

Probing the Efficacy of Relaxation Techniques of Primary Insomnia in a Non-Randomized Sample of University Students

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Abstract

Insomnia is a common sleep complaint that could affect students' academic activities, and if not mitigated, it may give way to the development of other disorders. This study investigates the efficacy of relaxation techniques on insomnia among university students with mild depression. A non-randomized design involving pretest posttest experimental/control group was used. Twenty-four students (treatment = 12; control = 12), with a mean age of 24.6, voluntarily participated in the study. Participants were pretested, and post tested after six weeks of exposure to relaxation technique components, and the data collected was statistically analyzed using JMP 13.2. After adjusting for the covariate, finding suggests a significant effect of relaxation technique $F(1, 21) = 22.416, p = .000$, in reducing insomnia among university students. Participants exposed to relaxation technique for insomnia achieved an average of 46% remission compared to 9% for the control group. The study did not find significant differential effect of relaxation technique, $F(1, 9) = .369, p = .559$, in reducing insomnia of male compared to female university students. Based on these findings, we conclude that relaxation technique for insomnia is effective in helping students manage their sleep difficulty and this effectiveness is without gender bias.

Keywords: insomnia, relaxation techniques, sleep difficulty, sleep hygiene, impairment in functioning

Introduction

Insomnia is characterized by complaints of difficulty initiating or maintaining sleep, or nonrestorative sleep, which endure for some period and cause significant distress or impairment in functioning. Primary insomnia is characterized by unsatisfactory quantity and/or quality of sleep, which persists for a considerable period and is not a result of a comorbid medical, psychiatric condition or other sleep disorders. Sleep deprivation has short and long-term physiological and psychological consequences, which include decreased quality of life, reduced immunity, impaired cognitive and functional status (Chen, Yu, & Yang, 2008). Estimates of insomnia among students, ranges from approximately 11% to 60% (Gureje, Oladeji, Abiona, Makanjuola, & Esan, 2011; Hicks & Pellegrini, 2001; Lund, Reider, Whiting, & Prichard, 2009), with reports of poor sleep at school lasting for up to 3.5 years (Walsh, Benca, & Bonnet, 1999). Among students diagnosed with insomnia, about 6.8 – 11.4% used medication (either prescription or over the counter) and alcohol as sleep aid to help them sleep (Taylor & Bramoweth, 2010).

Due to uneasiness over the serious negative side effects of sleep medications, considerable research effort has been directed into the search for alternative, nondrug interventions capable of alleviating insomnia. Behavioral strategies such as progressive relaxation, deep breathing exercise, mindfulness, guided visualization meditation, yoga; biofeedback, stimulus control, and paradoxical intention among others are some type of relaxation intervention that have produced promising results. An explanation for the success of such treatment has been provided by Murtagh and Greenwood (1995) who demonstrated that poor sleepers are more physiologically aroused prior to and during sleep than are good sleepers. Studies designed to reduce such arousal through relaxation and desensitization of bedtime-related activity has been reported (Lundh, 2005; Morin, 2002; Alexandru, Robert, Viorel, & Vasile, 2009).

In one study, which attempted to identify more clearly the effect of behavioral strategies, Ahmed and Younis (2014) examined the effect of relaxation techniques on quality of sleep for patients with end-stage renal failure undergoing hemodialysis. The researcher used a convenient sample of 20 adult patients, with one group, before and after intervention. Two tools were used for data collection, which includes socio-demographic data assessment and Pittsburgh Sleep Quality Index that measures the sleep quality. Patients were exposed to four weeks' treatment sessions using progressive muscle relaxation, deep breathing exercise and guided visualization. The main result showed that the relaxation technique improved the total score of sleep quality and its dimensions in hemodialysis patients. It showed that the mean score of total Pittsburgh Sleep Quality Index decreased significantly after demonstration of relaxation techniques compared with the mean score of total Pittsburgh Sleep Quality Index one month before application of relaxation techniques. Ahmed and Younis (2014) recommended that periodic clinical assessment of sleep complaints should become routine for dialysis patients. In addition, non-pharmacological methods such as relaxation techniques should be used for the treatment of sleep problems in hemodialysis patients.

