Defeat and Entrapment Mediate the Relationship between Insomnia and Suicidal Ideation in
Young Adults

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Abstract

Objective - In recent years, there has been a growing interest in understanding the relationship between sleep disturbance and suicide. The current study aimed to advance understanding regarding the psychological processes driving these relationships, by examining if insomnia symptoms are related to suicidal ideation via perceptions of defeat and entrapment.

Method - Participants (n = 260) completed an anonymous self-report survey online assessing insomnia symptoms, chronotype, defeat, entrapment, suicidal ideation and behavior, and a range of covariates. Insomnia symptoms were associated with an increased suicide risk (independent of depression).

Results - Bivariate associations found insomnia severity to be related to poorer affective outcomes. The relationship between insomnia and suicidal ideation was mediated by perceptions of defeat and entrapment.

Conclusions - Taken together, these findings shed light on the psychological mechanisms linking sleep disturbance and suicidal ideation by highlighting the role of defeat and entrapment. These findings have the potential to improve suicide risk assessment and prevention in young adults experiencing difficulties initiating or maintaining sleep.

Keywords: sleep disturbance, insomnia, suicide, young adults, Integrated Motivational–Volitional Model of Suicidal Behavior

Highlights

- Defeat and entrapment mediate relationship between insomnia and suicidal ideation
- Evidence for IMV model in community sample
- Uses validated multi-item suicide measure

Defeat and Entrapment Mediate the Relationship between Insomnia and Suicidal Ideation in Young Adults

Suicide is the leading cause of non-accidental death in people aged 15–29 globally (World Health Organisation, 2019) and suicidal ideation is a risk factor for subsequently completed suicide (Brown, Beck, Steer, & Grisham, 2000). A large cross-cultural survey of people aged 18–22 in 21 countries found the median age of onset of suicidal thought, intent, and attempts all to be between 15 and 17 years (Mortier et al., 2018). Yet suicide prevention strategies aimed at young people remain ineffective (De Silva et al., 2013; Harrod, Goss, Stallones, & DiGuseppi, 2014). Better understanding the etiology of suicidal ideation and behaviors (SIBs) is important to inform the development of better risk assessment and intervention strategies in this population.

Intrinsic sleep disturbances have been identified as independent risk factors for SIBs (for reviews see: Drapeau & Nadorff, 2017; Liu et al., 2020; Malik et al., 2014; Pigeon, Pinquart, & Conner, 2012; Porras-Segovia et al., 2019). Insomnia is one such complaint and is characterised by subjective negative sleep experience related to difficulties falling asleep, remaining asleep, or waking up unusually early (American Academy of Sleep Medicine, 2014; American Psychological Association, 2013). Many studies have found insomnia to be associated with SIBs (Becker, Dvorsky, Holdaway, & Luebke, 2018; Bernert, Hom, Iwata, & Joiner, 2017; Bernert, Joiner Jr, Schmidt, & Krakow, 2005; Bernert, Kim, Iwata, & Perlis, 2015; Chu et al., 2017; Ennis et al., 2017; Hysing, Sivertsen, Stormark, & O'Connor, 2015; McCall et al., 2013; Nadorff, Anestis, Nazem, Harris, & Winer, 2014; Nadorff, Nazem, & Fiske, 2013; Pigeon et al., 2012; Seeman, 2018). Prevalence of insomnia in general adult populations has been reported as high as 25% (Cao et al., 2017; Morphy, Dunn, Lewis, Boardman, & Croft, 2007; Ohayon, 2002) and rates in young adults are broadly similar (Hysing et al., 2020; Khader et al., 2020; Petrov, Lichstein, & Baldwin, 2014; Roberts, Ramsay Roberts, & Chan, 2008; D. J. Taylor et al., 2011). A meta-analysis of 20 studies ($N = 147,753$) found insomnia to approximately double the risks of suicidal ideation, attempt, and completed suicide after controlling for known important risk factors such as depression (Pigeon et al., 2012). Similarly, another large meta-analysis of studies of individuals with

