Sheffield
Hallam
University

Anxiety and depression mediate the relationship between insomnia symptoms and the personality traits of conscientiousness and emotional stability

AKRAM, Umair <http://orcid.org/0000-0003-0150-9274>, GARDANI, Maria, AKRAM, Asha and ALLEN, Sarah

Available from Sheffield Hallam University Research Archive (SHURA) at:

http://shura.shu.ac.uk/24675/

Published version

Copyright and re-use policy

Sheffield Hallam University Research Archive
http://shura.shu.ac.uk

Anxiety and depression mediate the relationship between insomnia symptoms and the personality traits of conscientiousness and emotional Stability

Umair Akram PhD[a,b]*, Maria Gardani PhD[b], Asha Akram PhD[c], Sarah Allen PhD[d]

[a]Department of Psychology, Sociology and Politics, Sheffield Hallam University, UK
[b]Nuffield Department of Clinical Neurosciences, University of Oxford, UK
[c]School of Psychology, University of Glasgow, UK
[d]Department of Psychology, The University of Sheffield, UK
[e]Mental Health and Addiction Research Group, University of York, UK

Corresponding Author: u.akram@shu.ac.uk Department of Psychology, Sociology and Politics, Sheffield Hallam University, Collegiate Crescent, Sheffield, South Yorkshire, S10 2BP, UK.

Abstract

This study examined the relationship between the Big Five personality traits and insomnia symptoms in the general population. Additionally, the mediating role of anxiety and depression was examined. Participants (N=625) completed online measures of the big five personality traits and insomnia severity. Insomnia symptoms were independently related to extroversion, agreeableness, conscientiousness, emotional stability, anxiety and depression in univariate analysis. Linear regression determined conscientiousness and emotional stability to be the only traits predicting insomnia symptoms. However, these relationships were at least partially mediated by anxiety and depression. Whilst reduced levels of conscientiousness and emotional stability has previously associated with poor sleep and insomnia, the current outcomes shed light on the mechanisms which serve to mediate this relationship.

Keywords: Big Five Personality, Anxiety, Depression, Insomnia

Abbreviations

CBT – Cognitive Behavioural Therapy
CBTi - Cognitive Behavioural Therapy for Insomnia
HADS – Hospital Anxiety and Depression Scale
TIPI – Ten Item Personality Inventory
ISI – Insomnia Severity Index

Introduction

Symptoms of insomnia including difficulty initiating and maintaining sleep, early morning awakenings with an inability to return to sleep, and impaired daytime functioning are highly prevalent, affecting up to 10% of the general population at disorder level, and 30% at symptom level (Espie, Kyle, Hames, Cyhlarova, & Benzeval, 2012; Morin, LeBlanc, Daley, Gregoire, & Merette, 2006). It has been theorised that, an individual's personality may act as a predisposing, and potentially perpetuating, factor in relation to the disorder (Spielman, Caruso, & Glovinsky, 1987). In support, research has evidenced that insomnia appears to be related to a greater degree of: maladaptive perfectionistic traits; neuroticism; negative affect; social inhibition; internalisation; and anxious concerns; and lower levels of conscientiousness and emotional stability (Akram et al., 2018; Akram, Ellis, Myachykov, Chapman, & Barclay, 2017; Dekker, Blanken, & Van Someren, 2017; Duggan, Friedman, McDevitt & Mednick, 2014; Van de Laar, Verbeek, Pevernagie, Aldenkamp, & Overeem, 2010). However, the evidence base supporting the relationship between insomnia and personality remains mixed, with little consistency concerning the specific traits which are most predictive of insomnia (Dekker et al., 2017). Whilst this disparity may stem from methodological differences regarding the measure or population used, research should examine whether these relationships may be influenced by mediating psychological factors. With that in mind, research has evidenced the relationship between particular personality traits (i.e. Perfectionism, emotional stability) and insomnia symptoms to be mediated by anxiety and depression (Ahn et al., 2019; Akram, Ellis, Myachykov, Chapman, & Barclay, 2017; Batterham, Glozier & Christensen, 2012; Jansson-Fröjmark & Linton, 2007).

