

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/318971209>

Social Support as a Mediator Between Insomnia and Depression in Female Undergraduate Students

Article in Behavioral Sleep Medicine · August 2017

DOI: 10.1080/15402002.2017.1363043

CITATIONS

0

READS

81

2 authors, including:



Aly Suh

Sungshin Women's University

63 PUBLICATIONS 736 CITATIONS

SEE PROFILE

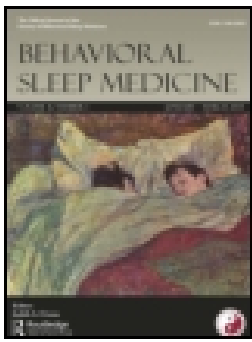
Some of the authors of this publication are also working on these related projects:



fMRI neuroimaging pilot study in females with nightmare disorder [View project](#)



Development of a comprehensive and customized diagnostic system for insomnia patients using machine learning [View project](#)



Social Support as a Mediator Between Insomnia and Depression in Female Undergraduate Students

Soohyun Kim & Sooyeon Suh

To cite this article: Soohyun Kim & Sooyeon Suh (2017): Social Support as a Mediator Between Insomnia and Depression in Female Undergraduate Students, Behavioral Sleep Medicine, DOI: [10.1080/15402002.2017.1363043](https://doi.org/10.1080/15402002.2017.1363043)

To link to this article: <http://dx.doi.org/10.1080/15402002.2017.1363043>



Accepted author version posted online: 07 Aug 2017.
Published online: 07 Aug 2017.



[Submit your article to this journal](#)



Article views: 45



[View related articles](#)



[View Crossmark data](#)



Social Support as a Mediator Between Insomnia and Depression in Female Undergraduate Students

Soohyun Kim^a and Sooyeon Suh^{a,b}

^aDepartment of Psychology, Sungshin Women's University, Seoul, Korea; ^bDepartment of Psychiatry and Behavioral Sciences, Stanford University, Stanford, California

ABSTRACT

Objectives/Background: Despite findings that insomnia and depression have a bidirectional relationship, the exact psychological mechanisms that link these disorders are largely unknown. The goal of this study was to identify whether social support mediates the relationship between insomnia and depression. *Methods:* The study sample ($N = 115$) consisted of females only, and all participants (mean age 21.77 ± 1.80) completed self-report measures of insomnia severity, depression, and social support. *Results:* Insomnia severity was significantly associated with low levels of social support ($B = -1.04$, $SE = .27$, $p < .001$) and high levels of depression ($B = .18$, $SE = 0.05$, $p < .001$). Social support mediated the effects of insomnia on depression (95% CI [.03, .15]). However, social support did not mediate the effects of depression on insomnia (95% CI [-.01, .32]). *Conclusions:* These findings suggest that interpersonal factors such as social support may be an important factor to consider in female insomnia patients in the context of preventing depression in this population.

Insomnia and depression are major problems of public health and are highly comorbid. Sixty-seven percent of individuals with major depressive disorder (MDD) also meet criteria for insomnia (Franzen & Buysse, 2008). A number of studies have shown that insomnia can lead to the development of depression (Baglioni et al., 2011; Baglioni, Spiegelhalter, Lombardo, & Riemann, 2010; Riemann, 2009). In a meta-analysis by Baglioni et al., (2011), nondepressed individuals with sleep difficulties have a twofold risk of developing depression compared to individuals without insomnia. In addition, insomnia patients with depression have worse clinical outcomes compared to patients who have insomnia only (Buysse et al., 2008; Staner, 2010). For instance, each disorder may serve to exacerbate or maintain one another (Staner, 2010). Thus the strong bidirectional association between insomnia and depression has been established (Alvaro, Roberts, & Harris, 2013; Buysse et al., 2008; Jansson-Fröjmark & Lindblom, 2008; Kim et al., 2009; Tsuno, Besset, & Ritchie, 2005). Therefore, research is needed to identify mechanisms of how insomnia confers to depression.

An increasing body of literature explores the impact of social support or interpersonal relationships on psychological disturbance (Gunn, Troxel, Hall, & Buysse, 2014; Johnson, Cuellar, & Gershon, 2016; Väänänen, Marttunen, Helminen, & Kaltiala-Heino, 2014). According to multiple studies, social support has been shown to be significantly associated with depression, with low levels of social support being a risk factor for depression (Bettge et al., 2008; Kaltiala-Heino, Rimpelä, Rantanen, & Laippala, 2001; Newman, Newman, Griffen, O'Connor, & Spas, 2007) and high social support playing a protective role against the development of depression (Denny, Fleming, Clark, & Wall, 2004; Piko, Kovacs, & Fitzpatrick, 2009).

