



Connecting the dots between insomnia and suicidal ideation: The mediating roles of depression, emotion dysregulation and thwarted belonging

Results

Cite this article: Simmons Z, Baldwin S, Jones J, Davis E, Sherriff D, Jube E, Wright A, Cruickshank J, Cheney E, Mills AJ, Chugg C, Crawford O, and Kay DB (2024). Connecting the dots between insomnia and suicidal ideation: The mediating roles of depression, emotion dysregulation and thwarted belonging. *Research Directions: Sleep Psychology*. **1**, e10, 1–9. <https://doi.org/10.1017/slp.2024.2>

Received: 29 December 2023

Revised: 24 June 2024

Accepted: 22 July 2024

Keywords:

insomnia; suicidality; suicidal ideation; interpersonal theory of suicide; emotion dysregulation

Corresponding author:

Daniel B. Kay; Email: daniel_kay@byu.edu

Zach Simmons¹, Scott Baldwin¹, Jolynn Jones¹, Elijah Davis², Dustin Sherriff¹, Eric Jube², Andrew Wright², Jared Cruickshank², Eric Cheney², Andrew J. Mills², Carter Chugg², Olivia Crawford² and Daniel B. Kay¹

¹Department of Psychology, Brigham Young University, Provo, UT, USA and ²Department of Neuroscience, Brigham Young University, Provo, UT, USA

Abstract

Insomnia's impact on psychological functioning is known to increase suicide risk. The underlying mechanisms of this association are unclear. This study explored psychological factors including depression, emotion dysregulation, perceived burdensomeness and thwarted belongingness as possible mechanisms in the association between insomnia and suicidal ideation in a nationally representative sample for age, sex and race in the United States. Participants ($N = 428$) completed a Qualtrics survey of demographics, Insomnia Severity Index, Difficulties in Emotion Regulation Scale, Interpersonal Needs Questionnaire, Frequency of Suicidal Ideation Inventory and PROMIS-Depression and PROMIS-Anxiety short forms. Regression analyses and structural equation modeling were used. Insomnia severity was associated with greater suicidality ($p < 0.001$, $CI = 0.19-0.31$). When accounting for depression severity, emotion dysregulation and perceived burdensomeness fully mediated insomnia-suicidal ideation frequency association ($\beta = 0.04$, $p = 0.045$; $\beta = 0.24$, $p < 0.001$). Insomnia has major implications on psychological functioning, which may serve as mechanisms through which insomnia confers risk for suicidality. Our model posits that insomnia prevents regional sleep restoration in brain regions involved in psychological functioning, thereby conferring risk for suicidality. Insomnia may be an ideal upstream target for reducing suicidality and its risk factors, including depression, emotion dysregulation and perceived burdensomeness.

Insomnia involves difficulty going to sleep or going back to sleep when awakened in the night or early morning. Approximately 10–15% of adults have insomnia disorder, making it the most prevalent sleep disorder, and periodic symptoms of insomnia are far more common in the general population affecting over 30% annually (Chung et al., 2015; Roth 2007). Insomnia can have a profound impact on psychological functioning and has been linked to poorer mental health, cognitive performance deficits and averse work-related outcomes (Kucharczyk et al., 2012; Leger & Bayon 2010; Léger et al., 2014). The negative impact of insomnia on psychological functioning, at its height, may influence one's desire to live. Like insomnia, rates of suicide have risen in the United States in recent decades (Garland et al., 2018; Hedegaard et al., 2020), and there is mounting evidence for a close association between symptoms of insomnia and suicidality (Pigeon et al., 2012). Several psychological factors have been studied as potential mechanisms, and some studies suggest that depression does not fully explain this association (Bernert & Nadorff 2015; Bjørngaard et al., 2011; Kay, Dombrovski et al., 2016; Simmons et al., 2021; Simmons et al., 2020; Tubbs et al., 2022). This study addresses the question, “What role do sleep and circadian rhythms play in psychological functioning including motivation, emotion, cognition and performance?” by testing several psychological factors that may explain the association between insomnia and suicidal ideation frequency including emotion dysregulation, thwarted belongingness and perceived burdensomeness, while accounting for depression.

Emotion regulation, as described by Gratz and Roemer, is a multifaceted construct involving “the (a) awareness and understanding of emotions, (b) acceptance of emotions, (c) ability to control impulsive behaviors and behave in accordance with desired goals when experiencing negative emotions, and (d) ability to use situationally appropriate emotion regulation strategies flexibly to modulate emotional responses as desired in order to meet individual goals and situational demands” (Gratz & Roemer 2004). The absence of any of these facets is thought to indicate emotion dysregulation. Emotion dysregulation is associated with insomnia and has been proposed as a mechanism through which insomnia and general psychiatric impairments are related (Vanek et al., 2020). More specifically, emotion dysregulation may be a mechanism in

© The Author(s), 2024. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.



the association between insomnia and suicidal ideation (Bernert & Joiner 2007; Bernert & Nadorff 2015; Chu *et al.*, 2017).

Joiner's interpersonal theory of suicide (IPTS) is a prominent explanation of suicide that involves three major risk factors: thwarted belongingness, perceived burdensomeness and acquired capacity (Van Orden *et al.*, 2010). Thwarted belongingness refers to an unmet basic human need for social connectedness, leading to social isolation and interpersonal distress. Perceived burdensomeness refers to one's maladaptive perception that suicide would relieve the burden they impose on the world (Van Orden *et al.*, 2010). These two factors, but not acquired capacity, have been found to correlate with insomnia and suicidality, and there is evidence they may be mechanisms in the association between insomnia and suicidal ideation (Chu *et al.*, 2016; Chu *et al.*, 2017; Golding *et al.*, 2015; Nadorff *et al.*, 2014; Van Orden *et al.*, 2010). Other studies are mixed or failed to show that these factors are involved in the association between insomnia and suicidal ideation (Britton *et al.*, 2019; Chu *et al.*, 2016; Hom *et al.*, 2017; Hom *et al.*, 2019). In this study, we aimed to determine whether emotion dysregulation, thwarted belongingness or perceived burdensomeness play a mediating role in the insomnia-suicidal ideation severity association, even when accounting for depression.