One of the most prominent models of personality is the five-factor model (Goldberg, 1993), comprised of five traits: extroversion, agreeableness, conscientiousness, emotional stability (or neuroticism) and openness to new experiences (Gosling, Rentfrow, & Swann, 2003). Of these, research has reliably demonstrated poor-sleep and insomnia symptoms to be associated with reduced emotional stability (a tendency to be emotionally reactive and experience more negative emotions) and low levels of conscientiousness (a tendency to be reliable, well-organised and hardworking) (Dekker et al., 2017; Duggan et al., 2014; Hintsanen et al., 2014). Interestingly, the direction of these two traits are predictive of health outcomes, with those lacking in conscientious and emotional stability at greater risk of mortality (Kern & Friedman, 2008; Lahey, 2009) and mental health difficulty (Chien, Ko, & Wu, 2007; Kotov, Schmidt, & Watson, 2010; Lahey, 2009). Health promoting behaviours (i.e. exercise, healthy diet, lower risk taking, community integration and relationship stability prominent in conscientious individuals are linked to reduced mortality (Bogg & Roberts, 2004; Friedman & Martin, 2011; Kern & Friedman, 2008). In contrast, neurotic individuals experience greater negative emotions (e.g. anxiety, hostility, nervousness, depression), risk taking behaviour, somatic complaints, and endorse fewer health promoting behaviours (Booth-Kewley & Vickers, 1994; Watson & Pennebaker, 1987). Of particular note, symptoms of anxiety and depression appear to be commonly reported amongst individuals low in conscientious and emotional stability (Chien et al., 2007; Kotov et al., 2010).

Similarly, insomnia is generally associated with reduced immune functioning (Taylor, Lichstein & Durrence, 2010), risk taking behaviour (Womack et al., 2013), mortality risk (Parthasarathy et al., 2015), and psychological disorders, of which anxiety and depression appear to be the most prominent.
Here, anxiety often acts as a precursor for insomnia due to growing worry and ruminative thinking through the pre-sleep period, and depression developing as a result, perhaps due to the encumbering nature of daytime impairments and poor quality of life associated with the disorder (Ford & Kamerow, 1989; Staner, 2010; Kyle, Espie, & Morgan, 2010). These findings suggest that if insomnia is associated with conscientious and emotional stability, this association may be mediated by symptoms of anxiety and depression.

Therefore, this exploratory study aimed to investigate the mediating role of anxiety and/or depression on the relationship between insomnia symptoms and the Big Five personality traits after controlling for the presence of other potentially co-occurring physiological sleep disorders (e.g. sleep apnoea, narcolepsy). Specifically, this study aimed to: i) determine the extent to which symptoms of insomnia were independently related to the traits of extroversion,

agreeableness, conscientiousness, emotional stability and openness to new experiences; and ii) determine whether any confirmed relationships were mediated by symptoms of anxiety and/or depression.

Method

Sample and Procedure

An online cross-sectional survey was conducted, involving questions examining the relationship between the big five personality traits and symptoms of insomnia, anxiety and depression. The procedure was approved by the Sheffield Hallam University Research Ethics Committee, and all participants provided informed consent, and were aware of their right to withdraw.

Members of the general population were targeted through social media websites. Additionally, students from a number of Northern Institutions in the UK were sought through respective course participation schemes. 732 participants began the online survey and 625 respondents provided complete data. Course credit was provided on completion where requested. Those who reported: conducting shift work, a central nervous system disorder, presently using sleep altering medication, a prior head injury or significant sleep disorder symptoms other than insomnia (e.g. apnoea, sleepwalking, narcolepsy, restless legs syndrome/periodic limb movement, circadian rhythm disorder) were omitted from analysis (n=48). Therefore, a final sample of 557 participants (mean age=24.40±11.46, range 18-81, 75% female; 74% student) were included into the analysis. This sample size was deemed sufficient for a 95% confidence level, exceeding our target of 500 complete responses leaving an acceptable 4.5% margin of error (Niles, 2006). Of note, to ensure the absence of a sleep/wake disorder other than insomnia the SLEEP-50 questionnaire (Spoormaker, Verbeek, Van Den Bout, & Klip, 2005) was used (see 'Measures' for details).

