

Effect of Progressive Muscle Relaxation on Anxiety and sleep quality in Pre-University Students: A randomized controlled clinical trial

1-Tahereh Roozbahani, Msc, Faculty of nursing and midwifery, ShahidBeheshti University of Medical Sciences and Health Services, Tehran, Iran

t.roozbahani@yahoo.com

2- Manijeh Nourian, PhD ,Pediatric and Neonatal Intensive Care unit Department,, Faculty of nursing and midwifery,ShahidBeheshti University of Medical Science and Health Services,Tehran,Iran(Corresponding Author).

Email: manighea@yahoo.com

mnourian@sbmu.ac.ir

FAX: 021-88202521, TEL:02188655366-71. Mobil: 09125446122

3- Kiyarash Saatchi, GP, Inspector and Instructor Association of Acupuncture, Tehran, Iran.

drsaatchi@yahoo.com

4- AzamMoslemi, PhD Candidate, DeptofBiostatistics,ShahidBeheshti University of Medical Sciences, Tehran, Iran. Moslmiazam@gmail.com

Abstract

Aims: sleep disorder and Anxiety experience in adolescence is more intense than other periods of life. The relaxation of the muscles leads to the mind relaxation, because it prevents the production of negative thoughts. So, this study is done with the purpose of determining the effects of Progressive Muscle Relaxation (PMR) on pre-university students' anxiety and sleep quality.

Materials and Methods: In this randomized controlled clinical trial, 304 pre-university students of public schools in Malayer city that had inclusion criteria, were selected into two groups of PMR and control, with simple random sampling. PMR was taught to intervention group and the students were asked to do the relaxation once a day for a month. Anxiety score of the whole samples was measured at the beginning, during and end of the intervention by using the "Beck Depression Inventory" and sleep quality score was measured at the

beginning, and end of the intervention by using Pittsburgh sleep quality index. Data was analyzed by using SPSS version 20, repeated measures test and paired-sample t-test were used.

Results: The mean of the control group's anxiety score was 14.96 ± 8.22 , reaching 16.56 ± 8.08 after two weeks and 19.45 ± 8.27 at the end of the fourth weeks. The mean of the intervention group's anxiety scores was 15.71 ± 8.58 . It fell down to 13.33 ± 9.06 at the end of the second week and 10.64 ± 9.30 at the end of the fourth week. Using repeated measures test, showed significant difference between two groups in mean of anxiety scores ($p=0.008$), and was significantly different on three times ($p<0.001$) Also, the sleep quality score in both control and intervention groups were significantly different after one month ($p<0.001$).

Conclusion: The findings of this study showed the PMR caused an anxiety decrease and sleep quality increase in pre-university students.

Key words: Progressive muscle relaxation, Anxiety, sleep quality, Students

Introduction:

Many psychological injuries in adulthood are rooted in problems during adolescence. Problems concerned with maturity are such that adolescence could be considered to be crisis and tension period (1). It is hardly seen that there is no anxiety crisis during this period (2). Anxiety disorders are among the most frequently seen psychiatric disorders among adolescents and according to the studies 10% to 20% of students suffer from anxiety (3). This experience could be intensified during this period mainly because of such factors as identity seeking, getting rid of family values, need for independence and attempt to build future (4). Besides, as they are obsessed by educational and occupational pressures, on one hand, and their parents' and teachers' expectations, on the other hand, they develop anxiety (5). This period coincides with the time during which the person is preparing oneself for the university entrance exam and this would lead to the adolescent's stress and their families (6). As anxiety is a kind of reaction to a perceived threat (7), it could lead to mood swings, early fatigue, sleep disorders, muscular disorders, less concentration and irritability if it is persistent (8). Problems concerned with school progress, poor social relation, unclear occupational and educational future could help students develop anxiety (9). On the other hand, scientific evidence suggests that anxiety as well as some mental disorders are associated with certain changes in sleep physiology. So, there is a significant relationship between psychiatric

disorders such as depression and anxiety with insomnia. Also, Studies showed that there is a significant relationship between anxiety and sleep related disorders(10). Anxiety and sleep disorder could have various consequences such as school performance disruption (2), learning disruption, mental capabilities debilitation, and inability to realize potentials (11). As a result, not only could not school objectives be achieved but also their psychological development suffers. If not treated, these problems could lead the adolescent to hopelessness, disappointment, loneliness, and finally to depression and suicide (5). Different treatments have been considered for anxiety and sleep disorder: medical treatment is the most significant one (12). Benzodiazepines are the most frequently used to control anxiety. Although effective and relatively safe, they have their own side effects which could be worsened if taken during a long period (13).

