

Insomnia and nightmares as markers of risk for suicidal ideation in young people:

Investigating the role of defeat and entrapment

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Abstract

Objectives: Although converging evidence has identified sleep problems as robust predictors of suicidal ideation in young people, the psychological processes driving these associations are not yet known. The current study aimed to test predictions, informed by the Integrated Motivational-Volitional (IMV) Model of Suicidal Behaviour, concerning the role of feelings of defeat and entrapment within the sleep-suicide relationship.

Methods: Fifteen and sixteen year old volunteers (n=1045) from Scottish secondary schools completed an anonymous self-report survey assessing insomnia symptoms, nightmares, suicidal ideation, depressive symptomology and feelings of defeat and entrapment.

Results: Both insomnia symptoms and nightmares were associated with an increased likelihood of reporting suicidal ideation (independent of depression). Perceptions of both defeat and entrapment were elevated in young people who reported clinically salient insomnia and/or nightmares, relative to those who did not. The relationship between insomnia and suicidal ideation was fully mediated by perceptions of defeat and entrapment, whilst nightmares were indirectly associated with suicidal ideation through perceptions of defeat and entrapment.

Conclusions: Taken together, these findings provide novel insights into the psychological mechanisms linking sleep disturbance and suicidality by highlighting the role of defeat and entrapment. Clinically, these findings have the potential to improve suicide risk assessment and prevention in young people experiencing difficulties with their sleep.

Keywords: sleep disturbance, insomnia, nightmares, adolescence, self-harm, suicide

Brief summary

Current knowledge/study rationale: Insomnia and nightmares confer increased risk for suicidal ideation in young people. However, the psychological processes driving this association are not yet known. This study tested a hypothesized multistep mediational pathway, derived from the Integrated Motivational Volitional Model of Suicidal Behavior, to further understanding regarding the role of two robust suicide related constructs, defeat and entrapment, as mediators within the sleep-suicidal ideation relationship in adolescents.

Study Impact: Taken together, analyses supported the hypothesised role of defeat and entrapment, as mediators, driving the psychological pathway from sleep disturbance to suicidal ideation in young people. These findings suggest that suicide risk assessment, prevention, and intervention efforts aimed at young people should consider insomnia, nightmares, defeat and entrapment as important modifiable clinical targets.

During adolescence, both sleep problems and suicide represent major public health concerns.^{1,2} A converging body of research evidence, spanning different study designs, samples and assessment techniques, suggests that sleep disturbances represent evidence-based risk factors for suicidal thoughts and behaviours.³⁻⁵ The transition from childhood to adolescence is accompanied by several biological and psychosocial changes that interact to create an increased vulnerability to sleep problems in young people.⁶ Two specific types of sleep disturbance that are frequently reported during adolescence are insomnia and nightmares. Insomnia is the most common sleep disorder in adolescence.⁷ When employing DSM-V criteria for Insomnia, a recent study reported a prevalence rate of 18.5%.⁸ Nightmares are also common during adolescence.^{9,10} One investigation, conducted recently within the UK, reported that 19.4% of adolescents experienced frequent nightmares.¹¹ Both insomnia and nightmares confer increased risk for suicidal ideation in young people. These relationships have been demonstrated in both community and clinical samples.^{9,10,12-17}

Whilst the relationship between clinically salient sleep problems and suicidality is well established, research examining the psychological mechanisms accounting for this association is in its infancy. Research has begun to uncover the psychological processes linking sleep and suicide in adults.¹⁸⁻²¹ For example, Littlewood and colleagues¹⁹ recruited adults, with experience of trauma and symptoms of post-traumatic stress disorder (PTSD), and tested a serial mediation pathway whereby nightmares were predicted to have an indirect effect on suicidal behaviours through perceptions of defeat, entrapment and hopelessness (pessimism for the future). Defeat refers to a sense of failed struggle in relation to the loss or disruption of some valued status or internal hierarchical aims, whilst entrapment is characterised by an individual's perception of their circumstances as being inescapable.⁴² Defeat and entrapment are considered to be distinct but overlapping constructs, in the same

way a depression and hopelessness are correlated but have discriminant validity.³⁰ The authors derived this pathway from the Cry of Pain Model of suicidality and the predicted mediational model was supported by bootstrapped analysis. These findings have begun to help us better understand the mechanisms by which nightmares confer suicide risk in adults. However, investigations of this nature within adolescent samples are particularly limited. A recent systematic review²² highlighted only one study that had examined potential psychological mediators of the sleep-suicide relationship in this age group.²³ That is, it remains unclear why sleep problems are associated with increased suicidal risk within this unique²⁴ developmental period.

Further, it is not yet known whether the psychological constructs underlying these relationships are consistent across different types of sleep disturbances. Whilst investigations consistently demonstrate a direct relationship between nightmares and suicidal thoughts and behaviours²⁵⁻²⁷, the evidence regarding the association between insomnia and suicidality is mixed^{19,26,28}. It remains to be seen if similar or distinct psychological pathways lead to suicidal ideation from insomnia relative to nightmares.

