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Effect of Mindfulness on Sleep and Resilience in Students

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### **Abstract**

University students are exposed to various stressors during their studies. Accordingly, students would benefit from enhanced resilience to buffer against stress. Research has shown that good sleep quality fosters resilience. Hence, improving sleep quality will subsequently enhance resilience. Mindfulness-based interventions have been shown to have many beneficial outcomes, including sleep quality improvement. This study investigated whether a mindfulness-based intervention would improve sleep quality and in turn enhance resilience in a student population. Participants were assigned to either the intervention ( $n = 20$ ) or control group ( $n = 18$ ). The mindfulness-based intervention consisted of a 20-minute audio guided exercise that was completed daily by the intervention group before they went to bed. Participants in the intervention group were required to complete the exercise over 7 days. During this time, both groups were also asked to complete a daily sleep diary. The Pittsburgh Sleep Quality Index, sleep diaries, Resilience Scale, and participants' marks were used to assess the hypotheses. Results of the study were nonsignificant. The intervention group did not show improved sleep quality and duration compared to the control group. The intervention group did not show improved resilience compared to the control. The correlation analysis showed that there was a trend-level positive association between improved sleep duration and improved resilience for the intervention group only ( $r = .33$ ,  $n = 20$ ,  $p = .08$ ). The outcomes of the study provide tenuous support for the literature which suggests that good sleep quality and duration is important for resilience.

**Keywords:** mindfulness, sleep, sleep quality, sleep duration, resilience

There are heavy demands placed on university students and the pressure to meet these demands often has adverse consequences on students. Common stressors encountered by students are financial worries, academic pressure, and the transition to adulthood (Selesho, 2012; Wilson-Strydom, 2010). Resilience is a protective factor against stressors (Schussler et al., 2018). Evidently, good sleep quality fosters resilience (Tabibnia & Radecki, 2018), and thus improving sleep quality would also have a beneficial effect on resilience. Mindfulness-based interventions (MBIs) have offered promising outcomes on addressing various psychological and behavioural concerns, particularly sleep quality and duration (Creswell, 2017). It is thus argued that through participating in an MBI, sleep quality will be improved which subsequently enhances resilience. This literature review will firstly discuss resilience and the effect poor sleep quality has on it, secondly, it will illustrate the potential MBIs have for improving sleep quality, and finally, examine the gap within the literature that this study intended to fill.

Resilience can be defined as “successfully adapting to adversity” (Tabibnia & Radecki, 2018, p.59). Having been resilient also makes one more resilient (Tabibnia & Radecki, 2018). That is, if one has had previous success with overcoming a stressor, this would have a buffering effect against common or new stressors (Tabibnia & Radecki, 2018). However, people have various degrees of resilience and the extent of their resilience is subject to change based on a range of factors, one being sleep quality (Seelig et al., 2016; Tabibnia & Radecki, 2018).

Many health and well-being issues arise from sleep deprivation (Yoo, Gujar, Hu, Jolesz, & Walker, 2007). Sleep quality is an important factor in fostering resilience as shown in the literature. Palagini et al. (2018) found that Italian out-patients with insomnia reported lower resilience than good sleepers which was illustrated by the challenges participants had in executing goal-oriented planning and time management skills. Similarly, this was evident in Seelig et al. (2016)’s study whereby military personnel from the United States with insomnia symptoms or who slept for less than 6 hours a night were more likely to have lower subjective health reports, early discharge, and lose more workdays. This is unsurprising since it is recommended that individuals get at least 7 hours of sleep a night in the interest of promoting resilience (Tabibnia & Radecki, 2018). Furthermore, it has been speculated that sleep deprivation is associated with reduced connectivity between the medial prefrontal cortex (MPFC) and amygdala which has implications for emotion regulation and subsequently resilience (Yoo et al., 2007). This was evident in Palagini et al.’s (2018) study as low resilience was linked to emotion dysregulation. Ultimately, it is clear that there is an

association between sleep quality and resilience which demonstrates the importance of improving sleep quality.

The literature has shown that MBIs have favourable effects on sleep quality (Britton, Haynes, Fridel, & Bootzin, 2010; Ong, Shapiro, & Manber, 2008). MBIs are based on principles found within Buddhism and have only recently become popular in western psychology (Kabat-Zinn, 2003). A broad definition of mindfulness is that it is “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p.145). However, given the variety of mindfulness practices even within Buddhism, there is no consensus on how to define or practice mindfulness in the literature (Bishop et al., 2004). There are several types of MBIs. The most well-known is mindfulness-based stress reduction (MBSR) which was developed by Kabat-Zinn (1982) initially to treat chronic pain. The success of MBSR led to the development of mindfulness intervention retreats and more brief interventions as well as MBIs online and as smartphone applications (Creswell, 2017). Furthermore, MBIs have been shown to be applicable for a variety of concerns, one of these concerns being poor sleep (see, e.g. Brewer et al., 2011; Carlson et al., 2013; Ma & Teasdale, 2004; Schmidt et al., 2011).

Ong, Ulmer, and Manber (2012) have suggested through their metacognitive model of insomnia that mindfulness practices improve sleep quality because they enhance ability to shift attention to more adaptive thinking. That is, individuals with insomnia have attentional biases whereby they constantly think about their inability to fall asleep and this thinking subsequently interferes with their ability to fall asleep (Ong et al., 2012). Similarly, Lau, Leung, Wing, and Lee (2018) found that healthy Chinese adults who scored highly for awareness and acceptance in a mindfulness questionnaire had reduced psychological stress and this was associated with better quality of sleep. This result is congruent with Lindsay and Creswell’s (2017) Monitor and Acceptance Theory (MAT) which specify the underlying mechanisms of mindfulness. MAT proposes that *attention monitoring* makes you more likely to be aware of your affective experience as well as more likely to react to it. However, when *attention monitoring* occurs under conditions of *acceptance*, there is an addition of emotion regulation which reduces the reactivity associated with *attention monitoring* (Lindsay & Creswell, 2017).

Research using MBIs have found positive subjective reports of sleep quality (Creswell, 2017). For instance, Hall et al. (2018) conducted a randomised controlled trial (RCT) on Chinese university students and found that low-intensity MBI significantly reduced

self-reported measures of depression, stress, and anxiety as well as improved subjective sleep quality. Hülshager, Feinholdt, and Nübold (2015) also reported that low-dose MBIs significantly improved subjective sleep quality. Other studies have also reported that these effects can be seen nine weeks post-intervention (Klatt, Norre, Reader, Yodice, & White, 2017). MBIs for sleep disturbance are also applicable in older populations as found by Black, O'Reilly, Olmstead, Breen, and Irwin (2015).

