 patients with social anxiety disorder (SAD) were compared with age- and sex-matched nonclinical controls on the Pittsburgh Sleep Quality Index. Results revealed that SAD was associated with poorer sleep quality, a longer sleep latency, and greater daytime dysfunction relative to controls. SAD patients did not endorse decreased sleep duration, decreased sleep efficiency, or increased use of sleep medication relative to controls. Stein and colleagues also assessed the role of depression in these relationships. Interestingly, history of depression did not predict significant differences in sleep impairment in patients with SAD.

A few limitations to this study warrant discussion and point to additional areas for future research. Stein et al. [1993] note that their findings are limited by the exclusion of individuals with current comorbid major depressive disorder and by the sole use of treatment-seeking socially anxious individuals. Given the high rate of comorbid depression among socially anxious individuals, this exclusion limits the generalizability of results. Further, the majority of socially anxious individuals do not seek treatment [Magee et al., 1996] due to a variety of factors [Olson et al., 2000]. Future work is thus necessary to determine if the association between social anxiety, depressive symptoms, and sleep problems can be generalized to non-treatment-seeking socially anxious individuals.

This study extended prior work regarding the relationship between anxiety and sleep disturbances in several ways. First, we examined whether social anxiety was associated with a specific type of self-reported sleep disturbance, insomnia symptoms, in a nonreferred sample. Consistent with the existing literature on anxiety and insomnia, we hypothesized that social anxiety would be associated with higher rates of insomnia. Second, we examined whether depressive symptomatology modulated the risk for greater levels of insomnia. Given the established link between depression and insomnia, we expected depressive symptoms to increase the severity of insomnia. Third, we examined whether depressive symptomatology mediated this relationship, thereby at least partially accounting for the relationship between social anxiety and insomnia symptoms. In line with past work [Stein et al., 1993], it was hypothesized that social anxiety would remain a significant predictor of insomnia after controlling for depressive symptoms.

METHOD

PARTICIPANTS

The sample consisted of 176 (57.4% female) undergraduate students who received research credit for participation. Ages ranged from 18 to 32 (M = 19.21, SD = 1.46). The racial/ethnic composition of the sample was as follows: African American (7.5%), American Indian or Alaskan Native (0.6%), Asian American (2.3%), Caucasian (77.6%), Hispanic/Latino (9.2%), mixed race/ethnicity (1.7%), and other (1.1%). All participants were enrolled in an Introduction to Psychology course, which is a prerequisite course for a number of majors at the university (e.g., psychology, education, business, and nursing). The majority of the sample (88%) were either in their first or second year of college.

PROCEDURE

All experimental guidelines were in accordance with the American Psychological Association standard
ethical guidelines. Prior to data collection, this study was approved by the Florida State University Institutional Review Board. Participants signed up for the experiment outside of class, and testing sessions took place during regular business hours on the university campus. All participants were informed that they would be asked about their emotions, behaviors, and self-perceptions. Informed consent was obtained prior to completing a battery of self-report questionnaires. Although the experiment was conducted in a group setting, the students had minimal to no interactions with one another due to specific seating arrangements. At the completion of the experimental session, participants were debriefed.

**MEASURES**

**Social Interaction Anxiety Scale.** The SIAS is a self-report scale designed to assess social interaction fears [Mattick and Clarke, 1998]. This scale has demonstrated high levels of internal consistency across clinical and nonclinical samples [Heimberg et al., 1992; Mattick and Clarke, 1998; Osman et al., 1998]. In the present sample, the SIAS demonstrated excellent internal consistency ($\alpha = .91$) and scores ranged from 0 to 60 ($M = 20.06, SD = 12.13$). To increase generalizability to individuals with SAD, a cutoff score was used to identify those with clinically meaningful social anxiety problems. Prior research indicates that one standard deviation above a community sample mean ($M = 19.9, SD = 14.2$) on the SIAS correctly classified 82% of patients with SAD [Heimberg et al., 1992]. This cutoff score was used to identify participants with clinically significant social anxiety symptomatology ($n = 23$). These participants were then matched on age, race/ethnicity (Caucasian or non-Caucasian), and gender with 23 individuals scoring below the SIAS community sample mean. The mean age of this subsample was 19.35 years old ($SD = 1.25$ years). The racial/ethnic composition of the subsample was as follows: African American (10.9%), Asian American (4.3%), Caucasian (65.2%), Hispanic/Latino (10.9%), mixed race/ethnicity (4.3%), and other (2.2%). The high SIAS group obtained a mean score of 42.52 ($SD = 6.22$), whereas the low SIAS group obtained a mean score of 10.17 ($SD = 3.89$). These means are comparable to those obtained in previous work using this clinically meaningful cutoff [Ham and Hope, 2005]. Furthermore, this high SIAS group mean score is consistent with means found in samples composed of treatment-seeking SAD patients [Gibb et al., 2005].

