

ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

Associations between Sleep and Emotion Regulation in Healthy Young Adults

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### **Abstract**

Previous studies suggest that sleep deprivation and poor sleep quality are associated with impaired emotion regulation. Although there is a literature delineating specific types of emotion regulation strategies (e.g., cognitive reappraisal), little is known about the ways in which sleep disruptions characteristic of particular psychopathologies (e.g., post-traumatic stress disorder, major depressive disorder) affect specific regulatory strategies. This study aimed to investigate the role that sleep disruption has in the associations between Depression, PTSD and Alcohol Dependence and the use of cognitive reappraisal, impulsivity inhibition and experiential avoidance. This cross-sectional survey collected data from students at the University of Cape Town (N = 282). Measures included the Patient Health Questionnaire for Depression-9, the Primary Care Post-Traumatic Stress Disorder Screen and the Alcohol Use Disorders Identification Test-Consumption as a means of screening participants. The Godin Leisure-Time Exercise Questionnaire and the Medical Outcomes Study Social Support Survey were used to measure physical activity and social support respectively. A multiple regression analysis indicated that sleep quality, measured by the Pittsburgh Sleep Quality Index – over and above other variables such as physical activity, social support, and gender – significantly predicted a composite emotion regulation score. A series of ANOVAs detected significant differences in sleep quality between healthy participants and participants with probable depression, and between participants with probable depression and alcohol dependence. Furthermore, sleep quality significantly moderated the relationship between PTSD and experiential avoidance. The findings imply that people with worsened sleep quality may struggle to regulate their emotions and potentially hamper their emotional well-being. Furthermore, poorer sleep quality may increase use of experiential avoidance in people with probable PTSD. Therefore, appropriate treatment provided for people with varying psychopathology – particularly PTSD – may need to focus on improving their sleep quality in order to nullify use of maladaptive emotion regulation strategies.

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People who achieve sufficient amounts of good-quality sleep tend to display healthy psychological functioning (Shochat, Cohen-Zion, & Tzischinsky, 2014; Wilson et al., 2017). Conversely, those who are sleep deprived tend to experience relatively poor psychological functioning (e.g., impaired attention and sadness; Daniela et al., 2010; van der Helm, Gujar, & Walker, 2010). Of particular importance for the current study is recent research demonstrating that sleep deprivation and poor sleep quality have specific effects on emotion regulation (Baum et al., 2014; Reddy, Palmer, Jackson, Farris, & Alfano, 2016). The current study investigates the role of sleep in the association between specific emotion regulation strategies and probable psychopathology in university students.

*Emotion regulation* is defined as an individual's attempt to manage and modify his/her experience of an emotional response to an emotion-eliciting stimulus (e.g., to regulate anger in response to verbal confrontations; Mauss, Troy, & LeBourgeois, 2013; O'Leary, Bylsma, & Rottenberg, 2016). Psychological literature suggests that emotion regulation can involve the use of adaptive or maladaptive strategies. Adaptive strategies include *cognitive reappraisal* (i.e., cognitively reframing the perspective one takes toward a situation that typically generates negative emotion; Wilson et al., 2017) and *inhibiting impulsive behaviour* (i.e., successfully controlling an immediate response to a stimulus; Anderson & Platten, 2011). Maladaptive strategies include *experiential avoidance* (i.e., both an unwillingness to stay in contact with aversive internal experiences and to take action to alter them or the contexts that have been created by them; Wolgast, Lundh, & Viborg, 2013).

There is strong literature establishing that poor sleep may impair emotion regulation (see, e.g., McRae et al., 2012; Palmer & Alfano, 2017; Tavernier & Willoughby, 2014), it is only recently that empirical studies have examined associations between sleep quality and the use of particular (mal)adaptive strategies to regulate particular emotional states. These studies have demonstrated, for instance, that poorer self-reported sleep quality is associated with poorer use of cognitive reappraisal strategies to regulate emotion (Mauss et al., 2013; McRae et al., 2012; Reddy et al., 2016), and that higher levels of objectively measured sleep deprivation are associated with increased emotional responding to negative emotional stimuli, and hence with decreased inhibition of impulsive and maladaptive behaviours (Anderson & Platten, 2011; de Wit, 2008; Drummond, Paulus, & Tapert, 2006).

A related strand of the psychological literature attempts to identify mechanisms that underlie links between disrupted sleep (i.e., sleep that is of poor quality and/or of insufficient length) and emotion dysregulation within psychopathological conditions (Babson, Blonigen, Boden, Drescher, & Bonn-Miller, 2012; Kahn, Sheppes, & Sadeh, 2013). An underlying

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motivation for seeking such mechanisms is the fact that poor sleep quality is characteristic of many psychiatric illnesses, including major depressive disorder (MDD), posttraumatic stress disorder (PTSD), and Alcohol Use Disorder (AUD) (American Psychiatric Association [APA], 2013).

With specific regard to MDD, polysomnographic (PSG) studies indicate that sleep in individuals diagnosed with this disorder may be characterised by delayed sleep onset/latency, longer periods of rapid eye movement (REM) sleep, and increased waking after sleep onset (Edge, 2010; Goldsmith, Casola, & Varenbut, 2006). Patients who meet the symptoms of a MDD diagnosis have the tendency to experience emotion-eliciting stimuli more negatively (Edge, 2010). Furthermore, studies have illustrated that difficulties in utilizing cognitive reappraisal as an emotion regulation strategy are present within these patients as they struggle to reduce negative emotional states, such as sadness, when using cognitive reappraisal (Andreotti et al., 2013; Diedrich, Hofmann, Cuijpers, & Berking, 2016; Klumpp et al., 2017).

With specific regard to PTSD, PSG studies indicate that sleep architecture is often characterised by increased sleep onset/latency, reduced sleep efficiency (i.e., a larger proportion of time spent in bed being awake versus sleeping), and abnormalities in REM latency (i.e., the time taken to reach the first REM period; Capaldi, Guerrero, & Killgore, 2011; Mellman, Kobayashi, Lavela, Wilson, & Hall Brown, 2014; Williams, Collen, Orr, Holley, & Lettieri, 2014). These sleep disruptions appear to impair extinguishment of fear responses (i.e., anticipation of a future and/or eminent threat perceived as a risk to one's body or life) in people diagnosed with PTSD (Goldstein & Walker, 2014; Pace-Schott, Germain, & Milad, 2015; Pickett, Barbaro, & Mello, 2015).

Another explanation for impairment in extinguishing fear responses manifested in PTSD symptomatology is the role of using experiential avoidance (Seligowski, Lee, Bardeen, & Orcutt, 2015). People suffering from PTSD and who have developed a conditioned fear response subsequent to experiencing a traumatic event utilise experiential avoidance to avoid any stimuli pertaining to that fear (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Furthermore, studies have suggested that persistent use of experiential avoidance intensifies and prolongs the durability of PTSD symptoms (Basharpoor, Shafiei, & Daneshvar, 2015; Tull, Gratz, Salters, & Roemer, 2004).

Amongst alcohol-dependent people, complaints of sleep disruptions are common, even during periods of acute withdrawal and abstinence (Gann et al., 2001; Sivertsen, Skogen, Jakobsen, & Hysing, 2015). PSG studies of people with AUD find prolonged sleep onset latency, reduced overall sleep time, reduced REM sleep, increased REM latency, and

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increased awakenings following sleep onset (Gann et al., 2004; Garcia & Salloum, 2015). Based on research investigating the association between sleep disruptions and impulsive behaviour, decreased inhibition of impulsive behaviour serves as a precursor for problematic substance use, such as dependence on alcohol (Anderson & Platten, 2011; de Wit, 2008). This illustrates that people with AUD experience significant difficulties in controlling impulsivity which may worsen their symptoms.

In summary, it appears that sleep disruption affects emotion regulation strategies, and that this associative link may account for the way in which some clinical symptoms are expressed within MDD, PTSD, and AUD. Although there is some evidence for the association and overlapping of specific sleep difficulties and psychopathology, and association between use of emotion regulation strategies and psychopathology, more methodologically sound research is needed on (a) specific relationships between sleep disruption and emotion regulation, and (b) whether there are differences present in the use of specific emotion regulation strategies between MDD, PTSD and alcohol dependence. Furthermore, more investigation is needed on the relevance that sleep disruptions have on people with symptoms of MDD, PTSD or AUD and their use of cognitive reappraisal, impulsivity and experiential avoidance.

### **Research Aims and Hypotheses**

Using a sample of university undergraduates, the study set out to accomplish three aims. First, this study aimed to investigate the relationship between sleep disruption and emotion regulation. Second, this study aimed to investigate whether there are differences present between students free of psychiatric illness and students with probable MDD, PTSD and AUD in terms of sleep disruption, emotion regulation, and use of cognitive reappraisal, impulsivity inhibition, and experiential avoidance strategies. Third, this study aimed to investigate the role that sleep disruption plays in the associations between depressive, PTSD and alcohol dependent symptoms and use of cognitive reappraisal, impulsivity inhibition and experiential avoidance.

Hence I tested three specific hypotheses:

1. Self-reported amount and quality of sleep will be a significant predictor (over and above, for instance, age, gender, and social support) of self-reported emotion regulation.
2. There will be significant differences in the amount and quality of sleep; emotion regulation; cognitive reappraisal; impulsivity inhibition, and experiential avoidance

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among students free of psychiatric illness (i.e. healthy controls) and students with probable MDD, PTSD, and AUD.

- a) Healthy Controls will report better amount and quality of sleep and emotion regulation compared to the other groups.
  - b) Healthy Controls will report better emotion regulation (i.e., less difficulty in regulating emotion) compared to the other groups.
  - c) The MDD/Depression group will report the lowest tendency to use cognitive reappraisal compared to the other groups.
  - d) The AUD/Alcohol Dependent group will report the highest impulsive control difficulties compared to the other groups.
  - e) The PTSD group will report the highest tendency to use experiential avoidance compared to the other groups.
3. Self-reported amount and quality of sleep will significantly moderate the relationship between (a) MDD and cognitive reappraisal, (b) PTSD and experiential avoidance, and (c) alcohol dependence and impulsivity inhibition.

### Methods

#### Design and Setting

This cross-sectional survey study utilised data collected via online survey from University of Cape Town (UCT) students.

#### Participants

I used convenience sampling to recruit participants through two platforms. First, I sent an email (Appendix A) via the UCT Department of Psychology's Student Research Participation Program (SRPP) Vula site inviting registered psychology students to participate. Second, I sent a similar email (Appendix B) to the UCT-wide email listserv, inviting other registered students to participate. The only eligibility criterion for participation was that the individual was a registered student at UCT.

Three hundred and thirty-eight (116 SRPP and 222 non-SRPP) students completed the online survey described below. I excluded 56 data sets from the final analyses because they were missing at least one response on two or more of the individual survey measures. Hence, the final sample size was  $N = 282$  (202 women, 80 men; age range = 18-60 years).