Most studies investigating the effect of MBIs on sleep quality rely primarily on subjective reports; hence, there are few studies which report objective sleep quality data (Britton et al., 2010). Britton, Haynes, Fridel, and Bootzin (2012) reported that both their subjective and objective data (obtained using polysomnography) showed favourable outcomes on sleep quality. Another study relied on actigraphy and also found evidence to support the benefits of MBIs on sleep quality (Lengacher et al., 2015). Overall, it should be evident that MBIs are beneficial for improving sleep quality in a variety of contexts and for different populations.

Nevertheless, given the fairly recent development of MBIs it is unsurprising that there are a few shortcomings shared across the literature as well as gaps. To begin, there is a lack of a comprehensive and definitive understanding of MBIs. That is, mindfulness is conceptualised differently in studies to the extent that there is no standard of what a MBI is aside from the fact that it needs to incorporate “mindfulness” practices (Bajaj & Pande, 2016). Even within an MBI, the protocol can diverge across studies (Bajaj & Pande, 2016). To my knowledge, Bishop et al. (2004) has been the only paper to propose an operational definition of MBIs. However, this definition was not readily taken up by the literature because it overlooked the distinction between the state of mindfulness and the trait of mindfulness (Blanke & Brose, 2017).

Another issue present in the literature is that the majority of studies are correlational and rely on subjective measures to draw conclusions (Caldwell, Harrison, Adams, Quin, & Greeson, 2010; Creswell, 2017). Although subjective data is valuable, the addition of objective measures could provide more insight into the precise mechanisms that MBIs target (Creswell, 2017). Furthermore, many studies are concerned with trait or dispositional mindfulness, which are measured using questionnaires, and so do not utilise an MBI (i.e. there is a lack of experimental research).

Finally, MBI research is largely concerned with improving sleep quality in other populations (e.g. human service professionals, social workers, etc.) and not necessarily student populations (see, Klatt et al., 2017; Pidgeon, Ford, & Klaassen, 2014). Given that

there are vast differences between, for example, military personnel and students, further research should investigate the effects of MBIs on student populations.

Ultimately, it is important that further research is conducted on the benefits of MBIs for improving sleep, especially given the importance of sleep for resilience. This research should utilise both subjective and objective measures for the aforementioned reasons.

### **Rationale and Hypotheses**

It is evident that MBIs appear to have the potential to improve sleep quality and duration. This study investigated whether MBIs can improve sleep quality, and subsequently enhance resilience, in a South African student population. Since stress contributes to poor sleep quality/duration and the quality/duration of sleep influences resilience, it was hypothesised that the use of an MBI would improve sleep quality/duration, and hence, enhance resilience. The practical implications of this study's outcomes were that MBIs could be used as useful techniques to enhance resilience which would protect individuals against stress. I used three hypotheses to answer this research question:

H1: Participants obtaining the MBI will show improved sleep quality and duration when compared to the control group.

H2: Participants obtaining the MBI will show a higher degree of resilience when compared to the control group.

H3: Sleep improvement is directly related to an increase in resilience.

### **Methods**

#### **Design and Setting**

This study was conducted at UCT in the Department of Psychology. The study utilised an experimental design and investigated within- and between-subject effects. The independent variables (IVs) were (1) intervention type (i.e. intervention vs. control) and (2) time (i.e. pre-test vs. post-test intervention). The intervention group received the MBI, whereas the control group would only receive the intervention if it was found to be effective. The dependent variables (DVs) were (1) sleep quality and duration which was assessed using a sleep diary and (2) resilience which was assessed using a self-report questionnaire and participants' test and exam marks. Participants' marks were used to objectively measure how well they were coping. This study was nested within a larger study investigating the effect of an MBI on student mental health, however I only reported on results related to sleep quality/duration and resilience. Those who were eligible to participate were pseudo-randomly

assigned to either the intervention or control group. That is, every second eligible participant was assigned to the intervention group and the rest were assigned to the control group.

### **Participants**

**Recruitment.** Twenty-six participants were recruited using convenience sampling via UCT Psychology Department's Student Research Participants Program (SRPP; see Appendix A) and UCT's Department of Student Affairs (DSA; see Appendix B). Each participant was awarded 6 SRPP points upon completion of the full study. Students that completed the screening but were ineligible were awarded 1 SRPP point. Twelve participants were recruited via the Department of Student Affairs Research Invitation email. These participants were entered into a raffle to win one of three gift vouchers (R500, R300, and R200).

Recruitment of participants extended over 3 rounds. In the first round, 14 of the 20 eligible participants completed the study. In the second round, 2 of the 6 eligible participants completed it. In the final round, 22 of the 27 eligible participants completed it. Overall, 255 students completed the screening test.

**Eligibility criteria.** All students of any self-identified gender, between the ages of 18 to 40, and fluent in English were eligible to participate. Students were excluded from participation if they (a) were good sleepers or had severe sleep disturbance, (b) had current severe anxiety or depression, (c) had post-traumatic stress disorder, (d) had any neurological disorders known to affect sleep/mental health outcomes, (e) were using psycho-active drugs, (f) had a history of psychosis, and (g) had a current substance use disorder. The reason for this exclusion criteria was that these factors may have potentially had an independent effect on sleep and resilience (see, e.g. Conroy & Arnedt, 2014; Davies, Haddock, Yung, Mulligan, & Kyle, 2017; Inman, Silver, & Doghramji, 1990; Morin & Ware, 1996).

**Power analysis.** G\*Power was utilised to calculate the sample size required for the study to meet the appropriate statistical demands of a one-way ANOVA (Faul, Erdfelder, Buchner, & Lang, 2009). A sample size of 34 participants was suggested to achieve a power of .95 using an effect size estimate of .25. This study recruited 38 participants, hence the study was adequately powered.

### **Materials and Apparatus**

All questionnaires were completed electronically via Google Forms by participants.

#### **Screening and pre-to-post-test measures.**

**Sociodemographic questionnaire.** This questionnaire collected biographical information (see Appendix C).



***Pittsburgh Sleep Quality Index (PSQI)***. This self-report questionnaire consists of 19-items and assessed sleep quality in the previous month (see Appendix D; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). The 19-items are spread over seven components, namely: “subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction” (Buysse et al., 1989, p.195). Items 1-4 are open-questions relating to sleep patterns whereas 5-9 are closed-questions with 4 choices that range from 0-3; higher scores indicate poor sleep quality. The questionnaire was used to determine participant eligibility. Students were excluded if their score was  $<5$  or  $>12$ . Dietch et al. (2016) reported that the PSQI was an effective tool for detecting insomnia. Carpenter and Andrykowski (1998) found strong internal consistency and construct validity. Manzar et al. (2015) reported a Cronbach’s alpha of .74 for a student sample. Furthermore, the PSQI has been used successfully in the South African context (see, e.g., Henry, Wolf, Ross, & Thomas, 2015; Redman, Karstaedt, & Scheuermaier, 2018).