**Insomnia Severity Index.** The Insomnia Severity Index (ISI) is a 7-item self-report scale that measures severity of difficulties in areas such as sleep onset, sleep maintenance, and early morning awakenings [Bastien et al., 2001]. Each item is scored on a 0 (no problems) to 4 (very severe problems) scale, with a maximum total scale score of 28. A higher score represents greater severity of insomnia. More specifically, lower scores typically indicate no clinically significant insomnia (0–7) or subthreshold insomnia (8–14). Higher scores indicate clinical levels of insomnia that are either moderate (15–21) or severe (22–28). A cutoff score of 14 is generally consistent with clinical insomnia [Smith and Wegener, 2003]. In our sample, 27.0% of participants reported subthreshold insomnia, and 11.0% of participants scored in the clinical range. The internal consistency of this questionnaire and convergence with other insomnia measures have been well supported [Bastien et al., 2001; Morin, 1993]. In this study, we evaluated insomnia symptoms versus insomnia diagnoses. Nonetheless, the ISI shows optimal sensitivity and specificity for detecting sleep complaints and clinical insomnia [Savard et al., 2005]. For example, scores 8 and above (subthreshold insomnia) show 94.7% sensitivity, 47.4% specificity; scores above 14, typically indicative of clinical insomnia, show 51.3% sensitivity, 90.7% specificity (100% specificity is observed for scores of 20) [Savard et al., 2005]. In the present sample, the ISI demonstrated good internal consistency ($\alpha = .85$), and scores ranged from 0 to 22 ($M = 6.67, SD = 5.22$).

**Beck Depression Inventory.** The Beck Depression Inventory (BDI) is a 21-item self-report inventory that is used to assess the presence of depressive symptoms [Beck and Steer, 1987]. Participants are asked to indicate which statement best describes the way they have been feeling over the past 2 weeks. Each question is scored on a 0–3 scale. Total scores on the BDI can range from 0 to 63, with higher scores reflecting greater levels of depressive symptoms. A cut-point of 16 for depression in a nonclinical adolescent sample has been found to have a sensitivity ranging from 90 to 100% and a specificity of 93–96% [Barrera and Garison-Jones, 1988; Canals et al., 2001]. Although the BDI is not indicative of the full clinical syndrome of depression, it has yielded adequate reliability estimates, and it has been well validated as a measure of depressive symptomatology [Beck and Steer, 1987; Beck et al., 1988]. In the present sample, the BDI demonstrated good internal consistency ($\alpha = .85$), and scores ranged from 0 to 22 ($M = 5.50, SD = 5.35$).

**STATISTICAL ANALYSES**

First, bivariate zero-order correlations were conducted to examine the relationships among social anxiety, depressive symptoms, and insomnia in the entire sample. To provide descriptive information regarding the nature of insomnia, we examined the correlations between social anxiety and ISI item-level responses in the entire sample. A probability factor of .025 was used to control for Type I error. Single-item measures of sleep characteristics have been successfully used in prior work [Chang et al., 1997; Paffenharger et al., 1994]. Next, we examined the rates of clinically significant and subclinical insomnia using...
our clinical analog sample. Bivariate correlations were conducted to examine the links among social anxiety, depressive symptoms, and insomnia in this subsample.

To assess whether depressive symptoms serve to increase the likelihood that socially anxious individuals would experience insomnia, hierarchical regressions were computed for the entire sample and the subsample [Baron and Kenny, 1986]. Total insomnia served as the dependent variable in both models. In the first model, the predictive variables were the main effects of SIAS and BDI total scores and the interaction of SIAS total score × BDI total score. Variables were centered to reduce the multicollinearity [Holmbeck, 2002]. For both models, predictor variables were divided into two levels in the hierarchy: (a) the main effects of each variable in the interaction entered at level 1, and (b) the interaction term was entered at level 2. This model ensured that any observed effects for the interactions at level 2 cannot be attributed to shared variance with the variables at levels 1 [Cohen and Cohen, 1983].

Using the strategy proposed by Kenny et al. [1998], the meditational role of depressive symptoms on the relationship between social anxiety and total ISI scores was tested. The first requirement of this strategy rests with an association between social anxiety and insomnia. The second step for testing mediation with this strategy requires establishing a relationship between the predictor variable (social anxiety) and the proposed mediating variable (depressive symptoms). The third step for testing requires establishing a relationship between the proposed mediator and the criterion after controlling for the effects of the predictor. The final step involves evaluating the relationship between the predictor and the criterion when the variance accounted for by the proposed mediator has been removed. Traditionally, when this equation yields a nonsignificant effect for the predictor, the controlling variable is said to mediate the relationship.