#### Measures.

**Screening measures.** Based on their strong psychometric properties, the three measures described below were selected in order to screen participants for the presence of MDD, PTSD, and alcohol dependence symptoms.

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*The Patient Health Questionnaire for Depression-9 (PHQ-9;* Kroenke, Spitzer, & Williams, 2001) is a self-administered diagnostic screening instrument, covering the most recent 2-week period, used for assessing and monitoring probable depression severity in adults (Blackwell & McDermott, 2014). Respondents rate each of nine items on a 0-3 scale; so that a total score can range from 0-27 (see Appendix C). Higher scores represent greater severity of depression.

Regarding psychometric properties, the items focus on the DSM-5 (APA, 2013) diagnostic criteria for MDD, which suggests adequate content validity. The scale reportedly has high internal consistency ( $\alpha = .89-.86$ ; Blackwell & McDermott, 2014) and adequate test-retest reliability ( $\kappa = .84$ ; Kroenke et al., 2001).

Regarding use in South Africa, Cholera et al. (2017) conducted a successful validation study and suggested a cutoff score of  $\geq 10$  indicates the presence of a depressive disorder that would benefit from treatment (Cholera et al., 2017). For this reason, I used a cutoff score of  $\geq 10$  to identify participants whose datasets would be allocated to the Depression group.

The *4-item Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD;* Prins et al., 2003) is a short and reliable screening test comprising four yes/no items, each of which matches one underlying factor specific to the DSM PTSD diagnosis: re-experiencing, avoidance, hyperarousal, and numbing (Hanley, deRoon-Cassini, & Brasel, 2013; Appendix D).

Regarding psychometric properties, at a cutoff score of 3 the PC-PTSD has been demonstrated to have better specificity and sensitivity than the original Posttraumatic Stress Disorder Checklist (PCL; Prins et al., 2003). It reportedly also has good test-retest reliability ( $r = .83, p < .001$ ; Prins et al., 2003) and has been found to be 10% more effective than the General Health Questionnaire-12 – an assessment widely used in primary care and community settings – in accurately identifying PTSD cases (Ouimette, Wade, Prins, & Schohn, 2008).

Regarding use in South Africa, a successful validation study was conducted and a cutoff score of  $\geq 2$  that indicates a probable PTSD diagnosis was recommended (Peltzer & Louw, 2013). Hence, I used this cutoff score to identify participants whose datasets would be allocated to the PTSD group.

The *Alcohol Use Disorders Identification Test - Consumption (AUDIT-C;* World Health Organization, 2001) scale is a valid and reliable abbreviated version of the AUDIT screening test for alcohol abuse, alcohol dependence, and heavy drinking. Respondents rate each of three items on a 0-4 scale; so that total scores can range from 0-12 (see Appendix E).

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Higher scores indicate greater risk of alcohol consumption, encapsulating alcohol abuse, dependence and heavy drinking over an unspecified time period (Bradley et al., 2007).

Regarding psychometric properties, the instrument reportedly has good specificity and sensitivity, especially for detecting heavy drinking (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). It has also demonstrated high test-retest reliability and strong internal consistency ( $\alpha > .90$ ; Osaki et al., 2014).

At least two studies have validated the AUDIT-C for use in South Africa (Peltzer et al., 2007; O'Connor et al., 2011). Peltzer et al. (2007) used a cutoff score of 5 for both men and women to successfully identify hazardous and harmful drinkers. Hence, I used this cutoff score to identify participants whose datasets would be allocated to the Alcohol Dependent group.

### **Measure of sleep quality.**

The *Pittsburgh Sleep Quality Index (PSQI)* (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989) measures, using 19 self-rated items, seven domains of past-month sleep quality: sleep latency, sleep duration, sleep disturbances, use of sleep medication, daytime dysfunction, subjective sleep quality and habitual sleep efficiency (see Appendix F). The seven domain scores are summed to yield a global PSQI score, where a score  $\geq 5$  indicates a poor sleeper (Buysse et al., 1989).

Regarding psychometric properties, the PSQI has strong internal consistency ( $\alpha = .70 - .83$  for the seven domains; Mollayeva et al., 2016), and adequate convergent and divergent validity (Carpenter & Andrykowski, 1998).

Regarding use in South Africa, both van Wyk (2013) and van Wyk, Thomas, Solms, and Lipinska (2016) used the PSQI successfully to measure subjective sleep quality over a month period.

**Measures of emotion regulation.** The three measures described below were selected based on their strong psychometric properties and the specific emotion regulation strategies they measure. None of the three have been used in previously published South African research.

The *Emotion Regulation Questionnaire (ERQ)* (Gross & John, 2003) is a 10-item scale that measures the tendency of individuals to use the cognitive reappraisal strategy to regulate emotions. Respondents answer each item using a seven-point Likert-type scale, with options ranging from 1 (*strongly disagree*) to 7 (*strongly agree*; see Appendix G). The total score for use of cognitive reappraisal is represented by the mean of all scores attained on each item.



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The higher the mean score the greater the use of cognitive reappraisal (Ioannidis & Siegling, 2015).

Regarding psychometric properties, the ERQ has adequate internal consistency and temporal stability, as well as sound discriminant and convergent validity (Gross & John, 2003).

The *Brief Experiential Avoidance Questionnaire (BEAQ)*; Gámez et al., 2014) is an abbreviated (15-item) version of the Multidimensional Experiential Avoidance Questionnaire (MEAQ; Gámez, Chmielewski, Kotov, Ruggero, & Watson, 2011). Much like its parent scale, the BEAQ measures the tendency with which individuals use the experiential avoidance strategy to regulate emotion. Respondents rate each of the 15 items on a six-point Likert-type scale, with options ranging from 1 (*strongly disagree*) to 6 (*strongly agree*), so that total scores can range from 15-90 (see Appendix G).

Regarding psychometric properties, the BEAQ reportedly has a clear single-factor structure with good internal consistency ( $\alpha = .86$ ), and possesses equivalent convergent and divergent validity to the MEAQ (Upton, 2015; Gámez et al., 2014).

The *Difficulties in Emotion Regulation Scale (DERS)*; Gratz & Roemer, 2004) is a 36-item self-report measure that assesses an individual's levels of emotion dysregulation across six subscales; non-acceptance of emotional responses, difficulty engaging in goal-directed behaviour, impulsive control difficulties, lack of emotional awareness, limited access to emotion regulation strategies, and lack of emotion clarity (see Appendix H). In the current study, I will focus on the impulsive control difficulties subscale (items 3, 14, 19, 24, 27, and 32), which measures the use of impulsivity when distressed (Gratz & Roemer, 2004). Respondents rate to what extent the statement in each item applies to them on a five-point Likert-type scale, with options ranging from 1 (*almost never*) to 5 (*almost always*), so that total scores for impulsivity can range from 1-5 (Weiss, Gratz, & Lavender, 2015).

Regarding psychometric properties, the DERS has demonstrated good subscale internal consistency ( $\alpha = .80-.89$ ) and good test-retest reliability, as well as good construct and predictive validity (Weiss et al., 2015).

**Other measures.** Many variables aside from sleep quality may affect a person's regulation of emotion. These variables include age (Martins, Sheppes, Gross, & Mather, 2016); gender (Nolen-Hoeksema & Aldao, 2011); socioeconomic status (SES; Hoag, Tennen, Stevens, Coman, & Wu, 2016); social support (Doré, Morris, Burr, Picard, & Ochsner, 2017); and physical activity (Flueckiger, Lieb, Meyer, Witthauer, & Mata, 2016; O'Leary et al., 2016). I used a series of questionnaires to gather information regarding these variables.

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*Sociodemographic questionnaire.* This study-specific questionnaire (Appendix I) enquires about participants' age, sex, and socioeconomic status (SES). Gathering these data were important because previous research suggests that older individuals, women, and those with higher SES are more effective at emotion regulation and use a wider repertoire of regulation strategies (Côté, Gyurak, & Levenson, 2010; Martins et al., 2016; Nolen-Hoeksema & Aldao, 2011). In order to measure socioeconomic status, three categories of household income was used: lower income (R1 – R19 200); middle income (R19 201 – R307 200); and upper income (R 307 201 and above). These brackets were created based on current estimates of varying household income within South Africa.

The *Godin Leisure-Time Exercise Questionnaire (GLTEQ)*; Godin & Shephard, 1985) consists of three self-administered items that enquire about the frequency with which an individual engages in mild, moderate, and strenuous exercise (Appendix J). Capacities to regulate emotions appear to be reactive to physical activity, especially in young adults (Ready, Marquez, & Akerstedt, 2009).

Regarding psychometric properties, the GLTEQ possesses sound test-retest reliability ( $\kappa = .72$ ; Amireault & Godin, 2015) and good convergent validity.

Regarding use in South Africa, the GLTEQ has recently been applied in order to collect data from Gauteng-based university students regarding their participation in and constraints to being physically activity (Dhurup & Garnett, 2011).

The *Medical Outcomes Study Social Support Survey (MOSSSS)*; Sherbourne & Stewart, 1991) is a 19-item measure of social support comprising four subscales: emotional/informational support, tangible support, affectionate support, and positive social interaction (see Appendix L). Previously published literature suggests an individual's ability to regulate emotions is positively associated with the degree of social support available to him/her (Marroquin, 2011).

Regarding psychometric properties, the MOSSSS has demonstrated stable construct validity and good subscale internal consistency ( $\alpha = .88-.92$ ; King, McKenzie-McHarg, & Horsch, 2017).

Regarding use in South Africa, the MOSSSS was utilised and successfully validated in a study investigating characteristics related to social support and antiretroviral medication adherence (Ncama et al., 2008).

## **Procedure**

I compiled all of the instruments, or items from within instruments (i.e., the relevant items from the ERQ and DERS), into a single survey and placed that survey online using the

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Google Forms platform. Each email advertising the study contained a link to the survey. Hence, participants only had to follow the link to complete the survey.

At the beginning of the survey, each respondent was presented with an informed consent document (see Appendix M and Appendix N) that detailed (a) how each participant would be assigned a code number to ensure anonymity of responses, (b) how confidentiality of data would be secured, (c) the voluntary nature of participation, (d) the fact that there would no penalties for withdrawal. After reading and signing the document, the participant completed the survey. The instruments were presented in this order: PHQ-9, PC-PTSD, AUDIT-C, ERQ, BEAQ, DERS, sociodemographic questionnaire, GLTEQ, and MOSSSS. The final page of the survey featured a thank-you message to participants, a summary of the study's aims, and contact details for (a) research staff, so that participants who had questions pertaining to the study could have them answered, and (b) the UCT Student Wellness Centre and UCT Student Careline, so that participants who felt distressed during or after completing the survey could obtain appropriate help. Psychology students received course credit (1 SRPP point) for completing both the screening measures and for completing the subsequent measures. Non-SRPP students were compensated ZAR 30.00.

All study procedures were approved by the UCT Department of Psychology's Research Ethics Committee (see Appendix O).