Social support has also been implicated as an important factor to consider in insomnia research. While sleep has traditionally been viewed as an intrapersonal problem, recent research has gained

attention on the interpersonal aspects of insomnia (Chu et al., 2016; Rogojanski, Carney, & Monson, 2013). Insomnia affects social support in several ways. First, insomnia affects one's ability to interpret social information (Beattie, Kyle, Espie, & Biello, 2015). For example, insomnia has an effect on social cognition, including prejudice and perspective taking, which may in turn affect social relationships and attenuate social support (Singer, 2012). Additionally, sleep loss has been associated with impaired social functioning and neural systems such as mirror neuron systems related to social emotions, compassion, and empathy (Anderson & Dickinson, 2010; Killgore et al., 2007; Libedinsky et al., 2011; Singer, 2012). Second, poor sleepers have less chance to be supported from others (Chu et al., 2016). It is common for insomnia patients to limit their social activities because of increased fatigue and isolate themselves in an attempt to extend their opportunity to sleep. In addition, they perceive daily stressors to be more stressful than do good sleepers (Morin, Rodrigue, & Ivers, 2003), which may increase reactivity to interpersonal conflict. These processes demonstrate how insomnia is associated with overall social functioning and social support.

Considering previous research, the impact of social support may be an underlying mechanism through which insomnia is linked to depression. In considering the influence of sleep on social support, one potential mechanism by which insomnia may lead to depression is low social support. Despite evidence of this hypothesized pathway, the relation between insomnia, social support, and depression has largely been understudied.

College years have especially been shown to be a high-risk period for insomnia and depression because of challenges of varying schedules and environments (Gress-Smith, Roubinov, Andreotti, Compas, & Luecken, 2015). Furthermore, females are more affected by depression and insomnia compared to males (Roth, 2007; Van De Velde, Bracke, & Levecque, 2010). Females indicate twice higher prevalence of depression and gender is identified as a risk factor of insomnia, with an increased prevalence in females (Roth, 2007; Van De Velde et al., 2010). In addition, sleep disturbance could lead to low levels of social support, primarily for females (Hasler & Troxel, 2010).

In order to better understand the psychological mechanisms that underlie the relationship between insomnia and depression, the present study aimed to investigate the role of social support in the relationship between insomnia and depression in female undergraduates, using a cross-sectional study design. We hypothesized that social support will mediate the relationship between insomnia and depression.

Methods

Participants and procedures

A sample of students was recruited from a university in Seoul, Korea. Data were collected in September of 2015. All participants were currently enrolled in undergraduate psychology courses, and they had the option of participating in the study or completing an alternative assignment for course credit. Informed consent was obtained from all individual participants included in the study. Participants identified times they were available, and were contacted via e-mail to set up an appointment to visit the laboratory. All participants visited the laboratory and completed online questionnaires of insomnia, depression, and social support along with other demographic information, which took 15–20 min to complete.

The current study was approved by the institutional review boards from the institutions where the samples were recruited.

Measures

Demographic information

Demographic information was collected from participants, including their gender, age, and education.

Insomnia Severity Index

The Insomnia Severity Index (ISI; Bastien, Vallieres, & Morin, 2001) is a 7-item self-report questionnaire designed to assess the subjective symptoms and consequences of insomnia (Bastien et al., 2001). Each item is scored on a 0–4 Likert scale, with total scores ranging from 0 to 28. A higher score suggests more severe insomnia. Scores higher than 15 on the ISI indicate clinical insomnia (Bastien et al., 2001). Internal consistency was good in the current samples (Cronbach's $\alpha = .82$).

Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a 14-item self-report questionnaire designed to assess state of anxiety and depression (Zigmond & Snaith, 1983). It composes two subscales, with seven anxiety and seven depression items. Each item is scored on a 0–3 Likert scale, with total scores ranging from 0 to 21. A higher score reflects higher levels of anxiety and depression. For the current study, we used the 7-item depression subscale. Scores higher than 8 on the depression subscale are regarded as clinical depression. Internal consistency was good in the current sample (Cronbach's $\alpha = .86$).