***State-Trait Anxiety Index (STAI)***. This self-report questionnaire assessed and differentiated between anxiety as a trait and a state (see Appendix E; Spielberger, Gorsuch, & Lushene, 1970). The state section consists of 20-items that asked respondents to rate on a 4-point scale from *not at all* to *very much so* how they felt in a particular moment. The trait section consists of 20-items that asked respondents to rate on a 4-point scale from *almost never* to *almost always* how they generally feel. Higher scores in either or both sections indicated high levels of trait and/or state anxiety. The trait section was used to exclude students from participation and the state section was used as a pre-to-post-test measure. Students who scored  $\geq 59$  were excluded on the basis of having severe anxiety. Spielberger and Vagg (1984) report an internal consistency of .92. The STAI has been used in several South African studies (see, e.g., Roberts, Emsley, Pienaar, & Stein, 1999).

***Patient Health Questionnaire (PHQ-9)***. This self-report questionnaire consists of 9-items which assessed the severity of depression (see Appendix F; Kroenke, Spitzer, & Williams, 2001). Respondents were asked whether they, in the last two weeks, had experienced depressive symptoms on a 4-point scale from *not at all* to *nearly every day*. This measure was used as both a screening and pre-to-post test measure. Students were excluded from the study if their score was  $\geq 15$  as this was indicative of moderately severe to severe depression (Kroenke et al., 2001). The validity of the PHQ-9 in South African contexts for clinical samples has been shown to be good (Bhana, Rathod, Selohilwe, Kathree, & Petersen, 2015).

**Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD).** This self-report yes/no questionnaire consisted of 5-items and assessed the likelihood of having PTSD (see Appendix G; Cameron & Gusman, 2003). The questionnaire was only completed if the respondent had experienced or witnessed a traumatic event. This questionnaire was used as screening measure. Students were excluded if they answered ‘yes’ to 3 or more of the questions as this indicated probable PTSD (Cameron & Gusman, 2003). This measure has been successfully used in the South African context (see, e.g., Peltzer et al., 2013).

**Alcohol Use Disorders Identification Test Consumption (AUDIT-C).** This self-report instrument is the shortened version of the AUDIT and only had 3-items relating to consumption (see Appendix H). The measure recorded frequency of drinking, the quantity consumed in one setting, and frequency of binge drinking. There were 5 choices per item. The measure was scored out of 12, higher scores indicated that the individual was likely engaging in risky alcohol use and potentially had alcohol dependence. This measure was used to exclude participants with high alcohol consumption levels. The study used a cut-off score of 7 for men and 5 for women since the study used a student sample (DeMartini & Carey, 2012). The AUDIT has high internal consistency as Fleming, Barry, and MacDonald (1991) reported a coefficient  $\alpha = 0.80$  in a student sample. Moreover, the AUDIT-C is regularly used in South African research (see, e.g. Peltzer et al., 2007; Tomlinson et al., 2014).

**Resilience Scale (RS).** This self-report questionnaire consisted of 25-items that were used determine an individual’s degree of resilience (see Appendix I; Wagnild & Young, 1993). Respondents were provided statements and asked to rate their feelings towards each statement on a 7-point scale from *strongly disagree* to *strongly agree*. Higher scores were associated with greater resilience. This questionnaire was used as a pre-to-post-test measure. This measure has an internal consistency of .89 (Wagnild & Young, 1993). Further, the measure has been successfully used in these South African studies (see, e.g., Hitge & Van Schalkwyk, 2018; Koen, Van Eeden, & Wissing, 2011).

**Students’ Marks.** This measure was an objective indicator for resilience. The study used pre-intervention test marks and compared it to post-intervention test marks. The difference between the marks at each timepoint was taken as the indicator for resilience.

#### **Experimental measures.**

**Sleep Diary.** The National Sleep Foundation’s (NSF, 2019) sleep diary was used, it is a self-report measure which records sleep patterns and any activities affected by sleep or that affect sleep (see Appendix J). Participants recorded their waking and sleeping times, the length of the period asleep, how likely they were doze during the day, how they felt when

they woke up, and any times they were awoken during their sleep. Sleep diaries are regularly used in South African research (see, e.g., Greeff & Conradie, 1998; Rae et al., 2017).

***Mindfulness-based Intervention (MBI)***. This instrument was an audio recording of a South African guided mindfulness practice. The recording was in English and was 20 minutes long. The intervention required participants to be in a sitting position with their eyes open or closed. It specifically focused on the mindful technique of *awareness of breath* whereby participants were required to pay attention to their breathing patterns. If they lost focus (i.e. if their mind wandered) they would be asked to acknowledge their thoughts and accept that they had lost focus on the objective and then return their attention to their breathing. The last 4.30 minutes of the audio required the participant to practice without guidance. The guided practice taught a foundational mindfulness technique as identified by Bishop et al. (2004). Zeidan, Johnson, Diamond, David and Goolkasian (2010) found evidence that daily 20-minute mindfulness practice over the course of 4-days was effective at increasing one's ability to be mindful. Brief mindfulness practices have also been shown to promote self-regulation (Zeidan, Johnson, Gordon, & Goolkasian, 2010).

### **Procedure**

Students interested in the study completed an online screening/pre-test via Google Forms. Eligible participants were asked to sign-up for a briefing session. Separate briefing sessions for each group was set-up where the researcher provided an overview of the study as well as a demonstration of how to use the sleep diary. During this session the researcher also obtained participants' Whatsapp contacts. All participants were instructed to complete the sleep diary via Google Forms for the duration of the study. Before the intervention was used, a baseline of participants' sleeping habits was obtained using the sleep diaries. The intervention group received the MBI audio recording via email for use on a phone or laptop. They were instructed to use the guided practice before they intended to sleep. Daily reminders were WhatsApped to both groups in the morning and evening to remind them to record their sleep data. One follow-up was sent if participants did not complete a sleep diary. The intervention group received an additional reminder in the evening message to complete the mindfulness exercise. Participants were asked to respond to the message and confirm that they had completed the practice and sleep diary as a measure of adherence. The day following the last mindfulness practice, participants were reassessed on the pre-test measures. Following this, participants were emailed debriefing forms.

### **Ethical Considerations**

Informed consent was obtained before participants completed the screening test and then again before they participated in the intervention (see Appendix K). Participants were also asked to consent to providing their semester marks to the researchers. There were no penalties for students who did not provide consent for their marks. Following completion of the post-test administration, participants were emailed debriefing forms (see Appendix L). Participants who were ineligible due to having scoring in the severe range of the screening questionnaires were referred to the Student Wellness Centre at UCT. Ethical approval for the study was granted by the UCT Ethics Review Committee of the Faculty of Humanities, reference number PSY2019-016 (Appendix M).