Methods

A Qualtrics team recruited participants from the United States to complete an anonymous online survey between April and May of 2022. Participants were recruited from a number of sources including website intercept recruitment, member referrals, targeted email lists, gaming sites, customer loyalty web portals, permission-based networks and social media. We requested that the Qualtrics team strive for a sample that was nationally representative by age (18–34: 30%, 35–54: 32%, 55+: 38%), race (White: 75%, Black: 13%, Asian or Pacific Islander: 6%, American Indian/Alaskan Native or Other: 6%) and gender (male: 48%, female: 52%) based on United States census data to increase the generalizability of our findings. Participants were informed of the risks of the survey and provided informed consent electronically. To protect the participants, the national suicide prevention hotlines and texting services were provided at the beginning and end of the survey. Following informed consent, participants completed several questionnaires to assess demographics, insomnia severity, suicidal ideation frequency, emotional regulation, thwarted belongingness and perceived burdensomeness. Sample size was determined through previous study designs, as well as power analyses. Previous cross-sectional mediational studies investigating the role components of the IPTS play in the association between insomnia symptoms and suicidality have used sample sizes of 552 college students (Chu *et al.*, 2016), 937 United States (U.S.) military service members, 3,386 Army recruiters, 417 military veterans (Hom *et al.*, 2017), 469 U.S. undergraduate students, 352 adult mental health outpatients, 858 U.S. firefighters (Chu *et al.*, 2017), 747 undergraduate students, 604 undergraduate students (Nadorff *et al.*, 2014) and 151 adolescent psychiatric inpatients (Zullo *et al.*, 2017). Further, our power analysis found that a sample of 400 participants would allow us to distinguish small to medium effect sizes ($f^2 = 0.04$) with .85 power (G^*Power 3). Given previous studies' sample sizes and sample makeup and our power analyses, we suggest that a nationally representative sample of 400 individuals is sufficient for our study and offers a meaningful addition to the literature.

To maximize the variability of insomnia severity, a stratified sample with at least 100 participants for each quartile of insomnia

severity according to the Insomnia Severity Index (ISI) was recruited: 106 had minimal insomnia symptoms (ISI = 0–7), 107 had subthreshold insomnia (ISI = 8–14), 108 had moderate severity clinical insomnia symptoms (ISI = 15–21) and 103 had severe clinical insomnia (ISI = 22–28).

The Qualtrics team provided a sample of 428 participants who completed the survey without any missing data and who denied having a sleep apnea diagnosis. The Qualtrics team sought to ensure that demographic features were stratified across all four groups to avoid sampling bias. Four participants in the dataset they provided were excluded from analyses for completing the survey too quickly (<490 seconds). The analysis sample approximated national representation, 52% identified as female, 58% were white and 46% endorsed never being married. Participants with education levels from less than a high school diploma to doctorate and professional degrees, ages from 18 to 89 and an annual income from <\$10,000 to >\$190,000 were represented. Table 1 shows demographic features in the overall sample as well as across insomnia severity groups.

Measures

Demographics included were gender (woman, man, non-binary, other), age (18–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, 85–89), race (American Indian/Alaska Native, Asian, Black/African American, Native Hawaiian or Other Pacific Islander, White, multiracial, other), education (less than a high school diploma, high school degree or equivalent (e.g., GED), some college, associate degree, bachelor's degree, master's degree, professional degree, doctorate), income (<\$10,000, >\$10,000–\$40,000, \$40,001–\$90,000, \$90,001–\$190,000, >\$190,000) and marital status (never married, married, widowed, divorced, separated). Participants were asked to report the medications they were currently taking in a fill-in-the-blank format and any mental disorders they were currently and formally diagnosed with (depressive, psychotic, anxiety, personality, substance use, bipolar, neurodevelopmental, neurocognitive, trauma-related, obsessive-compulsive and somatic disorders) from a multi-selection item.

Insomnia severity was determined using the ISI, a widely used and well-validated measure of insomnia severity over the past 2 weeks (Bastien *et al.*, 2001). Emotional dysregulation was determined using the Difficulties in Emotion Regulation Scale (DERS), a 36-item self-report measure that asks participants to indicate the frequency of experiences they have that are related to emotion (Gratz & Roemer 2004). The DERS has excellent internal consistency ($\alpha = 0.93$), correlates well with the Negative Mood Regulation Scale ($r = 0.69$, $p < 0.01$) and demonstrates good test-retest reliability ($\rho = .88$, $p < 0.01$) (Gratz & Roemer 2004). Thwarted belongingness and perceived burdensomeness were determined using the Interpersonal Needs Questionnaire (INQ), a 15-item self-report measure. The sum of the first six items was the subscale for perceived burdensomeness, while the last nine items served as the subscale for thwarted belongingness. The INQ showed a good fit on confirmatory factor analysis in terms of the Comparative Fit Index (0.86–0.92), Tucker-Lewis Index (0.84–0.90), Root Mean Square Error of Approximation (0.06–0.08), and Standardized Root Mean Square Residual (0.05–0.07) (Van Orden *et al.*, 2012). Increased INQ scores predicted higher suicidality (thwarted belongingness 95% Confidence Interval for the Incidence Rate Ratio (CI IRR) = 1.007–1.009 and perceived burdensomeness 95% CI IRR = 1.04–1.90). Suicidal ideation frequency was determined using the Frequency of Suicidal