In another study, Deora and Anthony (2013) evaluate the effectiveness of relaxation training and sleep hygiene education for insomnia of depressed patients. The basic study objective was to evaluate whether relaxation training and sleep hygiene education intervention can be effective for female patients who experience major depressive disorder and insomnia. Therefore, a convenience sample of 10 female participants was recruited from an outpatient psychiatric private practice. Participants attended four consecutive, weekly outpatient sessions lasting approximately 1 hour. The initial session consisted of conducting a

psychiatric evaluation and administration of the Pittsburgh Sleep Quality Index to measure rating of sleep quantity and quality. Principles of sleep hygiene and relaxation exercises were introduced during the initial session. Subsequent sessions focused on reinforcement of the principles of sleep hygiene and relaxation training. Results showed that sleep hygiene education and relaxation training were effective in treating insomnia of depressed patients. Deora and Anthony (2013) concluded that Implementation of sleep hygiene education and relaxation training would provide nurses with evidence-based treatment alternatives or complements to pharmacotherapy in depressed patients.

Sleep problems are common concerns for students. Compromised sleep among students can lead to negative personal, social and functional consequences. Students with prolonged sleep problems may report higher levels of anxiety, depressed mood, physical pain and discomfort, poor academic performance and cognitive deficiencies. The condition may also be associated with long-term health consequences, including increased morbidity if left unattended. With its 25% prevalence rate among students in Nigeria, there is the need to address the problem (Gureje et al., 2011). This study sought to assess the efficacy of relaxation technique of insomnia; a behavioural method in treating primary insomnia among male and female students domiciled on the university campus. The long-term benefits were to improve their sleep quality, academic engagement and performance and avoid the risk of dependency and addiction through pharmaceutical approaches.

Methods

Research Design

The study used quasi-experimental design involving pretest posttest control group. This is because the design is useful in study where intervening variables are difficult to control and it enables the researcher to select the desired sample of the study on purpose or based on established criteria or presence of a condition of interest.

Participants

Twenty-four students (Male = 12; female = 12) of Ahmadu Bello University, Zaria, Nigeria who were identified with primary insomnia condition were selected and used for the study. The students were volunteers who have agreed to participate in the study after they were identified with the primary insomnia condition.

Outcome Measure

The primary outcome measure used was Insomnia Severity Index developed by Bastien, Vallieres and Morin (2001), to assess students' insomnia condition before and after intervention. The Insomnia Severity Index (ISI) was designed to be both an identification tool of insomnia severity and an outcome measure for use in insomnia intervention research (Bastien, et al. 2001). The ISI measured subjective insomnia severity during the previous weeks and the measure is relevant for the entire age range (Edinger et al, 2015). The measure included seven questions bothering on sleep onset, sleep maintenance, and consequences. The scores ranged from 0 to 28, and total scores are categorized into "absence of insomnia" (0–7), "sub threshold insomnia" (8–14), "moderate insomnia" (15–21) and "severe insomnia" (22–28). Consistent with Bastien et al. recommendation, a cutoff of ≥ 8 (Gellis, Arigo & Elliott, 2013) serves as threshold for participation in the study. Three experts in psychology and counselling department, Ahmadu Bello University, Zaria, established the face validity of the instrument. Morin et al. (2011) reported a reliability index of 0.90 for Insomnia severity index. ISI has also demonstrated 80% sensitivity and specificity (Bastien et al., 2001).

Insomnia research experts, Buysse, Ancoli-Israel, Edinger, Lichstein, and Morin (2006), recommended ISI as a tool for assessment of insomnia.

Treatment Regimen

The treatment regimen was discussed in three phases.