Measures

The Ten Item Personality Inventory

The Ten Item Personality Inventory (TIPI: Gosling et al., 2003) was used to assess the Big-Five personality dimensions. TIPI covers personality dimensions of Extroversion, Agreeableness, Conscientiousness, Emotional Stability and Openness to New Experiences using independent subscales. This instrument consists of 10 items with a common stem of 'I see myself as'. Each item consists of two descriptors that represent a pole of the Big-Five personality dimensions and is rated on a 7-point scale ranging from 1 (disagree strongly) to 7 (agree strongly). Many studies have supported the reliability and validity of the measure (c.f. Furnham, 2008; Gosling et al., 2008). The score for each subscale ranges from 2 to 14, with higher scores indicating a greater presence of the specific trait. Assessment of internal consistency yielded a Cronbach's alpha of .65.

Insomnia Severity Index

The Insomnia Severity Index assessed the experience of insomnia symptoms (Bastien, Vallières, & Morin, 2001). Comprised of 7 items, the severity of insomnia symptoms over the past two weeks including difficulty initiating and maintaining sleep and awakening too early are examined. Items are scored on a 5-point likert scale, with total scores ranging from 0–28. Higher scores represent greater insomnia symptoms. Initial assessment of the ISI among patients evaluated for insomnia demonstrated the measure to demonstrate a high internal consistency and reliability (Cronbach's alpha .74: Bastien et al., 2001). Assessment of internal consistency in the current study yielded a Cronbach's alpha of .85.

Hospital Anxiety and Depression Scale

Anxiety and depression were assessed using The Hospital Anxiety and Depression Scale (HADS: (Zigmond & Snaith, 1983). The scale consists of 14 fixed choice items (seven for both anxiety and depression) each scored between 0 and 3, and each with a maximum total score of 21. Higher scores on each subscale represent greater anxiety (HADS-A) and depression (HADS-D). In a review of 747 studies using the HADS, Bjelland and colleagues (2002) provided support for the measures factor structure, discriminant validity and internal consistency. Assessment of internal consistency in the present study yielded a Chronbach's alpha of .85 for the anxiety subscale, and .75 for the depression subscale.

Subscales of the SLEEP-50 (Spoormaker et al., 2005) implied the absence of sleep disorders including: apnoea, sleepwalking, narcolepsy, restless legs syndrome/periodic limb movement, and circadian rhythm disorder. Whilst comprising of fifty items; items relating to insomnia (assessed by the ISI) or sleep hygiene (not a sleep disorder) were omitted in the current study. For each item, participants rated the extent that each statement (e.g. "I am told that I wake up gasping for air") was applicable in the past month (0=not at all, 4=very much). Total scores of: ≥15 indicate apnea; ≥7 sleepwalking; ≥7 narcolepsy; ≥7 restless legs syndrome/periodic limb movement; and ≥8 a circadian rhythm disorder.

Statistical Analysis

Pearson's bivariate correlations examined associations between each of the big five personality traits with symptoms of insomnia, anxiety and depression. This was followed by a hierarchical linear regression analyses (using the enter method), with insomnia symptoms as the dependant variable, in order to determine whether any significant associations between the big five personality traits and insomnia symptoms were mediated by anxiety and depression after controlling for age and sex. Specifically, age and sex were entered as predictors in step-1; TIPI subscales in step-2; anxiety in step-3; and depression in step-4. Significance was considered at the $p < .05$ level.