One of the nursing interventions considered as an alternative or complementary treatments relaxation. Progressive Muscle Relaxation (PMR) or active relaxation is a technique through which one can progressively achieve relaxation through deliberately inducing and then releasing tension in one specific muscle (14). Evidence shows that the most common relaxation technique is PMR developed by Edmund Jacobson in 1938 and as it is easy to learn it is accepted by most people (15). Muscle relaxation helped mental relaxation because one cannot reach total physical relaxation when he is tense. Relaxation helps prevent negative thoughts and emotions and counteracts the tense muscular effects on the body (16). As PMR requires the patient's active involvement in the medical and care project, this principle is considered to be an important part in holistic nursing (17).

Relaxation helps students lessen exam anxiety (18) and drug addicts lower their stress and anxiety (19). It could also be effective in relieving back pains (15) and chronic neck pains (20), lower Irritable Bowel Syndrome (21), improving self-understanding among schizophrenic patients (22), relieving pain, itching, and stabilizing vital symptoms among burnt patients (23) and lowering anxiety among cardiac patients (24).

As the pre-university grade is the period during which students prepare themselves to enter university, this causes psychological pressures such as anxiety and sleep disorder among students (1). According to the data regarding anxiety and sleep disorder among students and findings of the research team, no studies have been done on using programs. This study is done with the purpose of determining the effects of PMR on pre-university students' anxiety and sleep quality.

Materials and Method

Being from randomized controlled clinical trial type, this study was conducted using 304 pre-university students within two groups of 152. According to the formula

$n \geq \frac{(z_{\alpha/2} + z_{\beta})^2 \sigma^2 (1 + 1/k)}{\varepsilon^2}$ Type I error probability $\alpha = 0.05 \Rightarrow z_{\alpha} = 1.96$ Ability test

$1 - \beta = 0.80 \Rightarrow z_{\beta} = 0.85$, Expected significant difference between the control and the intervention group $\varepsilon = \mu_1 - \mu_2$, The sample into two groups $k = 1$, Effect size $\theta = \text{effect size} = |\varepsilon|/\sigma = 0.34$, The minimum required sample in each group

$n = 2(1.96 + 0.85)^2 \left(\frac{1}{0.34}\right)^2 \cong 137$ Thus, taking into account the probability of attrition at follow-up, 152 samples in each group and total sample for this study is 304(25).

The target population for the study was the male and female students of public pre-university schools of Malayer. The study started on January 26 2015 and lasted for six months. The subjects first were checked for not having the following problems: background cancer, diabetes, cardiac problems, hepatitis, epilepsy, paralysis, anemia, peptic ulcer disease, asthma, kidney problems, migraine headache, anxiety disorder, mourning experience during the recent six months and getting hospital treatment during recent six months, taking drugs. They were required to participate in the study and obtain score eight or more from Beck Anxiety Questionnaire and obtain score five or more from Pittsburgh sleep quality index. Exclusion criteria were as follows: failing to complete the questionnaire and to attend the training sessions, to continue participating in the study, to attend the consultation sessions and examination by psychologists, losing a relative, parents' divorce and accident, getting sick and staying at hospital, performing PMR program less than 15 times a month during the one-month intervention.

