

**Exploring the impact and relationship of symptoms of depression, anxiety
and stress with sleep quality in college students**

Maria Mulvihill

15547047

Submitted in the National College of Ireland, Dublin, April 2018.

BA (Hons) Psychology

Supervisor: Dr. Grainne Kent

Submission of Thesis and Dissertation

National College of Ireland
Research Students Declaration Form
(*Thesis/Author Declaration Form*)

Name: *Maria Mulvihill*

Student Number: *15547047*

Degree for which thesis is submitted: *Bachelor of Arts (Hons) Degree*

Material submitted for award

- (a) I declare that the work has been composed by myself.
- (b) I declare that all verbatim extracts contained in the thesis have been distinguished by quotation marks and the sources of information specifically acknowledged.
- (c) My thesis will be included in electronic format in the College Institutional Repository TRAP (thesis reports and projects)
- (d) ***Either*** *I declare that no material contained in the thesis has been used in any other submission for an academic award.
Or *I declare that the following material contained in the thesis formed part of a submission for the award of

(State the award and the awarding body and list the material below)

Signature of research student: *Maria Mulvihill*

Date: *3/4/2018*

Submission of Thesis to Norma Smurfit Library, National College of Ireland

Student name: *Maria Mulvihill* **Student number:** *15547047*

School: *School of Business* **Course:** *Bachelor of Arts (Hons) in Psychology*

Degree to be awarded: *Bachelor of Arts (Hons) in Psychology*

Title of Thesis: *Exploring the impact and relationship of symptoms of depression, anxiety and stress with sleep quality in college students*

One hard bound copy of your thesis will be lodged in the Norma Smurfit Library and will be available for consultation. The electronic copy will be accessible in TRAP (<http://trap.ncirl.ie/>), the National College of Ireland's Institutional Repository. In accordance with normal academic library practice all theses lodged in the National College of Ireland Institutional Repository (TRAP) are made available on open access.

I agree to a hard bound copy of my thesis being available for consultation in the library. I also agree to an electronic copy of my thesis being made publicly available on the National College of Ireland's Institutional Repository TRAP.

Signature of Candidate: *Maria Mulvihill*

For completion by the School:

The aforementioned thesis was received by _____ **Date:** *3/4/2018*

This signed form must be appended to all hard bound and electronic copies of your thesis submitted to your school

Acknowledgements

I would like to take the time to thank all the people that have supported and encouraged me through conduction of this project.

Firstly, I would like to thank my mam and dad for their never-ending support and encouragement through this time, and for making it possible to for me to practice these academic opportunities over the past 3 years, I would not have got this far without you.

My group of friends in college (they know who they are), I am ever so grateful to you all. For the encouragement and help in times of doubtfulness, I would not have been able to continue on my journey without them.

I would like to thank my supervisor, Grainne Kent, who provided guidance and encouragement and who kindly made herself available for any queries.

I would also like to express my gratitude to Michelle Kelly, who provided me with great honest advice and endless help in the support classes.

Finally, I'm thankful for all the participants for kindly taking the time out to contribute to this project. It would not have been possible without you all.

Abstract

Aims: The emergence of mental-health concerns amongst the college student population is currently increasing. Along with this, sleep problems are becoming a leading concern with regards to mental health issues. The current study sought to investigate the impact of mental-health problems, (symptoms of depression, anxiety and stress) and how they might be interacting with sleep quality. It was hypothesised that depression, anxiety and stress symptoms would all relate to components of sleep quality and would predict poor sleep quality scores.

Methods: An Irish college student sample was recruited ($n = 95$) through convenience sampling. Cross-sectional measures were used to examine and survey students: DASS-21 was used to test for symptoms of depression, anxiety and stress. PSQI was used to test for “good sleepers” and “poor sleepers” and the different dimensions of sleep quality.

Results: The results showed the number of poor sleepers to be alarmingly high (91.2%), along with high frequencies on the different components. Depression, anxiety and stress symptoms all revealed positive relationships with sleep quality and its components. Multiple regression analysis` were performed to test for impact, and revealed depression and anxiety had no significant predicted high PSQI scores as a model. However, stress on its own was a significant predictor for high PSQI scores in students.

Conclusions: These findings illustrate that poor sleep quality and its relationship with depression, anxiety and stress are concerningly high in Irish students, albeit stress was the highest and most significant predictor, meaning practitioners and professionals in colleges need to strategically implement more services for students with concerns of mental health and sleep problems.

Table of contents

<u>Introduction</u>	1
Sleep quality and sleep deprivation	1
Anxiety and sleep quality	4
Depression and sleep quality	5
Stress and sleep quality	7
Depression, anxiety, stress and sleep quality	9
Aims and rationale	9
<u>Methods</u>	12
Participants and table 1	13
Design and Statistical analysis	13
Measures	13
Procedure	17
<u>Results</u>	18
Frequencies	18
Table 2	18
Descriptive Statistics	20
Table 3	21
Inferential Statistics	22
Correlations with all continuous variables	22
Table 4	23
Correlations between gender	24
Table 5	24
Multiple regression analysis	25
Table 6	26
Univariate regression analysis	27
Table 7	27
<u>Discussion</u>	28
Prevalence of poor sleepers	28
Depression, anxiety and PSQI scores	30
Gender differences	33
Stress and PSQI scores	33
Implications	34

Limitations	35
Conclusion	36
References	38
<u>Appendices</u>	<u>45</u>
Appendix A	45
Appendix B	46
Appendix C	47
Appendix D	49

Introduction

Sleep quality and Sleep deprivation

Good sleep quality has been linked to good overall health, good overall well-being, reductions in daytime sleepiness and greater psychological functioning's (Hyypa & Kronholm, 1989). Poor sleep quality has been associated with being a crucial feature of sleep problems e.g. chronic insomnia (Edinger et al., 2004). Sleep deprivation that comes with poor sleep quality tends to consist of total lack of sleep or a shorter than normal sleep period. Sleep deprivation affects the neural processes and results in an imbalance in states of wakefulness and neurocognition functioning. Adolescents often suffer from significant shortage of sleep, and this is also seen to be a chronic issue in regards to youths (Roberts, Roberts & Duong 2009). Some research has shown that sleep problems and inadequate sleep quality have had a more profound long-term affect and have persisted into college/university years. In a recent study, students completed online self-report measures, and were found to have persistent sleep deprivation and bad sleep quality (Lund, Reider, Whiting & Prichard, 2010). The onset of sleep problems at an early stage, permit early health problems and aid the development of possible chronic health issues (Worthman & Brown, 2007). Participants from a cohort study with a large sample of over 17,000, were questioned on their difficulties falling asleep or staying awake and waking unnecessarily early. The results found that of those who reported having sleep disturbances from the age of 16, approximately one third of them proceeded to report continual sleep disturbance at the age of 23, but the findings validity was questioned as parental reports were necessary when measuring at the age of 16 which may have amplified results (Dregan & Armstrong, 2010). This notion of sleep disturbance continuing over time, was supported by various other studies (Roberts, Roberts & Chan, 2001; Morphy, Dunn, & Lewis, 2007).

In contrast, a multi-method study that accounted for subjective and objective measurements of sleep, which consisted of three points in time and included self-reports of anxiety, depression (with DASS) and sleep problems (with PSQI), along with an actigraph (which captures movement through the day and sleeping periods) in Time 1, then Time 2 and 3 protocols did not change. Albeit, from Time 1 to Time anxiety symptoms increased, but it was found that sleep quality improved in the transition from school to college, but there were no differences seen after the transition (Doane, Gress-Smith, & Breitenstein, 2014).

In a study among undergraduate students from second to fourth year and a total of 2,551 participants, using the Pittsburgh Sleep Quality Index scale, 55.8% reported having poor sleep quality overall, with females having a more significant difference (Lemma, Gelaye, Berhane, Worku, & Williams, 2012), but in contrast other studies have found no differences between male and female. (Lund et al., 2010; Taylor & Bramoweth, 2010)

A broader sample was obtained including adolescents, young employees and university students using subjective measures firstly asking how much sleep was necessary to them to feel rejuvenated, then about sleep time and wake time, then sleep length calculated among sleep time and wake time, then the ratio of real sleep time on normal day to self-confessed sleep needed. Then both the Chronic Fatigue Scale and Epworth Sleepiness Scale were used and found that although the claimed number of hours needed for sleep decreases through the years between secondary school years to college years (Oginska & Pokorski, 2006), most complaints of sleep were found in university students.

In a Lebanese university sample, students were assessed on demographics, academia, occupation and socioeconomic status. Then health behaviours were measured and finally any health conditions (e.g. sleep disorders). The Pittsburgh Quality Index Scale along with the

Morning-Eveningness was used to assess sleep quality and parameters. Students claimed to have relatively regular sleep schedules with 61.3% of them being categorised as a poor sleeper in comparison to 56.1% proclaimed to be poor sleepers with an abnormal sleep schedule, but it should be noted that through these findings come down to particular socioeconomic and cultural factors. (Kabrita, Hajjar-Murca & Duffy, 2014).