Table 1. Demographic and psychological features across insomnia severity groups

Characteristic	Overall sample				
	(<i>n</i> = 424)	NI (<i>n</i> = 106)	SI (<i>n</i> = 107)	CIM (<i>n</i> = 108)	CIS (<i>n</i> = 103)
Gender					
Man	195 (46%)	35 (33%)	56 (52%)	65 (60%)	39 (38%)
Woman	221 (52%)	71 (67%)	49 (46%)	39 (36%)	62 (60%)
Non-binary	7 (2%)	0 (0%)	2 (2%)	3 (3%)	2 (2%)
Other	1 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)
Age					
18–24	57 (13%)	16 (15%)	12 (11%)	15 (14%)	14 (14%)
25–34	68 (16%)	14 (13%)	14 (13%)	14 (13%)	26 (25%)
35–44	77 (18%)	15 (14%)	23 (22%)	25 (23%)	14 (14%)
45–54	60 (14%)	11 (10%)	18 (17%)	19 (18%)	12 (12%)
55–64	70 (17%)	19 (18%)	11 (10%)	17 (16%)	23 (22%)
65–74	68 (16%)	20 (19%)	22 (21%)	15 (14%)	11 (11%)
75–84	23 (5%)	11 (10%)	6 (6%)	3 (3%)	3 (3%)
85–89	1 (0%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
American Indian/Alaska Native	11 (3%)	4 (4%)	2 (2%)	3 (3%)	2 (2%)
Asian	38 (9%)	17 (16%)	13 (12%)	6 (6%)	2 (2%)
Black/African American	91 (21%)	36 (34%)	21 (20%)	22 (20%)	12 (12%)
Native Hawaiian or Other Pacific Islander	3 (1%)	1 (1%)	1 (1%)	1 (1%)	0 (0%)
White	244 (58%)	38 (36%)	62 (58%)	64 (59%)	80 (77%)
Multiracial	21 (5%)	4 (4%)	4 (4%)	6 (6%)	7 (7%)
Other	16 (4%)	6 (6%)	4 (4%)	6 (6%)	0 (0%)
Education					
Less than high school diploma	20 (5%)	6 (6%)	4 (4%)	7 (6%)	3 (3%)
High school degree or equivalent	125 (29%)	25 (24%)	39 (36%)	30 (28%)	31 (30%)
Some college, no degree	110 (26%)	27 (25%)	20 (19%)	26 (24%)	37 (36%)
Associate's degree	51 (12%)	14 (13%)	10 (9%)	17 (16%)	10 (10%)
Bachelor's degree	81 (19%)	18 (17%)	25 (23%)	20 (19%)	18 (17%)
Master's degree	29 (7%)	11 (10%)	9 (8%)	5 (5%)	4 (4%)
Professional degree	4 (1%)	1 (1%)	0 (0%)	3 (3%)	0 (0%)
Doctorate	4 (1%)	4 (4%)	0 (0%)	0 (0%)	0 (0%)
Income					
<\$10,000	69 (16%)	17 (16%)	18 (17%)	15 (14%)	19 (18%)
\$10,000–\$40,000	164 (39%)	46 (43%)	32 (30%)	46 (43%)	40 (39%)
\$40,001–\$90,000	131 (31%)	29 (27%)	32 (30%)	34 (31%)	36 (35%)
\$90,001–\$190,000	48 (11%)	8 (8%)	21 (20%)	12 (11%)	7 (7%)
>\$190,000	12 (3%)	6 (6%)	4 (4%)	1 (1%)	1 (1%)
Marital status					
Divorced	52 (12%)	15 (14%)	5 (5%)	15 (14%)	17 (17%)
Married	152 (36%)	42 (40%)	44 (41%)	38 (35%)	28 (27%)
Never married	196 (46%)	40 (38%)	56 (52%)	50 (46%)	50 (49%)
Separated	10 (2%)	3 (3%)	1 (1%)	2 (2%)	4 (4%)
Widowed	14 (3%)	6 (6%)	1 (1%)	3 (3%)	4 (4%)

(Continued)

Table 1. (Continued)

Characteristic	Overall sample				
	(<i>n</i> = 424)	NI (<i>n</i> = 106)	SI (<i>n</i> = 107)	CIM (<i>n</i> = 108)	CIS (<i>n</i> = 103)
Suicidal ideation frequency	10 (6)	6 (3)	9 (5)	10 (5)	13 (6)
Depression severity	21 (9)	12 (5)	20 (9)	24 (8)	29 (7)
Anxiety severity	19 (8)	12 (5)	18 (7)	22 (6)	25 (6)
Emotion dysregulation	89 (28)	66 (19)	85 (24)	98 (25)	106 (28)
Thwarted belonging	33 (14)	25 (13)	31 (13)	35 (13)	41 (14)
Perceived burdensomeness	15 (10)	9 (6)	14 (10)	15 (10)	21 (12)

Note: NI = no clinically significant insomnia, SI = subthreshold insomnia, CIM = clinical insomnia (moderate severity), CIS = clinical insomnia (severe), *M*(*SD*), *n*(%).

Ideation Inventory (FSII) total score, a 5-item self-report measure that asks participants to assess the frequency of suicidal ideation-related experiences over the past year. The FSII has excellent internal consistency ($\alpha = 0.96$), strong convergent validity with other measures of depression including the Adult Suicidal Ideation Questionnaire ($r = 0.88$, $p < 0.01$), Suicide Behaviors Questionnaire-Revised ($r = 0.85$, $p < 0.01$), and Beck Depression Inventory ($r = 0.54$, $p < 0.01$), and moderate test-retest reliability ($\rho = 0.61$) (Chang & Chang, 2016). Depression severity was measured using the Patient-Reported Outcomes Measurement Information System (PROMIS) Emotional Distress – Depression – Short Form, an 8-item self-report instrument. Anxiety severity was evaluated using the PROMIS Emotional Distress – Anxiety – Short Form, a 7-item self-report measure. The PROMIS measures display high internal consistency ($\alpha = .95$ and $.93$, respectively) and good convergent validity with the Center for Epidemiologic Studies Depression Scale ($r = .83$ and $.80$, respectively) and are sensitive to change in treatment (Pilkonis et al., 2011; Schalet et al., 2016).

Statistical analysis

Multiple regression analyses between self-reported insomnia and suicidal ideation frequency were used to gauge the strength of this relationship while controlling for demographic variables, depression and anxiety. We used structural equation modeling to perform an uncontrolled mediational analysis to understand the role emotion regulation, thwarted belongingness and perceived burdensomeness play in the relationship between insomnia severity and suicidal ideation frequency. We then used a controlled mediational model to account for depression in the previously described analysis. The mediational models are saturated. All analyses were completed in STATA 17 (StataCorp, 2021. Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC).

Results

Results for the uncontrolled and controlled multiple regression models are presented in Table 2. In both analyses, we controlled for demographic variables (age, gender, race-ethnicity, educational attainment and marital status). In the controlled model, we also included depression and anxiety severity. The uncontrolled model was significant, $F_{(32,391)} = 5.39$, $p < 0.001$, $R^2 = 0.306$. Insomnia severity was associated with increased suicidal ideation frequency, even when accounting for demographic variables. The age categories of 55–64, 65–74 or 75–84 were associated with lower suicidal ideation frequency, and individuals who identified as

Black/African American had lower suicidal ideation frequency. The controlled model was also significant, $F_{(32,389)} = 11.37$, $p < 0.001$, $R^2 = 0.498$. Insomnia was not significantly associated with suicidal ideation frequency when controlling for anxiety and depression severity. Individuals who identified as American Indian/Alaska Native or as being multiracial had higher suicidal ideation frequency. Depression severity was also associated with higher suicidal ideation frequency.

Results for the structural equation models are presented in Figures 1 and 2. In both models, we tested whether the association between insomnia severity and suicidal ideation frequency was mediated by emotion regulation, thwarted belongingness and perceived burdensomeness using maximum likelihood estimation. Both the uncontrolled and controlled models were saturated. Unstandardized beta values are reported.

In the controlled model, we accounted for depression severity in addition to emotion regulation, thwarted belongingness and perceived burdensomeness. In this model, insomnia severity was significantly associated with emotion regulation, thwarted belongingness and perceived burdensomeness. Emotion regulation and perceived burdensomeness were significantly associated with suicidal ideation frequency, while thwarted belongingness was not. The indirect effects for emotion regulation and perceived burdensomeness were significant, while the indirect effect for thwarted belongingness was not. The direct effect, indirect effect and the total effect were significant (Figure 1). Chi-squared fit statistics for the uncontrolled model was $\chi^2(10, n = 424) = 1195.79$, $p < 0.001$. The ratio of the indirect effect to the total effect between insomnia severity and suicidal ideation frequency was 0.84, suggesting that 84% of the variance in the total effect was explained by the mediator variables. These results suggest that the association between insomnia severity and suicidal ideation frequency is partially mediated by emotion regulation and perceived burdensomeness.