Pretreatment phase (week 1). Before administration of instrument, the researcher introduced himself to the research participants and exchange pleasantries to create good rapport. The venue for the weekly intervention was around student's hostel accommodation. After that, the students were briefed on the essence of the study. Consent was obtained from them after which, they filled questionnaire that was used to assess their insomnia severity. Consistent with Bastien et al. recommendation (Gellis et al., 2013), only students who scored ≥ 8 on the Insomnia Severity Index (ISI), and showed absence of a sleep disruptive medical/psychiatric condition, substance abuse disorder, and/or other sleep disorder participated in the study. Insomnia Screening Checklist (Alberta Health and Wellness, 2007) was used to assess for absence or presence of comorbid condition. These criteria are consistent with elements of a Diagnostic and Statistics Manual of Mental Disorders (DSM-4 and DSM-5) algorithm for diagnosis of primary insomnia (Lichstein, Durrence, Taylor, & Riedel, 2003; Morin & Espie, 2003; American Psychiatric Association, 2000, 2013; American Academy of Sleep Medicine, 2005). Data collected at this point served as baseline or pretest data, and bases for inclusion. Participants were taught how to fill the instruments, after which arrangements were made regarding further meetings.

Treatment phase (week 2–5). Relaxation intervention was applied to the treatment group during this period. The treatments were delivered on Saturdays and intervention sessions which took place during first semester, 2016 lasted for six-weeks. The average time per session was 48 minutes and the ranges were between 30 minutes and 1 hour. The Relaxation Techniques used were based on Ethan (2008), and National Sleep Foundation (2015), recommendations for reducing insomnia respectively.

Week	Relaxation technique	Brief description
2	Deep breathing exercise	It is encouraged such that individual can have a controlled breath that can release tension, worries and control heart rate
3	Progressive relaxation techniques	It involves exercise aimed at inducing a state of deep muscular relaxation as well as helping one to learn the difference between tension and relaxation
4	Guided visualization meditation	GVM was instructed by encouraging positive feelings of peacefulness. The idea in this exercise is to focus your attention on a pleasant image or story, so that your mind can let go of worries or thoughts that keep you awake.
5	Mindfulness technique	It is instructed so that individual can't stop thinking too much once they've gone to bed, and it will help them to learn to calm their mind and do away with racing thoughts and worries.
6	Posttest	Post-test and revision & termination

Table 1: Brief description of treatment administered

After each week of intervention, participants were given handout containing treatment recommendations, to serve as a guide during practice. All treatments instructions were delivered around the participants' hostel at an agreed time and sometimes at a serene location for convenience. To reduce interaction effect, participants in the treatment group and control group came from different hostels. All the interventions were administered with the help of a female research assistant who was briefed on the study protocol. As seen in Table 1, each intervention differs in specific content but, all sessions center around the following main activities: finding out about progress, ascertaining problems in home practice, encouraging level of adherence, and introducing new intervention. The interventions used are those that have been shown efficacious in prior researches and have been recommended by the American Academy of Sleep Medicine for the treatment of insomnia (Morgenthaler, et al. 2006).

Post-treatment phase (week 6). During this phase, a post intervention test using the Insomnia Severity Index was administered. This was used to compare with pretest data to examine changes that occurred over the course of the intervention. At the last count, attrition rate from both groups was found to be 0% as all participants who participated in the study also, completed it. The reasons for this might not be unconnected to the fact that intervention took place around the participant's hostel and their sustained interest in the study. However, before termination, the researcher informed the participants on what to do when there is a relapse (fall back to the treatment handout). Finally, the participants were made to understand that longitudinal data suggests that treatment gains are extremely durable with time. They are most often maintained or improved over time and that relapse rates will be small provided they continue good habits (abstain from things that precipitate and perpetuate the condition in the first place).

For ethical reason, participants in the control group were given the treatment handout containing systematic implementation of the intervention for self-help at the completion of the study. The reason is to ensure that they also benefit from the treatment, and not being used and dumped to keep suffering from the problem. This method of self-help using relaxation technique has been shown to produce considerable benefits for insomnia sufferers.

Results

The data collected were statistically analyzed using a computer software: JMP ver. 13.2. The study used ANCOVA to test for treatment effects. ANCOVA is applicable when two or more groups are subjected to pre-test and post-test while the pre-test is treated as a covariate to "control" for pre-existing differences between the groups (Stevens, 1996; Tabachnick & Fidell, 2013). However, prior to testing the treatment effects, a test of assumption of homogeneity of regression slope was carried out [see figure 1]. A .05 criterion of statistical significance was used in testing the treatment effect.