psychiatric illness found insomnia was associated with a more than two-fold increase in the risk of any suicidal outcome (Malik et al., 2014). However, the association between insomnia and suicide can become insignificant when relevant covariates and mediating variables are accounted for. Some studies have found that insomnia no longer has a significant influence on suicidal ideation or behaviors when constructs such as depression or entrapment are controlled for (e.g., Bernert et al., 2005; Nadorff et al., 2014; Sami, Danielle, Lihi, & Elena, 2018; Woosley, Lichstein, Taylor, Riedel, & Bush, 2014). The proposed causal role of sleep disturbances in SIBs and, mental ill health more generally, is also supported by studies that have found improving sleep quality reduces symptoms of psychopathologies (Baroni, Bruzzese, Bartolo, Ciarleglio, & Shatkin, 2017; Christensen et al., 2016; Dewald-Kaufmann, Oort, & Meijer, 2014; Freeman et al., 2017; Seeman, 2018; Wahlstrom, Berger, & Widome, 2017). Additional research is required to better resolve the driving factors of the sleep–SIBs relationship.

Young adulthood sees significant change in both sleep behaviors and rates of SIBs. Sleep behaviors typically change for the worse with the onset of adolescence, and often remain so until midlife, due to alterations in physiological, social, and behavioral factors (Baroni et al., 2017; Roenneberg et al., 2004). As with many psychopathologies more broadly, first onset of SIBs typically occurs in adolescence (Mortier et al., 2018) and suicide rates increase rapidly through early adulthood (Martini et al., 2019; Snowden et al., 2017). Recent epidemiological studies demonstrate that both SIBs and sleep disturbances remain a problem in this population. Sivertsen et al. (2019) report a prevalence of 7.2% for 12 month suicidal ideation and 0.4% for suicide attempt in the same period in a sample of over 50,000 young adults. Khader et al. (2020) reports a similar prevalence of 7.4% for 12 month suicidal ideation in their sample of more than 100,000 university students. Further, 26% of Khader et al.'s sample had experienced traumatic or difficult sleep disturbances in the same period. This sleep distress was associated with a three-fold increase in the likelihood of having experience suicidal ideation in the preceding year ($OR = 3.01$, 95% CI [2.86, 3.16]). Clearly SIBs are still a significant problem in young adults and sleep disturbances may offer a malleable risk factor to improve this situation.

Contemporary models of suicide attempt to integrate the complex interaction of biopsychosocial factors involved in the development of suicidal ideation, as well as explaining the transition to suicidal behaviors. These frameworks are important to guide principled research into SIBs and develop evidence-backed interventions. One such model is the Integrated Motivational–Volitional Model of Suicidal Behavior (IMV; O’Connor, 2011; O’Connor & Kirtley, 2018). Central to the IMV is the *Cry of Pain* model proposed by Williams (2014), which posits that SIBs are a response to subjective experiences of *defeat* and *entrapment*. Feelings of defeat arise when an individual experiences a “failed struggle” (Gilbert & Allan, 1998) which results in a desire to escape the triggering situation. This may be a failure to attain a fundamental need such as physical safety, or a more abstract goal such as failure to meet a professional career goal. Entrapment is the perception that the defeat-generating situation cannot be resolved nor escaped (Gilbert & Allan, 1998). Some individuals see a form of liberation from entrapment through death, and the theme of escape is common in suicide (Baumeister, 1990; Ikunaga, Nath, & Skinner, 2013; Kiamanesh, Dieserud, & Haavind, 2015; Kovacs, Beck, & Weissman, 1975; Meyer, Irani, Hermes, & Yung, 2017). The role of defeat and entrapment in relation to SIBs is well supported by empirical evidence (Branley-Bell et al., 2019; Littlewood, Gooding, Panagioti, & Kyle, 2016; Russell, Rasmussen, & Hunter, 2018; P. J. Taylor, Gooding, wood, & Tarrier, 2011; Tucker, O’Connor, & Wingate, 2016; Wetherall, Robb, & O’Connor, 2019). Hence, identifying and mitigating sources of defeat and entrapment offers a pathway for prevention or reduction of SIBs.