Regarding the direct effects in the controlled model, insomnia severity was significantly associated with emotion regulation, but not with thwarted belongingness or perceived burdensomeness. Emotion regulation and perceived burdensomeness were significantly associated with suicidal ideation frequency, while thwarted belongingness was not. The indirect effects in the insomnia–suicidal ideation frequency path for emotion regulation, thwarted belongingness and perceived burdensomeness were not significant. The direct effect between insomnia severity and depression severity was significant. Further, the direct effects between depression severity and suicidal ideation frequency, emotion regulation, thwarted belongingness and perceived

Table 2. Insomnia severity as a predictor of suicidal ideation frequency

	Model 1		Model 2	
	<i>p</i>	95% <i>CI</i>	<i>p</i>	95% <i>CI</i>
Insomnia severity	>0.001***	0.19–0.31	0.836	–0.06–0.08
Age (18–24)				
25–34	0.703	–1.45–2.15	0.955	–1.58–1.49
35–44	0.262	–2.81–0.77	0.376	–2.22–0.84
45–54	0.654	–2.35–1.48	0.741	–1.37–1.92
55–64	0.039*	–3.92––0.10	0.222	–2.66–0.62
65–74	0.004**	–5.03––0.96	0.452	–2.48–1.10
75–84	0.017*	–6.03––0.61	0.258	–3.70–0.99
85–89	0.391	–14.53–5.69	0.746	–10.06–7.22
Gender (Man)				
Woman	0.400	–1.51–0.61	0.585	–1.16–0.66
Non-binary	0.798	–4.62–3.55	0.491	–4.72–2.27
Other	0.475	–6.18–13.23	0.330	–4.19–12.42
Race-ethnicity (White)				
American Indian/Alaska Native	0.152	–0.86–5.52	0.009**	0.91–6.37
Asian	0.205	–3.15–0.68	0.260	–2.57–0.70
Black/African American	0.037*	–2.71––0.09	0.279	–1.74–0.50
Native Hawaiian/Pacific Islander	0.586	–7.18–4.06	0.762	–5.54–4.06
Multiracial	0.093	–0.32–4.19	0.042*	0.07–3.92
Other	0.245	–4.06–1.04	0.417	–3.08–1.28
Educational attainment (Less than high school degree)				
High school degree or equivalent	0.915	–2.47–2.21	0.870	–1.84–2.17
Some college, no degree	0.470	–3.28–1.52	0.361	–3.00–1.10
Associate’s degree	0.492	–3.56–1.72	0.280	–3.50–1.01
Bachelor’s degree	0.521	–3.38–1.72	0.480	–2.96–1.39
Master’s degree	0.305	–4.55–1.43	0.437	–3.56–1.54
Professional degree	0.923	–5.75–5.21	0.361	–6.86–2.50
Doctorate degree	0.820	–6.07–4.81	0.925	–4.88–4.44
Income (<\$10,000)				
\$10,000–\$40,000	0.579	–1.89–1.06	0.851	–1.38–1.14
\$40,001–\$90,000	0.057	–3.13–0.04	0.329	–2.04–0.68
\$90,001–\$190,000	0.565	–2.70 – 1.47	0.561	–1.26–2.32
>\$190,000	0.334	–4.92–1.67	0.962	–2.75–2.89
Marital status (Never married)				
Divorced	0.746	–1.40–1.95	0.425	–0.85–2.01
Married	0.448	–1.73–0.77	0.853	–1.17–0.97
Separated	0.187	–1.04–5.29	0.297	–1.27–4.45
Widowed	0.787	–3.26–2.47	0.485	–3.31–1.58
Depression severity	–	–	<0.001	0.32–0.50
Anxiety severity	–	–	0.320	–0.17–0.06

Note: Model 1 controls for demographic variables. Model 2 controls for demographic variables, anxiety severity and depression severity. **p* < 0.05, ***p* < .01, ****p* < .001.

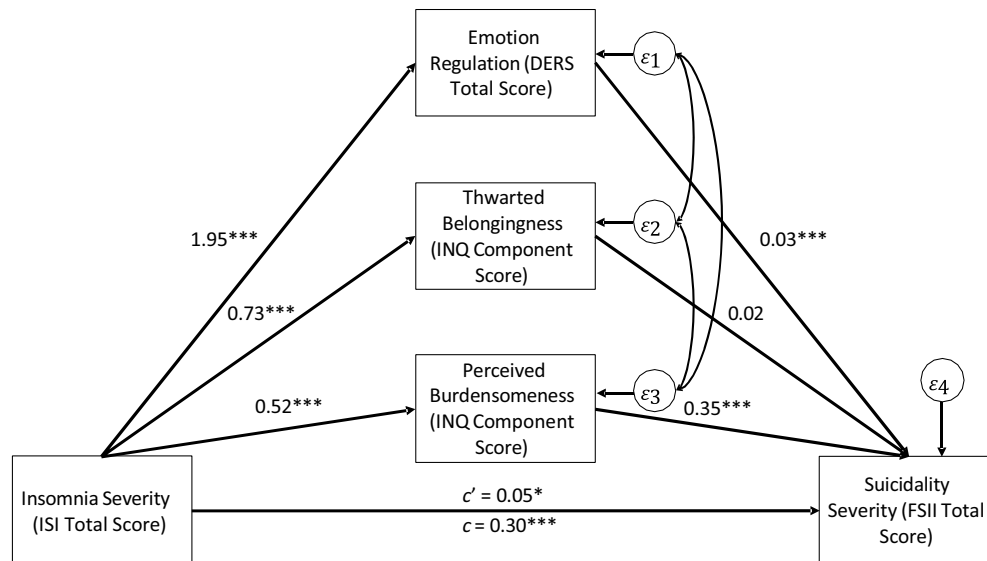


Figure 1. Uncontrolled mediational model for emotion regulation, thwarted belongingness and perceived burdensomeness in insomnia–suicidal ideation frequency association. Note: ISI: Insomnia Severity Index, DERS: Difficulties in Emotion Regulation Scale, INQ: Interpersonal Needs Questionnaire, FSII: Frequency of Suicidal Ideation Inventory.