Scale of Social Support

The Scale of Social Support (SSS; Park, 1985) is a 25-item self-report questionnaire designed to measure perceived support through others, including four types of social support behavior; appraisal support, emotional support, informational support, and material support (Park, 1985). Appraisal support means affirmation or positive feedback from others, while emotional support is the form of affective behaviors including love, trust, listening, and caring. Informational support is advice or suggestion and material support is a tangible resource or aid such as money, time, or labor (Park, 1985). Each item is scored on a 1–5 Likert scale, with total scores ranging from 25 to 125. A higher score indicates higher social support from others. The SSS demonstrated excellent internal consistency in the present study samples (Cronbach's $\alpha = .96$).

Statistical analysis

Prior to analysis, data were cleaned and checked for technical errors. All 115 participants completed every item in the study and no cases were removed.

Analyses were conducted using SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics and frequency analysis were used to analyze demographic variables. Correlations were used to examine relationships of major factors such as insomnia, depression, and social support.

To estimate the mediating effect of social support on the association between insomnia and depression, we conducted the mediation model with one mediator (Hayes, 2013) and bootstrap analysis using SPSS PROCESS (Hayes, 2013). Sobel's method has usually tested the significance of the Baron and Kenny style mediation effect by multiple regression. However, this method might have increased the likelihood of Type I error and caused decreased power in small samples (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; MacKinnon, Lockwood, & Williams, 2004). Thus, we conducted the bootstrap analysis to estimate the mediation effect that was recommended when the sample size and mediating effect are both small (Cheung, 2007). For bootstrap analysis, 100 is a justifiable minimum sample size to lower statistical errors (Koopman, Howe, Hollenbeck, & Sin, 2015). In addition, a bootstrapping procedure was performed to examine for mediation effect without assuming normality of sampling distribution (MacKinnon et al., 2002). When the confidence interval (CI) does not include the value 0, the indirect effect is significant (Hayes, 2013). In the current study, bootstrapping was done with 5,000 resamples and bias-corrected 95% CIs were used to investigate the indirect effects.

Results

Descriptive statistics and correlates

We conducted analyses on 115 students who completed questionnaires (mean age 21.77 ± 1.80 ; 100% females). Fifty-six participants (48.7%) reported no insomnia and depression, 19 (16.5%) reported insomnia only, 19 (16.5%) reported depression only, and 21 (18.3%) reported both insomnia and depression. In addition, there were significant correlations between all major factors, including insomnia, depression, and social support (all $ps < .01$). Insomnia and depression were positively correlated and social support was negatively correlated with insomnia and depression (see Table 1 for descriptive statistics and correlates).

Social support as a mediator in the effect of insomnia on depression

Figure 1 presents results of the bootstrapped regression and mediation model for the effects of insomnia on depression through social support. The overall model accounted for approximately 18% of the variance in depression ($R^2 = .18$, $F[1, 113] = 26.36$, $p < .001$). Insomnia significantly predicted social support ($B = -1.04$, standard error [SE] = $.27$, $p < .001$) and social support significantly predicted depression ($B = -.07$, $SE = .01$, $p < .001$). The direct effects of insomnia on depression remained significant after controlling for the effects of social support ($B = .18$, $SE = 0.05$, $p < .001$). The confidence intervals for the indirect effect of social support did not contain 0 (95% confidence interval [CI] [.03, .15]), suggesting that social support was a significant mediator in the relationship between insomnia and depression. The effect size (kappa-squared) for the mediating effect was .13 (CI [.05, .23]), yielding a medium-range effect size.

Table 2 shows that indirect effect of insomnia on depression through four types of social support using the four subscales of the material support, emotional support, appraisal support, and informational support. All types of social support (material support, emotional support,

Table 1. Descriptive statistics and correlations of indicators of insomnia, depression, and social support ($N = 115$).

	1. ISI	2. HADS	3. SSS
1. ISI	1		
2. HADS	.44**	1	
3. SSS	-.34**	-.49**	1
<i>M (SD)</i>	12.81 (5.32)	6.26 (3.28)	97.27 (16.33)
<i>Range</i>	4 – 26	0 – 18	49 – 125

** $p < .01$.

Note. Abbreviations: ISI = Insomnia Severity Index; HADS = Hospital Anxiety and Depression Scale; SSS = Scale of Social Support.

