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**Anxiety and depression mediate the relationship between self-disgust and insomnia
disorder**

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Abstract

Objectives: There is limited research on the association between insomnia and negative self-conscious emotions. This study assessed if individuals with insomnia reported higher scores in self-disgust than normal sleepers, and if the association between insomnia and self-disgust was mediated by depression and anxiety.

Methods: Twenty seven individuals with DSM-5 Insomnia Disorder and 30 normal sleepers completed self-reported measures of self-disgust, anxiety and depression.

Results: Individuals with insomnia reported significantly higher scores in self-disgust, anxiety and depression than normal sleepers. Insomnia significantly predicted self-disgust, but this association was mediated by anxiety and depression.

Conclusions: This is the first study that demonstrated the association between clinically diagnosed insomnia in young adults and self-disgust, and highlighted the mediating effects of anxiety and depression.

Keywords: Insomnia; self-disgust; anxiety; depression; mediation modelling.

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Introduction

Insomnia is characterized by difficulty initiating and maintaining sleep, early morning awakenings with an inability to return to sleep and impaired daytime functioning, and affects approximately 10% of the population¹. Individuals with insomnia often report problems with emotion regulation and self-perception²⁻³ and have been found to engage in more violent suicidal attempts compared to non-insomnia patients⁴ and display self-focused attention on awakening and throughout the day in order to assess and confirm the perceived poor nature of their sleep⁵. From a cognitive perspective, this pattern of thinking acts as a maintaining factor of the disorder that potentiates cognitive arousal, distress, and negative thoughts concerning sleep⁶.

Research has also shown that individuals with insomnia and poor sleepers negatively appraise aspects of the physical self, including cutaneous body image; aspects of their facial appearance (i.e. complexion); skin age; and physical cues pertaining to tiredness^{2,7-9}. This pattern of negative self-perception may extend to the experience of aversive self-conscious emotions, such as shame and guilt¹⁰. Self-disgust is a self-conscious emotion characterized by disgust directed to the self¹¹. It is an enduring cognitive-affective state that shares common features with other self-conscious emotions, such as shame and guilt, but has unique phenomenological, expressive and evaluative properties¹¹⁻¹². Self-disgust has been associated with a range of psychopathologies¹³, but it has not been studied in the context of insomnia as yet. If insomnia symptoms are associated with the self-conscious emotion of shame and guilt¹⁰, it is theoretically plausible to expect an association between insomnia and self-disgust. Previous research has shown an association between self-attacking thought control

strategies and insomnia severity in older adults¹⁴. Also, a relationship was documented between the "hated self" (a subscale of the Forms of Self-criticizing/Attacking and Self-reassuring Scale (FSCRS)¹⁵ and anxiety/insomnia (measured with the General Health Questionnaire)¹⁶. Furthermore, insomnia is commonly associated with anxiety and depression, with anxiety often being a precursor for insomnia due to increasing worry and ruminative thinking during the pre-sleep period, and depression emerging as a consequence perhaps due to the debilitating nature of daytime impairments and poor quality of life associated with the disorder.¹⁷⁻¹⁸ In addition, diary studies have shown that sleep disturbance at night leads to daily mood disturbances, including anxiety and depressive symptoms¹⁹. These findings suggest that if insomnia is associated with self-disgust, this association may be mediated by insomnia-induced symptoms of anxiety and depression. Therefore, the aim of the present study was twofold: to assess if individuals with insomnia report greater self-disgust compared to normal-sleepers (Hypothesis 1), and examine if the association between self-disgust and insomnia is mediated by symptoms of anxiety and depression (Hypothesis 2).

Methods

Participants

Participants were recruited from the general population using posters around Sheffield Hallam University, and social media. Participants completed a diagnostic screening questionnaire to determine eligibility to take part and group allocation – insomnia or normal-sleeper (see 'Measures' for details). The sample consisted of 27 individuals with DSM-5 insomnia disorder (mean age=28.74 years, SD=11.26 years; 85.2% female), and 30 normal-sleepers (mean age=25.28 years, SD=9.44 years; 64.3% female).