### **Data Management and Statistical Analyses**

I analysed the data using the Statistical Package for the Social Sciences (SPSS; version 25.0). This study's  $\alpha$  was set at .05 following standard conventions (Jones & Sommerlund, 2007). The results related to assumptions were only reported if any assumptions were violated. Outliers were removed if they were 3 standard deviations away from the mean; three values were removed on this basis. All questionnaires were scored following standard protocols.

**Descriptive statistics.** A set of descriptive statistics was produced to provide an overview of the dataset regarding sample characteristics and baseline scores. This was also used to check that all statistical assumptions were upheld and whether the groups were matched at baseline. Independent samples t-Tests were conducted to analyse the sample characteristics and baseline scores of the groups.

**Inferential statistics.** Independent samples t-Tests and bivariate correlation were used to analyse the data. The five variables being measured were converted to change scores. That is, the pre-test scores were subtracted from the post-test scores and this difference was used to analyse whether the intervention group experienced an improvement in their resilience and sleep quality and duration compared to the control group.

**Hypothesis 1: *Between-group differences in sleep quality and duration.*** To evaluate whether the intervention group, relative to the control group, had improved sleep quality and duration following the intervention, I ran an independent samples *t*-Test. The outcome variables included sleep duration, the likelihood of dozing during day and how refreshed participants felt after waking up.

**Hypothesis 2: *Between-group differences in resilience.*** To evaluate whether the intervention group, relative to the control group, increased their degree of resilience and improve in their tests and exams following the intervention, I ran an independent samples *t*-

Test. The outcome variables included resilience scores and students' test and exam marks. All marks obtained were converted into percentages.

**Hypothesis 3: Sleep duration improvement x resilience.** To assess whether improvements in sleep were associated with improvements in resilience, I ran a bivariate correlation. The change in sleep duration from pre-to-post intervention was taken as a measure of sleep improvement and the change in resilience scale scores from pre-to-post intervention was taken as a measure of resilience improvement.

## Results

### Descriptive statistics

Table 1 summarises the sample characteristics and pre- and post-test scores of each group. Both groups were similar in terms of age and the distribution of gender. Overall, the sample had more women which was expected since the majority of participants were psychology students and most psychology students are women. The analyses detected no significant differences between each group's scores on the screening measures. All groups were matched on their screening measures' scores.

Table 1

*Sample Characteristics (N = 38)*

Variable	Group		<i>t</i>	<i>p</i>	ESE	95% CI	
	Control ( <i>n</i> = 18)	Intervention ( <i>n</i> = 20)				LL	UL
Age (years)			.65	.52	.22	-.85	1.65
<i>M(SD)</i>	20 (1.91)	20 (1.82)					
Range	18 - 26	18 - 25					
Gender			-.19	.85	-.06	-.33	.27
Female	13	15					
Male	5	5					
PSQI			-.60	.55	-.20	-1.46	.80
<i>M(SD)</i>	7.33 (1.88)	7 (1.56)					
Range	5 - 11	5 - 10					
STAI-T			-.36	.72	-.12	-6.78	4.73
<i>M(SD)</i>	44.28 (8.37)	43.25 (9.05)					
Range	30 - 57	25 - 58					
PHQ-9			.02	.99	.01	-2.43	2.48
<i>M(SD)</i>	6.78 (4.14)	6.80 (3.32)					
Range	0 - 14	1 - 13					
PC-PTSD			.05	.97	.02	-.49	.52
<i>M(SD)</i>	.39 (.78)	.40 (.75)					
Range	0 - 2	0 - 2					
AUDIT-C			.07	.94	.02	-1.19	1.28
<i>M(SD)</i>	1.56 (1.89)	1.60 (1.88)					

Range            0 – 6            0 – 6

*Note.* Means are presented, with standard deviations in parentheses. ESE = effect size estimate (Cohen's *d*); CI = confidence interval; LL = lower limit; UL = upper limit; PSQI = Pittsburgh Sleep Quality Index; STAI-T = State-Trait Anxiety Index – Trait; PHQ-9 = Patient Health Questionnaire; PC-PTSD = Primary Care – Post-Traumatic Stress Disorder; AUDIT-C = Alcohol Use Disorders Identification Test – Consumption. All listed *p*-values are two-tailed.

Table 2 summaries each group's scores at baseline. Analyses detected no significant differences group differences at baseline. Participants from each group were not matched in terms of the course marks that were used in this study because those that were recruited through DSA came from various departments at the university.

Table 2

*Descriptive Statistics: Baseline scores (N=38)*

Variable	Group		<i>t</i>	<i>p</i>	ESE	95% CI	
	Control ( <i>n</i> = 18)	Intervention ( <i>n</i> = 20)				LL	UL
RS			-.04	.97	-.04	-9.40	9.06
	M ( <i>SD</i> )	135.17 (12.52)	135.00 (15.22)				
	Range	109 – 162	106 – 159				
Marks			1.99	.06	.87	-.35	16.49
	M ( <i>SD</i> )	60.56 (7.75) <sup>a</sup>	68.63 (10.40) <sup>b</sup>				
	Range	44 – 73	52 – 83				
Doze			.26	.80	.09	-.46	.59
	M ( <i>SD</i> )	2.33 (.91)	2.40 (.68)				
	Range	0 – 3	1 – 3				
Wakeup			.63	.54	.21	-.29	.54
	M ( <i>SD</i> )	1.72 (.57)	1.85 (.67)				
	Range	1 – 3	1 – 3				
Duration			-1.00	.32	-.33	-1.17	00:26
	M ( <i>SD</i> )	06:35 (01:34)	06:10 (01:02)				
	Range	03:30 – 09:00	04:00 – 08:00				

*Note.* Means are presented, with standard deviations in parentheses. ESE = effect size estimate (Cohen's *d*); CI = confidence interval; LL = lower limit; UL = upper limit; RS = Resilience Scale; Doze = how likely the participant was to doze during the day; Wakeup = how the participant felt when they woke up; Duration = how long the participant slept.

<sup>a</sup>Based on *n* = 9; eight participants in this group did not provide their semester marks; one participant in this group was an outlier. <sup>b</sup>Based on *n* = 14; six participants in this group did not provide their semester marks. All listed *p*-values are two-tailed.

### Inferential statistics

Table 3 shows the outcomes of the analysis for each variable. The intervention group scored higher their resilience, wakeup, and duration scores compared to the control group. The control group scored higher in their marks and doze scores compared to the intervention group. The differences in the outcome variables were considered small. However, of note is that analyses showed for the duration variable that the intervention group increased their duration by 43 minutes whereas the control group increased theirs by 17 minutes. At the end of the study both groups were getting approximately 7 hours of sleep.