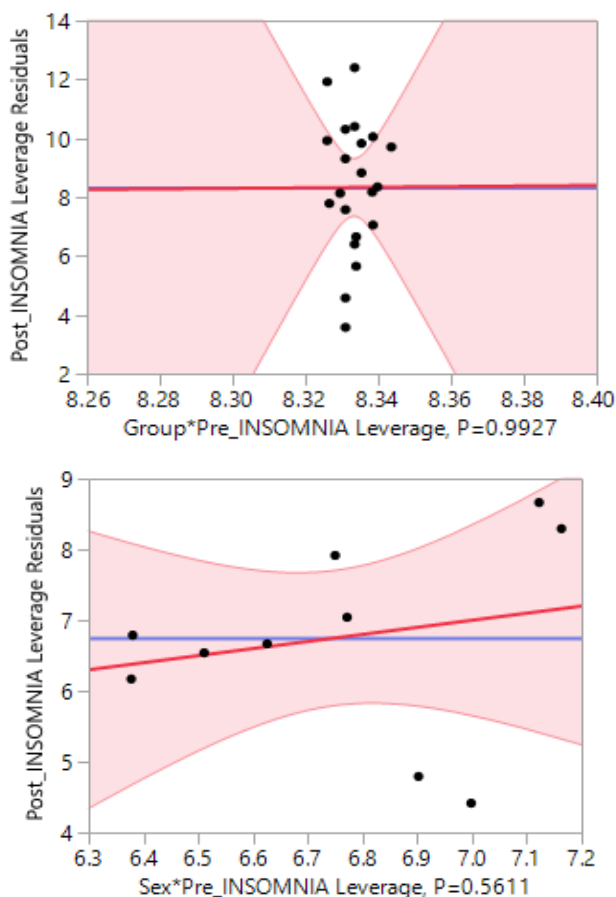


Figure 1: Leverage plot for Pre_insomnia*Group and Pre_insomnia*Sex testing the homogeneity of regression slope assumption

Figure 1 showed the analysis of covariance (ANCOVA) assumption test, which requires that, the relationship between the covariate and dependent variable for each of the groups is the same. Usually, similar slopes on the regression line for each group indicate this. Unequal slopes would indicate that there is an interaction between the covariate and the group. If there is an interaction then the results of ANCOVA could be misleading (Stevens, 1996; Tabachnick & Fidell, 2013). In this study, the interaction of Pre_insomnia*Group is not significant, $p = .9927$. The interaction of Pre_insomnia*Sex is also not significant, $p = .5611$. The results therefore support the appropriateness of the use of ANCOVA in analyzing the data for the study.

Level		<i>Least Sq Mean</i>	<i>Std Error</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Pre-insomnia	Treatment Group	12.416	0.679	11.007	13.825
	Control Group	10.916	0.679	9.5078	12.325
Post-insomnia	Treatment Group	6.750	0.643	5.416	8.083
	Control Group	9.916	0.643	8.583	11.250

N (RE) = 12; N (CTL) = 12

Table 2: Pre and post mean response of treatment Group and Control Group

Table 2 shows the pretest and posttest mean scores of participants in the intervention group and control group. It reveals that at pretest, students assigned to receive relaxation technique for insomnia had a higher mean score (12.42 ± 0.679 ; 95%CI = 11.007 – 13.825) when compared to students in the control group (10.92 ± 0.679 ; 95%CI = 9.5078 – 12.325). However, after treatment, students in the intervention group had a mean score lower (6.75 ± 0.643 ; 95%CI = 5.416 – 8.083) than control group (9.92 ± 0.643 ; 95%CI = 8.583 – 11.250). This outcome suggests that the intervention has an effect with treatment group having a better within group average remission rate of 45.6% when compared to 9.2% for the control group.

<i>Source</i>	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
Model	63.844 ^a	2	31.922	6.355	.007*
Error	105.489	21	5.023		
C Total	169.333	23			

a. R Squared = .377 (Adjusted R Squared = .318)

Table 3: One-way analysis of covariance showing model effects

Table 3 shows a one-way analysis of covariance (ANCOVA) which was used to compare the effectiveness of relaxation technique designed to reduce participants' insomnia condition against a control group. The test was carried out with participants' pretest scores on Insomnia Severity Index used as the covariate. The model was found to be statistically significant, $F(2, 21) = 6.355$, $p = 0.007$; RMSE = 2.241, implying differential effects of relaxation technique in reducing insomnia between the two groups. The overall model was found to explain 37.7% variance.