### **Statistical Analyses**

All inferential statistical analyses were completed using SPSS (version 24), with alpha set at .05 for all decisions regarding statistical significance. Before conducting those analyses, I conducted a preliminary inspection of the descriptive statistics and ensured the relevant assumptions underlying the planned analyses were upheld.

**Testing Hypothesis 1.** This hypothesis stated that self-reported amount and quality of sleep (as indexed by the PSQI scores) will be a significant predictor (over and above age, gender, SES, leisure-time physical activity (as indexed by the GLTEQ scores), and social support (as indexed by the MOSSSS scores) of self-reported emotion regulation.

Regarding the outcome variable, I created a composite emotion regulation score by transforming each participant's ERQ, BEAQ, and DERS total score into a  $z$ -score, using the mean and standard deviation for each measure (obtained score – sample mean / sample standard deviation). Because higher scores on the DERS and the BEAQ indicate poorer emotion regulation, I multiplied the ERQ  $z$ -transformed values by -1 in order to combine the three appropriately. Then, I averaged the three  $z$ -scores to form the composite emotion

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regulation score for each participant. The higher the emotion regulation composite score, the higher the emotion dysregulation (i.e., the more poorly the participant regulates emotion).

To test the hypothesis, I conducted a backwards stepwise multiple regression analysis. All underlying assumptions of multiple regression analyses, such as normality of distributed data, no multicollinearity and homoscedasticity were tested. Should any of the assumptions have been violated, I noted them.

For the analysis, variables were entered in the following order: emotion regulation (dependent variable), age, gender, sleep quality, leisure-time physical activity, SES, and social support. Backwards stepwise multiple regression analysis was used because it allows testing of the effect of several independent/predictor variables on one dependent/outcome variable by systematically removing predictor variables from the model based on the size and significance of their contribution to predicting scores in the outcome variable (Durrheim & Tredoux, 2013; Field, 2009).

Using G\*Power version 3.1.9.2 (Faul, Erdfelder, Lang, & Buchner, 2007), a post-hoc power analysis revealed that, with a sample size of  $N = 282$ , a total of six predictors and  $\alpha = .05$ , a statistical power of .37 was achieved assuming a small effect size of Cohen's  $f^2 = .02$ . A statistical power of 1.00 was achieved assuming both a medium effect size of Cohen's  $f^2 = .15$  and large effect size of Cohen's  $f^2 = .35$  accordingly.

**Testing Hypothesis 2.** I hypothesised that there will be significant differences in the amount and quality of sleep; emotion regulation; cognitive reappraisal; impulsivity inhibition, and experiential avoidance among students free of psychiatric illness (i.e. healthy controls) and students with probable MDD, PTSD, and AUD.

To prepare for inferential statistical analyses testing this hypothesis, I allocated each participant's dataset to one of four groups (Healthy Control, Depression, PTSD, and Alcohol Dependent) on the basis of their scores attained from the PHQ-9, PC-PTSD, and AUDIT-C measures. If participants attained a score of  $\geq 10$  on the PHQ-9 their datasets were allocated to the Depression group. If participants attained a score of  $\geq 2$  on the PC-PTSD their datasets were allocated to the PTSD group. If participants attained a score of  $\geq 5$  on the AUDIT-C their datasets were allocated to the Alcohol Dependent group. If participants did not meet any of these thresholds their datasets were allocated to the Healthy Controls group. If participants met or exceeded the cut-off scores of all three screening measures (i.e., on the PHQ-9, PC-PTSD, and AUDIT-C), their datasets were excluded from further subsequent data analyses.

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The size of each group was as follows: Healthy Controls ( $n = 71$ ), Depression ( $n = 43$ ), PTSD ( $n = 31$ ), and Alcohol Dependent ( $n = 20$ ). Five separate one-way ANOVAs investigated between-group differences in sleep quality (as measured by the PSQI), emotion regulation (as measured by the composite score), and use of cognitive reappraisal (as measured by the ERQ), impulsivity inhibition (as measured by the DERS), and experiential avoidance (as measured by the BEAQ) strategies. All underlying assumptions of normality of distributed data, equal group sizes and homogeneity of variance were tested. Should any of the assumptions have been violated, I noted them.

For a total sample size of  $N = 165$ , a total of four groups, and  $\alpha = .05$ , a statistical power of .16 was achieved assuming a small effect size of Cohen's  $f^2 = .10$ . A statistical power of .76 was achieved assuming a medium effect size of Cohen's  $f^2 = .25$  and a statistical power of .99 was achieved assuming a medium effect size of Cohen's  $f^2 = .40$ .

**Testing Hypothesis 3.** I hypothesised that self-reported amount and quality of sleep (as measured by the PSQI total score) will significantly moderate the relationship between (a) MDD and cognitive reappraisal (as measured by the PHQ-9 and ERQ respectively), (b) PTSD and experiential avoidance (as measured by the PC-PTSD and BEAQ respectively), and (c) alcohol dependence and impulsivity inhibition (as measured by the AUDIT-C and impulsivity subscale scores from the DERS respectively). Before proceeding with testing this hypothesis, I conducted a set of bivariate correlation analyses in order to determine if there were any significant correlations between a) PSQI, ERQ, BEAQ, and DERS scores and b) PSQI scores and Depression, PTSD, and Alcohol Dependence.

To test these hypotheses, I ran three separate moderation analyses. For each of the three separate moderation analyses, I conducted a hierarchical multiple regression analysis with PSQI scores as the moderator variable. All underlying assumptions of multiple regression analyses, such as normality of distributed data, no multicollinearity and homoscedasticity were tested. Should any of the assumptions have been violated, I noted them. What is important to note is that the predictor variable (psychopathological conditions) was a categorical variable with four categories and was subsequently recoded into three dummy variables with the Healthy Controls group as the reference group (i.e., Depression v. Healthy Controls, PTSD v. Healthy, and Alcohol Dependent v. Healthy). The moderator variable of PSQI scores was mean-centred. Furthermore, an interaction variable between PSQI scores and the dummy variables as the predictor variable was produced by multiplying the mean-centred PSQI scores with values for the dummy variables.

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For each moderation analysis, two models were derived. With ERQ scores as the outcome variable, the first model of the first moderation analysis included a) mean-centred PSQI scores and b) the four groups (i.e., Healthy Controls, Depression, PTSD, and Alcohol Dependent) that were dummy coded. The second model included interaction terms yielded from multiplying each dummy coded variable with PSQI scores that were mean-centred. The second and third moderation analysis included the DERS and BEAQ scores respectively. Furthermore, both models in the second and third moderation analysis included the same variables as illustrated in the first.

With a sample size of  $N = 165$ , one predictor variable and  $\alpha = .05$ , a statistical power of .44 was achieved assuming a small effect size of Cohen's  $f^2 = .02$ . A statistical power of 1.00 was achieved assuming both a medium effect size of Cohen's  $f^2 = .15$  and large effect size of Cohen's  $f^2 = .35$  accordingly.

## Results

### Sample Characteristics

Table 1 displays a summary of key sociodemographic characteristics of the final sample of the four groups: Healthy Controls, Depression, PTSD, and Alcohol Dependent. Potential between-group differences in age were explored using a one-way ANOVA. The assumption of normality and homogeneity of variance was upheld for age in years. The analyses detected no statistically significant between-group differences in age between students free of psychiatric illness (i.e. healthy controls) and students with probable MDD, PTSD, and AUD. Therefore, age did not need to be considered in any further analyses.

Two chi-squared tests of contingency were conducted to explore any between-group differences between the four listed groups and gender and socioeconomic status. The underlying assumption of independence of observations was upheld and expected frequencies on both variables were greater than five. Regarding socioeconomic status, the analysis detected no significant between-group differences. Regarding gender, the analysis detected significant between-group differences (see Table 1).

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Table 1  
*Sociodemographic Characteristics of Psychopathological Groups (N = 165)*

Variable	Group								$F/\chi^2$	$p$	ESE
	Healthy Controls ( $n = 71$ )		Depression ( $n = 43$ )		PTSD ( $n = 31$ )		Alcohol Dependent ( $n = 20$ )				
Age (years)	22.69	(7.41)	22.02	(5.31)	21.29	(2.31)	22.55	(3.39)	.45	.72	.01
Gender									8.08	.04	.22
Female	55	(.77)	31	(.72)	23	(.74)	9	(.45)			
Male	16	(.23)	12	(.28)	8	(.26)	11	(.55)			
Socioeconomic Status									5.78	.45	.13
Lower income	16	(0.23)	10	(0.23)	10	(0.32)	7	(0.35)			
Middle income	33	(0.46)	25	(0.58)	16	(0.52)	8	(0.40)			
Upper income	22	(0.31)	8	(0.19)	5	(0.16)	5	(0.25)			

*Note.* For the variable *Age*, means are presented with standard deviations in parentheses. For the variables *Gender* and *Socioeconomic Status*, raw numbers are presented with percentage in parentheses. ESE = effect size estimate (in this case, Partial Eta Squared for the one-way ANOVA and Cramer's V for chi-squared tests of contingency and Fisher's exact tests).

**Testing Hypothesis 1: Variables predicting emotion regulation outcome**

This hypothesis stated that self-reported amount and quality of sleep (as indexed by the PSQI scores) will be a significant predictor (over and above age, gender, SES, leisure-time physical activity (as indexed by the GLTEQ scores), and social support (as indexed by the MOSSSS scores) of self-reported emotion regulation.

Tests of the assumptions underlying multiple regression analysis detected a total of five outliers (i.e., observed data points that are notably distant from other data points) that affected not only the normality of distribution of age and GLTEQ data, but also the accuracy of the final regression model. I removed from final analysis the datasets containing those outliers, leaving a final sample size of  $N = 277$  to test this hypothesis. Normality of data distribution for the MOSSSS scores were violated. I used the squaring transformation method to normalize these data, and then proceeded with the analysis.

With a total sample size of  $N = 277$ , a total of six predictors and  $\alpha = .05$ , a statistical power of .36 was achieved assuming a small effect size of Cohen's  $f^2 = .02$ . A statistical power of 1.00 was achieved assuming both a medium effect size of Cohen's  $f^2 = .15$  and a large effect size of Cohen's  $f^2 = .40$ .

The descriptive statistics for all variables included in the analysis are shown in Table 2.

Table 2  
*Mean, Standard Deviation, and Range Statistics of Predictor Variables (N = 277)*

Variable	<i>M</i>	<i>SD</i>	Range
Age	21.14	3.06	17
Sleep Quality PSQI Score	7.03	3.87	19
Leisure-Time Physical Activity Score	36.00	23.32	109
Social Support Score	8.13	1.74	7.83
Social Support (Squared)	69.12	25.45	95.3
Emotion Regulation Composite Score	.01	.75	3.9



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A pre-regression series of bivariate correlational analyses indicated that four predictor variables (Age, Sleep Quality, Leisure-Time Physical Activity, and Social Support) were significantly correlated with the outcome variable (Table 3). In terms of a preliminary observation of multicollinearity, multiple predictors were significantly correlated with each other but none were problematic (i.e., no scores exceeded  $r = .70$ ).

