

# Effect of Progressive Muscle Relaxation on Anxiety in Pre-University Students: A Randomized Controlled Clinical Trial

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## Abstract

**Introduction:** Anxiety experience in adolescents is more intense than other periods of life. The relaxation of muscles leads to the relaxation of the mind, because it prevents the production of negative thoughts. Therefore, this study was done with the purpose of determining the effects of Progressive Muscle Relaxation (PMR) on pre-university students' anxiety.

**Methods:** In this randomized controlled clinical trial, 304 pre-university students of public schools in Malayer city that had the inclusion criteria were allocated to 2 groups of PMR and control with simple random sampling. Progressive Muscle Relaxation was taught to the intervention group and the students were asked to do the relaxation once a day for one month. Anxiety score of the entire sample was measured at the beginning, during, and the end of the intervention, using the "Beck Depression Inventory". Data was analyzed using SPSS version 20, and repeated measures test.

**Results:** The mean of the control group's anxiety score was  $14.96 \pm 8.22$ , reaching  $16.56 \pm 8.08$  after 2 weeks and  $19.45 \pm 8.27$  at the end of the fourth weeks. The mean of the intervention group's anxiety scores was  $15.71 \pm 8.58$ . It decreased to  $13.33 \pm 9.06$  at the end of the second week and  $10.64 \pm 9.30$  at the end of the fourth week. The repeated measures test showed a significant difference between the 2 groups in mean anxiety scores ( $P = 0.008$ ), and was significantly different at the three time points ( $P < 0.001$ ).

**Conclusions:** The findings of this study showed that the PMR caused a decrease in anxiety in pre-university students.

## INTRODUCTION

Many psychological injuries in adulthood are rooted in problems during adolescence. Problems concerned with maturity are such that adolescence could be considered a period of crisis and tension [1]. It is rare to observe a lack of anxiety crisis during this period [2]. Anxiety disorders are among the most frequently seen psychiatric disorders among adolescents and according to previous studies 10% to 20% of students have anxiety [3]. This experience could be intensified during this period mainly because of factors such as identity seeking, getting rid of family values, need for independence, and attempt to build the 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 stress in adolescents 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 persistent [8]. Problems concerned with school progress, poor social relation, unclear occupational and educational future could help students develop anxiety [9].

Anxiety could have various consequences such as school performance disruption [2], learning disruption, mental capabilities debilitation, and inability to realize potentials [10]. As a result, this would influence both their school objectives and their psychological development. If not treated, anxiety could lead the adolescent to hopelessness, disappointment, loneliness, and finally to depression and suicide [5]. Different treatments have been considered for anxiety; medical treatment is the most significant [11]. 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 of time [12]. One of the nursing interventions, considered as an alternative or complementary treatment, is 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 [13]. 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 [14]. 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 tense muscular effects on the body [15]. As PMR requires the patient's active involvement in the medical and care project, this principle is considered to be an important part of holistic nursing [16].

Relaxation helps students lessen exam anxiety [17] and drug addicts lower their stress and anxiety [18]. It could also be effective in relieving back pain [14], chronic neck pain [19], and lower Irritable Bowel Syndrome [20], improving self-understanding among schizophrenic patients [21], relieving pain, itching, and stabilizing vital symptoms among burn patients [22] and lowering anxiety among cardiac patients [23]. As the pre-university period is the time during which students prepare themselves to enter the university, this causes psychological pressures, such as anxiety among students [1]. According to the data regarding anxiety among students and findings of the research team, no studies have been done on the use of programs for anxiety. This study was done with the purpose of determining the effects of PMR on pre-university students' anxiety.

## METHODS

Considering the randomized controlled clinical trial design, this study was conducted using 304 pre-university students within 2 groups of 152. According to the formula  $n \geq ((Z_{\alpha/2} + Z_{\beta})^2 \sigma^2 (1 + 1/k)) / \epsilon^2$ , type I error probability  $\alpha = 0.05 \Rightarrow Z_{\alpha/2} = 1.96$ , ability test  $1_{\beta} = 0.80 \Rightarrow Z_{\beta} = 0.85$ , expected significant difference between the control and the intervention group  $\epsilon = \mu_1 - \mu_2$ , sample in two groups  $k = 1$ , effect size  $\Theta =$  effect size  $= |\epsilon| / \sigma = 0.34$ , minimum required sample in each group  $n = 2(1.96 + 0.85)^2 (1 / (0.34)^2) \cong 137$ , and taking into account the probability of attrition at follow-up, 152 samples were allocated to each group and total sample for this study was 304 [24]. The target population for the study was male and female students of public pre-university schools of Malayer. The study was initiated on 26<sup>th</sup> of January 2015 and lasted for 6 months. The subjects were first checked for a lack of 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, hospital treatment during the recent six months, and taking drugs. They were required to participate in the study and obtained a score of eight or more from "Beck Anxiety Questionnaire". Exclusion criteria were as follows: failing to complete the questionnaire and to attend the training sessions, continue participating in the study, and attend the consultation sessions and examination by psychologists, losing a relative, parents' divorce and accident, becoming sick and staying at the hospital, performing the 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