Over the past few years, there has been elevated attention given to correlates of sleep quality. In study with German medical students, 144 participants took part in the completion of surveys at three points in time (during the semester, pre-exam and post-exam). Subjective sleep quality with PSQI was measured, along with a 10-point stress scale in which their stress at the time was rated at the three points in time. Approaching exams, 59% claimed poor sleep, in the duration of the semester 29% claimed to be poor sleepers, and post exams was dropped to 8%. (Ahrberg, Dresler, Niedermaier, Steiger & Genzel, 2012) These indications were linked to stress as an indication for poor sleep or poor sleep quality, then in turn a possibility of low performance in exams. In a communal sample (ages 18-65) taken from the German Health Survey Mental Health Supplement, global sleep quality was measured with the PSQI, poor sleep was highly related to anxiety and functional impairments beyond the exclusive effects derivable to anxiety disorders (Ramsawh, Stein, Belik, Jacobi & Sareen, 2009). Consistent findings with this in a population of Thai students with a finalised sample of 2,970, who were assessed cross-sectionally using the Morning-Eveningness Questionnaire, the PSQI, the Epworth Sleep Scale and General Health Questionnaire. Poor sleep quality had positive association and increased likeliness of developing common psychiatric disorders in a college population, particularly for evening chronotypes and those who experience day-time sleepiness (Haregu et al., 2015). Current literature would suggest that the prevalence of the symptoms of depression, anxiety and stress are at high rates (e.g. Mackenzie et al., 2011; Eisenberg, Gollust, Golberstein, & Hefner, 2007) particularly in college students. In

systematically examining the prevalence of anxiety, depression and stress among a college group, one of the most concerning relationships was with sleep quality (Beiter, et al., 2015). Little has been done to address and implicate changes in these concerning matters.

Anxiety and Sleep quality

Sleep problems/quality/disturbances and anxiety have been shown to be consistently interrelated and results have been similar in various studies. Part of the DSM-5 diagnostic criteria symptoms for generalised anxiety disorder includes sleep disturbance (restless, non-satisfactory sleep, trouble falling asleep or staying awake). A longitudinal study found in a representative sample of 943 children, signs of sleep disturbance in early years were related to anxiety 20 years on (Gregory et al., 2005), but these results have a degree of error as some years has not been accounted for from 21-25; where students could be experiencing extreme anxiety in their final year of college. On one hand sleep-problems seems to be more prominent amongst youths with generalised anxiety disorder (Alfano, Ginsburg, & Newman Kingery, 2007). Evening type (referring to chronotypes) persons who experience symptoms of insomnia and sleepiness in the day-time tend to be more prone to anxiety in young adults and middle-aged adults. (Simor, Zavecz, Palosi, Torok, & Koteles, 2014) The measurement of specification for chronotypes lacked a generalisability. In undergraduate populations of students, where depressive symptoms and sleep disturbances were present, anxiety was relatively higher along with physical and impaired cognitive functioning compared to individuals without sleep disturbances. Anxiety solely predicted poor sleep quality, as well as when rumination and trait anxiety when they were put together both equally predicted positively poor quality of sleep in undergraduate college students (Nyer et al., 2013; Zadwadski, Graham, & Gerin, 2013). Results in another study showed the type of anxieties affected by sleep quality amongst the German Health Survey with a large sample of 4,181 of an age range of 18-79, using PSQI, interview measures for mental disorders and Short Form

36 questionnaire that measured functional impairment, were all used in the analyses. General anxiety disorder (through the DSM-IV diagnoses of trained clinicians rather than self-report measurements) increased the chances by seven to about eight times the likelihood of being classified as a poor sleeper, this indication of poor sleep and anxiety then had profound effects on functional impairments (Ramsawh, et al., 2009). Insomnia has been linked to pre-existing anxiety at baseline, but also insomnia is a risk for the dawn of anxiety (Morphy, Dunn, Lewis, Boardmann, & Croft, 2007), but these findings were from more a clinical population. Insomnia in undergraduate students was related to social anxiety using the self-reported measures of the following Social Interaction Anxiety Scale, the Insomnia Severity Scale and Beck Depression Inventory, 60% of students who were socially anxious indicated significant levels of sleep impairments in a clinical sense. This suggests the onset of social anxiety possibly leading to the manifestation of insomnia symptoms (Buckner, Bernert, Cromer, Joiner, & Schmidt, 2008) but the sample was only exclusive to first and second years students. Those who already had chronic insomnia were at a higher risk of developing anxiety disorders, which would firmly suggest that chronic insomnia may a possible causal property for those at risk of developing anxiety disorders (Neckelmann, Mykletun & Dahl, 2007; Ohayon & Roth, 2003). More specifically to the existing study, longitudinal findings highlighted anxiety symptoms over the conversion from school to college and was related to subjective and objective measures of sleep problems (Doane, Gress-Smith, & Breitenstein, 2014).

Depression and Sleep quality

Sleep quality and depression, specifically poor sleep have been closely linked. For example, insomnia and depression tend to cooccur, and have a bidirectional relationship, the relationship insomnia predicts depression is equivalent to depression predicts insomnia (Siversten et al., 2012) this was found amongst a massive sample of 24,715 from a wide age

range between two data collected between 11 years, self-reports were used in this DSM-IV for insomnia, the Hospital Anxiety Depression Scale and somatic systems. Zadwadski, Graham and Gerin, (2013) found that in 1,244 undergraduates broken into 3 studies the mediation of anxiety, brought along a depressed mood and poor sleep quality (measured with PSQI) together, but it should be considered that rumination and loneliness were also part of the mediation found and women overpowered men in the sample which raises question if the results were applicable to an overall college student sample. Evening type people who experience sleepiness during the day and symptoms of insomnia, are at a higher risk for depression (Simor, et al., 2014) found in young to middle adulthood individuals. Findings in college students demonstrated a possible association with sleep disturbances and hyperarousal in subjects who showed great symptoms of depression, but in contrast to other studies' findings, sleep disturbances and severity of depression did not result in any association (Nyer et al., 2013). In medical students 30.6% reported had depressive symptoms used with the Emotional State Questionnaire and Questionnaire on Sleep and Daytime Habits. For men the night prior to an exam they experienced difficulty falling asleep, this subjective sleep quality was highly related to depressive symptoms but these sleep difficulties were not related to anxiety. For women, general sleep difficulties remained significantly associated to depression, but with these findings with high cut-off points in screening for possible anxious and/or depressed subjects (Eller, Aluoja, Vasar & Veldi 2006) this study relied specifically on male and female results as opposed to the sample as a whole. Interestingly, in a sample of adolescents when controls for gender, ethnicity, age, family income and puberty stage were brought into the equation, a depressed mood was not a predictor for poor sleep during the weeknights, but low self-esteem and performance in academia were (Roberts, Ramsey Roberts, & Duong, 2009) this opens a suggestion that other more logical internal and external factors may be generating elements of poor sleep.

The effects of bad sleep on depression may not be as bad for adolescents. In a more recent study, suicidal behaviour and sleep complaints had a possible cooccurring interaction with each other that is a potential risk factor for the magnitude of the early outbreak of depression in children and a youth sample (Lopes, Boronat, Wang, & Fu-I, 2016), but again this was derivable to a clinically assessed sample as the children tested were already diagnosed with affective disorder or major depressive disorder. Gregory et al. (2005) did not find any significant association with sleep problems in childhood with a diagnosis of depression in adulthood. Instead associations were with anxiety later in life. This finding is meaningful as the study was one of a longitudinal nature. In a primary care setting, amongst patients with depression, the prevalence of poor sleepers was significantly greater, and was found to be the greatest risk of possibly developing a sleep disorder (Kang, Jang, Ah Lee, & Sunwoo, 2013). In a community epidemiological study, depression and physical disorders were predictors of incidence insomnia and vice versa, insomnia was found to be a predictor incidence depression and overall deteriorating physical health (Cho et al., 2009; Morphy, Dunn, Lewis, Boardmann, & Croft, 2012). Depression remains a major risk factor for sleep disturbances across various different studies, although the prevalence of sleep disturbance shows an increase over the years, the prevalence of depression shows a decrease (Dregan & Armstrong, 2010). Moreover, results show poor sleep and depressive symptoms correlate in college students (Lund et al., 2012), but since they are both prevalent, they need to be more closely studied amongst students.