For the present study, the data were collected through the following instruments:

1. PMR Program Checklist
2. Demographical Questionnaire
3. Beck Anxiety Questionnaire
4. Pittsburgh sleep quality index

Beck Anxiety Questionnaire was developed by Beck and his colleagues in 1988 to check and evaluate the magnitude of anxiety symptoms. Each item characterizes one of the common anxiety symptoms (panic and mental symptoms). The questionnaire score ranges from 0 to 63. Score 0 to 7 indicates no anxiety, 8 to 15 low anxiety, 16 to 25 mild anxiety, 26 to 63 excessive anxiety (19). The internal consistency of the test was measured to be .92 by Beck and his colleagues (26). They also reported the reliability of the test, measured through test-retest method, to be 0.75. Reliability of the test (0.70) for the Iranian subjects was measured through retesting in Zahedan that administered the test twice spanning three weeks (27). The Pittsburgh Quality Index is a standard self-report tool designed to assess the quality of the sleep during the past month. This index includes 19 questions in 7 aspects of mental retardation, sleep duration, sleep period, adequacy of sleep, sleep disorders, sleep apnea and daily dysfunction. Each section of zero (no problem) has a score of 3 (serious problem). The overall Pittsburgh score of the Pittsburgh score is obtained from the aggregate scores of the seven domains and is between 0 and 21. The higher the quality indicates the lower the quality of the score, and a score of 5 or more indicates that the quality of the sleep is inappropriate. (28)

To make use of these instruments in the present study, content validity were investigated qualitatively through seeking ten faculty members' expert judgments of Shahid Beheshti School of Nursing and also some of the nurses working for adolescents. They provided appropriate feedback using syntactic criteria, proper wording and scoring. The required modification in the test was made after collecting their comments. To measure the validity of tests, the researcher administered tests to 15 people similar to the target group and it was reported to be .82 using alpha Cronbach for Beck Anxiety Questionnaire and it was .80 using alpha Cronbach for Pittsburgh sleep quality index.

Malayer includes five towns: Malayer, Samen, Jokar, Azandarian and Zanghene. Using random sampling, Malayer was selected to be the sample city. The city has four public pre-university schools, two for girls and two for boys. These schools are the same in terms of geographic distribution and located centrally in Malayer. There were 161 students at Seifieh boy school, 156 students at Motahari boy school, 193 students at Fatemeih girl school, and 184 students at EshqiFard girl school. As students who are studying at the same schools have close relations, there was the chance that the intervention group's members talk about the PMR program with the control group's members and hereby change the final results. Thus,

from among the present schools, one boy and one girl school were selected randomly for intervention group and the control group was selected from two other schools.

Having the school authorities' permission and explaining the purpose of the study, a list of all the students were provided along with their record numbers and the students whose record numbers ended with even numbers were selected to be included in the sample population. Then, the researcher introduced herself to the subjects and if she found the subjects appropriate for the study and they agreed to join the study, they were included in the intervention or control groups. But if they could not meet the criteria they were excluded from the study and the next subject was considered. After the selection of each subject, the researcher called his/ her parents and explaining the purpose of the study sought for their consent. At this point the subjects' levels of anxiety were measured through Beck Anxiety Questionnaire, and if the anxiety level, ranged from 8 to 63, and this point the subjects' levels of sleep quality were measured through Pittsburgh sleep quality index, and if the sleep quality level, ranged from five and more, students were placed in one of these groups. Finally, 75 subjects were selected from each school.

Training the subjects how to perform PMR was done by the researcher within five sessions lasting half an hour for groups of 75 students at schools. After the researcher made sure the students were capable to do the program properly, she assigned the subjects themselves to do it once a day (before going to the bed) for a month. The program was controlled by self-report checklist in addition to meeting them at school weekly and calling them. At the end of the second and the fourth week of the intervention, Beck Questionnaire was completed by the whole sample and At the end of the fourth week of the intervention, Pittsburgh sleep quality index was completed by the whole sample .In this study, 24 students were excluded. (From the intervention group, seven people who performed PMR program less than 15 times a month during the one-month intervention, one subject who was taking drugs, seven people who were sick and staying at hospital and from the control group, three people who failed to complete the questionnaire and six people who were sick and staying at hospital) .fig1

Using independent t test and repeated measures test procedures and paired-sample t.test, the data were analyzed through SPSS version 20. During all the stages, $p < 0.05$ was considered to be significant.