Within the field of suicide research, moving beyond main effect models to more complex theoretically informed models of suicide risk (involving mediators and moderators) has been highlighted as a priority for future investigations.²⁹ Research of this nature is crucial in terms of understanding why certain factors are associated with enhanced or diminished suicide risk. The Integrated Motivational-Volitional Model of Suicidal Behaviour (IMV)³⁰ is advantageous in this context as it provides a number of testable hypotheses, thereby highlighting candidate psychological mediators of the sleep-suicide ideation relationship.

The IMV: A theoretical context for examining the psychological mechanism linking sleep disturbance and suicidal ideation

The IMV proposes several variables that impact an individual's progression towards suicidal ideation, and the translation of these thoughts into suicidal acts. Intention to harm oneself is hypothesised to be determined by feelings of entrapment, the perception that there are no means of escape, results in suicidal behaviour being seen as the salient solution to life circumstances. Entrapment is triggered by defeat/humiliation which is often associated with stress. There is a substantial body of evidence that supports the hypothesised role of defeat and entrapment in psychological pathways giving rise to suicidal thinking.³⁴⁻³⁶ On the basis of the IMV, it could be hypothesized that sleep disturbances may act as a stressor³¹⁻³³ that can trigger feeling of defeat, which then contribute to a sense of entrapment.

Although sleep problems are not included within the IMV model, recent findings^{19,37} provide support for the pathway to suicidality proposed within this theoretical framework.³⁸ Specifically, experience of nightmares acted as a vulnerability factor, and was associated with increased perceptions of defeat and entrapment. Research to date has employed adult samples recruited from clinical populations. Despite the fact that young people are at high risk of sleep disturbances and of developing suicidal thoughts, the potential mediating role of defeat and entrapment on the sleep disturbance-suicidal ideation relationship has not yet been investigated in a sample of adolescents. Given that the majority of adolescents experiencing these thoughts will not come into contact with mental health services, it is important to determine whether these findings extend to a community sample of adolescents. Research of this nature, examining the hypothesised multi-step pathways linking sleep disturbance and suicidal ideation via perceptions of defeat and entrapment, is warranted. This is the case as

identifying modifiable risk factors that trigger the start of this trajectory, in young people, will be helpful in developing effective suicide prevention strategies.

The current study

The overarching aim of the present study was to test predictions, derived from the IMV, in order to advance understanding of the psychological mechanisms linking sleep disturbance (i.e. insomnia and nightmares) and suicidality in adolescents.

More specifically this study aimed to:

1. Determine whether insomnia and nightmares were associated with suicidal ideation independent of depressive symptoms.
2. Investigate differences in levels of defeat and entrapment between adolescents with and without clinically salient sleep disturbances (insomnia and nightmares).
3. Test hypothesised multi-step pathways linking sleep disturbance and suicidal ideation, via perceptions of defeat and entrapment (Figure 1).

It was predicted that 1) insomnia symptoms and nightmares would be positively related to suicidal ideation independent of depressive symptomology, 2) adolescents experiencing clinically salient sleep disturbances would report elevated perceptions of both defeat and entrapment, and 3) the association between subjective sleep disturbance and suicidal ideation would be linked via an indirect pathway whereby sleep disturbance would be linked to defeat, defeat would be associated with entrapment and entrapment would be related to suicidal ideation.

In investigating the role of defeat and entrapment in the pathway to suicidality, the current study complements the important work of Littlewood and colleagues,¹⁹. However, it the differences between both investigations should be considered to fully grasp the unique

contribution that the current study intends to make to the literature. Littlewood et al examined a clinical sample of 91 individuals who had experienced traumatic events and symptoms of PTSD. Comparatively, we were interested in examining a national community sample of adolescents. Littlewood and colleagues examined a serial mediational pathway, derived from the CoP, whereby nightmares were predicted to have an indirect effect on suicidal *behaviours* through defeat, entrapment and hopelessness (whilst controlling for depression and insomnia). The current investigation sought to test a serial mediational pathway, derived from the IMV, in two distinct sleep problems. Given that, The IMV proposes that entrapment is a predictor of suicidal intention, the current study predicted that insomnia/nightmares would have an indirect effect on suicidal *ideation* through defeat and entrapment (whilst controlling for depression and nightmares/insomnia).

[Figure 1 about here]

Method

Participants

The sample comprised 1045 adolescents (52.8% female) recruited from 19 mainstream schools across Scotland. Ages ranged from 15-17 years ($M=15.35$, $SD=0.68$). In terms of ethnicity, 97.2% of the sample was White. This is consistent with the 2011 Scottish Census. There was representation from urban ($n=16$) and rural ($n=5$) locations. The average percentage of pupils eligible for free meals in 2014 was 18.8%. This is widely used as a proxy for socioeconomic status. The schools participating in the present study had a range of 5.8% to 29.4% ($M=17.8\%$, $SD=8.12$) of pupils that were eligible for free meals.