Stress and Sleep quality

As stress tends to come with a lot of college/university lifestyle difficulties and academic demands, stress will be measured also along with sleep quality. Examining the height of stress occurrence leads to an indication that individuals struggle to cope with the extensive stress they are undergoing (Welle & Graf, 2010). Self-reports of sleep quality and

an association with stress response in cortisol levels (changes in the HPA axis of the brain) amongst a college and community population (Bassett, Lupis, Gianfermate, Rohleder, & Wolf, 2015) and differences were shown between gender, males reported high sleep quality with stronger cortisol stress levels and female responses were less reliant on the self-reports of sleep quality. Other research showed, 20.1% of students declared that stress had a negative impact on their sleep quality, the most common forms of stress they claimed were emotional stress and academic stress (Lund et al., 2010) but this was clearly reliant on self-rated reports. Medical students in Pakistan showed significantly great prevalence rates with poor sleep quality being 59.7% and psychological stress being 77% and the two were significantly associated with each other, measured with the Pittsburgh Sleep Quality Index and the Perceived Stress Scale (Waqas, Khan, Sharif, Khalid, & Ali, 2015). Academic performance was related to stress levels and quality of sleep before exams, this suggested and lead to the assumption of day time troubles with daily functioning because of sleepiness and a reduction in subjective sleep quality. This explains in the cases of medical students, possible negative effects on preparing for exams and performance in exams (Ahrberg et al., 2012). A number of students are obliged to work part-time (or full-time), which could lead to an added stress on top of academic stress. Perceived stress had a negative correlation with sleep quality e.g. a specific job stressor where interpersonal conflict portrayed an increase, the sleep quality showed a decrease in a job scenario in undergraduate part-time workers, essentially directly showed that work-related stress prompted different features of sleep quality (Fortunato & Harsh, 2006). In a laboratory experiment using polysomnographic measures, those who had scored high on stress related sleep disturbance had a more significant amount of disruption on the first night of being in the laboratory, the researchers suggested that this was a vulnerable property in insomniacs related to hyperarousal and is present independently of external factors e.g. daytime sleepiness (Drake, Richardson, Roehrs, Scofield, & Roth, 2004).

Depression, Anxiety, Stress and Sleep quality

In a study relating to the prevalence and correlations of depression, anxiety and stress using the DASS-21 as we will be using in the current study, 11% of participants indicated severe or extreme severity of stress levels, 11% reported severe or extreme severity levels of depression and 15% reported severe or extreme severity levels of anxiety. 19 'sources of concern' were controlled for, and the fifth most concerning was quality of sleep. These findings exemplify the importance of measuring such a variable that relate to individual and interpersonal aspects of daily life and are essential for the well-being of university students in achieving academic and professional success (Beiter, Nash, Mccrady, Rhoades & Linscomb, 2015). They also revealed in relation to sex differences that for both males and females, sleep was revealed as a moderately significant instigator for stress. Notably, the quality of sleep was not amongst the highest of concern but of course was of relative concern (25.9% moderately concern; 11.0% extreme concern). Lemma, Gelaye, Berhane, Worku, & Williams' (2012) findings would indicate a substantial number of students who were classified as poor sleepers (55.8%) that were associated with measures of mental health. Considering this study used two of the same measures as the current study, we would hypothesize that in this Irish population of college students, depression, anxiety and stress would all be related to poor sleep quality, and all predict it to some extent.

The current study

Foregoing research has explored depression, anxiety and sleep (Zawadzki, Graham & Gerin, 2013), depression and sleep quality (Dregan & Armstrong, 2010), anxiety and sleep quality and stress and sleep quality (Lund et al., 2010) however there is an insufficient number of studies that have explored the three dimensions (depression, anxiety and stress) specifically with sleep quality in an Irish college student population. Studies have also not

explored gender in relation to these dimensions, for that reason it may be of interest to explore it in the current study and analyse if the differences in their relationships are substantial. The present study aims to explore the symptoms of anxiety, depression and stress, and how they might be viciously intertwining with each other and quality of sleep. We want to see which dimension is more strongly predicting poor sleep quality so future efforts can prevent such an influence. The current study also intends to explore the prevalence of poor sleep if any and explore the different figures that illustrate the different components of sleep quality in students. Sleep and wakefulness is linked to good academic performance in college students (Eliasson, Lettieri & Eliasson, 2010), and having well-functioning cognitions is essential throughout the day. As known a person's general mental health is very important to their overall health, and it appears that the prevalence of mental health issues is increasingly high at the moment for college students particularly according to a vast majority of data (Hunt & Eisenberg, 2010). It may be possible that each student reacts differently to pressures that come with college life i.e. anxious symptoms, depression symptoms and stress symptoms (Welle & Graf, 2010) and this may interfere with an individual's daily cognitions and their overall mental health. If anxiety, stress and depression all have a significant relationship and predict poor sleep quality, consideration and further investigation would need to be made on providing interventional focuses in colleges. For example, bringing different programs to colleges nationwide, aiding the negative impact of the symptoms of anxiety, stress and depression and disturbances of a bad night's sleep are having on college life, and more education should be provided on the importance of a student's mental health and a good night's sleep.

The current study entails the following aims/hypotheses:

- 1) Primarily, to analyse the relationship between the symptoms of depression, anxiety and stress with sleep quality (including the subcomponents of the PSQI scale used) in

Irish college students; which we predict will all show at least moderate or strong relationships.

- 2) Secondly, to assess if there is any difference between males and female with the relationship of symptoms of depression, anxiety and stress with sleep quality in our sample
- 3) Thirdly, to examine if symptoms of depression, anxiety and stress predict global PSQI scores in this sample; we predict that all three will predict high global PSQI scores to some extent.

Method

Participants

The participants involved in the current study were college students, 95 in total. 32 males and 63 females participated, but some missing values were included for the first scale Depression, Anxiety and Stress scale ($n = 2$) and the second scale Pittsburgh Sleep Quality Index ($n = 4$). The participants were from different colleges/universities around Ireland. Participants were recruited and selected through an opportunistic combined with a snowball sampling method which is a non-probable sampling method of recruitment. It uses people from the target population who are readily available and willing to participate. It is a convenient sampling method for the purpose of time and lack of resources. Snowball sampling helps to extend recruitment from the same population of interest. The participants included people over the age of 18 to avoid any vulnerable populations and did not include anyone who was not in third level education. Stress for example, can decrease with age (Bergdahl & Bergdahl, 2002) which can interfere with the results and purpose of the study. The problem with this sampling is that it lacks a representative sample and can provide an institutional bias in the results.

Table 1. Frequencies for the current sample on each demographic variable ($n = 95$)

Variable	Frequency	Valid Percentage
Gender		
Female	63	66.3
Male	32	33.7

Design and Data analysis

For the current study a cross-sectional design was carried out through online questionnaires. The present study was of quantitative nature, with one question in Pittsburgh Sleep Quality Index being a qualitative answer.

With the data collected, statistical analyses were performed – frequencies, descriptives, Spearman's rho correlations, spearman's rho correlations between gender, standard multiple regression and a univariate linear regression were carried out with IBM SPSS Statistics 24.

Firstly, a Spearman's rho correlation was performed to determine relationships between depression, anxiety, stress, PSQI's seven subcomponents (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication and daytime dysfunction) and global PSQI scores of all participants. Spearman's rho was used due to non-normal distribution in preliminary analyses.

Secondly a comparison for correlations coefficients for two groups (Spearman's rho) was carried out by splitting the data file and assessing relationships between males and females with depression, anxiety and stress with overall global PSQI scores.

A standard multiple regression analysis was administered to examine interactions if any between depression and anxiety (predictor variables) with global PSQI scores (criterion variable).

In an attempt to avoid violation of the assumptions of multicollinearity in one standard multiple regression, instead a separate analysis was performed using a univariate regression analysis to test the impact for stress (predictor variable) with global PSQI scores (criterion variable) was performed with a univariate regression analysis.

Measures

Online surveys were used which consisted of two well-validated scales. 1) Depression Anxiety and Stress Scale (DASS-21). 2) The Pittsburgh Sleep Quality Index (PSQI). Included on the online questionnaire. Before completion of the survey, each participant was provided with an information sheet and a consent form. Both self-report measures have high reliability in gathering direct answers. The anonymity of the study could have possibly decreased social desirability, where participants affect the validity of the measures by answering responses under or over stating in respect to how they are accurately feeling, but this was hoped to be avoided due to high validity of the scales.