Ethical approval was obtained with code **sbmu.rec.1394.14** for the shahid Beheshti university of medical sciences and code IRCT2015080123450N1.

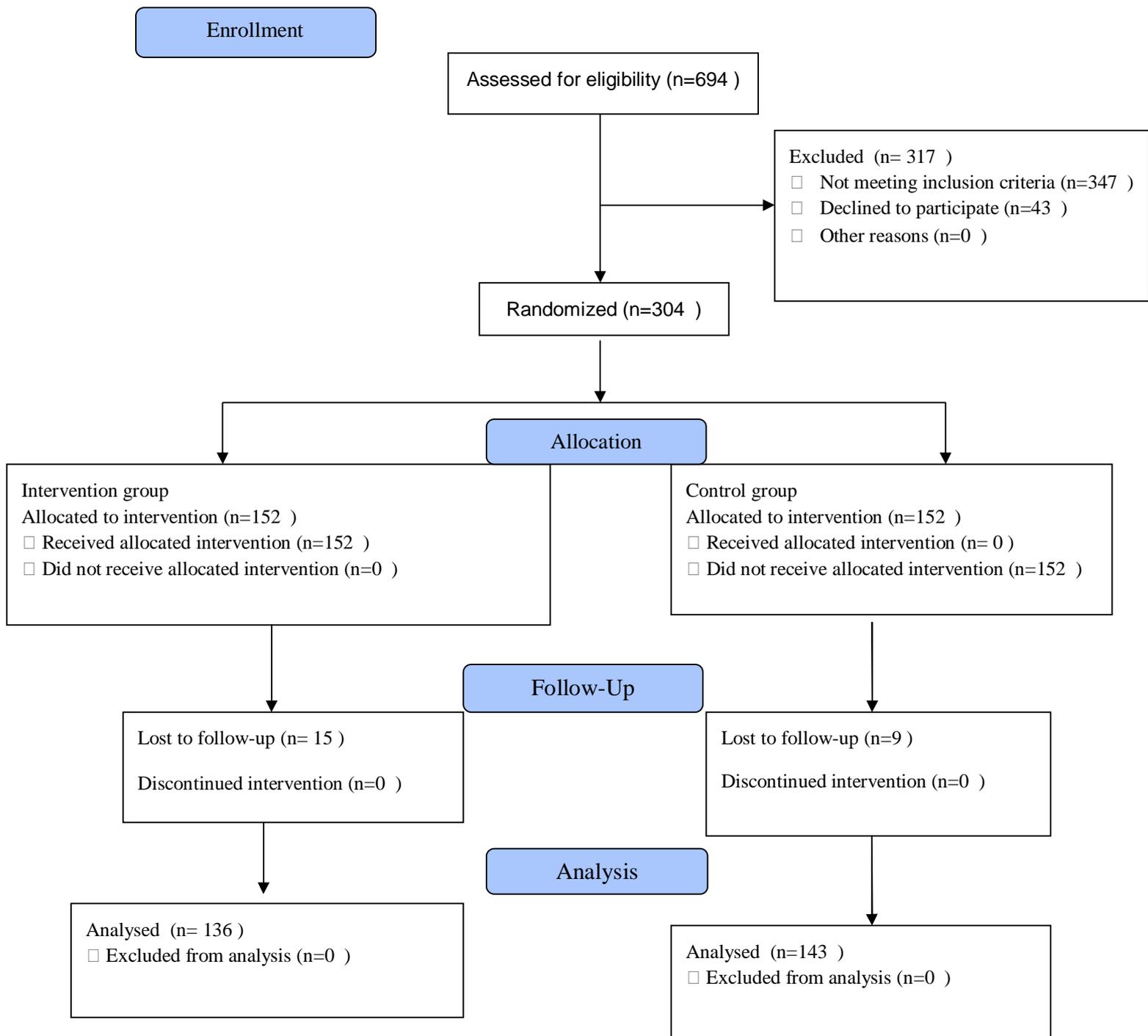


Fig 1: Consolidated standards of reporting trials flowchart

Findings

In this study, intervention (PMR program) was done for 152 male and female pre-university students in Malayer. The average age of the subjects was 17.4 ± 0.55 . 50% were male and 50% were female. Both groups were similar in terms of gender variables (using Chi square test), age, the initial anxiety score (using independent t-test). Before the intervention, the mean and standard deviation of both groups' anxiety scores were 15.13 ± 8.63 , showing low anxiety level. The mean and standard deviation of the control group anxiety score was 14.96 ± 8.22 , reaching 16.56 ± 8.08 after two weeks and 19.45 ± 8.27 at the end of the fourth week. While the mean and standard deviation of the intervention group's anxiety scores were 15.71 ± 8.58 , they fell down to 13.33 ± 9.06 at the end of the second week and 10.64 ± 9.30 at the end of the fourth week (Table 1).

Because the sample size in each group was more than 30, parametric methods were used. and Sphericity assumption was not significant, repeated measures and Greenhouse-geisser correction were used.

Using repeated measures test, showed significant difference between two groups in mean of anxiety scores ($p=0.008$). The mean anxiety score was significantly different on Three times ($p<0.001$) Also, The mean anxiety score was significantly different between two groups over three times ($p<0.001$) (table 2).

Mean and standard deviation of sleep quality score in the control group before intervention was 1.62 ± 5.75 , after one month which increased to 1.86 ± 6.86 and according to the t-test, this increase was significant ($p<0.001$). and in the intervention group, the mean and standard deviation of sleep quality score before the intervention were 1.48 ± 5.92 , which after one month of progressive muscle relaxation reached 1.42 ± 0.88 , and according to the paired t-test This decrease was significant. ($p<0.001$).table 3.

Discussion

In this study, the effect of a cognitive-behavioral treatment, PMR, on pre-university students' anxiety and sleep quality were investigated. The results from self-report checklists indicated that all the students did the program regularly at home. Also, to be sure they followed the program, the researcher did some regular phone calls and met the subjects regularly at school. PMR program made a significant difference in both groups' anxiety levels