Measures

Insomnia Symptoms. The Sleep Condition Indicator³⁹ is a clinical screening tool that can be used to assess DSM-5 Insomnia Disorder. The tool comprises 9 items which assess concerns about initiating/maintaining sleep, early morning awakening, subjective sleep quality, impact on daily functioning as well as duration and frequency of the sleep problem. Items were measured on a 5-point scale (0-4), with lower scores representing poorer sleep. Scores of <16 indicate probable Insomnia Disorder³⁹. The SCI demonstrated robust internal consistency in the current sample ($\alpha=0.83$). Further, the measure has shown convergent validity with the Pittsburgh Sleep Quality Index and Insomnia Severity Index as well as predictive validity in relation to Insomnia Disorder diagnosed by expert clinical interview.³⁹ The SCI has recently been demonstrated to have sound psychometric properties in a large sample of adolescents and young adults.⁵⁴

Nightmares. The Disturbing Dreams and Nightmare Severity Index⁴⁰ was employed to assess nightmare complaints. This 7 item scale assesses: the number of nights per week that nightmares occur, the total number of nightmares experienced per week, the number of awakenings due to nightmares (0=*never/rarely*, 4=*always*), the severity of the nightmare problem and also the intensity of the nightmares themselves. Severity and intensity are measured on a Likert-type scale ranging from no problem/not intense at all (0) to very severe problem/extremely severe intensity (6). Total scores range from 0-37, with higher scores representing a greater difficulty with nightmares. Scores >10 indicate the presence of clinically salient nightmare complaints (and possible Nightmare Disorder). In this investigation, this cut-off was used to identify participants with clinically salient nightmare symptoms. This measure has not yet been validated within an adolescent sample, but was chosen due to its ability to assess both the frequency, severity and intensity of participants'

experience of disturbing dreams and nightmares, and its frequent application within the field of suicide research.^{20,21,25} Internal consistency was good ($\alpha=0.86$) within this sample.

Depressive symptomology. The depression subscale of the Hospital Anxiety and Depression Scale⁴¹ contains 7 items, and is frequently used in community settings⁵². Each item has a 4 point Likert scale, ranging from 0 – 3. Higher scores indicate increased symptomology. Internal consistency was good ($\alpha= 0.83$). This measure has been validated for use in adolescent samples.⁵² Whilst a clinical cut-off is available for the HADS, depressive symptomology was included as a continuous covariate in this investigation.

Defeat. The Defeat Scale⁴² is a 16 item measure that assesses an individual's feelings of defeat (i.e. perceived failed struggle and loss of social rank). Respondents indicate on a 5 point scale (ranging from 0 to 4) the occurrence of these perceptions. Scores for each item are combined to create a total continuous score with higher scores indicating greater levels of defeat. Given that this measure has not yet been validated with an adolescent sample, we sought to examine the psychometric properties of this scale. Internal consistency was excellent ($\alpha = .95$) in this sample. Principal Component Analysis (PCA) was employed to examine the factor structure of this measure in an adolescent sample. Two factors were extracted accounting for 68.5 % of the total variance. The first factor accounted for 60.2 % of the total variance and the second factor accounted for 8.3 % of the total variance and accounted of the three items that are reverse coded. Application of the scree test indicated that only the first factor should be retained. Forcing a single factor solution resulted in loads for each item of 0.53 and above. This replicates the original validation of the defeat scale and suggests that it can be considered a unidimensional measure.

Entrapment. Perceptions of being trapped were assessed using the 16 item Entrapment Scale⁴² (e.g. I have a strong desire to escape from things in my life). The measure consists of two subscales: internal entrapment (perceptions of entrapment by one's own thoughts and feelings: e.g. 'I feel trapped inside myself'; 6 items) and external entrapment (perceptions of entrapment by external situations: e.g. 'I feel trapped by other people'; 10 items).

Respondents rate the extent to which each item describes their feelings on a five-point scale that ranges from 0 to 4. Responses to each item are combined to create a total score which can range from 0-64. Higher scores indicate greater levels of entrapment. Internal consistency for the total entrapment was excellent ($\alpha = .96$). In line with the original publication of this measure, we sought to examine the psychometric properties for the internal ($\alpha=0.91$) and external ($\alpha = 0.94$) subscales of entrapment separately. PCA was employed to examine the factor structure of both subscales. For the internal entrapment subscale, one factor was extracted, accounting for 68.2 % of the variance. All items loaded positively above 0.80. These results suggest that the internal entrapment scale is a unidimensional measure. For the external entrapment scale, one factor was extracted, accounting for 65.8 % of the variance. All items loaded positively above 0.80. These results suggested that the external entrapment scale is a unidimensional measure.

Suicidal Ideation. History of suicidal ideation was assessed using a single item; "Have you ever thought about ending your own life?" Participants were asked to provide a binary response (yes/no).⁵⁰

Procedure

This study adhered to the British Psychological Society's Ethical Guidelines as well as the British Educational Research Association's Ethical Guidelines. Approval was obtained from the University Ethics Committee.

Participants were recruited as part of a larger adolescent health and lifestyle survey. A range of other variables were measured but are not the central focus of this paper. Once permission had been received from local education authorities, gatekeepers in schools, and parents/guardians, young people were invited to participate in the study. Respondents completed anonymous self-report surveys independently within a classroom setting. To reinforce the private and confidential nature of the survey, participants sealed their questionnaires in an envelope and returned to the researcher. All adolescents were debriefed and provided with contact details for local physical and mental health support services.