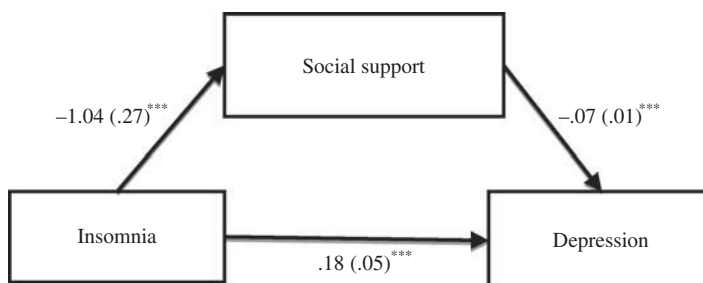


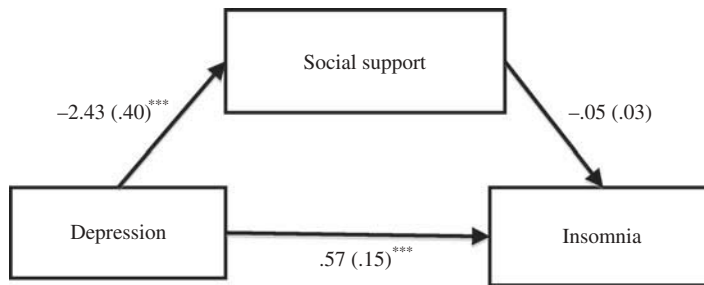
Figure 1. Model with social support as a mediator in the effect of insomnia on depression.

Note. Unstandardized coefficients are presented with standard errors in parentheses. The indirect effect of insomnia on depression through social support was significant (95% confidence interval [.03, .15]). *** $p < .001$.

Table 2. Indirect effect of insomnia on depression through four types of social support (5,000 bootstrap samples).

Mediator	<i>B</i>	<i>SE</i>	BC 95% CI	
			Lower	Upper
Emotional Support	.07	.03	.03	.15
Material Support	.06	.02	.03	.13
Appraisal Support	.06	.02	.02	.14
Informational Support	.04	.02	.01	.11

Note. Abbreviations: *B* = Unstandardized coefficient; *SE* = Standard Error of indirect effect; BC = Bias Corrected; CI = Confidence Interval.

**Figure 2.** Model with social support as a mediator in the effect of depression on insomnia.

Note. Unstandardized coefficients are presented with standard errors in parentheses. The indirect effect of insomnia on depression through social support was not significant (95% confidence interval [-.01, .32]). *** $p < .001$.

appraisal support, and informational support) mediated the relationship between insomnia and depression.

Social support does not mediate the effect of depression on insomnia

Reverse mediation model for the effects of depression on insomnia through social support was presented in Figure 2. The overall model accounted for approximately 18% of the variance in insomnia ($R^2 = .18$, $F[1, 113] = 26.36$, $p < .001$). However, the confidence intervals for the indirect effect of social support contained 0 (95% CI [-.01, .32]), suggesting that social support was not a significant mediator in the effect of depression on insomnia.

Discussion

The current study examined social support as a mediator between insomnia and depression in female undergraduates. The bidirectional relationship between insomnia and depression has been established (Alvaro et al., 2013; Buysse et al., 2008; Jansson-Fröjmark & Lindblom, 2008; Kim et al., 2009; Tsuno et al., 2005). But most studies have been focused on clarifying shared neurobiological mechanisms (Benca & Peterson, 2008) and little is known about the underlying psychological mechanisms. Our study results indicated that social support mediated the effect of insomnia on depression. However, social support was not a significant factor in the effects of depression on insomnia. These results suggest that low social support could be one pathway that insomnia confers to high risk for depression.

There are several possible interpretations for the link between insomnia and social support. First, poor sleep could affect an individual's ability to interpret social information. Previous research suggested that sleep loss associated with social decision making and social emotion such as fairness, compassion, and empathy (Singer, 2012). The lack of ability to interpret social information may have a negative effect on social interaction and these processes may further lead to social support deficits,

resulting in low levels of social support. Second, poor sleepers tend to use ineffective coping skills and they perceived daily stressors as more stressful than good sleepers did (Morin et al., 2003). It is common for insomnia patients to limit their social activities when they experience insomnia symptoms, as they may view social activities in the nighttime as interfering with their bedtime routine. Additionally, increased fatigue due to insomnia symptoms may also limit their social activities, which in turn may lead to social isolation. Finally, individuals who are sleep-deprived look less attractive and trustworthy (Axelsson et al., 2010; Todorov, 2008). Such factors may affect social interaction and social support negatively. Although we did not investigate these factors, it will be important to examine the social behaviors that individuals with insomnia engage in that results in deficits in social support in future research.