Table 3

*Independent samples t-Test*

Variable	M	<i>t</i>	<i>p</i>	ESE	95% CI	
					LL	UL
Resilience	1.54	.48	.64	.16	-5.03	8.12
Marks <sup>a</sup>	-7.33	-1.58	.13	-.73	-17.05	-2.39
Doze	-.005	.11	.91	.04	-.50	.55
Wakeup	.03	-.02	.98	-.01	-.48	.47
Duration	00:26	1.03	.31	.34	-00:25	01:18

*Note.* M = mean difference; ESE = effect size estimate (Cohen's *d*); CI = confidence interval; LL = lower limit; UL = upper limit; RS = Resilience Scale; Doze = how likely the participant was to doze during the day; Wakeup = how the participant felt when they woke up; Duration = how long the participant slept. <sup>a</sup>Based on  $N = 21$ ; fourteen participants did not provide their semester marks; three participants' scores were outliers. All listed *p*-values are two-tailed.

**Hypothesis 1.** Analyses detected no significant results for the outcome variables, sleep duration, the likelihood of dozing during day and how refreshed participants felt after waking up.

**Hypothesis 2.** Analyses detected no significant results for the resilience scores. However, a significant difference was detected for students' marks.

**Hypothesis 3.** The analysis detected no significant relationships. However, for participants in the intervention group only, there was a trend-level positive association between the change in sleep duration and the change in resilience ( $r = .33$ ,  $n = 20$ ,  $p = .08$ ). These results show that participants in the intervention that slept longer, also had increased resilience. There was no similar relationship between the change in sleep duration and the change in resilience in the control group ( $r = -.23$ ,  $n = 18$ ,  $p = .18$ ).

## Discussion

The main objective of this research paper was to investigate whether mindfulness would improve sleep quality and duration and in turn improve resilience in a South African student population. To accomplish this, three hypotheses were tested: (1) participants obtaining the MBI will show improved sleep quality and duration when compared to the control group, (2) participants obtaining the MBI will show a higher degree of resilience when compared to the control group, and (3) sleep improvement is directly related to an increase in resilience. Participants in the intervention group showed no significant improvement in their sleep quality and quantity as well as resilience in comparison to the control group. However, there was a trend-level association between improved sleep and improved resilience for the intervention group. This suggests that good sleep may be a necessary factor for enhanced resilience.

### **Hypothesis 1: Between-group differences in sleep quality and duration**

The hypothesis that the intervention group will show improved sleep quality and duration compared to the control group was not confirmed. Sleep quality improved in both the intervention and control groups after the study interval. Regarding sleep duration, in comparison with baseline, participants receiving the MBI slept on average 43 minutes longer, while participants in the control group slept on average only 17 minutes longer, although these differences were not statistically meaningful. Ultimately, the main findings relating to the hypothesis do not match the literature. A possible explanation for this is that the dose and how long the mindfulness intervention lasted was too low and short to have an effect on the intervention group. Dose in this regard refers to the frequency of practice.

The current literature shows that mindfulness exercises can be effective at improving sleep quality and duration. However, the majority of successful studies typically had higher doses and longer practices. For instance, Lengacher et al. (2015) found a significant improvement in sleep quality in their sample of American breast cancer survivors. Their study also utilised objective sleep data. Their intervention group participants completed 6 weekly 2-hour mindfulness sessions and were asked to complete 15-45 minutes optional practices during the course of the 12-week study. The control group completed normal post-treatment clinic visits (i.e. received usual care) and were asked not to engage in any activities related to mindfulness and meditation. There were statistically significant improvements at both the 6- and 12-week mark for the intervention group.

Similarly, Klatt et al. (2017) found significant improvement in sleep quality and quantity in a sample of Danish bank employees. Participants in the intervention attended 8 weekly 1-hour mindfulness sessions which included yoga and reflective writing. They also



received optional audio recorded mindfulness practices. The control group was placed on a wait-list and received no treatment. Those in the intervention group experienced a significant improvement in sleep measures compared to the control group and this was seen 9 weeks post-intervention too.

In another study, Hall et al. (2018) conducted a mindfulness intervention study over a period of 7 weeks and required participants to complete at-home audio practices that lasted between 25-27 minutes. They were required to use these recordings for at least 2-hours per week. In addition, these participants had to complete two 1.5- hour in-person sessions. Their study utilised a wait-list control condition. Hall et al. (2018) detected a significant improvement in sleep quality for the intervention group in comparison to the control at week 4. At week 7, this was still true for the intervention group.

In these studies, the mindfulness exercise lasted an hour or more and was accompanied with additional exercises. The mindfulness exercise used in this study was only 20 minutes and was practiced for only 7 days. Ordinarily, mindfulness exercises last at least 40 minutes and extend over 8 weeks (Creswell, 2017). Thus, this study used a low dose and the length of the intervention was short. A likely reason for this study's intervention being ineffective at improving sleep may be because it utilised a low dose since studies with short timeframes have been shown to be effective.

For example, Hülshager et al. (2015) conducted their mindfulness interventions study over 10 days and found that the group receiving the mindfulness intervention had an improvement in their sleep quality and duration in comparison to the control group. Their sample consisted of Dutch workers from various fields. Participants in the intervention group attended a briefing session where the mindfulness practices they were to complete were explained to them. The intervention group was required to complete four practices (Three-Minute Breathing Space, Body Scan, Mindful Routine Activity, and Loving Kindness). The length of 3 of the practices were not specified, however, they were to be performed throughout the day, specifically the Mindful Routine Activity and Loving Kindness. Hülshager et al. (2015) study outcome suggests that mindfulness practices require more doses and do not necessarily need to extend over weeks to be effective.

The implication of this outcome for this hypothesis is that mindfulness practice likely requires higher doses in student populations for it to be effective.

### **Hypothesis 2: Between-group differences in resilience**

The hypothesis that the intervention group will show improved resilience compared to the control group was not confirmed. The intervention group did not show significantly

higher resilience and mark scores. Both groups had similar means for the RS post-intervention with the intervention group having a slightly higher average. Participants in the control group had on average higher marks compared to participants in the intervention group. According to the study's predictions, improved sleep would be associated with enhanced resilience. Thus, given that the first hypothesis was nonsignificant, this hypothesis was also expected to be nonsignificant.

The increase in both groups' resilience scores may possibly be a result of the placebo effect. Participants in both groups were asked to keep sleep diaries and received daily reminders to complete these diaries. The increase in both groups resilience thus may have occurred because the control group was also asked to focus on an aspect of their behaviour (i.e. their sleeping habits) during the study. This may have led to a bias where participants in the control group unintentionally or intentionally believe that they experienced a change during the course of the study and so responded accordingly in their sleep diaries.

Another potential explanation is that, similar to hypothesis one, the dose of mindfulness in the study was too low to impact the resilience levels in the intervention group. Consequently, higher doses of mindfulness may be necessary to evaluate whether mindfulness can be effective at improving resilience in student populations.