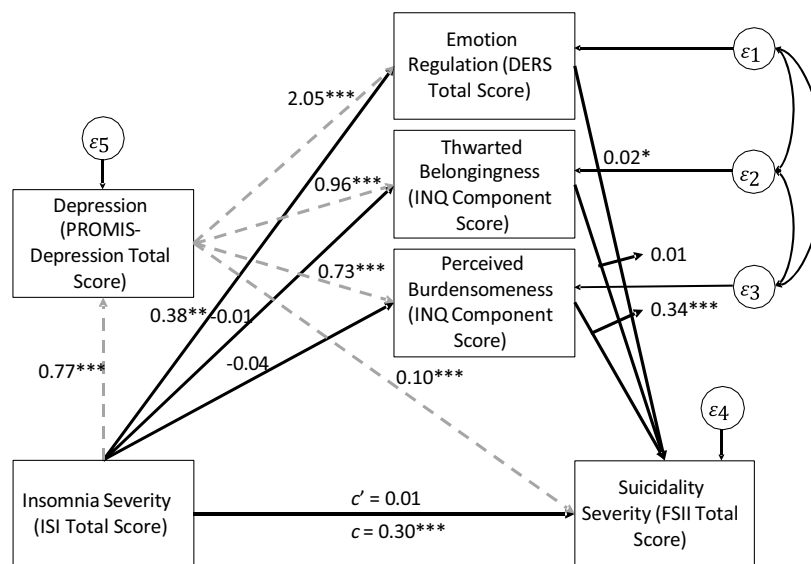


Figure 2. Controlled mediational model for emotion regulation, thwarted belongingness and perceived burdensomeness in insomnia–suicidal ideation frequency association. Note: ISI: Insomnia Severity Index, DERS: Difficulties in Emotion Regulation Scale, INQ: Interpersonal Needs Questionnaire, PROMIS-Depression: The Patient-Reported Outcomes Measurement Information System Emotional Distress – Depression – Short Form, FSII: Frequency of Suicidal Ideation Inventory.

burdensomeness were significant. The indirect effect in the insomnia-suicidality path through depression was significant. The indirect effects in the insomnia-mediator paths through depression were significant for emotion regulation, thwarted belongingness and perceived burdensomeness. The indirect effects for the depression-suicidality paths through the mediator variables were significant for emotion regulation and perceived burdensomeness, but not thwarted belongingness. Regarding the association between insomnia and suicidal ideation frequency, the direct effect was not significant, while the indirect effect and the total effect were significant (Figure 2). Chi-squared fit statistics for the controlled model was, $\chi^2(15, n = 424) = 1705.86, p < 0.001$. The ratio of the indirect effect to the total effect between insomnia

severity and suicidal ideation frequency was 0.96, suggesting that 96% of the variance in the total effect was explained by the mediator variables. These results suggest that the association between insomnia severity and suicidal ideation frequency is mediated by emotion regulation and perceived burdensomeness through depression severity.

Discussion

In this study, we found evidence that several psychological factors are involved in the association between insomnia and suicidal ideation. In a sample that approximated a representative U.S. adult sample, we replicated previous studies suggesting that insomnia is

an important marker and risk factor for suicidality through several psychological factors. Greater insomnia severity was associated with more frequent suicidal ideation over the past year, even when controlling for demographic features. When accounting for depression, we found that emotion dysregulation and perceived burdensomeness, but not thwarted belongingness, played unique roles in the association between insomnia and suicidal ideation frequency. This is consistent with a previous study where an indirect effect for insomnia symptoms was observed through perceived burdensomeness and depressive symptoms (Zullo et al., 2017). While insomnia severity was associated with thwarted belongingness, it did not explain the association between insomnia and suicidal ideation frequency. Two previous studies found that thwarted belongingness mediated insomnia and suicidality cross-sectionally but not longitudinally (Chu et al., 2016; Chu et al., 2017), and an additional study indicated a similar mediation effect cross-sectionally but not longitudinally through both thwarted belongingness and perceived burdensomeness (Hom et al., 2019). One study found that thwarted belongingness explained the association between insomnia and suicidal ideation frequency only through depression (Britton et al., 2019), while another found that the relationship between insomnia and suicidal ideation is explained by thwarted belongingness only among Veterans, but not among civilians or service members (Tubbs et al., 2022). Another set of studies indicated that thwarted belongingness and perceived burdensomeness play equally significant roles in mediating the relationship between insomnia symptoms and suicidal ideation. In one sample, thwarted belongingness was found to have a stronger indirect effect on suicidal ideation than perceived burdensomeness (Tucker et al., 2021). As collective results are inconclusive, further study, especially with longitudinal methodologies, is necessary to understand the mediating effects of thwarted belongingness in this association. Although thwarted belongingness is an important and overlooked association of insomnia, it is possible that the association between insomnia and suicidal ideation frequency is better accounted for by emotion dysregulation and perceived burdensomeness, via depression.

Our findings suggest that depression is a major factor when considering the specific association between insomnia severity and suicidal ideation frequency. This association was fully mediated by depression symptoms severity. Several prior studies suggest that depression severity may account for the association between insomnia symptoms and suicide risk (Bishop et al., 2019; Britton et al., 2019; Bryan et al., 2015; Guo et al., 2024; Nadorff et al., 2013; Pompili et al., 2013; Zullo et al., 2017), while many others suggest insomnia is a risk factor for suicidality above and beyond depression (Becker et al., 2018; Bjørngaard et al., 2011; Bozzay et al., 2016; Ferentinos et al., 2016; Kay et al., 2016; Pigeon et al., 2012; Simmons et al., 2021; Simmons et al., 2020; Wong et al., 2016). These mixed findings suggest that the role of depression in the association between insomnia and suicidal ideation is complex and may depend to some degree on the sleep and suicidality dimensions measured.

In a review by Littlewood and colleagues, they integrated findings of sleep problems as related to suicidal thoughts and behaviors into a contemporary model. The model included pathways from sleep problems to suicidal thoughts and behaviors through various types of cognitive appraisals such as hopelessness, entrapment, defeat, situational and self-appraisals along with the psychosocial factors of thwarted belongingness and social isolation (Littlewood et al., 2019). Additionally, the integrated motivational-volitional model proposes that ruminative thoughts potentially

strengthen relationships between defeat and entrapment (O'Connor, 2011). Rumination is a symptom commonly experienced with depression. As our model indicates that difficulty sleeping poses a risk for suicidal ideation through depression and then emotion regulation and perceived burdensomeness, rumination could be an upstream target to address in reducing depression, emotion dysregulation and perceived burdensomeness. Other targets for intervention could be focused on adapting negative cognitive appraisals, including those contributing to feelings of hopelessness, entrapment and defeat, or addressing the restoration of healthy sleep. Evidence for cognitive behavioral therapy for insomnia suggests that specifically helping to reduce insomnia symptoms can reduce depression severity and suicidal ideation frequency (Trockel et al., 2015).