The current study expands the literature by suggesting the role of social support in the relationship between insomnia and development of depression. This may partially be explained by the shared biological mechanism of stress reactivity and activation of the hypothalamic-pituitary-adrenal (HPA) axis (Buckley & Schatzberg, 2005). Both depression and insomnia have been associated with HPA axis activation (McKay & Zakzanis, 2010; Vreeburg et al., 2009). And social support has a buffering effect on stress and decrease activation of HPA axis (Hostinar, Sullivan, & Gunnar, 2014). Thus, low levels of social support make individuals with insomnia more vulnerable to stressful life events and increases the likelihood of depression to occur via activation of the HPA axis. It will be informative for future studies to explore the role of physiological markers of social support, such as oxytocin, in the role of insomnia and depression.

Interestingly, social support did not mediate the effects of depression on insomnia. There can be several explanations for this. With few exceptions, a number of studies have shown that depressed individuals report less social support compared to nondepressed individuals (Dobson & Dozois, 2011; Lakey & Orehek, 2011; Väänänen et al., 2014). Because depressed individuals already have low levels of social support, social support may be a less important factor to consider in the relationship from depression to insomnia, as these individuals are already socially isolated. A study by Cacioppo, Hawkley, and Thisted (2010) which investigated the effects of social isolation and depression in a five-year longitudinal study found that social isolation at an earlier time point significantly predicted depression at a later time point, but not vice versa (Cacioppo et al., 2010). Additionally, considering the cross-sectional nature of our study design, the strong associations between depression, insomnia, and social support may have obscured the weaker association between insomnia and social support. Further longitudinal studies will be needed to clarify the mediation effect of social support between insomnia and depression.

The role of social support in the relationship of insomnia leading to higher risk of depression has several important clinical implications. Previous studies have shown that insomnia patients with depression have worse clinical outcomes compared to patients who have insomnia only (Buysse et al., 2008; Staner, 2010). Each disorder may serve to maintain or exacerbate one another and these processes may impede recovery (Staner, 2010). From a clinical point of view, our findings suggest that addressing social support could contribute to preventing development of depression throughout insomnia treatment. For example, including therapeutic components to enhance social support, such as social skills training, in an insomnia treatment program would be useful. Additionally, emphasizing treatment modalities such as behavioral activation in insomnia treatment could help prevent insomnia patients from isolating themselves by limiting social activities due to insomnia symptoms. Further, the current study indicated that four types of social support—material support, emotional support, appraisal support, and informational support—all mediated the relationship between insomnia and depression. These findings suggest that various type of social support could have an effect on the development of depression for individuals who have insomnia.

This study has several limitations. The current study was conducted on female undergraduates. Therefore, the result may not be generalizable to general or clinical populations. Our sample especially showed a relatively high average score on the ISI ($M = 12.81$, $SD = 5.32$) compared to other studies. This was slightly higher than other studies that measured ISI scores in Korean undergraduates (mean age = 21.53, 74.5% female, ISI average score = 8.45; Chu et al., 2016) and

U.S. undergraduates (mean age = 18.7, 55% female, ISI average score = 10.7; Gress-Smith et al., 2015). This difference does not appear to be explained by cross-cultural differences, but may be due to our sample consisting of females only. Females indicate twice higher prevalence of insomnia and a number of studies have shown that females are more affected by depression or insomnia compared to men (Roth, 2007; Van De Velde et al., 2010). We speculate that the higher average of ISI scores in our sample may be due to these gender differences. Additionally, Hasler and Troxel found that sleep disturbance predicted negative social interactions, primarily for females, but not males (Hasler & Troxel, 2010). Insomnia, depression, and the role of social support should also be examined in both genders in future studies. Second, there may have been cultural differences. Considering that South Korea is a collectivistic culture, it is possible that individuals who grow up in collectivistic cultures seek for more social support networks (Kim, Sherman, & Taylor, 2008) and have higher social sensitivity (Way & Lieberman, 2010). Future studies should be conducted on populations of various ages, genders, and cultures. Third, although Koopman and colleague (2015) suggested that 100 is a good minimum sample size to lower statistical errors for bootstrapping methods, the sample size was relatively small in this study. It would be helpful to test a larger sample size to generalize the findings. Fourth, insomnia in our study was measured by self-report assessment. Although previous studies indicated that ISI is useful to assess the subjective symptoms and consequences of insomnia (Bastien et al., 2001), including objective measurements such as polysomnography, actigraphy, or sleep diaries in future studies may help to measure sleep deprivation or sleep patterns more objectively and consistently. Finally, the current study was cross-sectional design. Thus, it precluded inferences verifying causality related to insomnia, social support, and depression. Utilizing a longitudinal design in future studies may be informative to assess a causal relationship among insomnia, social support, and depression.