Depression, Anxiety and Stress Scale (DASS-21)

Depression, Anxiety and Stress Scale, which was developed by Lovibond and Lovibond (1995) in the University of New South Wales (Australia). This scale is a set of three of self-report subscales used to assess symptoms and the prevalence of depression, anxiety and stress over the past week. The whole scale consisted of the 21 version of questions. Questions were answered on a four-point likert scale 0-3, 0 being “did not apply to me” and 3 being “applied to me very much” to the participant. 7 items per each of the three measurements, states of depression, anxiety and stress. The depression part of the scale assessed hopelessness, dysphoria, lack of interest/involvement, devaluation of life, self-depreciation, inertia and anhedonia. The depression subscale included questions: 3, 5, 10, 13, 16, 17 and 21. The anxiety subscale assessed subjective anxiety, situational anxiety, autonomic arousal, skeletal muscle affects. The anxiety subscale included questions 2, 4, 7, 9, 15, 19 and 20. The stress part of the scale assessed chronic non-specific arousal; it assessed agitation/irritability/over-reactiveness, difficulty relaxing, nervous arousal and impatience. The stress subscale included questions 1, 8, 11, 12, 14 and 18. (Note: question 6 was left out

by default but was supposed to be included in the subscale stress). Each subscale added each item together and multiplied by 2 for a total score. This scale is not intended to clinically diagnose any participants, but only used in this study to detect symptoms. The Cronbach's Alpha was calculated for the internal consistency for each subscale: Depression 0.90, Anxiety 0.83 and Stress 0.84. (see Appendix C for full items on DASS-21 scale)

Severity scores for DASS-21:

	<i>Depression</i>	<i>Anxiety</i>	<i>Stress</i>
<i>Normal</i>	0-9	0-7	0-14
<i>Mild</i>	10-13	8-9	15-18
<i>Moderate</i>	14-20	10-14	19-25
<i>Severe</i>	21-27	15-19	26-33
<i>Extremely severe</i>	28+	20+	34+

Pittsburgh Sleep Quality Index (PSQI)

PSQI was used in this study to measure subjective sleep quality. PSQI was originally developed by Buysse, Reynolds, Monk, Berman & Kupfer, (1989). This scale is a well renowned global scale. It has been widely used for assessing adults, college students (e.g. Lund et al., 2010; Ahrberg, et al., 2012; Zawadaski, Graham & Gerin, 2013) and various other populations (e.g. Ramsawh, et al., 2009). The scale consists of 18 items and is based on self-report answers and measures. The scale usually includes 19 items but, question 10 was excluded as the version found did not include it and it did not seem necessary for the overall scoring of components. Question 10 seems to be more specifically measuring sleep disorders like sleep apnea and restless leg syndrome. The scale includes 7 components which include sleep latency, sleep disturbances, sleep duration, subjective sleep quality, daytime

dysfunction, habitual sleep efficiency and use of sleep medications over the past month. Each item is used to calculate the components. The Subjective sleep quality component included question 6 and required no computing. Sleep latency included question 2 which had to be recoded (<15 mins was changed into 0, 16-30 minutes changed to 1, 31-60 minutes changed to 2, and >60 mins was changed to 3), this was added to with question 5a to complete the total for this component. The Sleep duration component included question 4 which was recoded (> 7 hours changed into 0, 6-7 hours was changed into 1, 5-6 hours was changed into 2, and < 5 hours changed into 3) and required no computing. The Habitual sleep efficiency component included question 4, then calculating the number of hours spent in bed with question 3 and question 1, then hours slept/hours spent in bed was multiplied by 100 to calculate a total percentage which had to be recoded (> 85% was changed to 0, 75-84% was changed into 1, 65-74% was changed into 2, and < 65% was changed to 3). The Sleep disturbances component included question 5b-5j and recoded firstly (not during the past month was changed to 0, less than once a week was changed into 1, once or twice a week was changed into 2, and three or more times a week was changed to 3) all these scores were then added up and recoded again (0 remained 0, 1-9 was changed to 1, 10-18 was changed to 2, 19-27 was changed to 3). The Use of sleeping medication component included question 7 where answers were recoded (not during the past month was changed to 0, less than once a week was changed to 1, once or twice a week 2 and three or more times a week was changed to 3). The Daytime dysfunction component included question 8 that needed to be recoded (never was changed to 0, once or twice was changed to 1, once or twice a week was changed to 2 and three or more times a week was changed to 3) added with question 9 that had to be recoded first (very good to 0, fairly good was changed to 1, fairly bad to 2, and a very bad to 3) to get a total score. Then all components were added together to compute an overall global PSQI score. Global PSQI scores over 5 indicate “poor sleepers”, and scores under 5 indicate

“good sleepers”. The Cronbach’s alpha calculated for internal consistency for the PSQI was 0.74. (see Appendix D for full PSQI items).

Procedure

Before commencement, a research proposal was submitted through the National College of Ireland Ethics Committee and was approved. Online questionnaires were publicised on Facebook, WhatsApp groups or via email, with the link of the questionnaires on <https://www.google.com/forms/> where it was outlined to participants that the target population was exclusively college students. Before proceeding with the present study, as explained in the consent form the participant’s requirements of participation was established, participants were clearly made aware of their rights as participant and the confidential nature of the study. When the participants were given the option to tick the boxes stating they were over 18, tick the box where it declared they were aware of their rights as a participant, the confidentiality and voluntary nature, tick the box that stating they have read the entire information/consent form, and aware of the requirements of the study. Once every participant ticked each box, which willingly marked their decision to be a part of the study, google forms then moved onto to the questionnaires. The first questionnaire was the Depression, Anxiety and Stress Scale which included 21 scale items. When the participant answered all the questions in the first questionnaire, they were given the option to click next which brought them onto to the next questionnaire which was the Pittsburgh Sleep Quality Index which consisted of 18 items that included short answer questions and scale items. After all the questionnaires, all participants were lightly debriefed after the questionnaires, where the researcher made acknowledgement and thanked participants for their involvement and coalition in the study, provided helpline services if necessary, and finally when the participant clicked ‘submit’ their data was collected and conclusively admitted in the study.

Results

Frequencies

Table 2. Frequencies for the current sample PSQI in each subcomponent

Variable	Frequency	Valid Percentage
Subjective sleep quality		
Very good	2	2.2
Fairly good	34	37.0
Fairly bad	40	43.5
Very bad	16	17.4
Sleep latency		
Very good	3	3.2
Fairly good	27	28.7
Fairly bad	37	39.4
Very bad	27	28.7
Sleep duration		
>7 hours	52	54.7
6-7 hours	15	15.8
5-6 hours	20	21.1
<5 hours	8	8.4
Habitual sleep efficiency		
>85%	67	71.3
75%-84%	20	21.3
65%-74%	2	2.1
<65%	5	5.3

Sleep disturbances		
0	1	1.1
1-9	58	63.0
10+	33	35.9
Use of medication		
Not during the past month	73	79.3
Less than once a week	8	8.7
Once or twice a week	8	8.7
3 or more times a week	3	3.3
Daytime dysfunction		
0	73	79.3
1-2	8	8.7
3-4	8	8.7
5-6	3	3.2
Global PSQI scores		
Good sleepers	8	8.8
Poor sleepers	83	91.2

Descriptive statistics

Descriptive statistics for each of the measured variables in this study are presented in Table 3. Preliminary analysis indicated that Depression, Anxiety, Stress and Global Sleep Quality scores were positively skewed with a number of outliers. For the purposes of the current study these outlying scores were retained. Depression, Anxiety and Stress levels were normal-to-moderate and Global PSQI scores were indications of overall poor sleepers. Although the sample size is small, the somewhat low standard error values, and close 95% confidence intervals suggests that the current sample is reasonably representative of the Irish college student population. The current data was non-normally distributed, and results were skewed to the left (negatively skewed). Due to non-normal distribution, non-parametric inferential statistics had to be used.

Table 3. Descriptive statistics of all continuous variables (*n* = 95)

	Mean (95% Confidence Intervals)	Std. Error Mean	Median	SD	Range
Depression	9.11 (7.86 – 10.35)	.63	8	6.05	0-24
Anxiety	8.90 (7.79 – 10.01)	.56	9	5.39	0-21
Stress	10.42 (9.38 – 11.46)	.52	10	5.05	1-19
Subjective sleep quality	1.76 (1.60 – 1.92)	.08	2	.76	0-3
Sleep latency	1.94 (1.76 – 2.11)	.09	2	.84	0-3
Sleep duration	.83 (.62 – 1.04)	.11	0	1.04	0-3
Habitual sleep efficiency	.41 (.25 – .57)	.08	0	.78	0-2
Sleep disturbances	1.35 (1.24 – 1.45)	.05	1	.50	0-2
Use of medication	.36 (.20 – .52)	.08	0	.78	0-3
Daytime dysfunction	1.99 (1.84 – 2.14)	.08	2	.72	1-3
Global PSQI Scores	8.68 (7.96 – 9.40)	.36	8	3.47	3-19

Inferential statistics – Correlations

The relationship between depression, anxiety and stress with global sleep quality and the subcomponents of the PSQI scale was investigated using a Spearman's Rho correlation. Preliminary analyses were carried out to ensure no violation of the assumption of normality, linearity and homoscedasticity. There was strong positive relationship between depression and global PSQI scores $\rho = .5$, $n = 89$, $p < .001$. These two variables shared approximately 25% variance. There was a moderate positive relationship with anxiety and global PSQI scores $\rho = .4$, $n = 89$, $p < .001$. These two variables shared approximately 16% variance. There was a strong positive relationship between stress and global PSQI scores $\rho = .57$, $n = 90$, $p < .001$. These variables shared approximately 32% variance. There was a strong positive relationship with sleep disturbances and depression $\rho = .57$, $n = 90$, $p < .001$. These two variables shared approximately 32% variance. There was also strong positive relationship between daytime dysfunction and stress $\rho = .57$, $n = 91$, $p < .001$. These two variables shared approximately 32% variance.