The role of constructs from the IMV, as well as other models of suicide, have been explored as mediators of the sleep–SIBs relationship. Work by Chu et al. (2016) found the *thwarted belongingness* construct of the Interpersonal Theory of Suicide (Van Orden et al., 2010) mediated the relationship between insomnia and suicidal ideation in university students. Russell et al. (2018) found that the defeat–entrapment pathway of the IMV model mediated the relationship between suicidal thoughts and insomnia in adolescents. Similarly, Littlewood, Gooding, Panagioti, and Kyle (2016) found that defeat and entrapment mediated with link between nightmares and suicide in people experiencing PTSD (although *hopelessness* was included as a mediator subsequent to entrapment). Related qualitative work by Littlewood,

Gooding, Kyle, Pratt, and Peters (2016) has also highlighted the role of sleep as a source of relief from perceptions of entrapment. No studies to date have examined the role of defeat and entrapment in the insomnia–SIBs in a community sample of young adults.

The present study aimed to further explore the relationship between sleep disturbance and suicide in young adults in the context of the IMV model. This is motivated by the high prevalence of sleep disturbances and suicidal behaviors in young adults (O'Connor et al., 2018; Russell et al., 2019; Sivertsen et al., 2019). Additionally, existing research of the sleep–SIBs relationship in adults using constructs from the IMV model has, to date, been limited to a single clinical sample Littlewood, Gooding, Panagioti, and Kyle (2016). However, subclinical levels of suicidal ideation and related symptoms such as depressed mood are common in student populations (Cukrowicz et al., 2011; Wu, Lai, Lau, & Walden, 2020) MORE REFS. As such, the aim of the present study was to test if insomnia is related to suicidal ideation via perceptions of defeat and entrapment after controlling for depression in a community sample of young adults.

Hypotheses

H₁: Increased insomnia symptoms will be associated with increased suicidal ideation and behaviors, along with poorer affective outcomes.

H₂: Insomnia severity will be an independent predictor of suicidal ideation and behaviors, after controlling for depression severity.

H₃ The relationship between suicidal outcomes and insomnia will be mediated by perceptions of defeat and entrapment.

Materials and Methods

Participants and Procedure

The study was designed in line with British Psychological Society guidelines. Ethical approval was granted by the University of Glasgow College of Science and Engineering Ethics Committee. Participants were recruited via social media, online forums, and university participant pool mailing lists to complete an online survey in May–July 2019 and gain in January–March 2020 (N.B. data collection ended prior to CoViD-19-related restrictions were placed on people's behaviors). The survey was described as being about sleep and its links to mood and/or mental health. Participants were provided with a link to a survey hosted on the University of Glasgow Experimentum platform (<https://exp.psy.gla.ac.uk>) which complies with the General Data Protection Regulation (EU) 2016/679. An information page with warnings about the sensitive nature of the topic was presented with contact details for relevant support services. After reading this page and providing consent, participants were asked to complete the measures described below. A debriefing page thanked participants and restated the contact details for support services. The only inclusion criterion was to be aged 18-24 years old. Usable responses were obtained from 260 participants (170 female [65.4%], 89 male [34.2%], 1 other gender [0.4%]) with a median age of 21 years. The majority were students (202 students [77.7%], 45 employed [17.3%], 13 unemployed [5.0%]).

Measures

Demographics. Participants reported their age in years; gender (male, female, or other); whether they primarily identified as students, employed, or unemployed; if they were in school, college, or university (if appropriate); and if they were in education full-time or part-time (if appropriate).

Insomnia. The Sleep Condition Indicator (SCI; Espie et al., 2014) is an 8-item measure of self-reported insomnia symptoms over the previous month. Each item is scored from 0–4, with higher scores indicating better sleep quality. It has good psychometric properties for detecting DSM-5 insomnia disorder and ICSD-3 chronic insomnia disorder, with a score of 16 or less indicating clinical level of dysfunction (Espie et al., 2014; Wong et

al., 2017). Internal consistency of the SCI (and all other measures listed below) was assessed by Cronbach's (1951) α and McDonald's (1999) ω_t statistics: $\alpha = .88$, $\omega_t = .91$.