Funding

This work was supported by the Sungshin University Research Grant of 2017 (2017-1-11-021).

References

- Alvaro, P. K., Roberts, R. M., & Harris, J. K. (2013). A systematic review assessing bidirectionality between sleep disturbances, anxiety, and depression. *Sleep*, *36*(7), 1059–1068. doi:10.5665/sleep.2810
- Anderson, C., & Dickinson, D. L. (2010). Bargaining and trust: The effects of 36-h total sleep deprivation on socially interactive decisions. *Journal of Sleep Research*, *19*(1–Part-1), 54–63. doi:10.1111/j.1365-2869.2009.00767.x
- Axelsson, J., Sundelin, T., Ingre, M., Van Someren, E. J., Olsson, A., & Lekander, M. (2010). Beauty sleep: Experimental study on the perceived health and attractiveness of sleep deprived people. *BMJ*, *341*, c6614. doi:10.1136/bmj.c6614
- Baglioni, C., Battagliese, G., Feige, B., Spiegelhalder, K., Nissen, C., Voderholzer, U., . . . Riemann, D. (2011). Insomnia as a predictor of depression: A meta-analytic evaluation of longitudinal epidemiological studies. *Journal of Affective Disorders*, *135*(1), 10–19. doi:10.1016/j.jad.2011.01.011
- Baglioni, C., Spiegelhalder, K., Lombardo, C., & Riemann, D. (2010). Sleep and emotions: A focus on insomnia. *Sleep Medicine Reviews*, *14*(4), 227–238. doi:10.1016/j.smr.2009.10.007
- Bastien, C. H., Vallieres, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, *2*(4), 297–307. doi:10.1016/s1389-9457(00)00065-4
- Beattie, L., Kyle, S. D., Espie, C. A., & Biello, S. M. (2015). Social interactions, emotion and sleep: A systematic review and research agenda. *Sleep Medicine Reviews*, *24*, 83–100. doi:10.1016/j.smr.2014.12.005
- Benca, R. M., & Peterson, M. J. (2008). Insomnia and depression. *Sleep Medicine*, *9*, S3–S9. doi:10.1016/s1389-9457(08)70010-8
- Bettge, S., Wille, D.-P. N., Barkmann, C., Schulte-Markwort, M., Ravens-Sieberer, U., & Group, B. S. (2008). Depressive symptoms of children and adolescents in a German representative sample: Results of the BELLA study. *European Child & Adolescent Psychiatry*, *17*(1), 71–81. doi:10.1007/s00787-008-1008-x
- Buckley, T. M., & Schatzberg, A. F. (2005). On the interactions of the hypothalamic-pituitary-adrenal (HPA) axis and sleep: Normal HPA axis activity and circadian rhythm, exemplary sleep disorders. *The Journal of Clinical Endocrinology & Metabolism*, *90*(5), 3106–3114. doi:10.1210/jc.2004-1056