Results

Univariate associations

Mean scores for the final sample were as follows: ISI, 4.72±4.74; HADS-A, 8.03±4.36; HADS-D, 4.43±3.23; extroversion, 4.12±1.53; agreeableness, 4.84±1.14; conscientiousness, 4.93±1.32; emotional stability, 4.00±1.53; and openness to new experiences, 5.04±1.07. Symptoms of insomnia were negatively related to extroversion (r=-.17, p=.001), agreeableness (r=-.09, p=.03), conscientiousness (r=-.22, p=.001), and emotional stability (r=-.35, p=.001) but not openness to new experiences (r=.04, p=.35). Moreover, symptoms of insomnia were also related to anxiety (.45, p=.001) and depression (r=.43, p=.001). Correlation coefficients between traits did not indicate collinearity (all r's >.70: See Table 1.

Sex Differences

Whilst, no sex differences in reported insomnia (t(554)=0.28,p=.78) and depressive symptoms (t(554)=0.18,p=.86) were observed, increased reports of anxiety demonstrated amongst females (M=8.25±4.34) relative to males (M=7.28±4.31: t(554)=-2.31,p=.02). Moreover, females were more agreeable (M=4.98±1.12: t(554)=-4.87,p=.001) conscientious (M=5.03±1.26: t(554)=,p=.01) and less emotional stable (M=3.86±4.31: t(554)=3.86,p=.001) relative to males (agreeableness, M=4.44±1.18; conscientiousness, M=4.67±1.46; emotional stability, M=4.32±1.62). Extraversion (t(554)=0.01,p=.99) and openness to new experiences (t(554)=1.28,p=.20) did not differ in sex.

Insert-Table1

Linear Regression Analyses

Linear regression analyses determined that emotional stability and conscientiousness, but not extroversion and agreeableness, significantly predicted insomnia symptoms (step2: 15% total variance explained: F(6,550)=16.22,p=.001) after controlling for age and sex (step1: >1% variance explained: F(2,554)=0.38,p=.96). After accounting for anxiety and depression, only age, conscientiousness, anxiety and depression remained significant predictors of insomnia symptoms in the subsequent steps (step3: 22% variance: F(7,549)=26.70,p=.001; step4: 25% variance: F(8,548)=22.77,p=.001; see Table 2). Therefore, whilst insomnia symptoms were associated with decreased emotional stability, this relationship appears to be mediated by anxiety and depression. Similarly, insomnia symptoms were associated with decreased conscientiousness, however this relationship appears to be partially mediated by anxiety and depression. Interestingly, age was not a significant predictor in the first step of the regression model but

became significant in step two when personality traits were added to the model, suggesting that a suppression effect may be evident.

Insert-Table2

Discussion

The present study examined the mediating role of anxiety and depression on the relationship between insomnia symptoms and the Big Five personality traits. Our results provide further evidence that specific aspects of the Big Five personality traits are associated with symptoms of insomnia. Here, extroversion, agreeableness, conscientiousness, and emotional stability were independently related to insomnia symptoms. However, in line with existing evidence (Dekker et al., 2017; Duggan et al., 2014; Hintsanen et al., 2014), when examined in a single regression model, only reduced conscientiousness and emotional stability were significantly predictive of insomnia symptoms. Furthermore, the relationship between emotional stability and insomnia symptoms was mediated by anxiety and depression, whereas conscientiousness was only partially mediated by these factors.