The marks used in this study came from different courses and although all the marks were converted into percentages for standardisation, we could not control for the difficulty levels between the courses. Nevertheless, the control group performed on average better than the intervention group in their tests and exams. This contrasts with the RS scores in which the intervention group had a higher resilience average outcome compared to the control group. The reason for this reversal may be a result of a smaller number of participants ( $n=21$ ) being used to assess the between-group differences for the marks outcome compared the full sample size used to assess the RS scores.

### **Hypothesis 3: Sleep duration improvement x resilience**

The hypothesis that there would be a relationship between the improved sleep and increased resilience was not confirmed, however, there was a trend-level weak positive relationship between improved sleep duration and increased resilience for the intervention group only. There was no such association between sleep duration and resilience for the control group. This study was mainly interested in whether a mindfulness practice would improve sleep duration and in turn, whether improved sleep duration would enhance resilience. This finding provides some tenuous support for this as well as for the current literature which suggests that good sleep quality is necessary for resilience.

To elaborate, Arbinaga (2018) explored the relationship between subjective sleep quality and resilience. Sleep quality was assessed using the Pittsburgh Sleep Quality Index and resilience was assessed using the Resilience Scale. Their sample consisted of 116 dance students. They found that participants who reported poor sleep quality were significantly more likely to report low resilience in comparison to those who reported good sleep quality. Participants with shorter sleep duration (<7 hours) were also significantly more at risk of low resilience than those with longer sleep times (>7 hours).

In another study, Palagini et al. (2018) investigated how insomnia may affect resilience. Their study had 58 participants with insomnia and 38 good sleepers. Insomnia severity was measured using the Insomnia Severity Index and resilience was measured using the Resilience Scale for Adults. They found that participants with insomnia had significantly lower resilience than participants who were considered good sleepers.

These studies suggest that good sleep quality and/or duration is associated with higher degrees of resilience whereas poor sleep quality and/or duration is associated with lower degrees of resilience. This study's outcomes suggest that longer sleep leads to higher degrees of resilience. Both groups had longer sleep duration; participants in the intervention group had on average a 43-minute improvement whereas the control group had a 17-minute improvement. At the end of the study both groups were getting approximately 7 hours of sleep. According to Arbinaga's (2018) results, this would suggest that both groups sleep duration outcomes would be associated with higher degrees of resilience. However, only the intervention group showed a possible association.

In the context of this improvement and bearing in mind that the dose of the mindfulness practice was low, a tenuous association between improved sleep and resilience in the intervention group specifically, may be preliminary evidence that this intervention has the capacity to improve sleep and subsequently resilience.

### **Limitations and Directions for Future Research**

This study's findings must be viewed with the following methodological limitations in mind. First, the intervention was an at-home activity which meant that adherence could not be guaranteed. The incentives for completing the study may also have impacted adherence. The study relied on participants from the SRPP which requires that psychology students participate in studies to receive duly performed status for their courses. The problem with this is that some participants may have participated solely for the purpose of being awarded SRPP points and likely had not taken the intervention seriously enough. Since this was an expected issue, participants were asked to confirm via Whatsapp that they had completed the

intervention and it was up to the researcher to trust that they had completed it. Future studies may benefit from having in-person sessions whereby participants will be asked to actively engage or to utilise online apps (e.g. Headspace) which record data regarding adherence (e.g. time completed). In addition, future studies may want to also investigate which mediums (i.e. how mindfulness practices are taught) are more appropriate for student populations.

Second, the study did not use objective sleep data. Many studies investigating the effects of MBIs rely on subjective data and have all noted the limitations of this type of data. Furthermore, there are very few studies that have used objective sleep data so there is a scarcity in the literature regarding such studies. The lack of objective sleep data makes it difficult to establish causation which is necessary to be able to evaluate the effectiveness of the intervention. Hence, future studies should measure objective sleep data and could do so by potentially providing Fitbits or other sleep recording equipment to participants.

Third, the participants in both groups were not blind to aim of the research. This may have influenced participants to intentionally or unintentionally report better sleep quality and resilience outcomes following the intervention. Given the nature of the study, this was difficult to achieve. Future studies should provide the control group with an alternative activity (e.g. sham mindfulness; Zeidan et al., 2015) or utilise treatment as usual (TAU). A TAU group is useful in intervention studies as they would allow us to determine whether a mindfulness intervention is more effective or has other benefits compared to commonly used treatments. Furthermore, given the holistic approach of mindfulness interventions, there are no adverse side-effects and may be a more attractive treatment for people using pharmacological treatments (Kanen, Nazir, Sedky, & Pradhan, 2015).

Finally, a low dose and duration of mindfulness was used in this study. The study could not provide a higher dose or longer duration of the intervention on the basis of our population group and the incentives that we could provide them with. Future studies should have higher doses of mindfulness and a longer duration. These studies could also investigate whether higher doses or a longer duration is necessary for mindfulness interventions to be effective.

### **Summary and Conclusion**

The main objective of this study was to investigate the effect of MBIs on sleep and resilience in a student population. Specifically, I wanted to determine whether a mindfulness intervention would improve sleep quality and duration, and subsequently improved sleep quality and duration would enhance resilience. The results of the study detected no significant results. The mindfulness intervention used in this study did not improve sleep quality or

duration in the intervention group relative to the control group. It also did not enhance resilience in the intervention group relative to the control group. However, analyses detected a positive trend towards significance in the relationship between improvement sleep duration and improved resilience in the intervention group. This suggests that longer sleep is possibly associated with improved resilience. A larger sample size would be necessary to investigate this relationship. In addition, the dose of mindfulness as well as length of the practice would need to be increased as it appears that a low dose (i.e. 20-minute practice) and short length (i.e. 7 days), is not enough to produce significant results to match the findings in the literature.

In conclusion, this study offers insight into whether a mindfulness programme may be useful for a South African student population. The methodological shortcomings of the paper provide direction for future studies investigating the applicability of mindfulness in this population.

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**Appendix A**  
**SRPP Advertisement**

Dear all,

You are invited to participate in a sleep intervention study.

**What is this study about?** The aim of this study is to evaluate mindfulness as an intervention for sleep challenges in university students.

**What will I be asked to do if I agree to participate?** You will be asked to answer a questionnaire before the intervention, and again after the intervention. The questionnaire will take approximately 40 minutes and will be in English. Participants selected to participate in the intervention will be asked to complete 20-minute mindfulness exercises for 1-week. At the end of this week all participants will be asked to complete a questionnaire.

**Would my participation in this study be kept confidential?** All participants' identities and any information you disclose will be kept confidential.

**What are the benefits of this research?** Those who participate in the study will get 6 SRPP points for next semester. You might have better sleep, and reduced stress, if the intervention is effective.