<i>Term</i>	<i>Estimate</i>	<i>Std Error</i>	<i>t Ratio</i>	<i>Prob> t </i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	6.306	2.413	2.61	0.016*	1.289	11.324
Group [RE]	-1.714	0.482	-3.55	0.002*	-2.716	-0.711
Group [CTL]	1.714	0.482	3.55	0.002*	0.711	2.716
Pre_INSOMNIA	0.174	0.203	0.86	0.402	-0.248	0.596

Table 4: Expanded Estimates Nominal factors expanded to all levels [treatment vs control]

Table 4 showed the expanded estimates nominal factors expanded to all levels. It showed that pretreatment outcome did not significantly influence the later outcome of the study, $\beta = 0.174$ [95%CI = -0.248 - 0.596], $t = 0.86$, $p = 0.402$. The relaxation intervention was significantly effective for the participants in the treatment group, $\beta = -1.714$ [95%CI = -2.716 – -0.711], $t = -3.55$, $p < .001$ compared to those in the control group, $\beta = 1.714$ [95%CI = 0.711 – 2.716], $t = 3.55$, $p < .001$. Participants in the treatment group had higher reduction in their insomnia condition than did those in the control group. To have a graphical view of the differential effects of the intervention after six weeks, a leverage plot for group was presented [see figure 2].

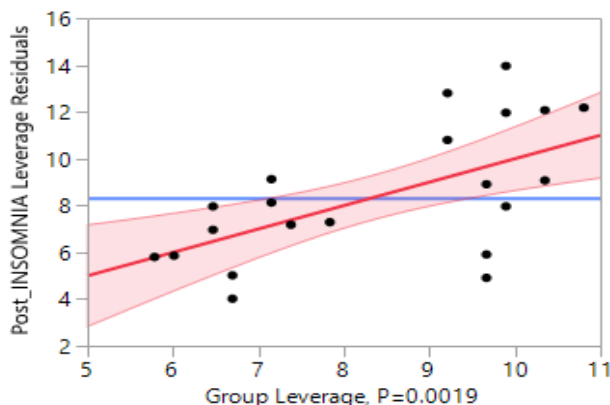


Figure 2: A Leverage Plot for Group showing graphical view of the differential effects of the relaxation techniques of insomnia among undergraduate students

Level		Least Sq Mean	Std Error	Lower 95%	Upper 95%
Pre-insomnia	Male	14.000	0.883	12.031	15.968
	Female	10.833	0.883	8.864	12.801
Post-insomnia	Male	6.833	0.579	5.541	8.125
	Female	6.666	0.579	5.374	7.958

N (M) = 6; N (F) = 6

Table 5. Pre and post mean response of male and female participants in the treatment Group

Table 5 shows the pre-intervention and post intervention mean scores of male and female participants exposed to relaxation technique for insomnia. It reveals that at pretreatment stage, male subjects assigned to receive relaxation technique for insomnia had a higher mean score (14.00±0.883; 95%CI = 12.031 – 15.968) when compared to female subjects (10.83±0.883; 95%CI = 8.864 – 12.801). However, after treatment, male subjects exposed to relaxation technique for insomnia had a mean score higher (6.83±0.579; 95%CI = 5.541 – 8.125) than their female counterpart (6.67±0.579; 95%CI = 5.374 – 7.958). This outcome suggests a better average remission rate of 51.2% for the male subjects when compared to 38.4% for female subjects.