Emotionally unstable individuals tend to experience adverse cognitive-emotional processes (John & Gross, 2004; i.e. worry, rumination, poor coping, and diminished emotion regulation). Whereas, those low in conscientiousness show deficits in responsibility, motivation, and self-control (Duggen et al., 2014). Together, the direction and combination of these two traits may contribute to disturbed sleep due to these underlying difficulties with regulating emotion and behaviour (Duggen et al., 2014). Indeed, a key maintaining feature of insomnia from a cognitive perspective is the presence of negatively toned cognitive activity, manifesting primarily in relation to sleep-related worry and rumination (Harvey, 2002). Whilst these two factors differ in directional focus, with worry pertaining to the future (e.g. *"my thoughts are racing, due to this I won't be able to fall asleep tonight"*) and rumination (e.g. *"I barely slept at all last night and now I can't focus on work"*) the past (Carney, Harris, Falco, & Edinger, 2013 ;Hiller, Johnston, Dohnt, Lovato, & Gradisar, 2015), both encompass recurrent negative thoughts relating to sleep. In turn, these cognitions fuel dysfunctional sleep-related behaviours (e.g. excess caffeine, daytime napping), and this may be more prevalent amongst those low in conscientiousness due to a lack of motivation and self-control. Consequently, the relationship between insomnia symptoms and the traits of conscientiousness and emotional stability may be explained by cognitive-emotional and behavioural deficits (Duggen et al., 2014) which serve to propagate negatively toned cognitive activity, ultimately resulting in poor sleep (Harvey, 2002). That said, these relationships were at least partially mediated by anxiety and depression. Here, it is likely that anxiety exacerbates pre-existing worry and negative ruminative thinking which leads to a negative thought cycle which transitions through the day and into to the pre-sleep period. In contrast, depressive symptoms may emerge considering the encumbering nature of the daytime consequences associated with insomnia (e.g. ability to cope with social and interpersonal difficulties, and the stressors of daily life) alongside the trait predisposition (i.e. conscientiousness and emotional stability) decreased to cope with these difficulties poorly (Staner, 2010).

Johann and colleagues (2018) recently highlight personality as a risk factor for dropout and treatment resistance from cognitive behavioural therapy for insomnia (CBTi). Whilst the authors focused on perfectionism, emotionally unstable individuals have also been linked to resistance with cognitive behaviour therapy (CBT) interventions (Gurtman, Mcnicol, & Mcgillivray, 2013). Given this, it may be beneficial a modified CBTi for those resistant to the traditional form by considering personality (Johann et al., 2018). Specifically, an emphasis on cognitive restructuring and alleviating sleep-related worry and anxiety may serve to normalise sleep-related cognitions in low conscientiousness and emotionally unstable individuals (Gurtman et al., 2013). Alternatively, CBT for anxiety and/or depression may hold therapeutic potential for insomnia. Here, physicians may allocate time to sleep-related cognitions and dysfunctional behaviours which perpetuate insomnia. In turn, the possibility emerges to prevent insomnia in its acute phase from transitioning further. As recently evidenced, this is possible with a single session of CBTi alongside a self-help booklet (Ellis, Cushing, & Germain, 2015).

Several limitations of the current study should be noted. The present sample was mostly female, and therefore the outcomes may not be entirely generalisable. That said, it has been demonstrated that women are more likely to experience disturbed-sleep compared to men (Zhang & Wing, 2006). Moreover, whilst a comprehensive assessment to address insomnia symptoms from the perspective of diagnostic criteria was used, the current outcomes cannot be extrapolated to individuals meeting diagnostic criteria for insomnia. Further, given the cross-sectional design, the causality of the relationships identified cannot be conclusively defined. However, this study did account for the often-overlooked presence of other potentially co-occurring physiological sleep disorders.

To summarise, the present outcomes add to the limited literature concerning the relationship between aspects of personality and insomnia. Whilst reduced levels of conscientiousness and emotional stability has previously associated with poor sleep and insomnia, the current outcomes shed light on the mechanisms which serve to mediate this relationship. Research should examine the possibility for modified CBTi approaches for treatment resistant individuals based on their personality.

References

Ahn, I. Y., Lee, S. J., Han, Y. S., Park, C. S., Kim, B. J., Lee, C. S., ... & Lee, D. (2019). effects of emotional stability on Insomnia through Anxiety in Patients with Cataracts. *Psychiatry investigation*, *16*(1), 93.

Akram, U., Ellis, J. G., Myachykov, A., Chapman, A. J., & Barclay, N. L. (2017). Anxiety mediates the relationship between multidimensional perfectionism and insomnia disorder. *Personality and Individual Differences*, *104*, 82-86.