Inclusion criteria:

- Between 18 - 40 years of age

Exclusion criteria:

- Have no neurological disorders known to affect sleep or history of psychosis
- Current psycho-active drug use
- A history of psychosis
- Are currently experiencing severe depressive, anxiety or post-traumatic stress disorder symptoms

**Please follow the link below**

**Appendix B**  
**DSA Advertisement**

Dear student,

You are invited to participate in a sleep intervention study. The main aim of this study is to evaluate mindfulness as an intervention for sleep challenges in university students.

**Inclusion criteria:**

- Between 18-40 years of age

**Exclusion criteria:**

- Have any neurological disorders known to affect sleep or mental health outcomes
- Current psycho-active drug use
- A history of psychosis
- Are currently experiencing severe depressive, anxiety or post-traumatic stress disorder symptoms

To participate you will need to complete a screening questionnaire and should you meet the eligibility criteria you will be invited via email to participate in the study. Completing the questionnaire does not guarantee you a place in the study. The questionnaire will take approximately 40 minutes. All selected participants will be asked to attend a 20-minute briefing session. Participants selected to be in the intervention will be asked to complete daily 20-minute mindfulness exercises at-home for 1-week. All participants will be asked to keep a sleep diary for the duration of the study (i.e. a week).

Some questions are of a personal nature, and might make you feel uncomfortable, for instance questions about your mental health. Participants' identities and any information disclosed will be kept confidential. Ethical approval has been granted.

If you complete this study, you will be entered into a raffle for a chance to win one of three Cavendish vouchers valued at: R200, R300, and R500.

If you are interested in participating in this study, follow the link below to complete the questionnaire:

**Appendix C**  
**Demographic Information**

First Name (Optional):

Last Name (Optional):

Telephone Number (Optional):

Email (Optional):

Student Number (Required):

Course Code (Required):

Date of Birth (Required):

Gender (Required):

- Male
- Female
- Other
- Prefer not to say

Highest Level of Education (Required):

- High School Graduate
- National Certificate or National Diploma
- Bachelors Degree or Higher Diploma
- Honours Degree or Post Graduate Certificate
- Masters Degree
- Doctors Degree

Primary Language (Optional):

In the last three months, how often have you seen a healthcare provider for physical or mental health issues? (Optional):

Do you have any chronic medical conditions? Please specify below (Optional)

Are you currently diagnosed with a mental health condition? Please specify below (Optional)



## Appendix D

### Pittsburgh Sleep Quality Index

During the past month: When have you usually gone to bed?

During the past month: How long has it taken you to fall asleep each night?

During the past month: When have you usually gotten up in the morning?

How many hours of actual sleep do you get at night?

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. Possible answers: (1) Not during the past month; (2) Less than once a week; (3) Once or twice a week; (4) Three or more times a week.

During the past month:

- I cannot get back to sleep within 30 minutes
- Wake up in the middle of the night or early morning
- I have to get up to use the bathroom
- I cannot breathe comfortably
- I cough or snore loudly
- I feel too cold
- I feel too hot
- I have bad dreams
- I have pain
- Other reason(s), how often do you have trouble sleeping because of this reason(s)
- How often have you taken medicine (prescribed or "over the counter") to help you sleep?
- How often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
- How much of a problem has it been for you to keep up enthusiasm to get things done?

During the past month, how would you rate your sleep quality overall? \*

- Very good
- Fairly good
- Fairly bad
- Very bad

**Appendix E**  
**State-Trait Anxiety Index**

State Anxiety:

A number of statements which people have used to describe themselves are given below.

Read each statement and then select the appropriate number to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers.

Do not spend too much time on any one statement but given the answer which seems to describe your present feelings best.

Possible answers: (1) Not at all; (2) Somewhat; (3) Moderately so; (4) Very much so.

1. I feel calm.
2. I feel secure.
3. I am tense.
4. I feel strained.
5. I feel at ease.
6. I feel upset.
7. I am presently worrying over possible misfortunes.
8. I feel satisfied.
9. I feel frightened.
10. I feel comfortable.
11. I feel self-confident.
12. I feel nervous.
13. I am jittery.
14. I feel indecisive.
15. I am relaxed.
16. I feel content.
17. I am worried.
18. I feel confused.
19. I feel steady.
20. I feel pleasant.

**Trait Anxiety:**

A number of statements which people have used to describe themselves are given below.

Read each statement and then select the appropriate choice to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but given the answer which seems to describe how you generally feel.

Possible answers: (1) Almost never; (2) Sometimes; (3) Often; (4) Almost always.

1. I feel pleasant
2. I feel nervous and restless
3. I feel satisfied with myself
4. I wish I could be as happy as others seem to be
5. I feel like a failure
6. I feel rested
7. I am "calm, cool, and collected"
8. I feel that difficulties are piling up so that I cannot overcome them
9. I worry too much over something that really doesn't matter
10. I am happy
11. I have disturbing thoughts
12. I lack self-confidence
13. I feel secure
14. I make decisions easily
15. I feel inadequate
16. I am content
17. Some unimportant thought runs through my mind and bothers me
18. I take disappointments so keenly that I can't put them out my mind
19. I am a steady person
20. I get in a state of tension or turmoil as I think over my recent concerns and interests

**Appendix F****Patient Health Questionnaire-9**

Over the past 2 weeks, how often you been bothered by any of the following problems?

Possible answers: (1) Not at all; (2) Several days; (3) More than half the days; (4) Nearly every day.

1. Little interest or pleasure in doing things.
2. Feeling down, depressed or hopeless.
3. Trouble falling asleep, staying asleep, or sleeping too much.
4. Feeling tired or having little energy.
5. Poor appetite or overeating.
6. Feeling bad about yourself - or that you're a failure or have let yourself or your family down.
7. Trouble concentrating on things, such as reading the newspaper or watching television.
8. Moving or speaking so slowly that other people could noticed. Or, the opposite - being so fidgety or restless that you have been moving around a lot more than usual.
9. Thoughts that you would be better off dead or of hurting yourself in some way.

### Appendix G

#### Primary Care Post-Traumatic Stress Disorder Screen

Sometimes things happen to people that are unusually or especially frightening, horrible, or traumatic. For example: a serious accident or fire; a physical or sexual assault or abuse; an earthquake or flood; a war; seeing someone be killed or seriously injured; having a loved one die through homicide or suicide.

Have you ever experienced this kind of event?      Yes      No

In the past month, have you:	Yes	No
Had nightmares about the event(s) or thought about the event(s) when you did not want to?		
Tried hard not to think about the event(s) or went out of your way to avoid situations that reminded you of the event(s)		
Been constantly on guard, watchful, or easily startled?		
Felt numb or detached from people, activities, or your surroundings?		
Felt guilty or unable to stop blaming yourself or others for the event(s) or any problems the event(s) may have caused		

## Appendix H

### Alcohol Use Disorders Identification Test – Consumption

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

How many standard drinks containing alcohol do you have on a typical day when you are drinking?