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2.989	2	1.495	0.779	0.487
Error	17.260	9	1.918		
Corrected Total	20.250	11			

a. R Squared = .148 (Adjusted R Squared = -.042)

Table 6: One-way analysis of covariance showing model effects by sex

Table 6 shows a one-way between-group analysis of covariance test, which sought to compare the responsiveness between male and female participants exposed to relaxation technique for insomnia. After adjusting for the pretest scores, the result of the analysis suggests there was no statistically significant variation between male and female students’

responsiveness to relaxation technique intervention for insomnia, $F(2, 9) = .779, p = 0.487$, $RMSE = 1.384$. The R Squared value of .148 indicates that only 14.8% of the variance in post intervention scores can be explained by gender after adjusting for covariate. The non-significant between group outcomes suggests that male and female responsiveness to relaxation technique for insomnia was the same as both groups show good level of improvements after intervention.

Discussion

The findings of this study reveal that there is a significant positive effect of relaxation technique in reducing insomnia among university students in Nigeria. When compared to control group, the result suggests that subjects exposed to relaxation techniques show significant improvement with a higher between and within group remission rate. This outcome corroborates previous findings by Ahmed and Younis (2014), who reported that relaxation technique improved the total score of sleep quality. Their result showed that the mean score of total Pittsburgh Sleep Quality Index decreased significantly after demonstration of relaxation techniques compared with the mean scores of total Pittsburgh Sleep Quality Index one month before application of relaxation techniques. It also corroborates results presented by Deora and Anthony (2013), which showed that Sleep hygiene education (SHE) and relaxation training were effective in treating insomnia of depressed patients. Therefore, Deora and Anthony (2013) concluded that Implementation of sleep hygiene education and relaxation training would provide nurses with evidence-based treatment alternatives or complements to pharmacotherapy in depressed patients.

No significant differences between male and female university students in Zaria were found using relaxation techniques. The technique was as effective in improving insomnia condition for the male subjects as for the female subjects. The finding although agrees with Lami, et al. (2016), report in their study on “Gender Differences in Patients with Fibromyalgia Undergoing Cognitive-Behavioral Therapy for Insomnia”, that both groups showed significant improvements in sleep quality, and also other researchers (e.g., Edinger et al. 2001; 2009; Fornal-Pawłowska & Szelenerger, 2013) who reported significant improvement in all sleep parameters at post intervention for both male and female subjects exposed to cognitive behaviour technique, and relaxation exercise (Ahmed & Younis, 2014; Deora & Anthony, 2013), it differ with Lami et al. (2016) findings which reported a differential treatment response between sexes. Male group exhibited significant changes at post-treatment in sleep disturbances compared to the female. A claim this study could not establish. One reason could be the small sample size of six males and six females used. Usually, smaller sample have lower tendency or power of detecting significant effect. Other reasons could be severity of the insomnia condition of the participants. Most of them have subthreshold to moderately severe level of insomnia, which is quite different from the chronic or very severe insomniac participants used by Lami et al. (2016). In addition, while Lami et al. study was on comorbid insomnia, this study was conducted on students with primary sleep complain. Another reason could the use of a female trainer who was involved in delivering the treatment package. The study has several limitations. It relied on self-reported measures of insomnia from student participants instead of objective measure. In addition, the study did not question the participant’s employment status and family wellbeing, all of which may be related to having sleep difficulty. Using individual rather than group intervention may yield improved result since every participant would be given adequate attention. The fact that these factors were not taken care of is a limitation of this study. Based on these limitations, we therefore state categorically that causal connections implied by the conclusions of this study

should be interpreted and taken with carefulness. It is hope that continued research among university student sample will address the study limitations to reveal actual causal mechanisms and help researchers and policymakers to better understand the health risks of insomnia among students with a view to help students with sleep difficulties regain control over their sleep and consequently improve their learning outcome.

Conclusion

Up to two-thirds of students in Nigerian universities have sleep problems (Victor & Abdulwahid, 2018). Without proper care, many may have severe insomnia that interferes with functioning. In addition, a significant number of them are reluctant to report their sleep difficulties without being prompted. School psychologists and counselors should ask students about sleep problems as part of routine attention. As suggested by the outcome of this study, when insomnia endures, the intervention of choice is relaxation technique. Six weeks intervention using relaxation techniques successfully leads to sleep improvements and reduces insomnia by 46% among university students' sample, without gender bias. Based on previous studies, this gain can be sustained by the patient long after the intervention terminates so long the patient maintains good habit.

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