We note several limitations of the current study including the use of cross-sectional data and online survey use. We acknowledge the potential statistical biases introduced by implementing mediational analyses with cross-sectional data. Cross-sectional approaches can lead to statistical biases that can significantly overestimate and underestimate the effects, even under ideal circumstances. Thus, we note that our cross-sectional data prevents definitive claims of directionality in these associations. Although a bidirectional association between insomnia and suicidality is supported in the literature (Liu et al., 2024), there is compelling evidence that insomnia symptoms are an upstream marker of or risk factor for suicide (Simmons et al., 2021). Thus, investigating the mechanism for this direction is critically important and is addressed by our approach. Limitations of online survey data include the possibility of a non-naïve sample in a non-standardized, non-monitored administration environment with limited checks on the validity of responses. However, this online survey allowed us to gather a large sample quickly and access a nationally representative sample with similar quality to student samples and laboratory data, based on rejection rates, statistical power, distributions and participant involvement (Kees et al., 2017; Sprouse, 2011). Additionally, we would like to note that we did not account for medications in the analyses in order to simplify the number of variables in the mediation analyses.

In conclusion, within the context of depression symptoms, perceived burdensomeness and emotion dysregulation are psychological factors that may play key roles in explaining how insomnia and suicidal ideation frequency are associated. We previously showed that insomnia symptoms reported during an intake assessment or during a routine clinical visit on a single-item insomnia question of the Outpatient Questionnaire-45.2 predicted suicide in psychiatric patients (Simmons et al., 2021). Combined with this study, we highlight that insomnia serves as a potent and easily assessed marker for suicide risk and a target for treatment and suicide prevention. Cognitive behavior therapy for insomnia is the frontline treatment for insomnia disorder and may also help in decreasing suicidality (Manber et al., 2011). Our findings add to a growing body of research that suggests insomnia symptoms are an important upstream target for suicide prevention as it may also help improve depression, emotion dysregulation and perceived burdensomeness.

Data Availability Statement. Raw data were generated at Brigham Young University. Derived data supporting the findings of this study are available from the corresponding author DBK on request.

Acknowledgments. This manuscript is a shortened version of Zach Simmons' dissertation. ChatGPT was used in some parts to help shorten the manuscript.

Author Contribution Statement. Zach Simmons was the lead author of this project. Daniel Kay was the senior author, and Scott Baldwin provided statistical guidance. All other authors were involved in the interpretation and refining of the writing for publication.

Funding Statement. This study was funded using internal funds. We acknowledge the generous donors who helped support the students who worked on this study including the Andrus and Garner Families.

Competing interests. DBK is the Editor-in-Chief of *Research Directions: Sleep Psychology*. The other authors have no conflicts of interest to declare.

Ethics Statements. Ethical approval was obtained from the ethics committee of Brigham Young University (BYU) (IRB2021-348). Participants provided consent by clicking a consent tab via Qualtrics. A waiver of written informed consent was approved by the BYU IRB to protect participants identity in our anonymous survey.

Connections References

Kay DB, Dzierzewski JM. What role do sleep and circadian rhythms play in psychological functioning including motivation, emotion, cognition, and performance? *Research Directions: Sleep Psychology*. 2024;1:e4. <https://doi.org/10.1017/slp.2023.5>