Chronotype. The reduced Morningness–Eveningness Questionnaire (rMEQ; Adan & Almirall, 1991; Loureiro & Garcia-Marques, 2015) is a five-item self-report measure of a person's chronotype. Items include preferred awakening time, preferred time of day, and self-appraisal as a morning/neither/evening type. Scores can range from 4–25, with higher scores indicating increased morningness. Internal consistency in the present sample was $\alpha = .57$, $\omega_t = .66$.

Depression, Anxiety, and Stress. The 21-item short form of the Depression, Anxiety, and Stress Scales (DASS-21; Henry & Crawford, 2005; Lovibond & Lovibond, 1995) is a composite measure of depression, anxiety and stress symptoms. Participants respond to seven questions for each of the three subscales using a four point Likert-type scale. Scores range from 0 (*'Did not apply to me at all'*) to 3 (*'Applied to me very much or most of the time'*). These subscores are then summed to give a total DASS-21 score and doubled to make comparable with the original 42-item version of the scale. Potential scores for each subscale range from 0–42 and total scores from 0–126. Higher subscale scores respectively indicate more frequent or severe experiences of depression, anxiety, and stress symptoms. Internal consistency for overall scale in the present sample was $\alpha = .95$, $\omega_t = .96$. Internal consistency for subscales: $\alpha_{depression} = .93$, $\omega_{t, depression} = .95$; $\alpha_{anxiety} = .87$, $\omega_{t, anxiety} = .89$; $\alpha_{stress} = .87$, $\omega_{t, stress} = .92$.

Defeat. The Defeat Scale (Gilbert & Allan, 1998) comprises 16 mixed-valence statements related to subjective experiences of feeling defeated, humiliated, or having failed to achieve goals. Participants respond to statements such as *'I feel that I am one of life's losers'* using a five point Likert-type scale from *'I never feel like this'* (0) to *'I always feel like this'* (4). Potential scores ranges from 0–64, with higher scores indicating increased perceptions of defeat. Internal consistency in the present sample was $\alpha = .96$, $\omega_t = .96$.

Entrapment. The entrapment scale (Gilbert & Allan, 1998) comprises 16 statements related to subjective experiences of being unable to escape from or resolve situations in which an individual feels defeated or to have failed. Subscales measure feelings of entrapment

triggered by internal (six items; e.g., *'I would like to escape from my thoughts and feelings'*) and external causes (10 items; e.g., *'I feel trapped by other people'*). Responses are given using a five point Likert-type scale from *'Not at all like me'* (0) to *'Extremely like me'* (4). Potential scores range from 0–64, with higher scores indicating increased perceptions of entrapment. Internal consistency in the present sample was $\alpha = .96$, $\omega_t = .97$. Internal consistency for the internal entrapment subscale was $\alpha = .94$, $\omega_t = .96$. Internal consistency for the external entrapment subscale was $\alpha = .93$, $\omega_t = .95$.

Suicidal Ideation and Behaviors. The Suicidal Ideation Attributes Scale (SIDAS; van Spijker et al., 2014) is a 5-item combined measure of SIBs. It provides a brief assessment of the intensity of these outcomes over the previous month and their effects on daily functioning. The SIDAS was selected as it was designed to be completed online without the need for clinical supervision. Responses are provided using an 11 point Likert-type scale ranging from 0–10. Each item has unique response anchors which are relevant to that item. For example, *'In the past month, how often have you had thoughts about suicide?'* is anchored by *'Never'* (0) and *'Always'* (10). Potential scores range from 0–50 with higher scores indicating more frequent and/or severe suicide-related outcomes. van Spijker et al. (2014) suggest a cut-off score of 20 or greater to indicate high suicide risk. Internal consistency in the present sample was $\alpha = .90$, $\omega_t = .92$.