Prior to carrying out a multiple regression analyses, a bivariate correlation was necessary to determine the relationships between all independent variables and the dependent variable. This relationship was assessed using a Spearman's rho. Results from the correlation are presented in the table 4.

Table 4. Correlations of continuous variables – symptoms of depression, anxiety, stress, 7 components of PSQI, and global PSQI scores

Variables	1	2	3	4
1. Depression	1			
2. Anxiety	.65	1		
3. Stress	.76***	.70**	1	
4. Global PSQI scores	.50**	.40*	.57**	1
5. Subjective sleep quality	.32	.27**	.46**	.37**
6. Sleep latency	.40	.27*	.41**	.44**
7. Sleep duration	.20	.16	.19	.22*
8. Habitual sleep efficiency	.31	.27**	.31**	.20
9. Sleep disturbances	.57	.54**	.50**	.22*
10. Use of sleep medication	.15	.41	.23*	.16
11. Daytime dysfunction	.51	.40**	.57**	.37**

Note. Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Correlations

Given that the p value is $> .05$ the result is non-statistically significant. We can therefore conclude that there is no statistically significant difference in the strength of correlations between depression, anxiety and stress with global PSQI scores between females and males. See table 5.

Table 5. Split file correlations between males and females – with depression, anxiety stress and global PSQI scores

Variables	1	2	3	4
Female				
1. Depression	1			
2. Anxiety	.71***	1		
3. Stress	.78***	.74***	1	
4. Global PSQI scores	.48***	.40**	.59**	1
Male				
1. Depression	1			
2. Anxiety	.49**	1		
3. Stress	.70**	.37*	1	
4. Global PSQI scores	.48**	.26	.53**	1

Note. Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Inferential statistics – Multiple Regression

A Multiple regression analysis was performed to determine if global PSQI scores could be explained by symptoms of depression and anxiety.

Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. The correlations between the predictor variables and the criterion variable included in the study were examined (see Table 3 for details). These predictor variables were significantly correlated with the criterion variable, and these significant effects ranged from $r = .40$ (anxiety) to $r = .50$ (depression). The results indicate that the violation of the assumption of multicollinearity was not violated.

Since no *a priori* hypotheses had been created to determine the order of entry of the predictor variables, a direct method was used for the analysis. The two predictor variables explained 6% of variance in global PSQI scores $F(2, 86) = 2.61; p = .079$. Two of the two variables in the model were not found to be statistically significant when predicting global PSQI scores: depression ($\beta = .18, p = .21$), and anxiety ($\beta = .08, p = .56$).

Note: If depression only improves overall model fit and it explains new variance but is highly correlated with anxiety and global PSQI scores, anxiety decreases and becomes non-significant this is because anxiety does not uniquely explain global PSQI scores and the variance appears to become overlapped with depression (and vice versa). But in the present study the statistical power is not adequate enough to detach their effects.

Table 6. Multiple regression model predicting global PSQI scores

	<i>R</i>²	<i>B</i>	<i>B</i>	<i>SE</i>	CI 95% (B)
Model	.06				
Depression		.18*	.01	.01	-.01 / .02
Anxiety		.08	0	.01	-.01 / .02

Note. N = 89; Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Inferential statistics – univariate regression

Due to violating the assumptions of multicollinearity, the independent variables (depression, anxiety and stress) were not performed on a regression analysis together. Stress was performed in its own separate multiple regression analysis as seen below in Table 4.

The predictor variable stress explained 10% variance in global PSQI scores $F(1, 88)$ $p = .003$. Therefore, it can be concluded that stress was the highest predictor of global PSQI scores.

Table 4. Multiple regression model predicting global PSQI scores

	<i>R</i> ²	<i>B</i>	<i>B</i>	<i>SE</i>	<i>CI 95% (B)</i>
Model	.10				
Stress		.31*	.02	.01	.60 / .86

Note. $N = 89$; Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

One initial goal of the present study was to explore the level of the correlations between depression, anxiety and stress and sleep quality in an Irish student population. The determination to explore this was due to the findings of Beiter et al. (2015) in which positive relationships with symptoms of depression, anxiety and stress where sleep quality was of top concern (when controlling for 19 other variables). Additionally, there appeared to be a lack of investigation when measuring all three variables (depression, anxiety and stress) and overall sleep quality in the same analysis in an Irish college student population. However, the rationale was justified due to the ongoing research that suggests and supports the relationship between the three variables and sleep quality (Lemma et al., 2012; Beiter et al., 2015).

A second aim of the study was to explore the difference in relationships with the levels of depression, anxiety and stress in global PSQI scores in males and females. Bassett et al., (2015), revealed that males who reported high sleep quality showed strong cortisol stress responses, and on the other hand women's stress responses were less reliant on self-reports of sleep quality. Other studies revealed no differences between gender at all (Nyer et al., 2015). Due to these findings, the researcher thought it may be of interest to investigate this in the current sample to broaden the specific concerns that may have possibly needed more attention in gender differences.

A third aim of the study was to analyse whether depression, anxiety predicted poor sleep, and whether stress predicted poor sleep. Waqas et al., (2015) showed that perceived stress relative to academia was a predictor for poor sleep quality. Results also demonstrated that the prevalence of stressed students that cooccurred with poor sleep was high (82%). Given that Zadwadski, Graham and Gerin's (2013) findings would have exemplified the mediation between a depressed mood, trait anxiety and poor sleep quality, further contribution and

investigation was implemented into the prediction of symptoms of depression and symptoms of anxiety with sleep quality in the present study.

Prevalence of poor sleepers

A substantial number of poor sleepers (91.2%) were found amongst the current sample. The number of students who were classified as poor sleepers in this study is partially consistent with Lemma et al., (2012), who also found a concerning number of poor sleepers in their study. Arhberg et al., (2012) reported similarly high number of poor sleepers in a student population in exam periods and highly stressful time points.

Sleep quality broken down into its subcomponents disclosed high rates of subjective sleep quality were amongst the students scoring fairly bad and scoring very bad. Sleep disturbance was a very regular occurrence (see table 2). Sleep latency was also reported highly as fairly bad and very bad (see table 2). Similarly, Lund et al., (2010) found specifically for the sleep disturbances of PSQI scores, prevalence rates of 21.5% could not get to sleep within 30 minutes at least once or twice a week, 20% of students reported struggling to stay awake during social events 3 or more times in a week. The high prevalence of the different aspects of sleep quality and the disruptions found in the current study and the study previously discussed are consistent with it show that poor sleep quality is a growing concern for the majority of students in various cultures and populations. To the best of our knowledge, this is the first study of its kind conducted in an Irish student population that has examined sleep quality and possible correlates.

To summarise, it would appear that overall college students seem to be affected by poor sleep quality, even in different social and culture contexts, and evidently there needs to be more education provided for college students to avoid unhealthy adverse health effects for the duration of college and through the onset of adulthood. Moreover, other factors that college

students encounter could possibly be giving rise to poor sleep, for example caffeine consumption, alcohol consumption, smoking or use of substances (Lohsoonthorn et al., 2013), or a disorganised sleep schedule (Kabrita et al., 2014). Sleep is needed for the maintenance of high achieving performance and to regulate a good mental health, and for this reason more interventional practices should be implemented.

It should be noted that one of the questions from the PSQI questionnaire was a qualitative answer and was not included in the statistical analyses of the results. The question addressed “other reasons” people described having difficulty falling asleep. Common answers included; racing thoughts/overthinking, overuse of technology throughout the day and into the night (phone or laptop) and being overtired. These answers are all relative to the contribution of a bad night’s sleeps and also possible relation to the symptoms of depression, anxiety or stress. These kinds of manifestations warrant further research relative to thought processes endured before a night of sleep.

Depression and Anxiety and PSQI scores

The current study would suggest from the findings that although correlations with global PSQI scores and depression were high and anxiety were moderate, depression and anxiety did not significantly predict high global PSQI scores and showed very little variance (6%) as a whole model, which goes against our hypotheses.