Based on the size and significance of the partial correlations with the outcome variable, the predictor variable of SES was automatically removed in the final model of the backwards stepwise regression analysis. The variables left in the final model were gender, PSQI, GLTEQ, and MOSSSS.

The final model was a statistically significant fit for the data,  $F(4, 272) = 37.15, p < .001, R^2 = .35$ , with the predictor variables explaining 35.33% of the variance in the outcome variable. As seen in Table 4, gender, sleep quality, leisure-time physical activity, and social support significantly predicted emotion regulation. PSQI possessed the largest partial correlation ( $r = .47$ ) or unique variance with emotion regulation. Based on these results yielded, the first hypothesis was confirmed.

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Table 3

*Correlation Matrix for Key Variables Examining Relationships between Emotion Regulation and Other Variables, Final Sample (N=277)*

Variable	1.	2.	3.	4.	5.	6.	7.	8.
1. Emotion Regulation	-							
2. Age	-.146*	-						
3. Gender	.061	-.203*	-					
4. Sleep Quality Score	.505*	-.071	-.047	-				
5. Physical Activity Score	-.212*	.078	-.048	-.031	-			
6. Upper income v. Middle income	.015	-.053	-.060	-.020	.149*	-		
7. Lower income v. Middle income	-.003	.282*	-.025	.030	-.061	-.316*	-	
8. Social Support Squared	-.347*	.005	.182*	-.236*	.101*	-.033	-.061	-

\*  $p < .05$  (one-tailed).

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Table 4  
*Summary of Backwards Stepwise Regression Analysis for Predicting Emotion Regulation (N = 277)*

Variable	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
Age	-.02	.01	-.08	-.02	.01	-.08	-.02	.01	-.08			
Gender	.18	.09	.11*	.18	.09	.11*	.17	.09	.10*	.20	.08	.12*
Sleep Quality	.09	.01	.44*	.09	.01	.44*	.09	.01	.44*	.09	.01	.45*
Leisure-Time Physical Activity	-.01	.00	-.17*	-.01	.00	-.17*	-.01	.00	-.16*	-.01	.00	-.17*
Upper v. Middle income	.07	.09	.04	.08	.09	.04						
Lower v. Middle income	-.01	.09	-.00									
Social Support Squared	-.01	.00	-.24*	-.01	.00	-.24*	-.01	.00	-.24*	-.01	.00	-.25*
$R^2$		.36			.36			.36			.35	
<i>F</i> for change in $R^2$		21.73			.01			.76			2.60	

\* $p < .05$  (one-tailed).

### **Testing Hypothesis 2: Between-group differences in self-reported amount and quality of sleep, emotion regulation, and emotion regulation strategies**

This hypothesis stated that there will be significant differences in the amount and quality of sleep; emotion regulation; cognitive reappraisal; impulsivity inhibition, and experiential avoidance among students free of psychiatric illness (i.e. healthy controls) and students with probable MDD, PTSD, and AUD. Specifically, while I hypothesised that Healthy Controls would report better sleep quality and emotion regulation in contrast to participants in the other groups, I also predicted that in comparison to the other groups (a) the MDD/Depression group will report the lowest tendency to use cognitive reappraisal, (b) the AUD/Alcohol Dependent group will report the highest impulsive control difficulties, and (c) The PTSD group will report the highest tendency to use experiential avoidance.

Five separate one-way ANOVAs tested these hypotheses related to differences between PTSD, Depression, Alcohol Dependent, and Healthy Control groups on the PSQI, composite emotion regulation scores, ERQ, DERS, and BEAQ. The assumption of equal group sizes was not upheld. Although omnibus tests are fairly robust to unequal group sizes, I used post hoc tests that work with unequal group sizes.

Table 5 displays the relevant descriptive statistics and the results of the between-group comparisons. As mentioned, group sizes for each one-way ANOVA were unequal. If Levene's test of homogeneity of variance was violated I used the Games-Howell post hoc test - which works with heterogeneous variance and is accurate when group sizes are unequal - in order to reveal the source of any significant differences. If Levene's test was not violated, I used Hochberg's  $GT_2$  post hoc test was used.

The first one-way ANOVA investigated between-group differences in amount and quality of sleep as measured by the PSQI. Using Levene's test of homogeneity of variance, that amount and quality of sleep as measured by the PSQI did not meet the parametric assumption of homogenous variance (i.e.,  $p < .05$ ).

Analyses detected a significant between-group difference in the PSQI,  $F = 12.84$  (3, 161),  $p < .001$ ,  $\eta_p^2 = .19$ . The Games-Howell post hoc test revealed that the source of the significant difference in the PSQI was between the Healthy Controls and Depression group ( $p < .001$ ) and Depression and Alcohol Dependent group ( $p < .001$ ). On average, both the Healthy Control and Alcohol Dependent group's PSQI score was significantly lower than the Depression group's. Participants in the Depression group reported the highest mean PSQI score (i.e., the poorest amount and quality of sleep).

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The second one-way ANOVA investigated between-group differences in emotion regulation as measured by composite scores. According to Levene's test, variance was not homogenous (i.e.,  $p < .05$ ).

Analyses detected no significant between-group differences in emotion regulation as measured by composite scores. On average, participants in the Healthy Control group reported the lowest emotion regulation scores (i.e., they self-reported having better emotion regulation than did those in the other groups), whereas those in the Depression group reported the highest scores.

The third one-way ANOVA investigated between-group differences in cognitive reappraisal as measured by the ERQ. According to Levene's test, variance was homogenous (i.e.,  $p > .05$ ). Analyses detected no significant between-group differences in cognitive reappraisal as measured by the ERQ. On average, participants in the Healthy Control group reported the highest cognitive reappraisal scores (i.e., they self-reported having a higher tendency to use cognitive reappraisal than did those in the other groups), whereas those in the Alcohol Dependent group reported the lowest scores.

The fourth one-way ANOVA investigated between-group differences in impulsive control difficulties as measured by the DERS. According to Levene's test, variance was not homogenous (i.e.,  $p < .05$ ).

Analyses detected no significant between-group differences in impulsive control difficulties as measured by the DERS. On average, participants in the Healthy Control group reported the lowest impulsive control difficulty scores (i.e., they self-reported having a lower difficulty in control impulsivity than did those in the other groups), whereas those in the Depression group reported the highest scores.

The final one-way ANOVA investigated between-group differences in experiential avoidance as measured by the BEAQ. According to Levene's test, variance was homogenous (i.e.,  $p > .05$ ).

Analyses detected no significant between-group differences in experiential avoidance as measured by the BEAQ. On average, participants in the Healthy Control group reported the lowest experiential avoidance scores (i.e., they self-reported having a lower tendency to use experiential avoidance than did those in the other groups), whereas those in the Depression group reported the highest scores. Based on these results, overall the second hypothesis was disconfirmed.

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Table 5

*Descriptive Statistics and Summary of Results of the One-way ANOVAs Examining Between-Group Differences in Sleep Quality and Emotion Regulation (N = 165)*

Variable	Group								<i>F</i>	<i>p</i>	$\eta_p^2$
	Healthy Controls ( <i>n</i> = 71)		Depression ( <i>n</i> = 43)		PTSD ( <i>n</i> = 31)		Alcohol Dependent ( <i>n</i> = 20)				
Sleep Quality	4.44	(2.46)	7.58	(3.40)	5.87	(3.09)	4.15	(2.18)	12.84	.001	.19
Emotion Regulation	-.40	(.53)	-.13	(.75)	-.23	(.80)	-.22	(.51)	1.62	.19	.03
Cognitive Reappraisal	4.90	(1.06)	4.89	(1.29)	4.82	(1.35)	4.47	(1.31)	.66	.58	.01
Impulsivity	11.06	(4.10)	13.05	(5.46)	12.32	(5.71)	11.05	(3.36)	1.86	.14	.03
Experiential Avoidance	46.86	(11.12)	51.70	(11.84)	49.74	(13.69)	48.95	(10.64)	1.57	.20	.02

*Note.* Means are presented with standard deviations in parentheses for all variables.

### Testing Hypothesis 3: Sleep quality's moderation of the relationship between psychopathological conditions and each respective emotion regulation strategy

This hypothesis stated that self-reported amount and quality of sleep (as measured by the PSQI) will significantly moderate the relationship between (a) MDD and cognitive reappraisal (as measured by the PHQ-9 and ERQ respectively), (b) PTSD and experiential avoidance (as measured by the PC-PTSD and BEAQ respectively), and (c) alcohol dependence and impulsivity inhibition (as measured by the AUDIT-C and impulsivity subscale scores from the DERS respectively).

As evidenced in the previous set of analyses, only significant between-group differences were detected between the Healthy Controls, Depression, PTSD and Alcohol Dependent groups in terms of sleep quality (as measured the PSQI). Therefore, in order to proceed with testing hypothesis 3 based on these findings, I ran preliminary bivariate correlation analyses between a) PSQI, ERQ, DERS, and BEAQ scores and b) PSQI scores, Depression v. Healthy Controls, PTSD v. Healthy Controls, and Alcohol Dependence v. Healthy Controls. As displayed in Table 6, PSQI scores are significantly correlated with ERQ, DERS, and BEAQ scores. As displayed in Table 7, PSQI scores are significantly correlated with both Depression v. Healthy Controls and Alcohol Dependence v. Healthy Controls. Based on these results, I proceeded with the three moderation analyses in order to test hypothesis 3.

Table 6  
*Summary of Bivariate Correlations Examining Significant Correlations  
Between Sleep Quality and Emotion Regulation Strategies (N = 165)*

Variable	1.	2.	3.	4.
1. Sleep Quality (PSQI)	-			
2. Cognitive Reappraisal (ERQ)	-.26*	-		
3. Impulsive Control Difficulties (DERS)	.27*	-.30*	-	
4. Experiential Avoidance (BEAQ)	.18*	-.16*	.38*	-

*Note.* \* $p < .05$

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Table 7  
*Summary of Bivariate Correlations Examining Significant Correlations  
 Between Sleep Quality and Psychopathological Conditions (N = 165)*

Variable	1.	2.	3.	4.
1. Sleep Quality (PSQI)	-			
2. Depression v. Healthy Controls	.40*	-		
3. PTSD v. Healthy Controls	.06	-.29*	-	
4. Alcohol Dependence v. Healthy Controls	-.16*	-.22*	.18*	-

*Note.* \* $p < .05$

The first moderation analysis looked at whether there was a significant moderation effect between psychopathological conditions and self-reported amount and quality of sleep when predicting cognitive reappraisal.