and mean of score sleep quality, while anxiety and sleep quality were not significant before the study.

The subjects' anxiety mean score was 15.13 before the intervention, which was reported to be low in terms of the obtained score and anxiety level. Also the Italian high school students' anxiety mean score was reported to be low, using Hamilton anxiety questionnaire (29), but in one study, the students' (between 13 to 26 years old) anxiety mean score based on a self-report measure, showing a mild anxiety (8). Inconsistency of the mentioned study and the present one could be due to the large age difference among the subjects (13 years). Besides in other study, the students' anxiety mean score, aging from 11 to 16, was extreme anxiety for the both control and intervention groups (5), mainly due to crises during maturity period and the criterion score for inclusion into the study which was obtaining 45 from test anxiety questionnaire Sarason.

Using independent t test, the results indicated that there was a significant difference between the control and intervention groups' anxiety mean scores at the end of second and fourth week of the intervention, that is, the intervention group's anxiety mean score decreased after the second and the fourth week of doing PMR program, but the control groups' anxiety mean score increased after two and four weeks.

In the study conducted by researchers, whose objective were to find the effectiveness of PMR in alleviating chronic schizophrenic patients' anxiety, like the present study the control group's anxiety score increased and the intervention group's score fell down, that is, the score difference after the intervention was significant (30), but other researchers, who studied the effect of PMR on cancer patients' anxiety level under chemotherapy, the patients' anxiety mean scores in both control and intervention groups decreased after one month (31). The inconsistency of the above findings, that is, the decrease in the control group's anxiety level, might be due to the fact that the closer the students get to the university entrance exam the more they experience anxiety and this is why the control group's subjects in the present study showed great anxiety.

In this study, the findings using repeated measures test suggest that anxiety level was increasing during one month in the control group and the increase was significant. In the intervention group, based on the repeated measures test results, the anxiety level during the

PMR program was decreasing and it was significant. These results indicated alleviating the intervention group's anxiety level and effectiveness of the PMR program.