Data analytic strategy

IBM SPSS Statistics 24 for Windows (IBM Corp., Armonk, NY, USA) was used to conduct all statistical analyses. Given that groups were unequal (clinically salient sleep problems vs. no clinically salient sleep problems) and that the assumption of homogeneity of variance was violated (for depression, defeat and entrapment) bootstrapping was applied in all analyses. Bootstrapping is a non-parametric re-sampling technique. In this study, analyses were based on 5000 sample bootstrap replications. Initially, Pearson product-moment correlational analyses were conducted to allow for a preliminary examination of the interrelationships between all variables assessed within the study. Two binary logistic regressions (with "no suicidal ideation" as the reference category) were conducted to determine whether insomnia and nightmares predicted suicidal ideation. Depressive symptomology was controlled for in these analyses. Four separate ANCOVA analyses were

conducted in order to examine differences in perceptions of defeat and entrapment in young people with and without clinically salient sleep disturbances (insomnia and nightmares). Severity of depressive symptomology was included as a planned covariate. Finally, a serial multiple mediation pathway was tested using model six of the PROCESS algorithm for SPSS⁴³ whereby the relationship between sleep disturbance and suicidal ideation was mediated by perceptions of defeat and entrapment. Two separate mediational models were run. In the first model, the predictor variable was nightmares, the mediator variables were perceived defeat and entrapment and the outcome variable was suicidal ideation. This analysis controlled for presence of depressive symptomology and insomnia symptoms. This analysis was repeated with insomnia symptoms as the predictor variable and controlled for the presence of depressive symptomology and clinically salient nightmares. Direct and indirect effects were calculated for both models. Given that PROCESS expects complete data on all variables included in the model, and that 33 participants (3.2%) had missing data, this analysis was conducted using 96.8% of the original sample (n=1012). Missing data was handled using listwise deletion. Prior to testing all hypotheses, multicollinearity diagnostics were conducted. No issues were demonstrated.

Results

Preliminary analyses

Of the young people who took part in the study, 22.8% (n=231) endorsed having experienced suicidal ideation whilst 11.9%, of the sample reached the threshold for probable Insomnia Disorder. Of those that reported insomnia symptoms, 83.8% reported difficulties initiating sleep, 46.8% endorsed trouble maintaining sleep and 46.3% demonstrated issues with early morning awakening. Further, 19.5% reported experiencing clinically salient

nightmares. Descriptive statistics (for all continuous variables) and correlational analyses (for all study variables) are presented in Table 1. Associations between all variables were positive and statistically significant.

[Table 1 about here]

Are insomnia symptoms and nightmares associated with suicidal ideation?

The results of the binary logistic regression analyses investigating the relationship between the sleep variables and suicidal ideation, demonstrated that (after controlling for depression) insomnia symptoms (OR=3.19, 95% CI: 2.05,4.99, $p=0.001$) and nightmares (OR=3.38, 95% CI: 2.35,4.85, $p=0.001$) were significantly associated with increased odds of reporting suicidal ideation. Therefore, young people reporting insomnia symptoms were over three times more likely to report thoughts of suicide. This was also the case for those experiencing clinically salient nightmares.

Do adolescents with and without clinically salient sleep disturbances (insomnia and nightmares) differ in perceptions of defeat and entrapment?

ANCOVA analyses were conducted to address the second aim of the study. As demonstrated in Table 2, feelings of defeat ($F(1, 1044) = 100.40, p < 0.001; \eta_p^2 = 0.08$) and entrapment ($F(1, 1044) = 123.14, p < 0.001; \eta_p^2 = 0.11$) were elevated in young people with clinically salient insomnia symptoms relative to those not reaching the clinical threshold for probable insomnia disorder. Perceptions of defeat ($F(1, 1044) = 97.67, p < 0.001; \eta_p^2 = 0.09$) and entrapment ($F(1, 1044) = 98.63, p < 0.001; \eta_p^2 = 0.09$) were also significantly greater in young people reporting severe and intense nightmares relative to those who did not. These findings demonstrate that there are moderate between group differences, in terms of

perceived feelings of defeat and entrapment, when comparing young people with and without clinically salient sleep disturbances.

[Table 2 about here]

Do perceptions of defeat and entrapment mediate the relationship between nightmares and suicidal ideation?

The direct and indirect pathways between nightmares, defeat, entrapment and suicidal ideation, controlling for depression and insomnia are presented in Figure 2. Point estimates and bootstrapped 95% CI for the total indirect effect and three specific indirect pathways are provided in Table 3. Nightmares were significantly associated with suicidal ideation indirectly through defeat and entrapment. Nightmares, defeat and entrapment explained a moderate amount of the variability in suicidal ideation (Pseudo R^2 ; Cox and Snell = .32; Nagelkerke = .49; McFadden = .36). Nightmares maintained a significant direct relationship with suicidal ideation within the full mediational model, demonstrating that perceptions of defeat and entrapment may partially, but not fully, account for the relationship between nightmares and suicidal ideation.

[Figure 2 about here]

[Table 3 about here]

Do perceptions of defeat and entrapment mediate the relationship between insomnia symptoms and suicidal ideation?