RESULTS

RELATIONSHIP AMONG SOCIAL ANXIETY, DEPRESSIVE SYMPTOMS, AND INSOMNIA

Social anxiety was correlated with depressive symptoms \(r = .46, P < .01\). Insomnia was correlated with both social anxiety \(r = .26, P < .01\) and depressive symptoms \(r = .49, P < .01\). Social anxiety was associated with the following individual ISI items: dissatisfaction with current sleep \(r = .22, P < .01\), extent of functional interference due to sleep problems \(r = .22, P < .01\), noticeability of sleep problem to others \(r = .26, P < .01\), and worry/distress about sleep problems \(r = .18, P < .025\). Social anxiety demonstrated a trend toward correlation with early morning awakening \(r = .18, P = .026\), but was not correlated with difficulty falling asleep \(r = .10, P > .025\) or difficulty staying asleep \(r = .17, P > .025\).

Using our clinical analog sample, we found that almost 60% of socially anxious participants showed clinically significant or subclinical levels of sleep impairment. Specifically, 18.2% demonstrated clinical levels of insomnia, 40.9% exhibited subthreshold symptoms of insomnia, and 40.9% did not demonstrate clinically significant insomnia (see Fig. 1). Of control participants, the majority (57.1%) did not have clinically meaningful insomnia, 38.1% exhibited subthreshold insomnia symptoms, and only 4.8% demonstrated clinical levels of insomnia. In this subsample, zero-order correlations were similar to the overall sample. Specifically, social anxiety was significantly correlated with depressive symptoms \(r = .46, P < .01\). Insomnia was positively correlated with social anxiety \(r = .32, P < .05\) and depressive symptoms \(r = .54, P < .01\).

MODERATIONAL ANALYSES OF DEPRESSIVE SYMPTOMS ON SOCIAL ANXIETY–INSOMNIA

To test whether depressive symptoms serve to increase the likelihood that socially anxious individuals will experience insomnia, hierarchical regressions were computed for the entire sample and the subsample [Baron and Kenny, 1986]. Depressive symptoms did not moderate the relationship between social anxiety and insomnia for the entire sample, \(F(1, 133) = .19, P > .05\); nor for the clinical analog sample, \(F(2, 33) = .03, P > .05\). These results indicate that social anxiety
is similarly predictive of insomnia across levels of depressive symptoms.

**MEDIATIONAL ANALYSES OF DEPRESSIVE SYMPTOMS ON SOCIAL ANXIETY–INSOMNIA**

Next, the mediational role of depressive symptoms on the relationship between social anxiety and total ISI scores was tested [Kenny et al., 1998]. In these analyses, depressive symptoms mediated the relationship between social anxiety and insomnia (Table 1). The Sobel test subsequently revealed that BDI scores significantly mediated the association between SIAS and ISI scores ($z = 4.12, P < .0001$).

Due to limitations of conducting mediational analyses using cross-sectional data, one method of increasing confidence in the observed effects is to conduct additional analyses after reversing the proposed mediator with the criterion variable [Sheets and Braver, 1999]. In this case, we evaluated whether insomnia mediated the relationship between social anxiety and depressive symptoms. Regression analyses were not consistent with mediation in this direction as social anxiety remained a significant predictor of depressive symptoms. Regression analyses using cross-sectional data, one method of increasing confidence in the original model’s mediational effects.1

**DISCUSSION**

These data aid our understanding of sleep disturbance among socially anxious individuals in several ways. First, the present study is only the second report supporting the assertion that individuals with social anxiety suffer from disturbances in sleep. Our data revealed that social anxiety was associated with greater severity of insomnia. Second, these findings suggest that depressive symptomatology may play a vital role in the relationship between insomnia and social anxiety, serving as the first known study to identify one mechanism underlying the link between social anxiety and insomnia.

The mediational findings are inconsistent with Stein et al. [1993], who found that depressive symptoms were unrelated to insomnia among SAD patients. However, Stein and colleagues excluded participants with current major depressive disorder, focusing primarily on past history of depression. Our data suggest that accounting for current depressive symptoms may be critical in explaining existing sleep problems among individuals with clinically significant social anxiety. Given the high rate of depressive symptomatology and comorbid depression among socially anxious individuals [Kessler et al., 2005b], the current data have important implications for the assessment and treatment of social anxiety. For instance, it may be necessary to address the role of depressive symptoms and insomnia in the treatment of socially anxious patients.