Data Analysis

The dataset was screened by response time with listwise deletion applied if total response time was less than 25% of the mean time for the overall sample. Data was subsequently screened for incomplete responses; scalewise mean value replacement was applied on a per-respondent basis if they missed a single item on any or all of the DASS-21 subscales or the SCI. Mean value replacement was also used on the defeat and entrapment scales if the respondent missed up to two items per scale. Listwise deletion was applied otherwise, including if consent had not been obtained or if any items were missed on the SIDAS or rMEQ measures (item content on these short, five-item measures is relatively heterogeneous so mean value replacement was deemed inappropriate). This resulted in a final

sample of 260 respondents with complete data. Outliers were not removed as it is individuals reporting extremely negative outcomes that are of greatest relevance to the research question.

Data was analyzed using RStudio version 1.0.143 and R version 3.6.1. Significance was set at $p < 0.05$. Normality of data was assessed by Shapiro–Wilk tests and all measures deviated from normality. Therefore, nonparametric statistical methods were used throughout the analysis. H_1 was assessed using bivariate Kendall’s τ_b rank correlations. Additionally, differences in outcomes for those meeting the clinical cutoff for DSM insomnia were compared with those not meeting this criteria. These groups were compared with Mann Whitney U tests. H_2 was tested by hierarchical multiple regression. H_3 was tested using serial multiple mediation analysis using the *lavaan* R package (v.0.6-3) and nonparametric bootstrap resampling with 50000 iterations (Rosseel, 2012; Shrout & Bolger, 2002). Depression was included as a covariate in the mediation analysis at all stages to distinguish the independent effect of insomnia (Weis, Rothenberg, Moshe, Brent, & Hamdan, 2015). Note that use of mediation analysis on cross-sectional data must be justified based on existing theory (Fairchild & McDaniel, 2017; Shrout & Bolger, 2002); the empirically- and theoretically-supported defeat–entrapment pathway of the IMV model provides this justification in the present study. Holm-Bonferroni corrections (Holm, 1979) were applied to correlation and Mann-Whitney U tests with each treated as separate families of tests for pragmatic reasons.

Results

Preliminary Results

In this sample 108 participants (41.5%) met the cut-off score of the SCI to indicate probable insomnia disorder. Fifty people (19.2%) met the suggested cut-off score of the SIDAS to suggest a high-level of SIBs. Of those experiencing high levels of SIBs 41 also met the insomnia cut-off score (15.8% of overall sample, 82.0% of high suicidal ideation subgroup). Descriptive statistics are presented in Table 1 with bivariate association coefficients (Kendall’s τ).

TABLE 1 ABOUT HERE.

Groupwise comparison

Mann-Whitney U tests comparing participants that met the clinical cut-off for probable insomnia disorder (SCI score ≤ 16) with participants that did not meet the cut-off are shown in Table 2. The group with probable insomnia disorder had significantly worse outcomes on all mood- and suicide-related measures, and were slightly more inclined towards evening chronotype.

TABLE 2 ABOUT HERE.

Multiple Regression

Results of a hierarchical multiple regression analysis are shown in Table 3. In the final model including sleep–wake variables (Model 3; $F[8, 251] = 31.56, p < .001, R^2 = .50$, adjusted $R^2 = .49$), both insomnia ($\beta = -.34, SE = 0.06, t = -3.76, p < .001$) and depression severity ($\beta = .56, SE = 0.09, t = 9.42, p < .001$) were significant predictors of SIBs.

TABLE 3 ABOUT HERE.

Mediation Analysis

Multiple mediation analysis based on the defeat–entrapment pathway of the IMV model — with depression included as a covariate at all stages — found the total effect of insomnia on suicidal ideation was significant (point estimate = -0.316; 95% CI: -0.499, -0.143). Point estimates of bootstrapped unstandardised coefficients and bias-corrected confidence intervals for each pathway component are shown in Figure 1. A summary of point estimates of direct and indirect pathways is presented in Table 4. The direct effect of insomnia on suicidal ideation after accounting for depression severity remained just significant after inclusion of defeat and entrapment (point estimate = -0.165; 95% CI: -0.331, -0.005). The full indirect pathway linking insomnia to suicidal ideation via defeat and entrapment (point estimate = -0.041; 95% CI: -0.086, -0.015) accounted for 26.2% of the summed indirect effects and 13.0% of the total effect. The insomnia–defeat–suicidal ideation pathway (point estimate = -0.101; 95% CI: -0.196, -0.042) accounted for approximately 66.4% of the summed indirect

effects and 31.8% of the total effect. The insomnia–entrapment–suicide pathway was not significant. Overall, the indirect pathways including defeat and/or entrapment account for 47.9% of the total effect (point estimate = -0.152; 95% CI: -0.257, -0.069).