The direct and indirect (mediated) pathways between insomnia, defeat, entrapment and suicidal ideation, controlling for depression and nightmares are presented in Figure 3. Point estimates and bootstrapped 95% CI for the total indirect effect and three specific indirect pathways are provided in Table 4. Insomnia was significantly associated with suicidal ideation indirectly through defeat and entrapment but did not maintain a significant direct relationship with suicidal ideation within the full mediational model ($p=.997$). Insomnia, defeat and entrapment explained a moderate amount of the variability in suicidal ideation (Pseudo R^2 ; Cox and Snell = .32; Nagelkerke = .49; McFadden = .37). This shows that experiencing clinically salient insomnia symptoms is associated with feelings of defeat which are linked to a sense of entrapment. The perception that there is no means of escape is related to the onset of suicidal thoughts.

[Figure 3 about here]

[Table 4 about here]

Discussion

The overarching aim of the current study was to test theoretically derived predictions to advance understanding regarding the psychological mechanisms by which insomnia and nightmares confer an increased risk for suicidal ideation in young people. Results of this investigation reinforce previous evidence indicating that sleep disturbances, namely insomnia and nightmares, are associated with an increased risk of developing suicidal thoughts during adolescence.^{9, 10, 13-17} Our findings highlighted that young people reporting symptoms of insomnia were three times more likely to report thoughts of suicide. This was

also the case for those experiencing severe and intense nightmares. This association remained significant after controlling for the severity of depressive symptomology.

Moderate differences in feelings of defeat and entrapment were observed between individuals with clinically salient sleep complaints and those without. Specifically, young people experiencing insomnia or nightmares reported elevated perceptions of both defeat and entrapment. To the best of our knowledge, this is the first study to investigate these suicide related psychological constructs in relation to insomnia, overall, and nightmares in young people. The present study provided support for the hypothesised multi-step mediational pathway in that results of the mediation analysis suggested that nightmares are associated with defeat, defeat is linked to entrapment, and entrapment is related to thoughts of suicide. These findings reinforce recent research, from Littlewood and colleagues, conducted with adults experiencing PTSD, which highlights the underlying role of defeat and entrapment within the pathway to suicidality. Further, this study demonstrates that these pathways partially account for this relationship in a community sample. Support for the hypothesised multi-step mediational pathway was also provided when considering insomnia symptoms as a predictor. These findings offer novel insights regarding the link between sleep disturbance and suicidal thoughts, and provide preliminary evidence to suggest that these patterns are not specific to the experience of nightmares. This study reinforces the importance of defeat and entrapment as potentially transdiagnostic psychological constructs underlying suicidality.^{6, 44.}

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As this is the first study to examine the role of defeat and entrapment in the context of the sleep-suicide ideation relationship, within a community sample of adolescents, replication is important. Most research to date, examining the role of entrapment within the pathway to suicidality, has been conducted in relation to suicidal ideation, rather suicidal behaviour. As a

result, the evidence base is currently stronger for ideation than behavior.³⁸ The authors highlight that this should be interpreted as absence of evidence rather than evidence of absence. Therefore, it is important that future research, examining sleep disturbance as a marker of risk, seeks to extend the current research to suicidal behaviour.

Future research seeking to disentangle the nature of the link between insomnia/nightmares and defeat is warranted. With regards to insomnia, it is possible that perceptions of defeat could arise as a result of the impact of the sleep disorder on daytime functioning. Research conducted by Kyle, Espie and Morgan⁴⁶, employing focus groups and audio diaries, has demonstrated that individuals experiencing chronically disturbed sleep report daily difficulties with cognitive, emotional, interpersonal and physical functioning. The impairments cumulatively were reported to be associated with compromised social functioning, feeling like an outsider, the notion of struggling through the day, and reduced quality of life. These experiences could be conceptualized as “defeating”. However, Kyle et al.’s study has been conducted solely in adult samples and so findings should be applied to young people with caution. Concerning nightmares, it has been suggested that defeat may occur because of the nightmare content, or alternatively the individuals’ perception of their ability to cope or manage nightmares. These predictions should be scientifically tested in order to clarify mechanisms underlying the link between sleep disturbances and defeat.

Moderate between group differences in entrapment were demonstrated when comparing young people with and without clinically salient sleep disturbance. This suggests that sleep disturbance during adolescence could lead young people to feel trapped by both their own thoughts and feelings in addition to external events or situational factors. Further, direct effects existed between both sleep disturbances and entrapment. Future research should seek to obtain a more fine-grained understanding of the cognitive mechanisms that contribute

to entrapment within the context of sleep disorders. Littlewood et al.³⁷ hypothesised, based on interviews with adults with experience of depression, that sleep may offer an alternative to suicide by providing a temporary escape from problems in daily life. As such, difficulties initiating and maintaining sleep associated with insomnia and disturbed sleep associated with nightmares may deny these young people such an escape, leading them to feel trapped.

It is important to note that perceptions of defeat and entrapment partly, but not fully, mediated the relationship between sleep disturbances and suicidal ideation. This suggests that additional pathways may underlie this relationship and future research should focus on identifying other candidate psychological mechanisms (e.g. emotion regulation, impulsivity, rumination or neurocognitive deficits⁴⁷). On the other hand, the direct link between insomnia and suicidal ideation was not maintained within the full mediational model, supporting the notion that this effect is fully accounted for via these pathways.