Akram, U., McCarty, K., Akram, A., Gardani, M., Tan, A., Villarreal, D., ... & Mills, R. (2018). The relationship between type D personality and insomnia. *Sleep Health*, *4,* 360-63.

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, *2*, 297-307.

Batterham, P. J., Glozier, N., & Christensen, H. (2012). Sleep disturbance, personality and the onset of depression and anxiety: prospective cohort study. *Australian & New Zealand Journal of Psychiatry*, *46*(11), 1089-1098.

Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health-related behaviors: a meta-analysis of the leading behavioral contributors to mortality. *Psychological bulletin*, *130*(6), 887.

Booth-Kewley, S., & Vickers Jr, R. R. (1994). Associations between major domains of personality and health behavior. *Journal of personality*, *62*(3), 281-298.

Carney, C. E., Harris, A. L., Falco, A., & Edinger, J. D. (2013). The relation between insomnia symptoms, mood, and rumination about insomnia symptoms. *Journal of Clinical Sleep Medicine*, *9*, 567-575.

Chien, L. L., Ko, H. C., & Wu, J. Y. W. (2007). The five-factor model of personality and depressive symptoms: One-year follow-up. *Personality and Individual Differences*, *43*, 1013-1023.

Dekker, K., Blanken, T. F., & Van Someren, E. J. (2017). Insomnia and Personality—A Network Approach. *Brain Sciences*, *7*, 28.

Duggan, K. A., Friedman, H. S., McDevitt, E. A., & Mednick, S. C. (2014). Personality and healthy sleep: The importance of conscientiousness and neuroticism. *PloS one*, *9*, e90628.

Espie, C. A., Kyle, S. D., Hames, P., Cyhlarova, E., & Benzeval, M. (2012). The daytime impact of DSM-5 insomnia disorder: comparative analysis of insomnia subtypes from the Great British Sleep Survey. *Journal of Clinical Psychiatry*, *73*, e1478-84.

Ford, D. E., & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention?. *Jama*, *262*, 1479-1484.

Friedman, H. S., & Martin, L. R. (2011). *The longevity project: surprising discoveries for health and long life from the landmark eight decade study*. Hay House, Inc.

Furnham, A. (2008). Relationship among four Big Five measures of different length. *Psychological Reports*, *102*(1), 312-316.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American psychologist*, *48*, 26-34.

Gosling, S. D., Rentfrow, P. J., & Swann Jr, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*, 504-528.

Harvey, A. G. (2002). A cognitive model of insomnia. *Behaviour Research and Therapy*, *40*, 869-893.

Hiller, R. M., Johnston, A., Dohnt, H., Lovato, N., & Gradisar, M. (2015). Assessing cognitive processes related to insomnia: a review and measurement guide for Harvey's cognitive model for the maintenance of insomnia. *Sleep medicine reviews*, *23*, 46-53.

Hintsanen, M., Puttonen, S., Smith, K., Törnroos, M., Jokela, M., Pulkki-Råback, L., ... & Venn, A. (2014). Five-factor personality traits and sleep: Evidence from two population-based cohort studies. *Health Psychology*, *33*, 1214-23.

Jansson-Fröjmark, M., & Linton, S. J. (2007). Is perfectionism related to pre-existing and future insomnia? A prospective study. *British Journal of Clinical Psychology*, *46*, 119-124.

Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: a meta-analysis. *Psychological Bulletin*, *136*, 768-821.

Kyle, S. D., Espie, C. A., & Morgan, K. (2010). "… Not just a minor thing, it is something major, which stops you from functioning daily": quality of life and daytime functioning in insomnia. *Behavioral Sleep Medicine*, *8*, 123-140.

Lahey, B. B. (2009). Public health significance of neuroticism. *American Psychologist*, *64*(4), 241-56.

Morin, C. M., LeBlanc, M., Daley, M., Gregoire, J. P., & Merette, C. (2006). Epidemiology of insomnia: prevalence, self-help treatments, consultations, and determinants of help-seeking behaviors. *Sleep Medicine*, *7*, 123-130.