Measures

Screening questionnaire for eligibility and group allocation

A screening questionnaire previously used by our group² determined eligibility and insomnia status. This was completed with the experimenter to ensure valid diagnosis. Individuals who reported symptoms of a sleep/wake disorder other than insomnia, history of/existing psychiatric illness, a central nervous system disorder, use of medication that may affect sleep, prior head injury or current shift-work were ineligible to participate. Participants with insomnia met DSM-5 criteria for insomnia disorder²⁰. Specifically, individuals with insomnia reported dissatisfaction with sleep characterized by either a difficulty initiating or maintaining sleep or early morning awakenings. Insomnia had to be present for three or more nights per week, for at least three months, and cause significant daytime impairment. Finally, these conditions had to be met despite adequate opportunity to sleep. It was a requirement that normal-sleepers reported no problems with sleep and no history of any sleep-disorder. Of note, subscales of the SLEEP-50 questionnaire²¹ were used to ensure the absence of a sleep/wake disorder other than insomnia.

Self-Disgust

Self-disgust was measured using the Self-Disgust Scale (SDS)¹², an 18-item self-reported measure of disgust towards the self (e.g., "I find myself repulsive", "I often do things I find revolting"). Responses were scored on a 7-point Likert scale (1 = strongly agree, 7 = strongly agree), scores can range from 12-84, and higher scores reflect higher self-disgust. The internal consistency reliability of the scale was high (Cronbach's $\alpha = 0.88$).

Anxiety and Depression

Anxiety and depression were measured with the Hospital Anxiety and Depression Scale (HADS)²², a 14-item measure with total scores ranging from 0-21 for each subscale (HADS-A Cronbach's $\alpha=0.84$; HADS-D $\alpha=0.80$). Higher scores on the subscales HADS-A and HADS-D denote higher levels in anxiety and depression respectively.

Procedure

All participants provided written informed consent prior to participation. Ethical approval was granted by the Sheffield Hallam University Research Ethics committee. Participants were seated at a desk in a laboratory room and completed a questionnaire booklet consisting of the SDS and HADS.

Statistical analysis

To examine Hypothesis 1 we compared normal sleepers and individuals with insomnia on the 3 variables using independent samples t-tests using an alpha level of 0.01 (using Bonferroni correction). The association between the variables was explored using Pearson correlation coefficient. Finally, hierarchical linear regression and regression-based mediation modelling²³ were used to examine the direct and indirect effects of insomnia on self-disgust, after controlling for the effects of depression and anxiety (Hypothesis 2). In the hierarchical regression analysis and the mediation modelling, we used insomnia status as a dichotomous predictor variable (i.e., normal sleepers vs. insomnia disorder).

Results

Differences between Normal Sleepers and Individuals with Insomnia

Independent samples t-test showed that individuals with insomnia (INS) scored significantly higher than normal sleepers (NS) in SDS, $t(55)=-3.32, p=0.002$, (NS=27.93, INS=36.70) *Cohen's d* =0.87; HADS-A, $t(55)=-3.94, p< 0.001$, (NS=5.46, INS=9.37) *Cohen's d*=1.04; and HADS-D $t(55)=-4.38, p< 0.001$, (NS=1.90, INS=5.33) *Cohen's d*=1.14.

Association between Insomnia, Anxiety, Depression, and Self-Disgust

Pearson's correlations showed that self-disgust was significantly associated with anxiety, $r=0.67, p<0.001$; and depression, $r=0.70, p<0.001$. Hierarchical linear regression analysis was used to assess the association between insomnia and self-disgust after controlling for the effects of demographic variables (age, gender), depression, and anxiety. The analysis was

completed in two steps and an overall significant model, $F=18.16$, $p<0.001$ emerged predicting 62% (Adjusted R^2) of the variance in self-disgust. The first step included age, gender, and insomnia (i.e., normal sleepers vs. individuals with insomnia) and accounted for 22.6% of the variance. Adding anxiety and depression scores in the second step significantly increased predicted variance in self-disgust by 38.6% and turned the effect of insomnia non-significant (see Table 1).