The descriptive statistics and summary of inter-correlations between all key variables can be seen in Table 8. Analyses detected that the final model was significantly greater than zero,  $F(7, 157) = 3.19, p = .003, R^2 = .12$ , with all eight variables explaining only 12% of the variance in cognitive reappraisal. As displayed in Table 9, both mean-centred sleep quality ( $p < .001$ ) and the dummy variable of Alcohol Dependent v. Healthy Controls ( $p < .001$ ) significantly predicted cognitive reappraisal. Analyses detected no significant interaction between Depression v. Healthy Controls ( $p = .91$ ); PTSD v. Healthy Controls ( $p = .24$ ); Alcohol Depression v. Healthy Controls ( $p = .05$ ) and PSQI scores. Therefore, sleep quality had no significant moderation effect on the either of the relationships between the psychopathological conditions' and cognitive reappraisal.



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Table 8

*Descriptive Statistics and Inter-correlations Between Sleep Quality, Cognitive Reappraisal and Psychopathological Conditions (N = 165)*

Variable	1.	2.	3.	4.	5.	6.	7.	8.
1. Cognitive Reappraisal	-							
2. Depression v. Healthy	-.01	-						
3. PTSD v. Healthy	.01	-.29*	-					
4. Alcohol Dependent v. Healthy	-.10	-.22*	-.18*	-				
5. Sleep Quality (PSQI) Centered	-.26*	.40*	.06	-.16*	-			
6. Interaction Depression v. Healthy and Sleep Quality	-.11	.47*	-.14*	-.10	.68*	-		
7. Interaction PTSD v. Healthy and Sleep Quality	-.20*	-.03	.11	-.02	.43*	-.02	-	
8. Interaction Alcohol Dependent v. Healthy and Sleep Quality	-.13*	.11	.09	-.51*	.29*	.05	-.01	-
<i>M</i>	4.80	.26	.19	.12	.00	.55	.07	-.16
<i>SD</i>	1.21	.44	.39	.33	3.11	1.95	1.32	.86

*Note.* *M* = Mean scores and *SD* = Standard deviations. \* $p < .05$

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Table 9  
*Summary of First Moderation Analysis 1 Results*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
Depression v. Healthy	.29	.25	.11	.17	.26	.06
PTSD v. Healthy	.11	.25	.03	.08	.26	.03
Alcohol Dependent v. Healthy	-.47	.29	-.13	-.81	.34	-.22*
Sleep Quality (PSQI) Centered	-.13	.03	-.32*	-.08	.06	-.21
Interaction Depression v. Healthy and Sleep Quality				-.01	.08	-.01
Interaction PTSD v. Healthy and Sleep Quality				-.10	.09	-.11
Interaction Alcohol Dependent v. Healthy and Sleep Quality				-.26	.13	-.19
$R^2$		.10			.12	
$F$ for change in $R^2$		4.25*			1.69	

*Note.* \* $p < .05$  (one-tailed). Dependent Variable: Cognitive Reappraisal.

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The second moderation analysis looked at whether there was a significant moderation effect between psychopathological conditions and self-reported amount and quality of sleep when impulsive control difficulties. The descriptive statistics and summary of inter-correlations between all key variables can be seen in Table 10. Similar to the first moderation analysis, a number of significant inter-correlations were yielded amongst the key variables.

Analyses detected that the final model was significantly greater than zero,  $F(7, 157) = 2.12, p = .04, R^2 = .09$ , with all variables explaining only 9% of the variance in impulsive control difficulties. As displayed in Table 11, the results of model 1 reveal that only the main effects of mean-centred sleep quality (PSQI) ( $p < .001$ ) significantly predicted impulsive control difficulties. Furthermore, analyses detected no significant main or interaction effects. Therefore, sleep quality (as indexed by the PSQI) did not moderate either of the relationships between the psychopathological conditions' relationship with impulsive control difficulties.

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Table 10  
*Descriptive Statistics and Inter-correlations Between Sleep Quality, Impulsive Control Difficulties and Psychopathological Conditions (N = 165)*

Variable	1.	2.	3.	4.	5.	6.	7.	8.
1. Impulsive Control Difficulties	-							
2. Depression v. Healthy	.15*	-						
3. PTSD v. Healthy	.05	-.29*	-					
4. Alcohol Dependent v. Healthy	-.06	-.22*	-.18*	-				
5. Sleep Quality (PSQI) Centered	.27*	.40*	.06	-.16*	-			
6. Interaction Depression v. Healthy and Sleep Quality	.15*	.47*	-.14*	-.10	.68*	-		
7. Interaction PTSD v. Healthy and Sleep Quality	.18*	-.03	.11	-.02	.43*	-.02	-	
8. Interaction Alcohol Dependent v. Healthy and Sleep Quality	.09	.11	.09	-.51*	.29*	.05	-.01	-
<i>M</i>	11.81	.26	.19	.12	.00	.55	.07	-.16
<i>SD</i>	4.78	.44	.39	.33	3.11	1.95	1.33	.86

*Note.* *M* = Mean scores and *SD* = Standard deviations.

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Table 11  
*Summary of Second Moderation Analysis 2 Results*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
Depression v. Healthy	.85	.99	.08	1.16	1.03	.11
PTSD v. Healthy	.74	1.02	.06	.69	1.04	.06
Alcohol Dependent v. Healthy	.10	1.18	.01	.23	1.37	.02
Sleep Quality (PSQI) Centered	.36	.13	.24*	.32	.23	.21
Interaction Depression v. Healthy and Sleep Quality				-.09	.31	-.04
Interaction PTSD v. Healthy and Sleep Quality				.30	.36	.08
Interaction Alcohol Dependent v. Healthy and Sleep Quality				.11	.54	.02
$R^2$		.08			.09	
$F$ for change in $R^2$		3.43*			.43	

*Note.* \* $p < .05$  (one-tailed). Dependent Variable: Impulsivity.

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The third moderation analysis looked whether there was a significant moderation effect between the psychological conditions and self-reported amount and quality of sleep when predicting experiential avoidance. The descriptive statistics and summary of the inter-correlations can be seen in Table 12.

Analyses detected that the final model was not significantly greater than zero,  $F(1, 157) = 1.79, p = .09, R^2 = .07$ , with all variables explaining only 7% of the variance in experiential avoidance. As displayed in Table 13, the results of model 1 reveal that the main effects of mean-centred sleep quality (PSQI) ( $p < .001$ ) significantly predicted experiential avoidance. A significant interaction between the dummy variable of PTSD v. Healthy Controls and sleep quality (as indexed by the PSQI) ( $p = .048$ ) was detected. This illustrates that sleep quality significantly moderated the relationship between PTSD v. Healthy Controls and experiential avoidance. Refer to Figure 1 for a graphical representation of this moderation effect. Based on these results, the third hypothesis was only partially confirmed.

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Table 12  
*Descriptive Statistics and Inter-correlations Between Sleep Quality, Experiential Avoidance and Psychopathological Conditions (N = 165)*

Variable	1.	2.	3.	4.	5.	6.	7.	8.
1. Experiential Avoidance	-							
2. Depression v. Healthy	.14*	-						
3. PTSD v. Healthy	.03	-.29*	-					
4. Alcohol Dependent v. Healthy	.00	-.22*	-.18*	-				
5. Sleep Quality (PSQI) Centered	.18*	.40*	.06	-.16*	-			
6. Interaction Depression v. Healthy and Sleep Quality	.08	.47*	-.14*	-.10	.68*	-		
7. Interaction PTSD v. Healthy and Sleep Quality	.21*	-.03	.11	-.02	.43*	-.02	-	
8. Interaction Alcohol Dependent v. Healthy and Sleep Quality	.02	.11	.09	-.51*	.29*	.05	-.01	-
<i>M</i>	48.92	.26	.19	.12	.00	.55	.07	-.16
<i>SD</i>	11.83	.44	.39	.33	3.11	1.95	1.33	.86

*Note.* *M* = Mean scores and *SD* = Standard deviations.

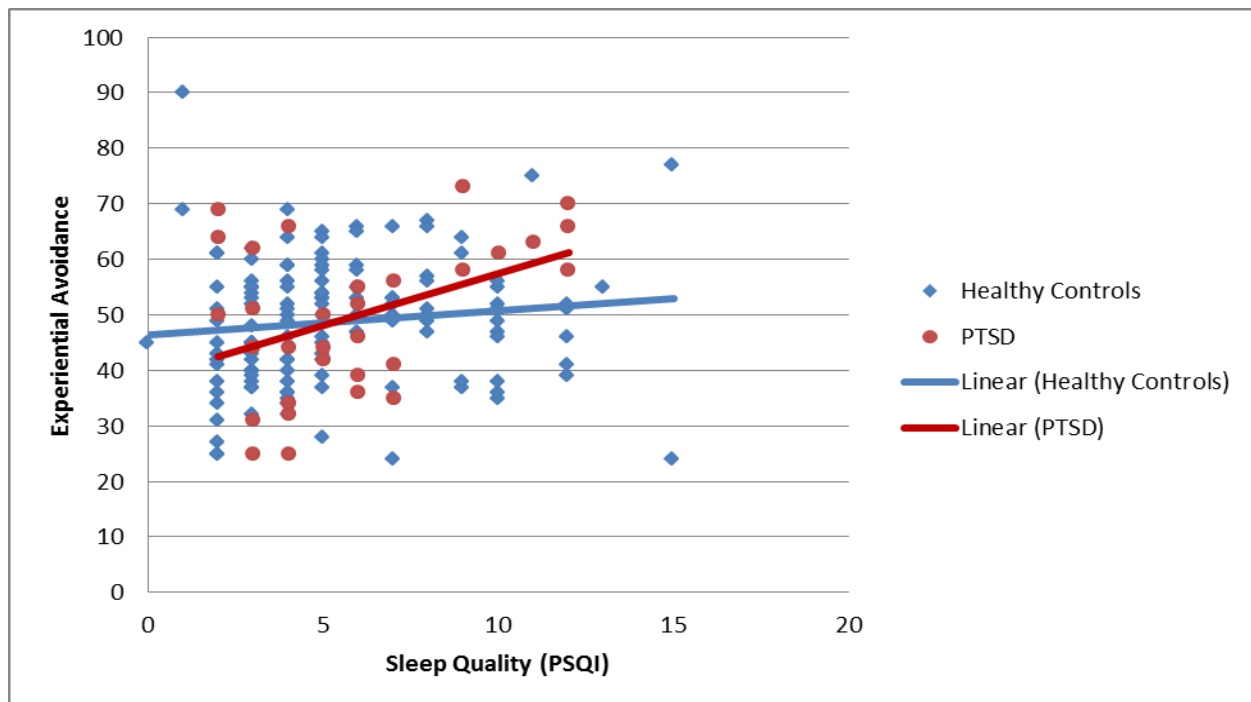
## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

Table 13  
*Summary of Moderation Analysis 3 Results*

Variable	Model 1			Model 2		
	<i>B</i>	<i>SEB</i>	$\beta$	<i>B</i>	<i>SEB</i>	$\beta$
Depression v. Healthy	3.14	2.49	.12	4.44	2.58	.17
PTSD v. Healthy	2.11	2.56	.07	2.03	2.59	.07
Alcohol Dependent v. Healthy	2.25	2.97	.06	2.54	3.42	.07
Sleep Score Centered	.54	.33	.14	.13	.57	.03
Interaction Depression v. Healthy and Sleep Quality				-.00	.77	.00
Interaction PTSD v. Healthy and Sleep Quality				1.76	.89	.20*
Interaction Alcohol Dependent v. Healthy and Sleep Quality				.30	1.35	.02
$R^2$		.05			.07	
$F$ for change in $R^2$		1.88			1.65	

*Note.* \* $p < .05$  (one-tailed). Dependent Variable: Experiential Avoidance.