Taken together, these findings provide preliminary evidence to suggest that insomnia and nightmares may confer risk for suicidal ideation in young people via increased perceptions of defeat and entrapment. On the basis of the IMV we hypothesised that sleep disturbance, in the form of insomnia or nightmares, could act as a stressor that contributes to perceptions of defeat, defeat then is associated with entrapment and entrapment is linked to suicidal ideation. Findings provided support for this hypothesised pathway in two distinct sleep disorders, providing preliminary evidence for this pathway in young people and ultimately suggesting that the IMV is a useful framework for examining the relationship between sleep problems and thoughts of suicide. Future research should seek to extend these findings to suicidal behaviour, whilst employing the IMV as an overarching framework.

The current study demonstrated that sleep disturbances and suicidal ideation are common and represent a public health issue for adolescents in Scotland. Insomnia and nightmares are prevalent within this population, with 11.9% of young people reporting clinically salient insomnia symptoms and 19.5% endorsing frequent and severe nightmares. Whilst research investigating insomnia in adolescents, using DSM-V criteria is sparse, Hysing et al.⁸ reported an insomnia prevalence rate of 18.5% in their sample of Norwegian adolescents. Whilst this is higher than the prevalence rate reported in the current study, there were notable differences in recruitment strategies employed by both studies. Hysing et al recruited both school attendees and non-attendees, whilst the current study excluded those that were absent from school during the data collection period. Given that insomnia symptoms are associated with higher odds of non-attendance at school⁴⁸ these differences in recruitment could partially account for the discrepancies in prevalence rates. Whilst nightmares are reportedly common during adolescence, the exact prevalence rate is not yet clear. Comparisons between studies are complicated by large variations in operationalisation and measurement. Almost 20% of young people within the current study reported experiencing frequent and severe nightmares; this is in line with previous work conducted within the UK.¹¹

Within the current study, 22.8% of Scottish adolescents reported suicidal ideation. A systematic review of 128 international school based and community studies⁴⁹ demonstrated a higher proportion (29.9%) of adolescents reporting suicidal ideation (CI: 26.1, 33.8). Nevertheless, the prevalence of suicidal ideation within the present investigation is notably higher (approximately 10%) than a separate recent study investigating suicidal and self-harming thoughts and behaviours in a community sample of Scottish adolescents.⁵⁰ Diversity in prevalence rates may be accounted for by differences in sampling strategies. For example,

Quigley et al. recruited participants aged 11-17 years old, whilst the current study invited participation from classes in which the majority of young people were aged 15-17 years old. This age range was chosen as adolescent risk taking behaviour peaks at this time and suicide is the second leading cause of death for 15-24 year olds.⁵⁰

Examining the link between sleep and suicidal ideation within the context of a theoretical framework could have implications for risk assessment and prevention. For example, the present study supports the potential utility of defeat and entrapment as indicators of suicidality in young people with insomnia and/or nightmares and could have implications for identifying those at risk of suicide. Further, sleep, as well as perceptions of defeat and entrapment, offer modifiable targets for interventions to target. Research suggests that CBT for insomnia reduces suicidal ideation in adults. However, further investigation is required to determine if CBT for insomnia has comparable effects in young people, and to establish if sleep interventions lead to a reduction of defeat and entrapment.

It is important, however, to interpret these findings in the context of the following limitations. Firstly, because of the cross-sectional nature of the data we were unable to investigate causal relationships between variables of interest. Temporal precedence is important in understanding mediational analyses⁵³ and cross-sectional designs do not allow an understanding of how processes unfold over time. Future research employing prospective designs will be crucial in providing important temporal information regarding identified relationships and mediational pathways. Further, this cross-sectional data was collected during a three-week period in June. Given that both sleep patterns and suicidality demonstrate variability across different seasons, it is possible that the time of year in which data was collected may confound the results. Longitudinal cohort designs (with multiple data

collection time points) would allow researchers to examine and account for the effects of seasonal variation on this relationship.

Secondly, the investigation relied solely on self-report measures. As a result, it is possible that results could have been impacted by memory related biases, socially desirable responding or demand characteristics. However, all scales employed, with the exception of the single item suicidal ideation measure, are recognized as reliable and valid. This is advantageous given that, until recently, the majority of research examining the link between sleep and suicidal ideation in adolescent samples has employed unstandardized and non-validated sleep measures that do not assess the full range of symptoms for sleep disturbances^{9,14,15} (e.g. insomnia is a multidimensional disorder with a characteristic profile of daytime and nighttime symptoms). Given the size of the sample and the research setting of the present study, it was not possible to employ the gold standard clinical evaluation to validate insomnia symptoms and diagnosis. However, the SCI is reliable, valid and is based on the most up to date (DSM-V) diagnostic criteria for insomnia³⁰ and the DDNSI^{20,26} has been employed frequently within suicide research. Future research would benefit from combining both objective and subjective measures of sleep. Employing daily diary or experience sampling methodologies would circumvent each of the aforementioned limitations and so should be considered in future research exploring the relationship between insomnia, suicidal ideation, and underlying psychological mechanisms.