"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 ranged from 0 to 63. Score 0 to 7 indicates no anxiety, 8 to 15 low anxiety, 16 to 25 mild anxiety, and 26 to 63 excessive anxiety [18]. The internal consistency of the test was measured to be 0.92 by Beck et al. [25]. They also reported the reliability of the test, measured through the test-retest method, as 0.75. The reliability of the test (0.70) for the Iranian subjects was measured through retesting in Zahedan that administered the test twice during three weeks [26]. To make use of this instrument in the present study, content validity was investigated qualitatively through seeking ten Faculty of Nursing (Shahid Beheshti University) members' expert judgments and also some of the nurses working with 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 the test, the researcher administered the test to 15 people similar to the target group, and validity was reported as 0.82 using Cronbach's alpha.

Malayer includes five towns, including Malayer, Samen, Jokar, Azandarian, and Zanghene. Using random sampling, Malayer was selected as the sample city. The city has four public pre-university schools, 2 for girls and 2 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 a chance for the intervention group members to talk about the PMR program with the control group members and hereby change the final results. Thus, among the present schools, one boy and one girl school were selected randomly for the intervention group and the control group was selected from 2 other schools. Having the school authorities' permission and explaining the purpose of the study, a list of all the students was 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. 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. However, if they did not meet the criteria, they were excluded from the study. After the selection of each subject, the researcher called his/her parents and explained the purpose of the study. At this point, the subjects' levels of anxiety were measured through Beck Anxiety Questionnaire, and if the anxiety level, ranged from 8 to 63, students were allocated to one of these groups. Finally, 75 subjects were selected from each school. Training the subjects on how to perform PMR was done by the researcher within 5 sessions, lasting half an hour for groups of 75 students. After the researcher made sure the students were capable of performing the program properly, she assigned the subjects to perform

the program once a day (before going to the bed) for one month. The program was controlled by a self-report checklist in addition to meeting them at their school on a weekly basis. At the end of the second and the fourth week of the intervention, Beck Questionnaire was completed by the entire sample. In this study, 24 students were excluded (from the intervention group, 7 people, who performed the PMR program less than 15 times a month during the one-month intervention, one subject, who was taking drugs, 7 people, who were sick and staying at the hospital, and from the control group, 3 people, who failed to complete the questionnaire and 6 people, who were sick and staying at the hospital were excluded), Fig 1.