References

- Bastien, CH, Vallieres, A, & Morin, CM (2001) Validation of the insomnia severity index as an outcome measure for insomnia research. *Sleep Medicine* 2(4), 297–307.
- Becker, SP, Dvorsky, MR, Holdaway, AS, & Luebbe, AM (2018) Sleep problems and suicidal behaviors in college students. *Journal of Psychiatric Research* 99, 122–128. doi: [10.1016/j.jpsychires.2018.01.009](https://doi.org/10.1016/j.jpsychires.2018.01.009)
- Bernert, RA, & Joiner, TE (2007) Sleep disturbances and suicide risk: a review of the literature. *Neuropsychiatric Disease and Treatment* 3(6), 735–743. doi: [10.2147/ndt.s1248](https://doi.org/10.2147/ndt.s1248)
- Bernert, RA, & Nadorff, MR (2015) Sleep disturbances and suicide risk. *Sleep Medicine Clinics* 10(1), 35–39. doi: [10.1016/j.jsmc.2014.11.004](https://doi.org/10.1016/j.jsmc.2014.11.004)
- Bishop, TM, Crean, HF, Hoff, RA, & Pigeon, WR (2019) Suicidal ideation among recently returned veterans and its relationship to insomnia and depression. *Psychiatry Research* 276, 250–261. doi: [10.1016/j.psychres.2019.05.019](https://doi.org/10.1016/j.psychres.2019.05.019)
- Bjørngaard, JH, Bjerkeset, O., Romundstad, P, & Gunnell, D (2011) Sleeping problems and suicide in 75,000 Norwegian adults: a 20 year follow-up of the HUNT I study. *Sleep* 34(9), 1155–1159. doi: [10.5665/sleep.1228](https://doi.org/10.5665/sleep.1228)
- Bozzay, ML, Karver, MS, & Verona, E (2016) Linking insomnia and suicide ideation in college females: the role of socio-cognitive variables and depressive symptoms in suicide risk. *Journal of Affective Disorders* 199, 106–113. doi: [10.1016/j.jad.2016.04.012](https://doi.org/10.1016/j.jad.2016.04.012)
- Britton, PC, McKinney, JM, Bishop, TM, Pigeon, WR, & Hirsch, JK (2019) Insomnia and risk for suicidal behavior: a test of a mechanistic trans-diagnostic model in veterans. *Journal of Affective Disorders* 245, 412–418. doi: [10.1016/j.jad.2018.11.044](https://doi.org/10.1016/j.jad.2018.11.044)
- Bryan, CJ, Gonzales, J, Rudd, MD, Bryan, AO, Clemans, TA, Ray-Sannerud, B, Wertenberger, E, Leeson, B, Heron, EA, Morrow, CE, & Etienne, N (2015) Depression mediates the relation of insomnia severity with suicide risk in three clinical samples of U.S. military personnel. *Depression and Anxiety* 32(9), 647–655. doi: [10.1002/da.22383](https://doi.org/10.1002/da.22383)
- Chang, EC, & Chang, OD (2016) Development of the frequency of suicidal ideation inventory: Evidence for the validity and reliability of a brief measure of suicidal ideation frequency in a college student population. *Cognitive Therapy and Research* 40(4), 549–556. doi: [10.1007/s10608-016-9758-0](https://doi.org/10.1007/s10608-016-9758-0)
- Chu, C, Hom, MA, Rogers, ML, Ringer, FB, Hames, JL, Suh, S, & Joiner, TE (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* 12(5), 647–652. doi: [10.5664/jcsm.5784](https://doi.org/10.5664/jcsm.5784)
- Chu, C, Hom, MA, Rogers, ML, Stanley, IH, Ringer-Moberg, FB, Podlogar, MC, Hirsch, JK, & Joiner, TE (2017) Insomnia and suicide-related behaviors: a multi-study investigation of thwarted belongingness as a distinct explanatory factor. *Journal of Affective Disorders* 208, 153–162. doi: [10.1016/j.jad.2016.08.065](https://doi.org/10.1016/j.jad.2016.08.065)
- Chung, KF, Yeung, WF, Ho, FY, Yung, KP, Yu, YM, & Kwok, CW (2015) Cross-cultural and comparative epidemiology of insomnia: the diagnostic and statistical manual (DSM), International classification of diseases (ICD) and International classification of sleep disorders (ICSD). *Sleep Medicine* 16(4), 477–482. doi: [10.1016/j.sleep.2014.10.018](https://doi.org/10.1016/j.sleep.2014.10.018)
- Ferentinos, P, Porichi, E, Christodoulou, C, Dikeos, D, Papageorgiou, C, & Douzenis, A (2016) Sleep disturbance as a proximal predictor of suicidal intent in recently hospitalized attempters. *Sleep Medicine* 19, 1–7. doi: [10.1016/j.sleep.2015.10.021](https://doi.org/10.1016/j.sleep.2015.10.021)
- Garland, SN, Rowe, H, Repa, LM, Fowler, K, Zhou, ES, & Grandner, MA (2018) A decade's difference: 10-year change in insomnia symptom prevalence in Canada depends on sociodemographics and health status. *Sleep Health* 4(2), 160–165. doi: [10.1016/j.sleh.2018.01.003](https://doi.org/10.1016/j.sleh.2018.01.003)
- Golding, S, Nadorff, MR, Winer, ES, & Ward, KC (2015) Unpacking sleep and suicide in older adults in a combined online sample. *Journal of Clinical Sleep Medicine* 11(12), 1385–1392. doi: [10.5664/jcsm.5270](https://doi.org/10.5664/jcsm.5270)
- Gratz, KL, & Roemer, L (2004) Multidimensional assessment of emotion regulation and dysregulation: development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment* 26(1), 41–54. doi: [10.1023/B:JOBA.0000007455.08539.94](https://doi.org/10.1023/B:JOBA.0000007455.08539.94)
- Guo, Z, Han, X, Kong, T, Wu, Y, Kang, Y, Liu, Y, & Wang, F (2024) The mediation effects of nightmares and depression between insomnia and suicidal ideation in young adults. *Scientific Reports* 14, 9577. doi: [10.1038/s41598-024-58774-5](https://doi.org/10.1038/s41598-024-58774-5)
- Hedegaard, H, Curtin, SC, & Warner, M (2020) Increase in suicide mortality in the United States, 1999–2018. *NCHS Data Brief* (362), 1–8.
- Hom, MA, Chu, C, Schneider, ME, Lim, IC, Hirsch, JK, Gutierrez, PM, & Joiner, TE (2017) Thwarted belongingness as an explanatory link between insomnia symptoms and suicidal ideation: findings from three samples of military service members and veterans. *Journal of Affective Disorders* 209, 114–123. doi: [10.1016/j.jad.2016.11.032](https://doi.org/10.1016/j.jad.2016.11.032)
- Hom, MA, Stanley, IH, Chu, C, Sanabria, MM, Christensen, K, Albury, EA, Rogers, ML, & Joiner, TE (2019) A longitudinal study of psychological factors as mediators of the relationship between insomnia symptoms and suicidal ideation among young adults. *Journal of Clinical Sleep Medicine* 15(1), 55–63. doi: [10.5664/jcsm.7570](https://doi.org/10.5664/jcsm.7570)
- Kay, DB, Dombrovski, AY, Buysse, DJ, Reynolds, CF, Begley, A, & Szanto, K (2016) Insomnia is associated with suicide attempt in middle-aged and older adults with depression. *International Psychogeriatrics* 28(4), 613–619. doi: [10.1017/s104161021500174x](https://doi.org/10.1017/s104161021500174x)
- Kay, DB, Karim, HT, Soehner, AM, Hasler, BP, Wilckens, KA, James, JA, Aizenstein, HJ, Price, JC, Rosario, BL, Kupfer, DJ, Germain, A, Hall, MH, Franzen, PL, Nofzinger, EA, & Buysse, DJ (2016) Sleep-wake differences in relative regional cerebral metabolic rate for glucose among patients with insomnia compared with good sleepers. *Sleep* 39(10), 1779–1794. doi: [10.5665/sleep.6154](https://doi.org/10.5665/sleep.6154)
- Kees, J, Berry, C, Burton, S, & Sheehan, K (2017) An analysis of data quality: professional panels, student subject pools, and Amazon's Mechanical Turk. *Journal of Advertising* 46(1), 141–155. doi: [10.1080/00913367.2016.1269304](https://doi.org/10.1080/00913367.2016.1269304)
- Kucharczyk, ER, Morgan, K, & Hall, AP (2012) The occupational impact of sleep quality and insomnia symptoms. *Sleep Medicine Reviews* 16(6), 547–559. doi: [10.1016/j.smrv.2012.01.005](https://doi.org/10.1016/j.smrv.2012.01.005)
- Leger, D, & Bayon, V (2010) Societal costs of insomnia. *Sleep Medicine Reviews* 14(6), 379–389. doi: [10.1016/j.smrv.2010.01.003](https://doi.org/10.1016/j.smrv.2010.01.003)
- Léger, D, Bayon, V, Ohayon, MM, Philip, P, Ement, P, Metlaine, A, Chennaoui, M, & Faraut, B (2014) Insomnia and accidents: cross-sectional study (EQUINOX) on sleep-related home, work and car accidents in 5293 subjects with insomnia from 10 countries. *Journal of Sleep Research* 23(2), 143–152. doi: [10.1111/jsr.12104](https://doi.org/10.1111/jsr.12104)
- Littlewood, DL, Kyle, SD, Carter, LA, Peters, S, Pratt, D, & Gooding, P (2019) Short sleep duration and poor sleep quality predict next-day suicidal