These findings were partially consistent with Roberts, Ramsey Roberts, and Duong, (2009) even with controls such as age, gender and income, a depressed mood was not found to be a predictor of a short night’s sleep in reference to poor sleep. In contrast to the present study, Lund et al., (2012), found that Profile Mood of States (which included depression symptoms) predicted PSQI scores. Zawadski et al. (2013), highlighted that anxiety (conjointly with rumination) was a mediator for a depressed mood and sleep quality. These findings would

advocate that when systematically examined together no predictions in high PSQI scores were observed amongst the existing sample. This may be due to the small sample size that did not provide enough statistical power to interpret these results fairly.

Although depression symptoms and anxiety symptoms inferred no prediction, it should be considered that their relationships were relatively moderate and strong much like the other literature discussed. As previously discussed Beiter, et al., (2015) discovered that sleep quality was a high correlate amongst their various controls that included depression, anxiety and stress also using DASS-21. Here in the current study referring to the association of symptoms of depression with PSQI scores, the relationship between the two was a strong one and shared a high percentage of variance. These findings are in conflict with Nyer et al. (2013) who did not find a direct association with sleep disturbances and depression severity (the global PSQI score in present study had the same correlation as the sleep disturbance subscale), but in their examination they assessed specifically individuals who already retained high depression scores before beginning the study. It is possible that if the same methodology had been taken in our study as they had with theirs results may have come out differently. If depression had been measured on its own model, predictions may have been more predominant than while in opposition the other variables that were included.

Sleep disturbances and daytime dysfunction as subcomponents a part of the PSQI also produced substantial relationships with depression and anxiety symptoms. Sleep disturbances was highly related to anxiety and depression which is not surprising due to the fact that insomnia is a symptom of depression. In other findings previously mentioned above (Nyer et al., 2013), where sleep disturbances depressive symptoms converged together which created heightened anxiety in individuals. Daytime dysfunction was also highly associated with anxiety. This could be because anxiety symptoms exacerbate poor sleep quality leading to functional deteriorations or poor sleep may be a marker for severe symptoms of anxiety. Similarly,

Ramsawh et al. (2009) also resulted in a high relationship with daytime dysfunction where generalised anxiety disorder was present. In contrast, a longitudinal study only found that the relationship between anxiety symptoms was a moderate one, although daytime sleepiness was indirectly predicted by anxiety symptoms (Wong, Ying Lau, Yin Wan, Cheung, Hui, Yink Mok, 2013). Sleep latency also displayed a moderately significant relationship with depressive symptoms, as for sleep latency and anxiety a small moderate relationship was displayed. Subjective sleep quality initiated a small-moderate relationship with depressive symptoms, when with anxiety symptoms it was a weak relationship. This was opposing to Eller et al. (2006) where they found a strong relationship with subjective sleep quality and depression symptoms but only specifically in men. Habitual sleep efficiency was a moderate relationship with depression symptoms, and with anxiety symptoms it was not far off being a moderate one. The use of medication differed between depression and anxiety symptoms. The relationship was very weak with depression but withheld a moderate relationship with anxiety symptoms. In partial alignment with this, recurrent anxiety symptoms (and depression symptoms) was a predictor for the use of sleep medication in unspecified sample (Omvik, Pallesen, Bjorvatn, Sivertson, Havik, & Nordus, 2010). Anxiety symptoms in the current study may have been a mediator for bad sleep, thus the common use of medication to combat poor sleep may have been a regular occurrence for those with anxiety symptoms. Sleep duration was the weakest association for anxiety and depressive symptoms (also for stress).

In conclusion, in terms of predictability depression and anxiety did not have outstanding results with global PSQI scores. Although, their relationships with sleep quality and some of sleep quality's components were evident. It may be of interest to measure the two modalities in their own model and take a more specific method i.e. use a scale that only measures anxiety and a scale that only measures depression.

Gender differences with depression, anxiety and stress correlating with global PSQI scores

A split file was used to compare the correlation coefficient for the males and females partaking in this study. In comparison with other study's, a compare groups (e.g. ANOVA, T-test) was not used due to the power of the sample size. Eller et al. (2006) used a multiple regression model for singular symptoms of sleep troubles to assess differences relative to males and females, and found for example, with females there was a relationship between initial insomnia and symptoms of depression, whereas males subjective sleep insomnia and depressive symptoms were related. But similarly, to our study, various studies also found no difference at all in gender (Basset et al., 2015; Nyer et al., 2015).

Stress and PSQI scores

Stress demonstrated a close relationship with daytime dysfunction and a very high level of variance was shared between the two. The finding in the existing study shares similarity with Ahrberg, Dresler, Niedmaier, Steiger, and Genzel's, (2012) findings where students were surveyed at exam period. Perceived stress increased and heightened daytime dysfunction in terms of poor sleep quality. Stress and sleep disturbances showed a strong relationship, this comes as no surprise due to the biological effects of stress has on the body (e.g. hyperarousal or oversimulation in the HPA axis) deliver a predilection for stress caused sleep disturbances particularly in stressful periods that are a regular occurrence in the present population. Subjective sleep quality, sleep efficiency and sleep latency all shared a moderate relationship with stress symptoms. Use of medication and sleep duration were weak relationships with stress symptoms.

Using a univariate linear regression, it was found that stress was the stronger predictor for high global PSQI scores. Due to multicollinearity (Tabachnick & Fidell 2013, p 138), stress

was determined with global PSQI scores separately as the relationship with stress and depression was relatively high. Stress often warrants and brings on depression and anxiety initially, so it is no surprise it was the stronger predictor of all three. Congruent with the current study, Lund et al., (2010) also found that stress had an interference on their sleep at least once a week. Stress overall in their study was the most critical explanation amongst their sample. The reports indicated it was academic or emotional stress interrupting their sleep. This could be the case for students in the present study; emotional stress (e.g. relationships) or academic stress (e.g. exams or assignments). Another possibility is job stress (Fortunato & Harsh, 2006) as many students have to support their education, living circumstances and social life. It would be as expected for students to be challenged with these types of stressors as college lifestyle generally entails a busy schedule or routine.

Implications

The results contained in the present study indicate the need for further research and investigation and possibly a need to implement more longitudinal research to comprehend more plausible findings. Another suggestion would be to perform a mediation analyse longitudinally to replicate more causal findings included in depression, anxiety and stress with poor sleep quality.

Screening of systematic and continual examination of mental and physical health (including quality of sleep) problems should be done regularly, to help evaluate the colleges and universities student's mental health. This should allow colleges to have readily available programs and further grow their counselling centres in an effort to further reduce mental health suffering amongst the college student population.

Since stress has the highest mean score, was highly related to global PSQI scores and was the strongest predictor for global PSQI scores, it would suggest that coping style programs

dealing with stress management throughout universities and colleges need to be constituted. Colleges should reach out to students to emphasise the importance of seeking help and working on mental and physical health. Professionals should also be highlighting the importance of the restoration that sleep provides in terms of reducing toxins and rejuvenating the body, the importance of an adequate amount of sleep, and how to take action on improving sleep. Consistent issues with sleep are problematic as they put students at risk for further health problems that can be more detrimental than just daily dysfunctions. Chronic insomnia for example is a big risk for mood problems (Neckelmann, Mykletun & Dahl, 2007) and substance misuse disorders (Roane & Taylor, 2008). Available resources could be utilized (e.g. Irish Sleep Society) to aid the formulation of programme strategies that could focus on information on health-related sleep, self-help awareness, guided schedules and services for sleep disorders. One example of an intervention that needs to be brought into colleges, is mindfulness-based interventions in dealing with stress and improving quality of sleep and quality of life for the student populations (Caldwell, Harrison, Adams, Quin & Greeson, 2010).

Limitations

The findings entailed in the existing study should be interpreted in light of several limitations. Firstly, the study was one of a cross-sectional nature meaning that the results cannot be comprehended as causal results making it difficult to determine whether stress is a result of high PSQI scores. The cross-sectional methodology also consisted of self-report measures reliant on subjective measures and this type of data can lead to possible risk of recall bias. It also lacks objective data on true physiological experiences (e.g. the use polysomnography in sleep studies), meaning their reports may exaggerated or inaccurate. However, the scales used have been replicated and used by several research studies so the results presented should be reliable to our sample.

Secondly, the qualitative answer mentioned previously may be other reasons for the result of being a poor sleeper. Due to the nature of the common answers provided, it may be possible that the answers are related to symptoms of stress, but this would need further examination. Question 10 on the original PSQI was excluded and may also have been reasoning for poor sleep, which included ‘Do you have a bed partner or a roommate?’ then preceded to ask ‘if you have a partner or a roommate, ask him/her how often in the past month you had: A) Loud snoring, B) Long pauses between breaths, C) Legs twitching or jerking while you sleep, D) Episodes of disorientation or confusion during sleep and E) Other restlessness while you sleep, please describe’. It should also be noted that one of the stress questions was left out by default question 6 ‘I tended to over-react to situations’. In saying that, it may have gave a more substantial result if it had been included, but stress was still the strongest predictor for global PSQI scores.