Indirect Effect of Insomnia on Self-Disgust

Preacher and Hayes²³ multiple mediation modelling method was used to assess the indirect effects of insomnia on self-disgust, and the mediation effects of depression and anxiety. Bootstrapping with 10000 resamples and 95% confidence intervals were used, and the Sobel test (z) was employed to determine the mediation effect. Both depression, $z=3.16$, $p=0.001$, and anxiety, $z=2.80$, $p=0.005$, significantly mediated the effects of insomnia on self-disgust.

Discussion

The findings of the current study showed that individuals with insomnia presented greater self-disgust, anxiety and depression compared to normal sleepers, supporting prior evidence that insomnia is associated with the experience of negative affective states, including self-hatred¹⁶, and negative self-conscious emotions^{11, 24}. Whilst self-disgust is known to be present in many psychopathologies including mood, eating and personality disorders¹³, in the present study we demonstrated for the first time the association between self-disgust and insomnia disorder, using the self-disgust scale¹² in a clinically diagnosed group of young adults with insomnia. The present findings further advance previous research that found an association between the "hated self", and the anxiety/insomnia subscale of the General Health Questionnaire in a non-clinical and a clinical sample with DSM-4 axis I and II Disorders¹⁶, and an association between self-attacking thought control strategies and insomnia severity in

older adults¹⁴. One possible explanation for the association between insomnia and self-disgust in the present study is that negative ruminations and maladaptive thought control strategies, such as self-attacking, may contribute to the development of self-disgust in people with insomnia. These maladaptive thought control strategies seem to be linked with insomnia severity and are more prominent at night-time¹⁴ and could be a maintaining factor of the disorder. Future research could investigate the role of dysfunctional thoughts in the relationship between insomnia and self-disgust. Our findings further showed that the association between self-disgust and insomnia was mediated by anxiety and depression. Recent research showed that nightly sleep disturbances can cause daytime mood disturbances, including symptoms of anxiety and depression¹⁹. Our findings extend this line of research by suggesting that anxiety and depression can account for the association between insomnia and the experience of self-disgust. Future studies should examine if the relationship between insomnia, anxiety and depression, and self-disgust is reciprocal representing a vicious cycle with feedback loops between sleep disturbances at night, mood disturbances in the day, and enduring self-conscious emotions (e.g., self-disgust). Indeed, this is in line with the recent paradigm shift whereby the role of insomnia moves away from being epiphenomenal to psychiatric disorders (e.g., anxiety and depression), now considering insomnia to be a *transdiagnostic* process co-occurring across psychopathologies²⁵.

The limitations of the present study should be noted. Whilst the current sample consisted of individuals meeting diagnostic criteria for insomnia disorder, the number of participant was limited. Moreover, the cross-sectional nature of the study limits the causality of the observed relationship. As such, it would be beneficial for further research to use longitudinal design to examine these associations. Despite these caveats, our study is the first to demonstrate the association between insomnia and the specific self-conscious emotion of self-disgust. Our findings support previous research noting that individuals with insomnia negatively appraise

aspects of the self^{2,5,7}, and is the first to examine the relationship between insomnia and self-disgust whilst incorporating the mediating role of anxiety and depression. Whilst cognitive behavioural therapy for insomnia remains the first line treatment for the disorder, it may be worthwhile to pursue other avenues amongst those who are treatment resistant. With that in mind, it has recently been noted that correcting aspects of negative interpretations of the self in insomnia should act as a focal point for novel treatment intervention⁷

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Table 1*Direct effects of Insomnia on Self-Disgust*

Step	Predictors	B	β	95% CIs for B	Adjusted R^2
1	Age	-0.310	-0.295*	-0.577 - -0.043	22.6%
	Gender	1.771	0.071	-4.650 - 8.192	
	Insomnia Status	9.655	0.444**	4.118 - 15.192	
2	Age	-0.159	-0.151	-0.353 - 0.035	62%
	Gender	3.823	0.153	-0.829 - 8.475	
	Insomnia Status	-0.442	-0.020	-5.200 - 4.316	
	HADS-A	0.821	0.319*	0.247 - 1.394	
	HADS-D	1.718	0.538***	1.010 - 2.427	

Note. HADS-A = Hospital Anxiety and Depression Scale - Anxiety; HADS-D = Hospital Anxiety and Depression Scale - Depression; * $p < 0.05$; ** $p < 0.005$; *** $p < 0.001$.

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