- ideation: an ecological momentary assessment study. *Psychological Medicine* 49(3), 403–411. doi: [10.1017/S0033291718001009](https://doi.org/10.1017/S0033291718001009)
- Liu, X, Yang, Y, Liu, ZZ, & Jia, CX (2024) Bidirectional associations between sleep problems and suicidal thought/attempt in adolescents: A 3-wave data path analysis. *Journal of Affective Disorders* 1(350), 983–990. doi: [10.1016/j.jad.01.153](https://doi.org/10.1016/j.jad.01.153)
- Manber, R, Bernert, RA, Suh, S, Nowakowski, S, Siebern, AT, & Ong, JC (2011) CBT for insomnia in patients with high and low depressive symptom severity: adherence and clinical outcomes. *Journal of Clinical Sleep Medicine* 7(6), 645–652. doi: [10.5664/jcsm.1472](https://doi.org/10.5664/jcsm.1472)
- Nadorff, MR, Anestis, MD, Nazem, S, Claire Harris, H, & Samuel Winer, E (2014) Sleep disorders and the interpersonal-psychological theory of suicide: independent pathways to suicidality? *Journal of Affective Disorders* 152–154, 505–512. doi: [10.1016/j.jad.2013.10.011](https://doi.org/10.1016/j.jad.2013.10.011)
- Nadorff, MR, Nazem, S, & Fiske, A (2013) Insomnia symptoms, nightmares, and suicide risk: duration of sleep disturbance matters. *Suicide and Life-Threatening Behavior* 43(2), 139–149. doi: [10.1111/sltb.12003](https://doi.org/10.1111/sltb.12003)
- O'Connor, RC (2011) The integrated motivational-volitional model of suicidal behavior. *Crisis* 32(6), 295–298. doi: [10.1027/0227-5910/a000120](https://doi.org/10.1027/0227-5910/a000120)
- Pigeon, WR, Pinquart, M, & Conner, K (2012) Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *The Journal of Clinical Psychiatry* 73(9), e1160–1167. doi: [10.4088/JCP.11r07586](https://doi.org/10.4088/JCP.11r07586)
- Pilkonis, PA, Choi, SW, Reise, SP, Stover, AM, Riley, WT, & Cella, D (2011) Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS®): depression, anxiety, and anger. *Assessment* 18(3), 263–283. doi: [10.1177/10731911111411667](https://doi.org/10.1177/10731911111411667)
- Pompili, M, Innamorati, M, Forte, A, Longo, L, Mazzetta, C, Erbutto, D, Ricci, F, Palermo, M, Stefani, H, Seretti, ME, Lamis, DA, Perna, G, Serafini, G, Amore, M, & Girardi, P (2013) Insomnia as a predictor of high-lethality suicide attempts. *International Journal of Clinical Practice* 67(12), 1311–1316. doi: [10.1111/ijcp.12211](https://doi.org/10.1111/ijcp.12211)
- Roth, T (2007) Insomnia: definition, prevalence, etiology, and consequences. *Journal of Clinical Sleep Medicine* 3(5 Suppl), S7–10.
- Schalet, BD, Pilkonis, PA, Yu, L, Dodds, N, Johnston, KL, Yount, S, Riley, W, & Cella, D (2016) Clinical validity of PROMIS depression, anxiety, and anger across diverse clinical samples. *Journal of Clinical Epidemiology* 73, 119–127. doi: [10.1016/j.jclinepi.2015.08.036](https://doi.org/10.1016/j.jclinepi.2015.08.036)
- Simmons, Z, Burlingame, G, Korbanka, J, Eastman, K, Thomas, D, Christensen, J, Jenson, M, Nadorff, MR, & Kay, DB (2021) Insomnia symptom severity is associated with increased suicidality and death by suicide in a sample of patients with psychiatric disorders. *Sleep* 44(7), zsab032. doi: [10.1093/sleep/zsab032](https://doi.org/10.1093/sleep/zsab032)
- Simmons, Z, Erickson, LD, Hedges, D, & Kay, DB (2020) Insomnia is associated with frequency of suicidal ideation independent of depression: a replication and extension of findings from the National Health and Nutrition Examination Survey. *Frontiers in Psychiatry* 11, 561564. doi: [10.3389/fpsy.2020.561564](https://doi.org/10.3389/fpsy.2020.561564)
- Sprouse, J (2011) A validation of Amazon Mechanical Turk for the collection of acceptability judgments in linguistic theory. *Behavior Research Methods* 43(1), 155–167. doi: [10.3758/s13428-010-0039-7](https://doi.org/10.3758/s13428-010-0039-7)
- Trockel, M, Karlin, BE, Taylor, CB, Brown, GK, & Manber, R (2015) Effects of cognitive behavioral therapy for insomnia on suicidal ideation in veterans. *Sleep* 38(2), 259–265. doi: [10.5665/sleep.4410](https://doi.org/10.5665/sleep.4410)
- Tubbs, AS, Killgore, WDS, Karp, JF, Fernandez, FX, & Grandner, MA (2022) Insomnia and the interpersonal theory of suicide among civilians, service members, and veterans. *Journal of Psychiatric Research* 155, 534–541. doi: [10.1016/j.jpsychires.2022.09.043](https://doi.org/10.1016/j.jpsychires.2022.09.043)
- Tucker, RP, Cramer, RJ, Langhinrichsen-Rohling, J, Rodriguez-Cue, R, Rasmussen, S, Oakey-Frost, N, Franks, CM, & Cunningham, CCA (2021) Insomnia and suicide risk: a multi-study replication and extension among military and high-risk college student samples. *Sleep Medicine* 85, 94–104. doi: [10.1016/j.sleep.2021.06.032](https://doi.org/10.1016/j.sleep.2021.06.032)
- Van Orden, KA, Cukrowicz, KC, Witte, TK, & Joiner, TE (2012) Thwarted belongingness and perceived burdensomeness: construct validity and psychometric properties of the Interpersonal Needs Questionnaire. *Psychological Assessment* 24(1), 197–215. doi: [10.1037/a0025358](https://doi.org/10.1037/a0025358)
- Van Orden, KA, Witte, TK, Cukrowicz, KC, Braithwaite, SR, Selby, EA, & Joiner, Jr, TE (2010) The interpersonal theory of suicide. *Psychological Review* 117(2), 575–600. doi: [10.1037/a0018697](https://doi.org/10.1037/a0018697)
- Vanek, J, Prasko, J, Genzor, S, Ociskova, M, Holubova, M, Sova, M, Kantor, K, Slepecky, M & Nesnidal, V (2020) Insomnia and emotion regulation. *Neuro Endocrinology Letters* 41(5), 255–269.
- Wong, MM, Brower, KJ, & Craun, EA (2016) Insomnia symptoms and suicidality in the National Comorbidity Survey: adolescent supplement. *Journal of Psychiatric Research* 81, 1–8. doi: [10.1016/j.jpsychires.2016.06.004](https://doi.org/10.1016/j.jpsychires.2016.06.004)
- Zullo, L, Horton, S, Eaddy, M, King, J, Hughes, J, Diederich, A, Kennard, B, Emslie, G, & Stewart, S (2017) Adolescent insomnia, suicide risk, and the interpersonal theory of suicide. *Psychiatry Research* 257, 242–248. doi: [10.1016/j.psychres.2017.07.054](https://doi.org/10.1016/j.psychres.2017.07.054)