Finally, lifetime suicidal ideation was measured using a single item self-report measure. The use of single item self-report measures to assess the presence of suicidal ideation, plans or attempts represents a widespread limitation within this literature. Although researchers have established definitions for suicidal ideation, single item questions do not inform participants of this definition and so they are required to rely on their own interpretation of the measure.

This may lead to misclassification. Further, single item measures fail to capture the breadth of the construct (e.g. severity and frequency). It should be noted that we assessed sleep disturbances within the last month and measured suicidal ideation across the lifetime of the participants. This represents a limitation as it is possible that a young person's experience of suicidal ideation may have occurred in advance of the development of a sleep problem. Future research should seek to build on the understanding provided by this study using prospective designs as well as reliable and valid measures of suicidal ideation.

Despite these limitations, this study represents the first examination of the relationship between sleep disturbances and suicidal ideation, in young people, within the context of a theoretical framework. Findings provide preliminary evidence to suggest that prevention efforts and intervention efforts aimed at reducing suicide risk in young people should consider that sleep disturbance, and feelings of defeat and entrapment could be important clinical targets to reduce risk among young people.

Abbreviations

95% CI – 95% Confidence Intervals

ANCOVA – Analysis of Covariance

CBT – Cognitive Behavioral Therapy

CoP – Cry of Pain Model of suicidality

DDNSI – Disturbing Dreams and Nightmare Severity Index

DSM-V – Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

IMV – Integrated Motivational-Volitional Model of Suicidal Behaviour

PTSD – Post-traumatic Stress Disorder

SCI – Sleep Condition Indicator

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Table 1: Means, standard deviations and Pearson product-moment correlational coefficients for insomnia, nightmares, depression, defeat, entrapment and suicide ideation.

	2.	3.	4.	5.	6.	Mean	SD
1. Insomnia	.39***	.29***	.40***	.42***	.29***	1.19	0.32
2. Nightmares		.26***	.38***	.38***	.34***	1.22	0.41
3. Depression			.62***	.58***	.40***	3.77	2.90
4. Defeat				.84***	.58***	16.92	13.21
5. Entrapment					.63***	10.17	13.51
6. Suicide Ideation							

*** $p < .001$. ** $p < .01$. * $p < .05$.

Table 2: Perceptions of defeat and entrapment in young people with and without sleep disturbances.

	Insomnia Disorder Symptoms		Nightmare Disorder Symptoms	
	Present	Absent	Present	Absent
Defeat	31.10 (15.33) ^a	14.90 (11.47) ^a	26.29 (15.29) ^b	14.19 (11.04) ^b
Entrapment	25.45 (17.23) ^a	11.39 (7.98) ^a	19.78 (16.77) ^b	7.35 (10.96) ^b

^a Row comparison significantly different, $p < .001$; ^b Row comparison significantly different, $p < .001$.

Table 3: Point estimates (unstandardized regression coefficients) for indirect effects and 95% bias corrected confidence intervals for multiple mediation analysis in which defeat and entrapment were represented as mediators in the association between nightmares and suicidal ideation (controlling for depression and insomnia).

Mediation Path	Point Estimate	95% confidence intervals ^a	
		Lower	Upper
Nightmares > Defeat > SI	.18	.04	.37
Nightmares > Defeat >Entrapment > SI	.33	.19	.52
Nightmares > Entrapment > SI	.12	.01	.25
Total indirect effect	.63		

SI: Suicidal Ideation

^a Statistical significance indicated by confidence intervals not containing 0.

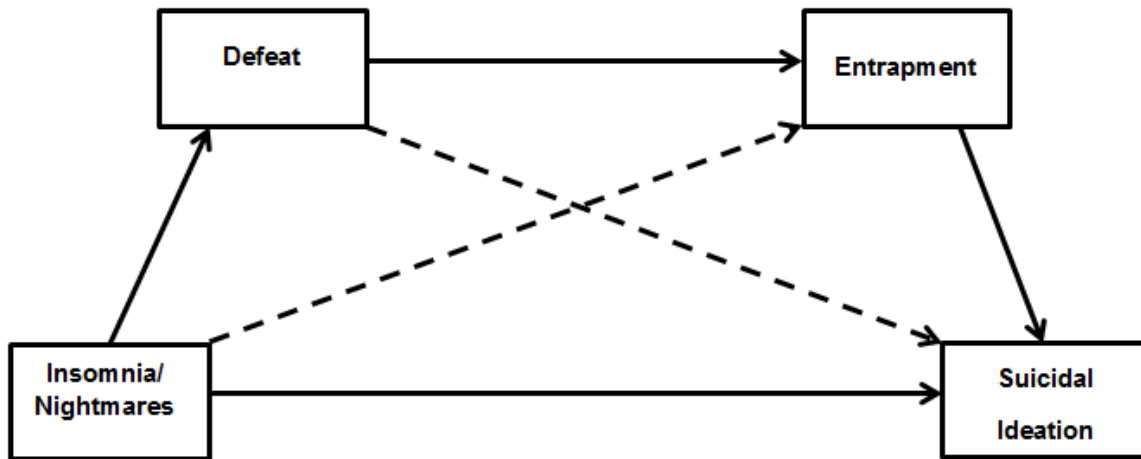
Table 4: Point estimates for indirect effects and 95% bias corrected confidence intervals for serial multiple mediation analysis in which defeat and entrapment were represented as mediators in the association between insomnia and suicidal ideation (controlling for depression and nightmares)

Mediation Path	Point Estimate	95% confidence intervals ^b	
		Lower	Upper
Insomnia > Defeat > SI	.25	.06	.53
Insomnia > Defeat >Entrapment > SI	.46	.28	.69
Insomnia > Entrapment > SI	.27	.09	.47
Total indirect effects:	.98		

^b Statistical significance indicated by confidence intervals not containing 0.