*Figure 1.* Scatterplot diagram of the moderation effect of self-reported amount and quality of sleep on the relationship between PTSD v. Healthy Controls and experiential avoidance.

### Discussion

The primary aims of the current study were to investigate a) the relationship between sleep disruption and emotion regulation and b) the role that sleep disruption has in the associations between Depression, PTSD and Alcohol Dependence and the use of cognitive reappraisal, impulsivity inhibition and experiential avoidance. In order to achieve these aims, I tested three specific hypotheses. Below, I first discuss the findings in relation to each of the three hypotheses within the context of applicable and recently-published literature. I end off with addressing the limitations of the study and suggest recommendations for future research to improve on the findings yielded.

#### **The association between amount and quality of sleep and emotion regulation**

This hypothesis stated that self-reported amount and quality of sleep would be a significant predictor over and above age, gender identity, SES, leisure-time physical activity and social support of self-reported emotion regulation. The first hypothesis was confirmed. The findings showed that amount and quality of sleep, gender, physical activity and social support were associated with and predicted self-reported emotion regulation. The amount and quality of sleep proved to be the strongest predictor of emotion regulation. It was expected that the amount and quality of sleep would be strongly associated with and predict emotion regulation. Prior studies have illustrated that individuals who reported poor sleep quality have

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struggled to adaptively regulate for example, sadness and reduce responses to negative emotion-eliciting stimuli (Guadagni, Burles, Ferrara, & Iaria, 2014; de Wit, 2008; Mauss et al., 2013; McRae et al., 2012). Findings from the current study suggest the importance of receiving an adequate amount and quality of sleep in order to improve regulation and modulation of one's emotions and reduce emotion dysregulation which could lead to numerous consequences, such as interference with one's social interactions (Tsypes, Aldao, & Mennin, 2013).

In terms of gender, females were unexpectedly found to possess higher difficulty in regulating emotions relative to males. However, research has illustrated that females not only possess a wider array of emotion regulation strategies but tend to use them more adaptively than males (McRae et al., 2008; Nolen-Hoeksem, 2012). One explanation for this study's findings is that a higher number of females reported high scores on the PHQ-9 screening for depression, which is known to present manifested difficulties in emotion regulation (APA, 2013).

Participants who reported higher leisure-time physical activity reported less difficulty in regulating their emotions. These findings may support research that has investigated the positive effect of physical activity on regulating emotion in young adults (Ready et al., 2009). Furthermore, moderate exercise has been associated with helping individuals recover from experiencing sadness to stressful situations (Bernstein & McNally, 2017), such as examinations which the student participants of this study were busy with at the time of data collection.

As expected, self-reported social support significantly predicted emotion regulation, such that high social support was associated with less difficulty in regulating emotion. This finding appears to confirm previous findings of the benefit of higher social support on emotion regulation given that it provides a support basis and allows for learning to improve on regulating emotion more adaptively (Doré et al., 2017; Marroquin, 2011).

On the contrary, socioeconomic status did not significantly predict emotion regulation. Although recent studies have established that higher socioeconomic status is associated with more effective regulation of emotion, the constraints of the measure used to record socioeconomic status could possibly explain why no statistical significance was present (Côté et al., 2010). Only the range of household income categorised under different levels was recorded. Other relevant factors that were not included were work experience of both the individual and family members and level of education to name a few.

**Findings from between-group differences in amount and quality of sleep, emotion regulation and regulatory strategies**

Hypothesis 2 stated that there will be differences in the amount and quality of sleep; emotion regulation; cognitive reappraisal; impulsivity inhibition, and experiential avoidance among students free of psychiatric illness (i.e. healthy controls) and students with probable MDD, PTSD, and AUD.

Only the first in the series of one-way ANOVAs detected a significant between-group difference. As expected, this analysis investigated between-group differences in amount and quality of sleep in students free of psychiatric illness (i.e. healthy controls) and students with probable MDD, PTSD, and AUD. The PSQI score which measured the amount and quality of sleep was significantly lower in the Healthy Control group compared to the Depression group, meaning that people void of probable Depression reported more adequate sleep. Because poor quality and amount of sleep is symptomatic of MDD, PTSD and AUD it is unsurprising that my findings demonstrated no significant differences in amount and quality of sleep between these three psychological conditions (Babson et al., 2012; Klumpp et al., 2017).

Despite the lack of significant between-group differences in emotion regulation, cognitive reappraisal, impulsive control difficulties and experiential avoidance, a few interesting findings are worth describing. First, students free of psychiatric illness reported less difficulty in regulating their emotions compared to students with probable MDD, PTSD, and AUD. It is understandable why this finding was yielded given the manifested dysregulation of emotions in MDD, PTSD and AUD (Aldao et al., 2010; Anderson & Platten, 2011; Diedrich et al., 2016).

Second, students free of psychiatric illness reported a higher tendency to use cognitive reappraisal compared to students with probable MDD, PTSD, and AUD. Given that the use of cognitive reappraisal is recognised as an adaptive regulatory strategy, people void of emotion dysregulation associated with psychiatric illnesses would tend to use it more (Wilson et al., 2017). Furthermore, students with probable MDD narrowly reported as high of a tendency as students free of psychiatric illness to use cognitive reappraisal which challenges previous research findings of the more stringent difficulties of cognitively reappraising negative emotion-eliciting stimuli in people with MDD (Andreotti, 2013; Diedrich, Hofmann, Cuijpers, & Berking, 2016). One potential reason for the this finding may pertain to students' self-reported symptoms of depression as a result of completing examinations.

Third, impulsive control difficulties were reported to be highest in students with probable MDD and lowest in students with probable AUD. Current findings that are challenged by these results are a) impulsivity or impulsive control difficulties are not symptomatic of a MDD diagnosis and b) more significant difficulties in controlling impulsive behaviours are associated with alcohol dependent people (APA, 2013; Anderson & Platten, 2011; de Wit, 2008). What is important to take away from these findings is that there were no significant differences in cognitive reappraisal, impulsive control difficulties and experiential avoidance between individuals assigned to the psychopathological groups.

### **Moderation of the relationships between the probable psychiatric disorders and the respective specific emotion regulation strategies**

Hypothesis 3 stated that the self-reported amount and quality of sleep will significantly moderate the relationship between a) MDD and cognitive reappraisal, b) PTSD and experiential avoidance and c) Alcohol Dependence and impulsivity inhibition. The third hypothesis was only partially confirmed. Although no significant between-group differences were detected in cognitive reappraisal, impulsive control difficulties and experiential avoidance, bivariate correlation analyses revealed significant correlations between the amount and quality of sleep and each of these three emotion regulation strategies. Of the three moderation analyses the findings demonstrated only one statistically significant moderation effect between a probable psychiatric disorder and an emotion regulation strategy.

The third moderation analysis, which included scores indicating the tendency to use experiential avoidance as measured by the BEAQ, yielded significant results. This moderation effect was demonstrated between those with a probable PTSD diagnosis and the emotion regulation strategy of experiential avoidance. The findings showed that students with a probable PTSD diagnosis reported a higher tendency to use experiential avoidance if their amount and quality of sleep was poor. Compared to students without probable PTSD, students with probable PTSD appear to make more use of experiential avoidance when their self-reported amount and quality of the sleep worsens.

These findings seem to reflect current research that illustrates not only the pertinence of sleep abnormalities in individuals with PTSD, but the association of poor amount and quality of sleep with increased use of maladaptive emotion regulation strategies such as experiential avoidance (Aldao et al., 2010; Goldstein & Walker, 2014; Pickett et al., 2015). This understanding may have serious implications for treatment of people with probable or a formal diagnosis of PTSD. As such, appropriate treatment provided for people with PTSD

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may need to focus on improving their sleep quality in order to nullify use of maladaptive emotion regulation strategies which could intensify and prolong the symptoms. According to Lipinska, Baldwin, and Thomas (2012), Prazosin - which serves sympatholytic drug used to treat high blood pressure and anxiety – has been found to alleviate nightmares during sleep that are symptomatic of PTSD.

Along with the lack of significant differences in these two regulatory strategies, analyses detected no significant moderation effects of the amount and quality of sleep between the probable psychiatric illnesses and cognitive reappraisal and impulsive control difficulties. This suggests that the tendency to use cognitive reappraisal and control impulsivity as emotion regulation strategies may not vary amongst individuals with and without probable MDD, PTSD or AUD. Furthermore, the amount and quality of sleep may not be associated with either increased or decreased tendency to use cognitive reappraisal and control impulsivity in people with and without probable MDD, PTSD or AUD.

**Limitations and Directions for Future Research**

Despite the notable implications of the results of this study, there are potential weaknesses that may affect the validity of the findings. Overall, this study collected and analysed data on key variables that were self-report in nature and therefore subjective. Future research would need to implement more objective measures of amount and quality of sleep and emotion regulation in order to build on from this study's findings. Regarding psychiatric diagnoses even though students were given measures to screen for probable MDD, PTSD, and AUD, their scores derived from these measures are not reflective of formal clinical diagnoses. This drawback impacts on the generalizability of the findings to individuals with a formal MDD, PTSD or AUD diagnosis, meaning that future studies would need to utilize data collected from individuals with clinical diagnoses to improve the validity of and expand upon the current findings of this study, especially findings that address the pertinence of the amount and quality of an individual's sleep.

Another potential limitation to this study is the time period in which the online survey responses were attained. Data was collected during midyear examinations for all UCT undergraduate students. Students would have been experiencing high physiological stress which is associated with high sleep disruptions, increased use of maladaptive strategies and a higher degree of depressive symptoms (Lee, Wuertz, Rogers, & Chen, 2013; Richardson, 2017). Therefore, experiences of stress by the participants that were not recorded in this study may have worsened and distorted their responses on sleep quality, emotion regulation and the PHQ-9 compared to when they were not experiencing high amounts of stress. Future research

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would need to record experiences of stress from participants and analyze what impact it may have on the association between the amount and quality of sleep and emotion regulation in individuals with clinical diagnoses of MDD, PTSD, and AUD.

A final potential limitation is the fact that based on the results of the preliminary chi-square test of contingency on gender, significant between-group differences in amount and quality of sleep may be attributable to the significant differences in gender that were found. Future studies may need to consider including gender as a covariate variable and take better account of gender differences.