FIGURE 1 ABOUT HERE.

TABLE 4 ABOUT HERE.

Discussion

The present study aimed to test the role of perceived defeat and entrapment as mediators of the established relationship between insomnia and SIBs in a sample of young adults, as per Williams' Cry of Pain theory and the Integrated Motivational-Volitional model of Suicidal Behavior of O'Connor and colleagues. The key novel finding of this study is that multiple mediation pathways via defeat and entrapment partially mediate the relationship between insomnia and SIBs in a community sample of young adults, after controlling for depressive symptom severity. This result provides additional empirical evidence for the psychological mechanisms proposed by the Cry of Pain and IMV models whereby sources of defeat and entrapment can initiate and maintain SIBs.

Individuals reporting levels of insomnia indicating probable clinical disorder were found to have poorer outcomes in all mood- and suicide-related measures. This finding, and the partial mediation of the insomnia–SIBs relationship by defeat and entrapment, confirms work by Russell et al. (2018). In their study of adolescents, probable insomnia was associated with increased perceptions and defeat and entrapment, and the insomnia–suicide relationship was also mediated by these constructs. Similarly, the mediating role of defeat and entrapment in the clinical sample of Littlewood, Gooding, Panagioti, and Kyle (2016) has been shown to extend to the present community sample of young adults. More generally, our results support previous work that sleep disturbances are positively associated with poorer mental health outcomes related to both affect/mood (e.g. depression, anxiety, and stress) and SIBs.

Identifying modifiable sources of defeat and entrapment in young adults is important for the development of suicide interventions. Previous research has highlighted insomnia to be a source of struggle with consequences for mental health, and treatment of sleep disturbances as

a way to improve a range of mental health conditions (Freeman, Sheaves, Waite, Harvey, & Harrison, 2020). In a qualitative study of the experience of insomnia, Kyle, Espie, and Morgan (2010) identified a key theme of “insomnia as an obstruction to the desired self” with one participant describing their struggles with insomnia as “some epic battle”. In a similar study by Yung, Chung, Ho, Yeung, and Ng (2016), a participant described their attempts to attain good quality sleep as “a torture, or a suffering” as evidence for one of Yung et al.’s main themes. Sleep disturbances have also been found to be quantitatively associated with perceived defeat (Littlewood, Gooding, Panagioti, & Kyle, 2016; Russell et al., 2018). Our results suggest that treatment of sleep disturbances may lead to reduced perceptions of defeat and entrapment. In turn, this could lead to improved mental health outcomes and reduced SIBs in individuals experiencing insomnia in this population. Improved understanding of the psychological mechanisms of the sleep disturbance–suicide relationship can thus aid development of effective treatments which focus on altering a person’s ability to cope with perceived defeat and entrapment through cognitive restructuring and behavior change.

Insomnia is a well-researched topic and a wide range of treatments exist for this common sleep disturbance. Particularly, cognitive behavioral therapy for insomnia (CBTI) has demonstrated efficacy and can be delivered without clinical supervision (Espie et al., 2019; Friedrich & Schlarb, 2018). This means CBTI can be offered essentially immediately to young people in the community if they are experiencing low or moderate levels of SIBs and coincident sleep disturbances. It can also be offered as a complementary treatment while on waiting lists for treatment as usual. Young adults may also face unique hurdles such as being dependent on parents or guardians for access to healthcare due to constraints related to privately-funded health systems. CBTI resources can be provided easily by schools, colleges, and employers which may overcome many barriers to treatment for young people. Additionally, SIBs are a sensitive and potentially stigmatized topic. Treating sleep disturbances offers a low-stigma approach to improving mental health, which young adults may be more comfortable discussing with healthcare providers, family etc. and which can be provided discretely.