Thirdly, the sample was problematic due to size and generalisability. The current sample was insufficient in terms of statistical analysis and statistical power. The variation in terms of gender was not balanced enough. Due to time and resources, it was not possible to obtain a larger and more balanced sample. Future research should consider a larger number of students and a more even ratio of males and females.

It should also be considered that other factors could have influenced poor sleep quality for example correlates of depression, anxiety and stress were found amongst college students like academics, finances, friends, general health, family, body-image, self-esteem (Beiter et al., 2015) and living circumstances could all be possible reasonings that was not controlled for poor sleep quality or mental health difficulties.

Conclusions

The findings of the present study provide an unprecedented view on the sleeping patterns and the overall mental health of the unique sample of Irish college students. This study conclusively illustrated that depression, anxiety and stress are closely related with poor sleep quality. Moreover, data provided evidence that stress was the strongest predictor with poor sleep quality (high global PSQI scores), whereas depression and anxiety did not show any predictions. Additionally, this gives rise and meaning to future research on college students and their overall well-being. Possibly the most important thing to take from these findings is the need to create further preventative measures for the future well-being and health of college students relevant to the extensive literature that unveils the correlates of sleep problems in young people.

References

- Ahrberg, K., Dresler, M., Niedermaier, S., Steiger, A., & Genzel, L. (2012). The interaction between sleep quality and academic performance. *Journal of Psychiatric Research, 46*(12). 1618-1622
- Alfano, C. A., Ginsburg, G. S., & Newman Kingery, J. (2007). Sleep-Related Problems Among Children and Adolescents with Anxiety Disorders. *Journal of the American Academy, 46*(2). 224-232
- Bassett, S. M., Lupis, S. B., Gianfermate, D., Rohleder, N., & Wolf, J. M. Sleep quality but not sleep quantity effects on cortisol responses to acute psychosocial stress. *The International Journal on the Biology of Stress, 18*(6). 638-644.
- Beiter, R., Nash, R., McCrady, M., Linscomb, M., Clarahan, M., & Sammut, S. (2015). The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *Journal of Affective Disorders, 173*. 90-96.
- Bergdahl, J., and Bergdahl, M. (2002). Perceived stress in adults: prevalence and association of depression, anxiety and medication in a Swedish population. *Stress and health, 18*(5). 235-241.
- Buckner, J. D., Bernert, M. S., Cromer, K. R. Joiner, T. E., & Schmidt, N. B., (2008). Social anxiety and insomnia: the mediating role of depressive symptoms. *Depression and Anxiety, 25*. 124-130.
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research, 28*(2). 193-213.

- Caldwell, K., Harrison, M., Adams, M., Quin, R. H., & Greeson, J. (2010). Developing Mindfulness in College Students Through Movement-Based Courses: Effects on Self-Regulatory Self-Efficacy, Mood, Stress, and Sleep Quality. *Journal of American College Health, 58*(5). 433-442.
- Cho, Y. W., Shin, W. C., Yun, C.H., Hong, S. B., Kim, J., Earley, C. J. (2009). Epidemiology of Insomnia in Korean Adults: Prevalence and Associated Factors. *Journal of Clinical Neurology, 5*(1). 20-23.
- Doane, L. D., Gress-Smith, J. L., Breitenstein, R. S. (2015). Multi-method Assessments of Sleep over the Transition to College and the Associations with Depression and Anxiety Symptoms. *Journal of Youth and Adolescence, 44*(2). 389-404.
- Drake, C., Richardson, G., Roehrs, T., Scofield, H., & Roth, T. (2004). Vulnerability to Stress – related Sleep Disturbance and Hyperarousal. *Sleep, 27*(2). 285-291.
- Dregan, A., & Armstrong, D. (2010). Adolescence Sleep Disturbances as Predictors of Adulthood Sleep Disturbances—A Cohort Study. *Journal of Adolescent Health, 46*(5). 482-487.
- Edinger, J. D., Bonnet, M. H., Bootzin R. R., Doghrami, K., Dorsey, C. M., Espie, C. A., Jamieson, A. O., McCall, W. V., Morin, C. M., & Stepanski, E. J. (2004). Derivation of Research Diagnostic Criteria for Insomnia: Report of American Academy of Sleep Medicine Work Group. *Sleep, 27*(8). 1567-1595.
- Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. (2007). Prevalence and Correlates of Depression, Anxiety and Suicidality Among University Students. *American Journal of Orthopsychiatry, 77*(4). 534-542.

- Eliasson, A. H., Lettieri, C. J., & Eliasson, A. H., (2010). Early to bed, early to rise! Sleep habits and academic performance in college students. *Sleep Breath, 14*(1). 71-75.
- Eller, T., Aluoja, A., Vasar, V., & Veldi, M. (2006). Symptoms of anxiety and depression in Estonian medical students with sleep problems. *Depression and Anxiety, 23*(4). 250-256.
- Fortunato, V. J., & Harsh, J. (2006). Stress and sleep quality: The moderating role of negative affectivity. *Personality and Individual Differences, 41*(5). 825-836.
- Gregory, A. M., Caspi, A., Eley, T. C., Moffit, T. E., O'Connor, T. G., & Poulton, R. (2005). Prospective Longitudinal Associations Between Persistent Sleep Problems in Childhood and Anxiety and Depression Disorders in Adulthood. *Journal of Abnormal Psychology, 33*(2). 157-163.
- Haregu, A., Gelaye, B., Pensukan, W. C., Lohsoonthorn, V., Lertmaharit, S., Rattananuopong, T., Tadesse, M. G., & Williams, M. A. (2015). Circadian rhythm characteristics, poor sleep quality, daytime sleepiness and common psychiatric disorders among Thai college students. *7*(2), 182-189.
- Hunt, J., & Eisenberg, D. (2010). Mental Health Problems and Help Seeking Behavior Among College Students. *Journal of Adolescent Health, 46*(1). 3-10.
- Hyppa, M. T., & Kronholm, E. (1989). Quality of sleep and chronic illnesses. *Journal of Clinical Epidemiology, 42*(2). 633-639.
- Kabrita, C. S., Hajjar-Murca, T. A., & Duffy, J. F. (2014). Predictors of poor sleep quality among Lebanese university students: association between evening typology, lifestyle behaviors, and sleep habits. *Nature and Science of Sleep, 6*. 11-18.

- Kang, J., Jang, J., Ah Lee, J., & Sunwoo, S. (2013). Factors Associated with Poor Sleep Quality in Primary Care. *The Korean Academy of Family Medicine, 34*(2). 107-114.
- Lemma, S., Gelaye, B., Berhane., Y., Worku, A., & Williams, M. A. (2012). Sleep quality and its psychological correlates among university students in Ethiopia: a cross-sectional study. *Bioelectronic Medicine Psychiatry*.
- Lopes, M., Boronat, A. C., Wang, Y., & Fu-I, L. F. (2016). Sleep Complaints as Risk Factor for Suicidal Behavior in Severely Depressed Children and Adolescents. *CNS Neuroscience & Therapeutics, 22*(11).
- Lothosoonthorn, V., Khidir, H., Casillas, G., Lertmaharit, S., Tadesse, M. G., Pensuksan, W. C., Rattananupong, T., Gelaye, B., & Williams, M. A. (2013). Sleep Quality and Sleep Patterns in Relation to Consumption of Energy Drinks, Caffeinated Beverages and Other Stimulants among Thai College Students. *Sleep Breath, 17*(3). 1017-1028.
- Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the Depression Anxiety Stress Scales (DASS)*. New South Wales: Psychology Foundation Monograph.
- Lund, H. G., Reider, B. D., Whiting, R. N., & Prichard, R. J., (2010). Sleep Patterns and Predictors of Disturbed Sleep in Large Population of College Students. *Journal of Adolescent Health, 46*(2). 124-132.
- Mackenzie, S., Wiegel, J. R., Mundt, M., Brown, D., Saewyc, E., Heilgenstein, E., Harahan, B., & Fleming, M., (2011). Depression and Suicide Ideation Among Students Accessing Campus Health Care. *American Journal of Orthopsychiatry, 81*(1). 101-107.
- Morphy, H., Dunn, K. M., Lewis, M., Boardmann, H. F., & Croft, P. R. (2007). Epidemiology of Insomnia: a Longitudinal Study in a UK Population. *Sleep, 30*(3). 274-280.