- Buysse, D. J., Angst, J., Gamma, A., Ajdacic, V., Eich, D., & Rossler, W. (2008). Prevalence, course, and comorbidity of insomnia and depression in young adults. *Sleep—New York Then Westchester*, 31(4), 473–480. doi:10.5167/uzh-10110
- Cacioppo, J. T., Hawkley, L. C., & Thisted, R. A. (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago health, aging, and social relations study. *Psychology and Aging*, 25(2), 453–463. doi:10.1037/a0017216
- Cheung, M. W. (2007). Comparison of approaches to constructing confidence intervals for mediating effects using structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal*, 14(2), 227–246. doi:10.1080/10705510709336745
- Chu, C., Hom, M. A., Rogers, M. L., Ringer, F. B., Hames, J. L., Suh, S., & Joiner, T. E. (2016). Is insomnia lonely? Exploring thwarted belongingness as an explanatory link between insomnia and suicidal ideation in a sample of South Korean university students. *Journal of Clinical Sleep Medicine: JCSM: Official Publication of the American Academy of Sleep Medicine*, 12(5), 647–652. doi:10.5664/jcsm.5784
- Denny, S., Fleming, T., Clark, T. C., & Wall, M. (2004). Emotional resilience: Risk and protective factors for depression among alternative education students in New Zealand. *American Journal of Orthopsychiatry*, 74(2), 137–149. doi:10.1037/0002-9432.74.2.137
- Dobson, K. S., & Dozois, D. J. (2011). *Risk factors in depression*. Cambridge, MA: Academic Press.
- Franzen, P. L., & Buysse, D. J. (2008). Sleep disturbances and depression: Risk relationships for subsequent depression and therapeutic implications. *Dialogues in Clinical Neuroscience*, 10(4), 473–481.
- Gress-Smith, J. L., Roubinov, D. S., Andreotti, C., Compas, B. E., & Luecken, L. J. (2015). Prevalence, severity and risk factors for depressive symptoms and insomnia in college undergraduates. *Stress and Health*, 31(1), 63–70. doi:10.1002/smi.2509
- Gunn, H. E., Troxel, W. M., Hall, M. H., & Buysse, D. J. (2014). Interpersonal distress is associated with sleep and arousal in insomnia and good sleepers. *Journal of Psychosomatic Research*, 76(3), 242–248. doi:10.1016/j.jpsychores.2013.11.010
- Hasler, B. P., & Troxel, W. M. (2010). Couples' nighttime sleep efficiency and concordance: Evidence for bidirectional associations with daytime relationship functioning. *Psychosomatic Medicine*, 72(8), 794–801. doi:10.1097/psy.0b013e3181eccd08a
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Press.
- Hostinar, C. E., Sullivan, R. M., & Gunnar, M. R. (2014). Psychobiological mechanisms underlying the social buffering of the hypothalamic–pituitary–adrenocortical axis: A review of animal models and human studies across development. *Psychological Bulletin*, 140(1), 256–302. doi:10.1037/a0032671
- Jansson-Fröjmark, M., & Lindblom, K. (2008). A bidirectional relationship between anxiety and depression, and insomnia? A prospective study in the general population. *Journal of Psychosomatic Research*, 64(4), 443–449. doi:10.1016/j.jpsychores.2007.10.016
- Johnson, S. L., Cuellar, A. K., & Gershon, A. (2016). The influence of trauma, life events, and social relationships on bipolar depression. *Psychiatric Clinics of North America*, 39(1), 87–94. doi:10.1016/j.psc.2015.09.003
- Kaltiala-Heino, R., Rimpelä, M., Rantanen, P., & Laipalla, P. (2001). Adolescent depression: The role of discontinuities in life course and social support. *Journal of Affective Disorders*, 64(2), 155–166. doi:10.1016/s0165-0327(00)00233-0
- Killgore, W. D., Killgore, D. B., Day, L. M., Li, C., Kamimori, G. H., & Balkin, T. J. (2007). The effects of 53 hours of sleep deprivation on moral judgment. *Sleep—New York Then Westchester*, 30(3), 345–352. doi:10.1093/sleep/30.3.345
- Kim, H. S., Sherman, D. K., & Taylor, S. E. (2008). Culture and social support. *American Psychologist*, 63(6), 518–526. doi:10.1037/0003-066x
- Kim, J. M., Stewart, R., Kim, S. W., Yang, S. J., Shin, I. S., & Yoon, J. S. (2009). Insomnia, depression, and physical disorders in late life: A 2-year longitudinal community study in Koreans. *Sleep*, 32(9), 1221–1228. doi:10.1093/sleep/32.9.1221
- Koopman, J., Howe, M., Hollenbeck, J. R., & Sin, H. P. (2015). Small sample mediation testing: Misplaced confidence in bootstrapped confidence intervals. *Journal of Applied Psychology*, 100(1), 194–202. doi:10.1037/a0036635
- Lakey, B., & Orehek, E. (2011). Relational regulation theory: A new approach to explain the link between perceived social support and mental health. *Psychological Review*, 118(3), 482–495. doi:10.1037/a0023477
- Libedinsky, C., Smith, D. V., Teng, C. S., Namburi, P., Chen, V. W., Huettel, S. A., & Chee, M. W. (2011). Sleep deprivation alters valuation signals in the ventromedial prefrontal cortex. *Frontiers in Behavioral Neuroscience*, 5, 70. doi:10.3389/fnbeh.2011.00070
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, 7(1), 83–104. doi:10.1037/1082-989x.7.1.83
- MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of the product and resampling methods. *Multivariate Behavioral Research*, 39(1), 99–128. doi:10.1207/s15327906mbr3901_4