### **Conclusion**

Based on the findings, the first aim of investigating the relationship between sleep disruption and emotion regulation, was accomplished. This study only lent partial support to the third primary aim investigating the role that sleep disruption plays in the associations between depressive, PTSD and alcohol dependent symptoms and use of cognitive reappraisal, impulsivity inhibition and experiential avoidance respectively. The amount and quality of sleep moderated the relationship between PTSD and tendency to use experiential avoidance in such a way that the more sleep disruptions a person with probable PTSD has, the more they tend to use experiential avoidance to regulate their emotions. This study contributes to the current psychological literature by illustrating the prominent relationship that sleep disruptions and other factors have with emotion regulation emotion. Furthermore, it highlights the importance of relevant sleep-specific treatments in targeting sleep disruptions in pervasive psychological conditions such as PTSD to reduce the use of maladaptive regulatory strategies that may exacerbate and prolong symptomatology.

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## Appendix A

### SRPP Email

Announcement

Subject            Online Survey Study: THE ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS (Get a head start and receive 1 SRPP point for the second semester)

Saved by           Lee Nicholson

Date                DD/MM/YYYY

Groups             site

Good day all,

I am an Honours student in Psychology doing a survey research study through the Department of Psychology. This study aims to look at the importance of sleep for emotion regulation and, more specifically, the specific relationships between sleep quality and emotion regulation strategies in individuals with and without mental health difficulties.

#### **What must you do to participate?**

Anyone can take part! All undergraduate Psychology students can participate, whether or not you have ever experienced any mental illness difficulties. This study comprises of 10 online surveys to be completed: 3 screening surveys; a short sociodemographic survey; a sleep quality survey; 3 emotion regulation surveys; a physical activity survey; and finally a social support survey. The surveys will be presented in this order. Please ensure that you read and complete the informed consent form first before proceeding with the study. I have included the link below to complete them all.

#### **Are there any risks and/or benefits to participating in this study?**

We are not aware of any possible risks to participation. If, however, you feel concerned about your scores on the screening measures, I will provide contact details for the UCT Student Wellness Centre and UCT Student Careline should you feel the need to seek help. If you receive a high score for any of the screening measures, I will contact you via email requesting your consent to provide referral details including the UCT Student Wellness Service Confidential Counselling Appointment Request Form. You will receive a total of **1 SRPP point** for completing all three screening measures and for completing all 7 other surveys mentioned. Please note that this point will only be awarded for the **second semester** of this year. Full completion as presented should take you no longer than 20 minutes. Again, please ensure you complete them all.

#### **What about confidentiality and wanting to stop participating?**

Participation in this study is voluntary and you may withdraw from the study at any time with no penalties. All information gathered will be confidential and anonymous; at no point will



## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

your name or personal details be disclosed to anyone other than those directly involved in the research.

**Any further questions?**

Should you have any questions with regards to the study, please email me on leenicholson796@gmail.com.

**Access to the online surveys**

Please follow this link to complete the surveys: [https://docs.google.com/forms/d/e/1FAIpQLScbMeYqQlswZFukeLVdFsxLGfPibHes-89Qxazs860LZgetQ/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLScbMeYqQlswZFukeLVdFsxLGfPibHes-89Qxazs860LZgetQ/viewform?usp=sf_link)

Kind regards,

Lee Nicholson

## Appendix B

### UCT wide email

Announcement

Subject            Looking for participation in an online survey research project!

Saved by           Lee Nicholson

Date                DD/MM/YYYY

Hi all,

#### **What is the title of my study?**

The association between sleep and emotion regulation in student participants.

#### **What is the study about?**

I am running a survey research study through the Department of Psychology. This study aims to investigate the importance of sleep for emotion regulation and, more specifically, the specific relationships between sleep quality and emotion regulation strategies in individuals with and without mental health difficulties.

#### **What must you do to take part?**

Anyone can take part! All registered students can participate, whether or not you have ever experienced any mental illness difficulties. This study comprises of 10 online surveys to be completed: 3 screening surveys; a short sociodemographic survey; a sleep quality survey; 3 emotion regulation surveys; a physical activity survey; and finally a social support survey. The surveys will be presented in this order. Please ensure that you read and complete the informed consent form first before proceeding with the surveys. I have included the link below to complete them all.

#### **Are there any risks and/or benefits to participating in this study?**

We are not aware of any possible risks to participation. If, however, you feel concerned about your scores on the screening measures, I will provide contact details for the UCT Student Wellness Centre and UCT Student Careline should you feel the need to seek assistance. If you receive a high score for any of the screening measures, I will contact you via email requesting your consent to provide referral details including the UCT Student Wellness Service Confidential Counselling Appointment Request Form. For full participation of the study you will be given R30, 00. Completing the entire list of surveys presented should take you no longer than 20 minutes. Again, please ensure you complete them all.

#### **What about confidentiality and wanting to stop participating?**

Participation in this study is voluntary and you may withdraw from the study at any time without any penalties. All information gathered will be strictly confidential and anonymous; at no point will your name or personal details be disclosed to anyone other than those directly involved in the research.

**Any further questions?**

Should you have any questions with regards to the study, please email me on [leenicholson796@gmail.com](mailto:leenicholson796@gmail.com).

**Access to online surveys?**

Please follow this link to complete the surveys:

[https://docs.google.com/forms/d/e/1FAIpQLSfliPi2G8BvB6Bi9fiDTGFG8wFnjj3878a6\\_JwuS2og8DOoQ/viewform?usp=sf\\_link](https://docs.google.com/forms/d/e/1FAIpQLSfliPi2G8BvB6Bi9fiDTGFG8wFnjj3878a6_JwuS2og8DOoQ/viewform?usp=sf_link)

Kind regards,

Lee Nicholson

## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

**Appendix C****Screening Survey One**

Over the last 2 weeks, please indicate how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things.	0	1	2	3
2. Feeling down, depressed, or hopeless.	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much.	0	1	2	3
4. Feeling tired or having little energy.	0	1	2	3
5. Poor appetite or overeating.	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down.	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television.	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual.	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way.	0	1	2	3

**Appendix D****Screening Survey Two**

In your life, have you ever had any experience that was so frightening, horrible, or upsetting that, in the past month, you:

1. Have had nightmares about it or thought about it when you did not want to?
  - Yes
  - No
  
2. Tried hard not to think about it or went out of your way to avoid situations that reminded you of it?
  - Yes
  - No
  
3. Were constantly on guard, watchful, or easily startled?
  - Yes
  - No
  
4. Felt numb or detached from others, activities, or your surroundings?
  - Yes
  - No

**Appendix E****Screening Survey Three**

Please indicate to what extent each of the following questions pertaining to alcohol consumption best applies to you.

Questions	0	1	2	3	4	Score
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
					Total	

**Appendix F****Sociodemographic Questionnaire**

Age: \_\_\_\_\_

Gender: \_\_\_\_\_

Please indicate below the category that best applies to you in terms of household income.

Household income level:

- Lower income (R1–R19 200)
- Middle income (R19 201–R307 200)
- Upper income (R307 201 and above)

## Appendix G

### Sleep Quality Measure

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. When have you usually gotten up in the morning? \_\_\_\_\_
4. How many hours of actual sleep do you get at night? (This may be different than the number of hours you spend in bed) \_\_\_\_\_

5. During the past month, how often have you had trouble sleeping because you...	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes	0	1	2	3
b. Wake up in the middle of the night or early morning	0	1	2	3
c. Have to get up to use the bathroom	0	1	2	3
d. Cannot breathe comfortably	0	1	2	3
e. Cough or snore loudly	0	1	2	3
f. Feel too cold	0	1	2	3
g. Feel too hot	0	1	2	3
h. Have bad dreams	0	1	2	3
i. Have pain	0	1	2	3
j. Other reason(s), please describe, including how often you have had trouble sleeping because of this reason(s):	0	1	2	3
6. During the past month, how often have you taken medicine (prescribed or "over the counter")	0	1	2	3



## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

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?	0	1	2	3
---	---	---	---	---

8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?	0	1	2	3
---	---	---	---	---

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Very good

Fairly good

Fairly bad

Very bad

---

9. During the past month, how would you rate your sleep quality overall?	0	1	2	3
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## Appendix H

### Emotion Regulation Survey One

I would like to ask you some questions about your emotional life, in particular, how you regulate and manage your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale:

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
1. When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about.	1	2	3	4	5	6	7
2. I keep my emotions to myself.	1	2	3	4	5	6	7
3. When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about.	1	2	3	4	5	6	7
4. When I am feeling positive emotions, I am careful not to express them.	1	2	3	4	5	6	7
5. When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm.	1	2	3	4	5	6	7
6. I control my emotions by not expressing them.	1	2	3	4	5	6	7
7. When I want to feel more positive emotion, I change the way I'm thinking about the situation.	1	2	3	4	5	6	7
8. I control my emotions by changing the way I think about the situation I'm in.	1	2	3	4	5	6	7
9. When I am feeling negative emotions, I make sure not to express them.	1	2	3	4	5	6	7

## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

10. When I want to feel less negative emotion, I change the way I'm thinking about the situation.	1	2	3	4	5	6	7
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## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

**Appendix I****Emotion Regulation Survey Two**

Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

	Almost never	Sometimes	About half the time	Most of the time	Almost always
1. I am clear about my feelings	1	2	3	4	5
2. I pay attention to how I feel.	1	2	3	4	5
3. I experience my emotions as overwhelming and out of control.	1	2	3	4	5
4. I have no idea how I am feeling.	1	2	3	4	5
5. I have difficulty making sense out of my feelings.	1	2	3	4	5
6. I am attentive to my feelings.	1	2	3	4	5
7. I know exactly how I am feeling.	1	2	3	4	5
8. I care about what I am feeling.	1	2	3	4	5
9. I am confused about how I feel.	1	2	3	4	5
10. When I'm upset, I acknowledge my emotions.	1	2	3	4	5
11. When I'm upset, I become angry with myself for feeling that way	1	2	3	4	5
12. When I'm upset, I become embarrassed for feeling that way.	1	2	3	4	5
13. When I'm upset, I have difficulty getting work done.	1	2	3	4	5
14. When I'm upset, I become out of control.	1	2	3	4	5
15. When I'm upset, I believe that I will remain that way for a long time.	1	2	3	4	5
16. When I'm upset, I believe that I will end up feeling very depressed.	1	2	3	4	5
17. When I'm upset, I believe that my feelings are valid and important.	1	2	3	4	5

## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

18. When I'm upset, I have difficulty focusing on other things.	1	2	3	4	5
19. When I'm upset, I feel out of control.	1	2	3	4	5
20. When I'm upset, I can still get things done.	1	2	3	4	5
21. When I'm upset, I feel ashamed at myself for feeling that way.	1	2	3	4	5
22. When I'm upset, I know that I can find a way to eventually feel better.	1	2	3	4	5
23. When I'm upset, I feel like I am weak.	1	2	3	4	5
24. When I'm upset, I feel like I can remain in control of my behaviours.	1	2	3	4	5
25. When I'm upset, I feel guilty for feeling that way.	1	2	3	4	5
26. When I'm upset, I have difficulty concentrating.	1	2	3	4	5
27. When I'm upset, I have difficulty controlling my behaviours.	1	2	3	4	5
28. When I'm upset, I believe there is nothing I can do to make myself feel better.	1	2	3	4	5
29. When I'm upset, I become irritated at myself for feeling that way.	1	2	3	4	5
30. When I'm upset, I start to feel very bad about myself.	1	2	3	4	5
31. When I'm upset, I believe that wallowing in it is all I can do.	1	2	3	4	5
32. When I'm upset, I lose control over my behaviour.	1	2	3	4	5
33. When I'm upset, I have difficulty thinking about anything else.	1	2	3	4	5
34. When I'm upset I take time to figure out what I'm really feeling.	1	2	3	4	5

## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

35. When I'm upset, it takes me a long time to feel better.	1	2	3	4	5
36. When I'm upset, my emotions feel overwhelming.	1	2	3	4	5

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## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

**Appendix J****Emotion Regulation Survey 3**

Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1. The key to a good life is never feeling any pain.	1	2	3	4	5	6
2. I'm quick to leave any situation that makes me feel uneasy.	1	2	3	4	5	6
3. When unpleasant memories come to me, I try to put them out of my mind.	1	2	3	4	5	6
4. I feel disconnected from my emotions.	1	2	3	4	5	6
5. I won't do something until I absolutely have to.	1	2	3	4	5	6
6. Fear or anxiety won't stop me from doing something important.	1	2	3	4	5	6
7. I would give up a lot not to feel bad.	1	2	3	4	5	6
8. I rarely do something if there is a chance that it will upset me.	1	2	3	4	5	6
9. It's hard for me to know what I'm feeling.	1	2	3	4	5	6
10. I try to put off unpleasant tasks for as long as possible.	1	2	3	4	5	6
11. I go out of my way to avoid uncomfortable situations.	1	2	3	4	5	6
12. One of my big goals is to be free from painful emotions.	1	2	3	4	5	6
13. I work hard to keep out upsetting feelings.	1	2	3	4	5	6
14. If I have any doubts about doing something, I just won't do it.	1	2	3	4	5	6
15. Pain always leads to suffering.	1	2	3	4	5	6

**Appendix K****Leisure-Time Physical Activity Survey**

During a typical 7-Day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number).

	Times per week	Totals
a. Strenuous exercise (heart beats rapidly) (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)		X9
b. Moderate exercise (not exhausting) (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)		X5
c. Mild/light exercise (minimal effort) (e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)		X3
Weekly Leisure-Time Activity Score		



## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

**Appendix L****Level of Social Support Survey**

Please indicate the extent to which each of the following statements best applies to you.

	None of the Time	A Little of the Time	Some of the Time	Most of the Time	All of the time
1. Someone you can count on to listen to when you need to talk.	1	2	3	4	5
2. Someone to give you information to help you understand a situation.	1	2	3	4	5
3. Someone to give you good advice about a crisis.	1	2	3	4	5
4. Someone to confide in or talk to about yourself or your problems.	1	2	3	4	5
5. Someone whose advice you really want.	1	2	3	4	5
6. Someone to share your most private worries and fears with.	1	2	3	4	5
7. Someone to turn to for suggestions about how to deal with a personal problem.	1	2	3	4	5
8. Someone who understands your problems.	1	2	3	4	5
9. Someone to help you if you were confined to bed.	1	2	3	4	5
10. Someone to take you to the doctor if you needed it.	1	2	3	4	5
11. Someone to prepare your meals if you were unable to do it yourself.	1	2	3	4	5
12. Someone to help with daily chores if you were sick.	1	2	3	4	5
13. Someone who shows you love and affection.	1	2	3	4	5
14. Someone to love you and make you feel wanted.	1	2	3	4	5
15. Someone who hugs you.	1	2	3	4	5

## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

16. Someone to have a good time with.	1	2	3	4	5
17. Someone to get together with for relaxation.	1	2	3	4	5
18. Someone to do something enjoyable with.	1	2	3	4	5
19. Someone to do things with to help you get your minds off things.	1	2	3	4	5

---

## **Appendix M**

### **Informed Consent Form (online)**

UNIVERSITY OF CAPE TOWN

Department of Psychology

#### **INFORMED CONSENT**

#### **The association between sleep and emotion regulation in student participants**

This form provides you with information about this study and seeks your informed consent to participate. Before you agree to take part in this study, please read the information below and ask the researcher (Lee Nicholson – leenicholson796@gmail.com) questions about anything that you do not understand. The data collected in this study is to be used towards the completion of an Honours degree in the Department of Psychology at the University of Cape Town.

#### **Study Purpose**

The purpose of this study is to investigate the importance of sleep on peoples' ability to regulate their emotions and, more specifically, the specific associations between sleep quality and emotion regulation strategies in various types of mental illness difficulties.

#### **Participation Tasks and Benefits of Participation**

Should you agree to participate in this study, you will first be asked to complete three screening measures for depression, posttraumatic stress disorder and alcohol dependence respectively. Following these, you will be asked to complete a series of surveys: a measure of sleep quality; three measures of emotion regulation strategies; a sociodemographic questionnaire asking for your age, gender, and household income; a measure of physical activity; and finally a measure of social support. Full completion of all surveys provided should take you no longer than 20 minutes. For completing all three screening measures and for completing the next series of surveys you will receive 1 SRPP point. This point will be allocated to the second semester course for which you will require the point. You will need to provide your name, email address, student number and course code if you wish to receive the SRPP point for this. However, your personal details will be stored separately from the rest of your answers, so that your answers cannot be linked to your name or student number.

#### **Participation, Withdrawal, Confidentiality and Risks**

Participation in this study is completely voluntary and you may withdraw from the study at any time without any consequences. All information will be treated with complete confidentiality and anonymity; at no point will your name or personal details be disclosed to anyone other than those directly involved in the research (i.e. myself and my supervisor). There are no foreseeable risks involved in this study and there are no costs involved on your behalf. However, should you feel concerned or uncertain about your results on the screening measures mentioned, I will provide contact details for the UCT Student Wellness Centre and UCT Student Careline. If you receive a high score for any of the screening measures, I will contact you via email requesting your consent to provide referral details including the UCT Student Wellness Service Confidential Counselling Appointment Request Form.

**Questions**

Any questions or problems related to the study should be directed to the researcher or his supervisors, Gosia Lipinska and Kevin Thomas:

Lee Nicholson    leenicholson796@gmail.com

Gosia Lipinska    gosia.lipinska@uct.ac.za

Kevin Thomas    kevin.thomas@uct.ac.za

If you have any questions about your rights as a research participant, feedback from the study, or issues related to the study itself, these may be sent to the Research Ethics Committee, Department of Psychology, University of Cape Town by contacting Rosalind Adams at Rosalind.Adams@uct.ac.za or at 021-6503427.

I have read and understood the above information regarding the study, the possible benefits and risks. Any questions I have about the study have been answered. I hereby voluntarily provide my consent to participate in the research study as explained above

Name:

Surname:

Student number:

Email Address:

Course to assign SRPP point to (a list of the applicable courses will be provide):

## **Appendix N**

### **Informed Consent Form (online)**

UNIVERSITY OF CAPE TOWN

Department of Psychology

#### **INFORMED CONSENT**

#### **The association between sleep and emotion regulation in student participants**

This form provides you with information about this study and seeks your informed consent to participate. Before you agree to take part in this study, please read the information below and ask the researcher (Lee Nicholson – leenicholson796@gmail.com) questions about anything that you do not understand. The data collected in this study is to be used towards the completion of an Honours degree in the Department of Psychology at the University of Cape Town.

#### **Study Purpose**

The purpose of this study is to investigate the importance of sleep on peoples' ability to regulate their emotions and, more specifically, the specific associations between sleep quality and emotion regulation strategies in various types of mental illness difficulties.

#### **Participation Tasks and Benefits of Participation**

Should you agree to participate in this study, you will first be asked to complete three screening measures for depression, posttraumatic stress disorder and alcohol dependence respectively. Following these, you will be asked to complete a series of surveys: a measure of sleep quality; three measures of emotion regulation strategies; a sociodemographic questionnaire asking for your age, gender, and household income; a measure of physical activity; and finally a measure of social support. Full completion of all surveys provided should take you no longer than 20 minutes. For completing all three screening measures, and for completing the next series of surveys you will be compensated with R30 for your full participation. You will need to provide your name and email address so that the researcher can contact you in order to arrange an appropriate meeting time and place to complete the transaction and allow you to sign off that you have received your compensation. However, your personal details will be stored separately from the rest of your answers, so that your answers cannot be linked to your name or student number.

#### **Participation, Withdrawal, Confidentiality and Risks**

Participation in this study is completely voluntary and you may withdraw from the study at any time without any consequences. All information will be treated with complete confidentiality and anonymity; at no point will your name or personal details be disclosed to anyone other than those directly involved in the research (i.e. myself and my supervisor). There are no foreseeable risks involved in this study and there are no costs involved on your behalf. However, should you feel concerned or uncertain about your results on the screening measures mentioned, I will provide contact details for the UCT Student Wellness Centre and UCT Student Careline. If you receive a high score for any of the screening measures, I will

## ASSOCIATION BETWEEN SLEEP AND EMOTION REGULATION IN STUDENT PARTICIPANTS

contact you via email requesting your consent to provide referral details including the UCT Student Wellness Service Confidential Counselling Appointment Request Form.

**Questions**

Any questions or problems related to the study should be directed to the researcher or his supervisors, Gosia Lipinska and Kevin Thomas:

Lee Nicholson    leenicholson796@gmail.com

Gosia Lipinska    gosia.lipinska@uct.ac.za

Kevin Thomas    kevin.thomas@uct.ac.za

If you have any questions about your rights as a research participant, feedback from the study, or issues related to the study itself, these may be sent to the Research Ethics Committee, Department of Psychology, University of Cape Town by contacting Rosalind Adams at Rosalind.Adams@uct.ac.za or at 021-6503427.

I have read and understood the above information regarding the study, the possible benefits and risks. Any questions I have about the study have been answered. I hereby voluntarily provide my consent to participate in the research study as explained above

Name:

Surname:

Email Address:

**Appendix O**  
**Ethical Approval Confirmation**

**UNIVERSITY OF CAPE TOWN**



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**Department of Psychology**

University of Cape Town Rondebosch 7701 South Africa  
Telephone (021) 650 3417  
Fax No. (021) 650 4104

28 June 2017

Lee Nicholson  
Department of Psychology  
University of Cape Town  
Rondebosch 7701

Dear Lee

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for your study: *The association between sleep and emotion regulation in student participants*. The reference number is PSY2017 -023.

I wish you all the best for your study.

Yours sincerely

A handwritten signature in cursive script, appearing to read 'Lauren Wild'.

Lauren Wild (PhD)  
Associate Professor  
Chair: Ethics Review Committee

University of Cape Town  
ΨPSYCHOLOGY DEPARTMENT  
Upper Campus  
Rondebosch

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