- Neckelmann, D., Mykletun, A., & Dahl, A. (2007). Chronic Insomnia as a Risk Factor for Developing Anxiety and Depression. *Sleep*, 30(7). 873-880.
- Nyer, M., Farabaugh, A., Fehling, K., Soskin, D., Holt, D., Papokostas, G. I., Pedrill, P., Fava, M., Pisoni, A., Vitolo, O., & Mischoulon, D. (2013). Relationship between sleep disturbances and depression, anxiety, and functioning in college students. *Depression and Anxiety*, 30(9). 873-880.
- Oginska, H., & Pokorski, J. (2006). Fatigue and Mood Correlates of Sleep Length in Three Age-Social Groups: School Children, Students, and Employees. *Chronobiology International*, 23(6). 1317-1328.
- Ohayon, M. M., & Roth, T. (2003). Place of chronic insomnia in the course of depressive and anxiety disorders. *Journal of Psychiatric Research*, 37(1). 9-15.
- Omvik, S., Pallesen, S., Bjorvatn, B., Sivertsen, B., Havik, O. E., & Nordhus, I. H. (2009). Patient characteristics and predictors of sleep medication use. *International Clinical Psychopharmacology*, 25(2). 91-100.
- Ramsawh, H. J., Stein, M. B., Belik, S., Jacobi, F., & Sareen, J. (2009). Relationship of anxiety disorders, sleep quality, and functional impairment in a community sample. *Journal of Psychiatric Research*, 43, 926-933.
- Roane, B. M., & Taylor, D. J. (2008). Adolescent Insomnia as a Risk Factor for Early Adult Depression and Substance Abuse. *Sleep*, 31(10), 1351-1356.
- Roberts, R. E., Roberts, C. R., & Chen, I. R. (2001). Functioning Adolescents With Symptoms of Disturbed Sleep. *Journal of Youth & Adolescence*, 30(1). 1-18.

- Roberts, R. E., Roberts, C. R., & Duong, H. T., (2009). Sleeplessness in adolescence: Prospective Data on Sleep deprivation, health and functioning. *Journal of Adolescent Health, 32*(5). 1045-1057.
- Simor, P., Zavec, Z., Palosi, V., Torok, C., & Koteles, F. (2014) The influence of sleep complaints on the association between chronotype and negative emotionality in young adults. *Chronobiology International, 32*(1). 1-10.
- Sivertsen, B., Salo, P., Mykletun, A., Hysing, M., Pallesen, S., Krokstad, S., Nordhus, I. H., & Overland, S. (2012). The Bidirectional Association Between Depression and Insomnia: The HUNT Study. *Psychosomatic Medicine, 74*(7), 758-765.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics (6th edn)*. Boston: Pearson Education
- Taylor, D. J., & Bramoweth, A. D., (2010). Patterns and Consequences of Inadequate Sleep in College Students: Substance Use and Motor Vehicle Accidents. *Journal of Adolescent Health, 46*(6). 610-612.
- Waqas, A., Khan, S., Sharif, W., Khalid, U., & Ali, A. (2015). Association of academic stress with sleeping difficulties in medical students of a Pakistani medical school: a cross sectional survey. *PeerJ*.
- Welle, P. D., & Graf, H. M. (2010). Effective Lifestyle Habits and Coping Strategies for Stress Tolerance Among College Students. *American Journal of Health Education, 42*(2). 96-105.
- Wong, M. L., Ying Lau, E. Y., Yin Wan, J. H., Cheung, S. F., Hui, C. H., Yink Mok, D. S. (2013). The interplay between sleep and mood in predicting academic functioning,

physical health and psychological health: A longitudinal study. *Journal of Psychosomatic Research*, 74. 271-277.

Worthman, C. M., & Brown, R. A., (2007). Companionable sleep: Social regulation of sleep and co-sleeping in Egyptian families. *Journal of Family Psychology*, 21(1). 124-135.

Zadwalski, M. J., Graham, J. E., & Gerin, W. (2013). Rumination and anxiety mediate the effect of loneliness on depressed mood and sleep quality in college students. *Health Psychology*, 32(2). 212-222.

APPENDICES

Appendix A.

INFORMATION SHEET

Project Details:

You have been invited to take part in this research project which will investigate the relationship between the symptoms of anxiety, depression and stress with sleep quality among full-time college students.

In this study, there will be two questionnaires for you to complete. The first questionnaire will ask you some general questions related to your self-perceived anxiety, depression and stress all in one questionnaire. The second questionnaire will ask you questions about your overall sleep quality. Taking part in this study should approximately take 10 minutes, and no more than 15.

Researcher Information:

My name is Maria Mulvihill and I am a third-year undergraduate student studying psychology at National College of Ireland. I am carrying out a research project for my final year thesis. My email is x15547047@student.ncirl.ie if you have any queries about the research project. My supervisor is Dr Grainne Kent who can also be contacted for queries at grainne.kent@ncirl.ie. This research project has already been approved by the Ethics Committee in the Psychology department of National College of Ireland.

Appendix B.

CONSENT FORM

REQUIREMENTS

1. You must be over 18 years of age to take part in this study.
2. You must also be currently attending college.

COST AND COMPENSATION

Your participation is voluntary and you will not receive any payments or rewards for participation.

CONSIDERATIONS

1. It should be noted that high scores on each of these questionnaires are for research purposes only, and do not indicate clinical diagnoses and are not used for the purpose of diagnosis.
2. The researcher is not qualified to provide any clinical or health-related advice. Should you have any concerns you should contact your GP.

YOUR RIGHTS AS A PARTICIPANT

1. You have a right to withdraw from this study at any time without any reasoning or explanation.
2. You also have the right to ask questions particularly if you have any concern about any aspect of the study. As I have provided above, you may contact myself the researcher or my supervisor if you do have any particular questions.
3. Preferably, it would be ideal to ask questions before taking part and submitting answers.
4. You have the right to ignore any questions if you do not wish to submit an answer.
5. Your data will be fully anonymised so it will not be possible to withdraw your data once the experiment is complete.

CONFIDENTIALITY

1. The results collected from this study i.e. your answers to the questionnaires will remain fully anonymous and personal details will not be published in this research study.
2. The only information we will gather about you are your gender and age. You will never be identifiable by name.
3. The data being collected is collected only for the purposes of the research as outlined above and not for any other reason.
4. Data will be published at the group level in the researcher's final year thesis.
5. The study will be presented in National College of Ireland by the researcher and viewed by any persons who wish to view the presentation. The thesis will also be examined by the Psychology department in National College of Ireland for the grading of the researcher's overall degree.

By ticking the box below, I agree that:

I am over 18

I am aware of my rights as a participant, the voluntary nature of the study, that my answers are confidential.

I have read the entire information sheet/consent form, am fully aware of my requirements in the participation of this study and I give consent to participate in this study.

Gender:

Male

Female

Appendix C.

DASS-21

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement. The rating scale is as follows: 0 Did not apply to me at all –

NEVER (N) 1 Applied to me to some degree, or some of the time – SOMETIMES (S) 2 Applied to me to a considerable degree, or a good part of time – OFTEN (O) 3 Applied to me very much, or most of the time - ALMOST ALWAYS (AA)

	N	S	O	AA
1. I found it hard to wind down	0	1	2	3
2. I was aware of dryness of my mouth				
3. I couldn't seem to experience any positive feeling at all				
4. I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)				
5. I found it difficult to work up the initiative to do things				
6. I experienced trembling (e.g. in the hands)				
7. I felt that I was using a lot of nervous energy				
8. I was worried about situations in which I might panic and make a fool of myself				
9. I felt that I had nothing to look forward to				
10. I found myself getting agitated				
11. I found it difficult to relax				
12. I felt down-hearted and blue				
13. I was intolerant of anything that kept me from getting on with what I was doing				
14. I felt I was close to panic				
15. I was unable to become enthusiastic about anything				
16. I felt I wasn't worth much as a person				
17. I felt that I was rather touchy				
18. I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)				
19. I felt scared without any good reason				
20. I felt that life was meaningless				

Appendix D.

Sleep Quality Assessment (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is an effective instrument used to measure the quality and patterns of sleep in adults. It differentiates “poor” from “good” sleep quality by measuring seven areas (components): subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month.

PLEASE NOTE For question 5 answer like so: During the past month, how often have you had trouble sleeping because you Not during the past month (0) Not during the past month (1) Less than once a week (2) Once or twice a week (3) Three or more times a week (choice of responses to 5A-J)

INSTRUCTIONS:

The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most

accurate reply for the majority of days and nights in the past month. Please answer all questions.

During the past month,

1. When have you usually gone to bed? _____

2. How long (in minutes) has it taken you to fall asleep each night?

3. What time have you usually gotten up in the morning?

4. A. How many hours of actual sleep did you get at night?

B. How many hours were you in bed? _____

5. A. Cannot get to sleep within 30 minutes

B. Wake up in the middle of the night or early morning

C. Have to get up to use the bathroom

D. Cannot breathe comfortably

E. Cough or snore loudly

F. Feel too cold

G. Feel too hot

H. Have bad dreams

I. Have pain

J. Other reason (s), please describe, including how often you have had trouble sleeping because of this reason (s):

6. During the past month, how often have you taken medicine (prescribed or “over the counter”) to help you sleep?

7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?
9. During the past month, how would you rate your sleep quality overall?