- 0
- 1 or 2
- 3 or 4
- 5 or 6
- 7 to 9
- 10 or more

How often do you have six or more drinks on one occasion?

- Never
- Less than monthly
- Monthly
- Weekly
- Daily or almost daily

### **Appendix I**

#### **Resilience Scale**

Please read the following statements. Click tick the box below which best indicates your feelings about that statement.

Possible answers: (1) Strongly disagree; (2) Disagree; (3) Disagree somewhat; (4) Neutral; (5) Agree somewhat; (6) Agree; (7) Strongly agree.

1. When I make plans, I follow through with them.
2. I usually manage one way or another.
3. I am able to depend on myself more than anyone else.
4. Keeping interested in things is important to me.
5. I can be on my own if I have to.
6. I feel proud that I have accomplished things in life.
7. I usually take things in stride.
8. I am friends with myself.
9. I feel that I can handle many things at a time.
10. I am determined.
11. I seldom wonder what the point of it all is.
12. I take things one day at a time.
13. I can get through difficult times because I've experienced difficulty before.
14. I have self-discipline.
15. I keep interested in things.
16. I can usually find something to laugh about.
17. My belief in myself gets me through hard times.
18. In an emergency, I'm someone people can generally rely on.
19. I can usually look at a situation in a number of ways.
20. Sometimes I make myself do things whether I want to or not.
21. My life has meaning.
22. I do not dwell on things that I can't do anything about.
23. When I'm in a difficult situation, I can usually find my way out of it.
24. I have enough energy to do what I have to do.
25. It's okay if there are people who don't like me.

**Appendix J****Sleep Diary**

Day of week (e.g. Monday, Tuesday):

I went to bed last night at:

I got out of bed this morning at:

Last night I fell asleep:

- Easily
- After some time
- With difficulty

How many times did you wake up during the night:

How long were you awake during the night:

Last night I slept a total of:

My sleep was disturbed by:

When I woke up for the day, I felt:

- Refreshed
- Somewhat refreshed
- Fatigued

How many caffeinated drinks did you consume in the morning?

How many caffeinated drinks did you consume in the afternoon?

How many caffeinated drinks did you consume in the evening?

I exercised at least 20 minutes in the:

- Morning
- Afternoon
- Evening
- Not applicable

Took a nap?

- Yes
- No

How long was the nap?

During the day, how likely was I to doze off while performing daily activities:

- No chance
- Slight chance
- Moderate chance



- High chance

Approximately 2-3 hours before going to bed, I consumed:

- Alcohol
- A heavy meal
- Caffeine
- Not applicable

In the hour before going to sleep, my bedtime routine included:

**Appendix K**  
**Informed Consent Form**

**Project Title:** Evaluating a mindfulness intervention for improving sleep and mental health in university students

**What is this study about?**

The aim of this study is to evaluate mindfulness as an intervention for sleep challenges in university students. This study is being conducted by Theophilus Oldjohn and Candice Knipe, from the Department of Psychology at UCT as partial fulfilment of the MA in Clinical Psychology Degree and Honours Psychology, respectively.

**What will I be asked to do if I agree to participate?**

You will be asked to answer a questionnaire before and after the intervention. You will be assigned either to receive the intervention, or not. Whether you receive the intervention or not, you will be asked to answer the questionnaire. The questionnaire will take about 30 minutes and will be in English. The whole study will take 1 week, with daily 20-minute exercises for those who receive the intervention. If you are willing, we will also ask you to disclose your exam marks.

**What are the risks of this research?**

There are no known risks for participating in this study.

**What are the benefits of this research?**

You will receive 6 SRPP points and may have improved sleep quality and duration; aside from this there are no direct benefits.

**Would my participation in this study be kept confidential?**

All the participants' identities and any information you disclose will be kept confidential.

**Participation is Voluntary**

Your participation in this research is completely voluntary. You may stop participating in this study at any stage. If you decide not to participate in this study or if you stop participating at any time, there will be no effect on your studies or relationship with the Department of Psychology. Please note, that you will only be entitled to the SRPP points upon completion of the study.

**What if I have questions?**

If you have any questions about the research study itself, please contact:

Theophilus Oldjohn

UCT - Child Guidance Clinic

Chapel Road

Rosebank

7700

South Africa

Tel: 081 3582781

Email: [oldjohnt@gmail.com](mailto:oldjohnt@gmail.com)

Candice Knipe

Tel: 071 413 7758

Email: [candice.knipe7@gmail.com](mailto:candice.knipe7@gmail.com)

Should you have any questions regarding this study and your rights as a research participant or wish to report any problems you have experienced related to the study, please contact:

**Supervisor:** Dr Gosia Lipinska

UCT Sleep Sciences and Clinical Neuropsychology

Department of Psychology

University of Cape Town

Tel: 021 640 3415

**Co- Supervisor:** Michelle Henry

Room 5.04 Hoerikwaggo Building

Tel: (021) 650 – 1804

*Alternatively contact directly:*

**Ethics Secretary:** Rosalind Adams

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Chemistry Road

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Rondebosch

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Tel: +27 21 650 3417

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**Appendix L**  
**Debriefing Form**

**Project Title:** Evaluating a mindfulness intervention for improving sleep and mental health in university students

Thank you for participating in this research study.

**What was the purpose of this research study?**

The aim was to investigate whether mindfulness practices would improve sleep quality and duration which subsequently would enhance resilience.

**What was done during this research study?**

Students were invited to complete an assessment which was both a screening and pre-test measure. Eligible participants were pseudorandomly assigned to either the intervention or control group. The intervention group were tasked with daily 20-minute mindfulness practices for a week. The intervention was provided in a guided awareness of breath audio. Both groups were required to record their sleep data via sleep diaries and, for some, Fitbits during this week. At the end of the week, all participants were asked to complete the assessment again as a post-test.

If the intervention is found to be effective, participants who part the control group will be provided with the intervention as well.

Should you have any questions regarding this study or wish to report any problems you have experienced related to this study, please contact the researchers or their supervisors:

**Researcher:** Theophilus Oldjohn

Tel: 081 3582781

Email: [oldjohnt@gmail.com](mailto:oldjohnt@gmail.com)

**Researcher:** Candice Knipe

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**Co- Supervisor:** Michelle Henry

Tel: 021 650 1804

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*Alternatively contact directly:*

**Ethics Secretary:** Rosalind Adams

Tel: 021 650 3417

Email: [rosalind.adams@uct.ac.za](mailto:rosalind.adams@uct.ac.za)

**Appendix M**  
**Ethical Approval**

UNIVERSITY OF CAPE TOWN



Department of Psychology

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

30 April 2019

Theo Oldjohn  
Department of Psychology  
University of Cape Town  
Rondebosch 7701

Dear Theo

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, Evaluating a mindfulness intervention for improving sleep and mental health in University students. The reference number is PSY2019-016.

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