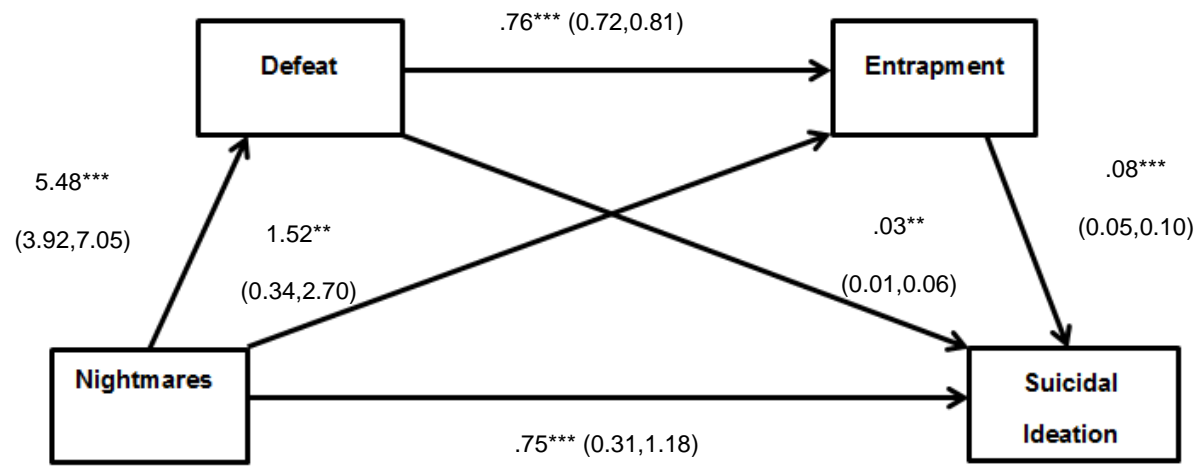
SI: Suicidal Ideation

Figure 1: Predicted serial multiple mediation pathway (highlighted in non-dashed lines) for association between insomnia/nightmares and suicidal ideation, via defeat and entrapment.



Predicted multiple mediation pathway highlighted in non-dashed lines

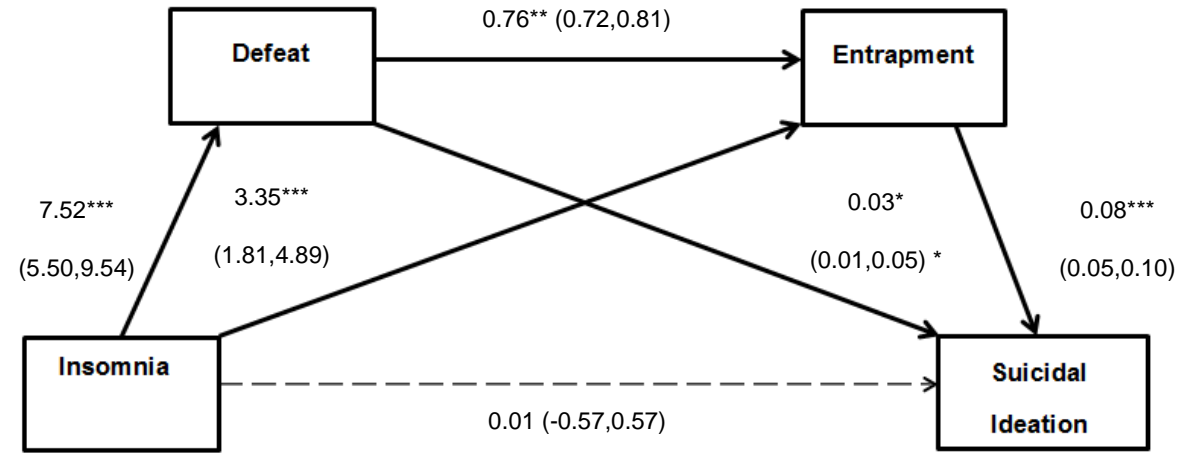
Figure 2: Serial multiple mediation model for the association between nightmares and suicidal ideation, via defeat and entrapment



*p<0.05, **p<0.01, ***p<0.001 coefficients and 95% bias corrected confidence intervals. Significant pathways are highlighted in bold.

Serial multiple mediation model with unstandardized regression

Figure 3: Serial multiple mediation model for the association between insomnia and suicidal ideation, via defeat and entrapment.



*p<0.05, **p<0.01, ***p<0.001 Serial multiple mediation model with unstandardized regression coefficients and 95% bias corrected confidence intervals. Significant pathways are highlighted in bold.