The insomnia–defeat–suicidal ideation indirect pathway was responsible for a large proportion of the overall indirect effect. This may be a consequence of the suicide-related measure used, as the SIDAS focuses on suicidal ideation (SI). This is in contrast to other measures which may examine suicidal intent and behaviors. The cyclical nature of the relationship between suicidal ideation, intent, and behaviors notwithstanding, we suggest that the dominant effect of the defeat pathway is due to the fact that defeat and ideation are the early stages of an increasingly distressful process. Feelings of defeat may cause passive or active suicidal ideation as a potential escape from the defeating situation. Fortunately for many people these feelings of defeat are temporary and are resolved by escape from and/or de-escalation of the relevant stressors. In turn, the sense of entrapment associated with chronic defeat and failed attempts to overcome the relevant stressors (Griffiths, Wood, Maltby, Taylor, & Tai, 2014) does not develop. The perception of entrapment has been highlighted as a driving factor in the transition from suicidal ideation to attempt (McManama O’Brien, Nicolopoulos, Almeida, Aguinaldo, & Rosen, 2019). This explains why the indirect pathway encompassing both defeat and entrapment plays a minor role in partial mediation of the insomnia–SIBs relationship (in comparison with the insomnia–defeat–suicidal ideation pathway) in our results. This hypothesis could be explored in future work by looking at the role of defeat and entrapment in individuals experiencing SI but grouped into those with/without active intent/behaviors. A stronger contribution of indirect mediation pathways involving entrapment in the group currently engaging in suicidal behaviors would be expected.

A strength of this study is that it uses the empirically-supported IMV Model of Suicidal Behavior and applies it to a novel research question. Additionally, as highlighted by Tubbs, Perlis, and Grandner (2019), many studies use single-items to measure suicidal outcomes or sleep disturbances often featured in larger batteries of questions related to health and well-being. Use of a single-item does not allow for proper resolution of the graded and complex nature of both suicide- and sleep-related variables. The present work overcomes this by using multi-item, validated measures of insomnia and suicidal ideation. This gives confidence that the constructs of interest in our hypotheses are congruent with the latent constructs measured by the validated questionnaires. They also allow quantification of the

severity of the outcomes measured, as opposed to the binary classifications that are a product of single items.

A limitation of this study is its observational cross-section design. This prohibits conclusions being drawn about the temporal nature of how feelings of defeat and entrapment develop and drive suicidal ideation in relations to insomnia. Although there is longitudinal evidence for a causal relationship between sleep evidence and suicide (Berman, 2017; Chaïb, Segovia, Baca-Garcia, & Lopez-Castroman, 2020; Fawcett et al., 1990; Littlewood et al., 2019), and many cross-sectional studies support this relationship, future work should include prospective longitudinal components to explore the temporal development of the sleep–defeat–entrapment–suicide relationship.

While more work remains to be done to explore the underlying mechanisms which link sleep disturbances to suicide, monitoring sleep (either objectively or subjectively) offers a practical and easily implemented additional method for assessing suicide risk in vulnerable individuals. More broadly, sleep disturbances are associated with far less stigma than affective disorders or suicidal ideations. As such, sleep may offer an alternative and more approachable method for individuals and healthcare workers to begin dialogue about mental health issues.

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Tables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	Median	IQR
1. Age										21	19–23
2. Insomnia	0.01									18	12–25
3. Chronotype	0.07	0.24***††								13	10–16
4. DASS-21	-0.11	-0.48***	-0.23***††							36	16–64
5. Depression	-0.12	-0.44***	-0.24***††	0.74***						10	4–22
6. Anxiety	-0.11	-0.43***	-0.20***†	0.72***	0.50***					10	2–20
7. Stress	-0.06	-0.43***	-0.17***NS	0.76***	0.53***	0.60***				14	8–24
8. Defeat	-0.11	-0.43***	-0.22***††	0.59***	0.67***	0.46***	0.44***			20	12–34
9. Entrapment	-0.09	-0.40***	-0.27***	0.63***	0.69***	0.49***	0.50***	0.67***		15	5–30
10. Suicide	-0.06	-0.39***	-0.15*NS	0.52***	0.54***	0.44***	0.40***	0.54***	0.55***	4	0–15

Table 1

Descriptive statistics and bivariate associations assessed using Kendall's τ coefficients. Crude significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Significance levels following Holm-Bonferroni correction remained mostly unchanged. Where significance levels changed these are indicated with the following superscripts: † $p < 0.05$, †† $p < 0.01$, NS no longer significant. Note: Age was not significantly associated with any measure either pre- or post-correction.