Niles, R. 2006. Robert Niles' Journalism Help: Statistics Every Writer Should Know. Retrieved from http://www.robertniles.com/stats/

Parthasarathy, S., Vasquez, M. M., Halonen, M., Bootzin, R., Quan, S. F., Martinez, F. D., & Guerra, S. (2015). Persistent insomnia is associated with mortality risk. *The American journal of medicine*, *128*(3), 268-275.

Spiegelhalder, K., Espie, C., Nissen, C., & Riemann, D. (2008). Sleep-related attentional bias in patients with primary insomnia compared with sleep experts and healthy controls. *Journal of Sleep Research*, *17*, 191-196.

Spoormaker, V. I., Verbeek, I., van den Bout, J., & Klip, E. C. (2005). Initial validation of the SLEEP-50 questionnaire. *Behavioral Sleep Medicine*, *3*, 227-246.

Staner, L. (2010). Comorbidity of insomnia and depression. *Sleep Medicine Reviews*, *14*, 35-46.

Taylor, D. J., Lichstein, K. L., & Durrence, H. H. (2003). Insomnia as a health risk factor. *Behavioral sleep medicine*, *1*(4), 227-247.

Van de Laar, M., Verbeek, I., Pevernagie, D., Aldenkamp, A., & Overeem, S. (2010). The role of personality traits in insomnia. *Sleep Medicine Reviews*, *14*, 61-68.

Watson, D., & Pennebaker, J. W. (1989). Health complaints, stress, and distress: exploring the central role of negative affectivity. *Psychological review*, *96*(2), 234.

Womack, S. D., Hook, J. N., Reyna, S. H., & Ramos, M. (2013). Sleep loss and risk-taking behavior: a review of the literature. *Behavioral sleep medicine*, *11*(5), 343-359.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta psychiatrica scandinavica*, *67*, 361-370.

Tables

Table 1.

Correlations between measures of insomnia symptoms, anxiety, depression and big five personality for all participants

	1.	2.	3.	4.	5.	6.	7.
1. Insomnia severity							
2. Anxiety	.45**						
3. Depression	.43**	.63**					
4. Extroversion	-.17**	-.29**	-.33**				
5. Agreeableness	-.09*	-.11**	-.16**	.05			
6. Conscientiousness	-.22**	-.26**	-.26**	.09*	.14**		
7. Emotional Stability	-.35**	-.68**	-.51**	.37**	.18**	.26**	
8. Openness to new experiences	.04	-.10*	-.16**	.35**	.25**	.10*	.15**

Note: Anxiety, Depression: Hospital Anxiety and Depression Scale.

* Sig at < .05, ** < .01

Table 2

Linear regression analyses with insomnia symptoms as the dependent variable; age, sex, agreeableness, conscientiousness, extroversion, emotional Stability, anxiety and depression as predictors

Predictors	R^2	β	*t*	Sig.
Step 1	.00			
Age		-.01	-.25	.80
Sex		-.01	-.13	.90
Step 2	.15			
Age		.08	2.15	.03*
Sex		-.04	-.86	.39
Agreeableness		-.01	-.33	.74
Conscientiousness		-.14	-3.38	.001**
Extroversion		-.05	-1.06	.29
Emotional Stability		-.32	-6.91	.001*
Step 3	.22			
Age		.08	2.06	.04*
Sex		-.04	-.96	.34
Agreeableness		-.02	-.49	.63
Conscientiousness		-.11	-2.67	.008**
Extroversion		-.03	-.70	.49
Emotional Stability		-.08	-1.44	.15
Anxiety		.37	7.23	.001**
Step 4	.25			
Age		.08	2.03	.04*
Sex		-.03	-.74	.46
Agreeableness		-.01	-.15	.88
Conscientiousness		-.09	-2.29	.02*
Extroversion		-.00	.03	.98
Emotional Stability		-.10	-.1.11	.27
Anxiety		.26	4.66	.001**
Depression		.21	4.30	.001**

Note: * Sig at < .05, ** < .01