- McKay, M. S., & Zakzanis, K. K. (2010). The impact of treatment on HPA axis activity in unipolar major depression. *Journal of Psychiatric Research*, 44(3), 183–192. doi:10.1016/j.jpsychires.2009.07.012
- Morin, C. M., Rodrigue, S., & Ivers, H. (2003). Role of stress, arousal, and coping skills in primary insomnia. *Psychosomatic Medicine*, 65(2), 259–267. doi:10.1097/01.psy.0000030391.09558.a3
- Newman, B. M., Newman, P. R., Griffen, S., O'Connor, K., & Spas, J. (2007). The relationship of social support to depressive symptoms during the transition to high school. *Adolescence*, 42(167), 441–460.
- Park, J.-W. (1985). *A study to development a scale of social support* (Doctoral dissertation). Yonsei University, Seoul, Korea.
- Piko, B. F., Kovacs, E., & Fitzpatrick, K. M. (2009). What makes a difference? Understanding the role of protective factors in Hungarian adolescents' depressive symptomatology. *European Child & Adolescent Psychiatry*, 18(10), 617–624. doi:10.1007/s00787-009-0022-y
- Riemann, D. (2009). Does effective management of sleep disorders reduce depressive symptoms and the risk of depression? *Drugs*, 69(2), 43–64. doi:10.2165/11531130-000000000-00000
- Rogojanski, J., Carney, C. E., & Monson, C. M. (2013). Interpersonal factors in insomnia: A model for integrating bed partners into cognitive behavioral therapy for insomnia. *Sleep Medicine Reviews*, 17(1), 55–64. doi:10.1016/j.smr.2012.02.003
- Roth, T. (2007). Insomnia: Definition, prevalence, etiology, and consequences. *Journal of Clinical Sleep Medicine: JCSM: Official Publication of the American Academy of Sleep Medicine*, 3(5 Suppl), S7.
- Singer, T. (2012). The past, present and future of social neuroscience: A European perspective. *Neuroimage*, 61(2), 437–449. doi:10.1016/j.neuroimage.2012.01.109
- Staner, L. (2010). Comorbidity of insomnia and depression. *Sleep Medicine Reviews*, 14(1), 35–46. doi:10.1016/j.smr.2009.09.003
- Todorov, A. (2008). Evaluating faces on trustworthiness: An extension of systems for recognition of emotions signaling approach/avoidance behaviors. *Annals of the New York Academy of Sciences*, 1124(1), 208–224. doi:10.1196/annals.1440.012
- Tsuno, N., Besset, A., & Ritchie, K. (2005). Sleep and depression. *The Journal of Clinical Psychiatry*, 66(10), 1254–1269. doi:10.4088/jcp.v66n1008
- Väänänen, J.-M., Marttunen, M., Helminen, M., & Kaltiala-Heino, R. (2014). Low perceived social support predicts later depression but not social phobia in middle adolescence. *Health Psychology and Behavioral Medicine: An Open Access Journal*, 2(1), 1023–1037. doi:10.1080/21642850.2014.966716
- Van De Velde, S., Bracke, P., & Levecque, K. (2010). Gender differences in depression in 23 European countries. Cross-national variation in the gender gap in depression. *Social Science & Medicine*, 71(2), 305–313. doi:10.1016/j.socscimed.2010.03.035
- Vreeburg, S. A., Hoogendijk, W. J., Van Pelt, J., DeRijk, R. H., Verhagen, J. C., Van Dyck, R., . . . Penninx, B. W. (2009). Major depressive disorder and hypothalamic-pituitary-adrenal axis activity: Results from a large cohort study. *Archives of General Psychiatry*, 66(6), 617–626. doi:10.1001/archgenpsychiatry.2009.50
- Way, B. M., & Lieberman, M. D. (2010). Is there a genetic contribution to cultural differences? Collectivism, individualism and genetic markers of social sensitivity. *Social Cognitive and Affective Neuroscience*, 5(2–3), 203–211. doi:10.1093/scan/nsq059
- Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, 67(6), 361–370. doi:10.1111/j.1600-0447.1983.tb09716.x