Our data cannot be used to ascertain the directionality of these various symptoms. Epidemiological data suggest, for instance, that the age of onset of anxiety disorders tends to be earlier than that of mood disorders [Kessler et al., 2005a]. In regard to social anxiety specifically, age of onset of SAD tends to precede that of mood disorders in comorbid patients [Kessler et al., 1999]. Alternatively, social anxiety may lead to the simultaneous development of depressive and insomnia symptoms. Epidemiological reports on insomnia suggest that, in the majority of cases, insomnia appears before (>40% of cases) or at the same time as (>22% of cases) mood disturbances; whereas for anxiety, insomnia typically occurs at the same time as the anxiety disorder (>38%) or after the anxiety disorder (>34%) [Ohayon and Roth, 2003]. Taken together with these data, the current findings provide support for the contention that social anxiety may increase risk for depressive symptoms that lead to insomnia. We attempted to strengthen confidence in this observation by evaluating an alternative model where insomnia mediated the relation between social anxiety and depressive symptomatology; no support was evident for such an account. However, it is certainly possible that socially anxious individuals may develop insomnia, which then leads to depressive symptomatology. Prospective work is needed to unravel the potentially complex relationships between social anxiety, depressive symptoms, and insomnia.

Our results should also be discussed in relation to a growing body of work indicating that catastrophic worry is strongly associated with insomnia [Harvey and Greenall, 2003; Watts et al., 1994]. Compared to good sleepers, those with insomnia are more likely to focus on worries or problems when attempting to fall asleep [Harvey, 2000]. In this way, catastrophizing, either

---

1Depressive symptoms were similarly found to mediate the relationship between social anxiety group (high versus low) and insomnia.

**TABLE 1. Regression analyses testing for mediation:** (1) effect of depressive symptoms on insomnia; and (2) effect of social anxiety on insomnia after controlling for depressive symptoms

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable(s)</th>
<th>$\beta$</th>
<th>$t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressive symptoms</td>
<td>1. Insomnia</td>
<td>.40</td>
<td>5.54**</td>
</tr>
<tr>
<td></td>
<td>Social anxiety</td>
<td>.46</td>
<td>5.99**</td>
</tr>
<tr>
<td>Insomnia</td>
<td>2. Social anxiety</td>
<td>.10</td>
<td>1.24</td>
</tr>
<tr>
<td></td>
<td>Depressive symptoms</td>
<td>.51</td>
<td>6.85**</td>
</tr>
</tbody>
</table>

Note. Social anxiety was measured with the Social Interaction Anxiety Scale (SIAS), depressive symptoms were measured with the Beck Depression Inventory (BDI), and insomnia was measured with the Insomnia Severity Index (ISI).

* $P < .05$.

** $P < .01$.
about sleep or social situations, may create risk for, and perhaps perpetuate, insomnia symptoms. This framework may inform the development of clinically efficacious treatments for co-occurring insomnia and social anxiety. Indeed, at least one recent investigation has examined these features in GAD [Belanger et al., 2004]. In this report, up to 63.6% of those with GAD endorsed some form of insomnia, and 86.5% reported that they had never experienced insomnia without, at the same time, experiencing excessive worries. This study also found that insomnia symptoms improved following traditional cognitive behavioral treatment for GAD. Although we know of no studies that have directly investigated the incorporation of sleep-related treatment techniques with CBT for anxiety disorders, the findings of Belanger et al. [2004] suggest that targeting catastrophic thoughts in SAD may facilitate improved sleep quality alongside overall reductions in social anxiety.

The current findings need to be considered in light of several limitations that suggest further work in this area. First, these data were cross-sectional, thereby limiting causal inferences. Second, these data include self-reports that are subject to biases such as social desirability, impression management, and memory. Although the present data serve as a useful first step in examining sleep quality in this population, future work involving more objective measurements of sleep, such as polysomnography, is warranted. Next, this study specifically investigated insomnia symptoms. It will therefore be useful to determine whether our findings replicate among those with an insomnia diagnosis. Future directions should also include the study of other sleep complaints among those with social anxiety, such as sleep disordered breathing and hypersomnia. It may also be beneficial to determine whether all anxiety conditions are associated with insomnia symptomatology and if so, whether this effect is driven by trait anxiety or whether there are specific mechanisms underlying particular anxiety disorders that place them at particular risk for insomnia. Finally, participants in this report were not formally diagnosed with SAD. On the basis of clinical cutoffs, we expect that many individuals in our high social anxiety group would likely receive a SAD diagnosis; however, future work should examine whether these findings generalize to a clinical sample.

Despite these limitations, the current study contributes to the thus far neglected area of the role of sleep in socially anxious individuals. To our knowledge, our study is the first to test a mediation model to clarify the associations among insomnia, social anxiety, and mood disturbances. Future work in this area may have important treatment implications, for if depressive symptoms in fact served as the pathway through which socially anxious individuals develop insomnia, it may be important to monitor and possibly directly target depressive symptoms in the treatment of co-occurring SAD and insomnia.

REFERENCES


Depression and Anxiety


Smith MT, Wegener ST. 2003. Measures of sleep: The Insomnia Severity Index, Medical Outcomes Study (MOS) Sleep Scale, Pittsburgh Sleep Diary (PSD), and Pittsburgh Sleep Quality Index (PSQI). Arthritis Care Res 49:S184—S196.