One study suggest that performing PMR program for one week could result in significant decrease in the chronic schizophrenic patients' anxiety., but the anxiety level increase was not significant in the control group (30). Also, performing PMR program twice a week alleviated the anxiety level significantly among women having unexpected pregnancy. Although the control groups' anxiety level decreased, the decrease wasn't significant (32).

In another study, the drug abusers' anxiety mean score, who were giving up, showed a significant decrease after 21 days performing PMR program while the control groups' anxiety mean score also decreased (19). This might suggest that, in addition to the PMR program effect, being at the rehabilitation center and deciding to give up could alleviate their anxiety level.

Results of a study showed that, there was no significant change in the cancer patients' anxiety level after doing PMR program but it decreased considerably after three months (31). The inconsistency might be due to the patients' high anxiety level as this anxiety level could influence controlling and lowering anxiety level and lengthen the required time to alleviate it. Also, another study showed that there was no significant difference in anxiety level after performing PMR program for one or two months (33). Also in Saidi et al. Study, the results showed that during three sessions of training a progressive muscle relaxant program and placing educational pamphlets and CDs for dialysis patients with a one-month progressive muscle relaxant program, the mean score of quality of sleep decreased significantly but could not improve the quality of sleep To the normal level. This can be explained by the severity of the severity of sleep in these patients. There was no change in the sixth dimension (taking sleep medications) (34). But in the study of Maler, the average grade of quality of bedding addicts leaving the facility at the camp increased the progression of the progressive muscle relaxant program after 21 days, but this increase was not significant (19). This suggests the lack of effect of progressive muscle relaxation program on quality of speech, which is inconsistent with the results of this study. One of the reasons for the inconsistency is that the results of this study can be attributed to the effects of factors such as addiction withdrawal concerns, distance from the family, feelings of exhaustion and group co-habitation that affect the quality of treatment of addicted patients. Therefore, longer and more

comprehensive educational and therapeutic programs may be needed to change their quality of life.

As strengths of this study are the following:

Increasing the number of samples, their availability, measurable parameters were studied and appropriate duration of intervention.

Limitations of the Study

Physical and psychological crises could influence students' anxiety and sleep quality level. If such crises had happened during the research study, subjects would have been excluded from the study, but some crises although small happened unexpectedly during the study which were beyond the researcher's control.

Conclusion

The results of the present study suggest that PMR program could help the pre-university students to lower their anxiety level and to upper their sleep quality. As a result, it could be recommended as a safe, inexpensive and easy way to alleviate students' anxiety and sleep disorder. If schools provide the opportunity for students to do the program during break times, it could lower the fatigue and psychological problems leading to learning disruptions.

Suggestions for further studies:

Future studies in more diverse populations are needed to identify a relationship between Anxiety and PMR. Additionally, it would be important to evaluate the effect of PMR on test Anxiety in this population, using a more consistent measure.

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Conflict of Interest: The authors declare that there is no conflict of interests regarding the publication of this paper.

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Table 1: Comparison of the mean and standard deviation score of Anxiety in the Intervention and Control groups in three time

Mean±SD Anxiety Score Groups	Before the intervention	During the intervention (After two weeks)	After the intervention (End of the fourth week)
Control	14.96±8.36	16.57±8.15	19.48±8.29
Intervention	15.30±9.07	13.04 ±9.70	10.48 ± 10.11

Table 2: Expression of markers of repeated measures

Variables Indicators	Mean square	f	Df	P value
time	16.46	6.03	1.36	0.008
group	3182.47	1.01	1	<0.001
The interaction between group and time	2960.9	13.6	1	<0.001

Table3: Comparison of the mean and standard deviation score of sleep quality in the Intervention and Control groups

Mean sleep quality score	Mean sleep quality score befor intervention	Mean sleep quality score after intervention	t	df	P value
control group	5.75±1.62	6.88±1.86	-9.88	142	<0.001
Intervention group	5.92±1.48	3.08±1.42	22.41	135	<0.001

Estimated Marginal Means of MEASURE_1