	No insomnia <i>N</i> = 152	Insomnia <i>N</i> = 108			
	Mdn (IQR)	Mdn (IQR)	<i>U</i>	<i>r</i>	<i>f</i>
Insomnia ^{***}	24 (20–27)	11 (7–14)	16416	0.85	1.00
Chronotype ^{***}	14 (12–17)	11 (9–14.25)	11497	0.34	0.70
DASS-21 ^{***}	20 (14–36)	66 (44–86.5)	2276	0.62	0.14
Depression ^{***}	6 (2–12)	22 (12–32)	2832.5	0.56	0.17
Anxiety ^{***}	5 (2–10)	20 (12–26)	2810.5	0.56	0.17
DASSS ^{***}	10 (6–16)	24 (14–32)	3058	0.54	0.19
Defeat ^{***}	15 (10–21.25)	36.5 (24.5–44)	2969.5	0.54	0.18
Entrapment ^{***}	8 (3–17)	28.5 (17–40.25)	3231	0.52	0.20
Suicide ^{***}	1 (0–6.25)	14.5 (4–28)	3506	0.50	0.21

Table 2

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Significance levels unchanged after application of Holm-Bonferroni correction to this set of nine tests. Mdn = median, IQR = interquartile range, *U* = Mann Whitney *U* test statistic, *r* = effect size ($|Z|/\sqrt{N}$; range 0–1; Field, Miles, & Field, 2012), *f* = common language effect size (McGraw & Wong, 1992).

Predictor	Model 1	Model 2	Model 3
Age	-0.58	0.19	0.07
Gender ^a :			
Male	-1.09	-0.06	0.29
Other	-9.27	-3.94	-6.63
Vocation ^b :			
Employed	1.07	-0.260	-0.44
Unemployed	13.44***	1.71	2.18
Depression		0.68***	0.563***
Insomnia			-0.34***
Chronotype			0.18
<i>p</i>	0.007	< 0.001	< 0.001
<i>R</i> ²	0.06	0.47	0.50
Adjusted <i>R</i> ²	0.04	0.46	0.49
Δ Adjusted <i>R</i> ²		+0.42	+0.03

Table 3

*Hierarchical multiple regression analysis of predictors of suicidal outcomes. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. ^a Reference category: female. ^b Reference category: student.*

Path	Estimate	Lower	Upper	P_M (%)	Ratio
Insomnia > Defeat > Suicide	-0.101**	-0.196	-0.042	31.8	-0.064
Insomnia > Defeat > Entrapment > Suicide	-0.041*	-0.086	-0.015	13.0	-0.026
Insomnia > Entrapment > Suicide	-0.010	-0.051	0.026	3.2	-0.001
Total indirect effect size	-0.152**	-0.260	-0.070	47.9	-0.097
Direct effect size	-0.165*	-0.331	-0.004	52.1	-0.105
Total effect size	-0.316***	-0.499	-0.143	100.0	-0.202

Table 4

*Point estimates and 95% confidence intervals of indirect and direct pathways resulting from multiple serial mediation analysis. Generated using 50000 bootstrapping iterations. P_M = proportion mediated as percentage of total effect size. Ratio = scale-normalised change in suicide score scale-normalised change in insomnia. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.*

Figures *Figure 1.*

Figure captions

1. Serial multiple mediation model for insomnia and suicidal ideation with defeat and entrapment as mediators (controlling for depression in all regressions). Unstandardised regression coefficients with 95% bias corrected confidence intervals in parentheses.

Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Dashed lines indicate insignificant relations.