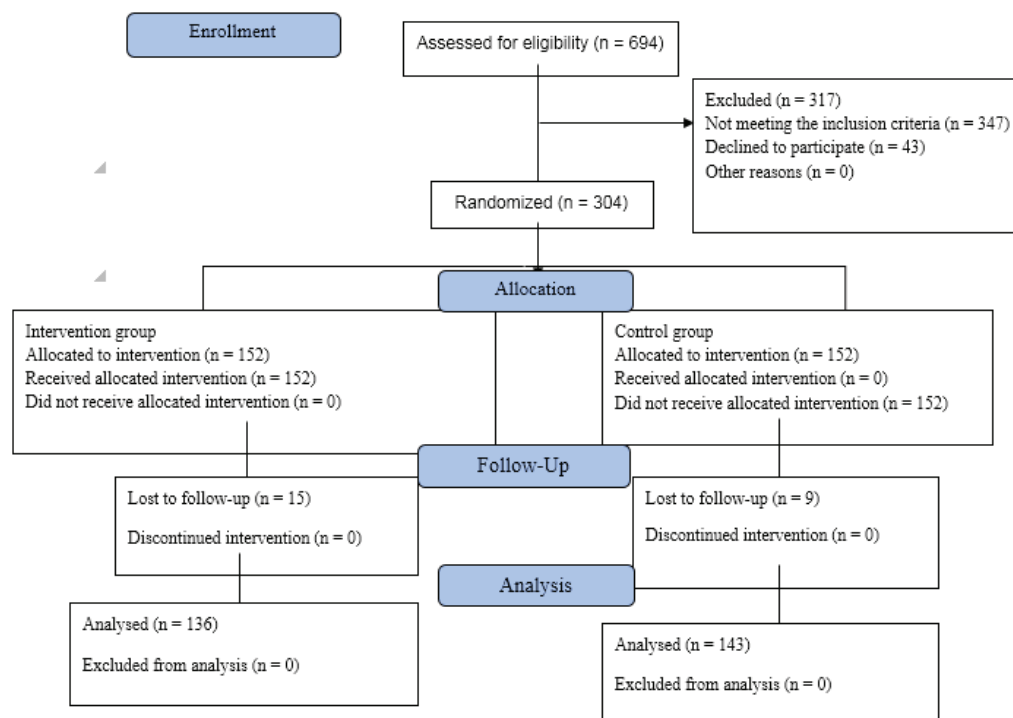


Figure 1: Standards of Reporting Trials Flowchart

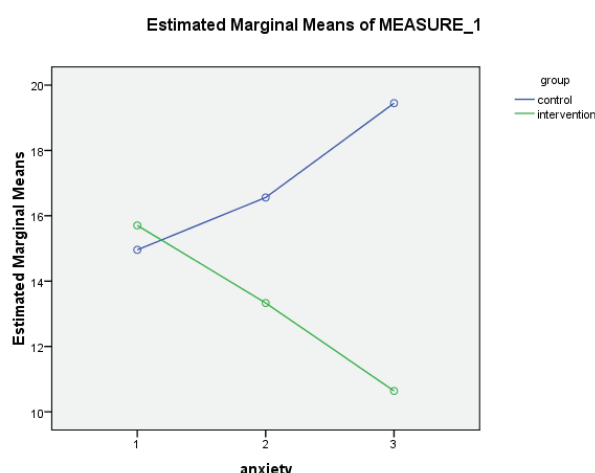


Figure 2: xx

Using repeated measures test procedures, the data were analyzed through the SPSS version 20 software. During all the stages,  $P < 0.05$  was considered to be significant. Ethical approval was obtained with code sbmu.rec.1394.14 from the Shahid Beheshti University of Medical Sciences (code IRCT2015080123450N1).

## RESULTS

In this study, the intervention (PMR program) was done for 152 male and female pre-university students in Malayer. The average age of the subjects was  $17.4 \pm 0.55$ . Fifty percent were male and 50% were female. Both groups were similar in terms of gender variables (using Chi square test), age, and their initial anxiety score (using independent t test). Before the intervention, the mean and standard deviation of both groups' anxiety scores were  $15.13 \pm 8.63$ , showing low anxiety level. The mean and standard deviation of the control group anxiety score was  $14.96 \pm 8.22$ , reaching  $16.56 \pm 8.08$

**Table 1:** Comparison of the MEAN and Standard Deviation Score of Anxiety in the Intervention and Control Groups during Three Time Point

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	8.29 ± 19.48
Intervention	9.07 ± 15.30	9.70 ± 13.04	10.48 ± 10.11

**Table 2:** Expression of Markers of Repeated Measures

Variables	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

after 2 weeks and  $19.45 \pm 8.27$  at the end of the fourth week. While the mean and standard deviation of the intervention group's anxiety scores were  $15.71 \pm 8.58$ , they decreased to  $13.33 \pm 9.06$  at the end of the second week and  $10.64 \pm 9.30$  at the end of the fourth week (Table 1).

Because the sample size in each group was more than 30, parametric methods were used. Sphericity assumption was not significant, repeated measures and Greenhouse-Geisser correction was used. The repeated measures test, showed a significant difference between the 2 groups in mean of anxiety scores ( $P = 0.008$ ). The mean anxiety score was significantly different between the 3 time points ( $P < 0.001$ ). Also, the mean anxiety score was significantly different between the 2 groups over the 3 time points ( $P < 0.001$ ) (Table 2).

## DISCUSSION

In this study, the effect of a cognitive-behavioral treatment, PMR, on pre-university students' anxiety was investigated. The results from self-report checklists indicated that all the students performed the program regularly at home. Also, to be sure they followed the program, the researcher made regular phone calls and met the subjects regularly at school. The PMR program made a significant difference in both groups' anxiety levels, while this anxiety was not significant before the study. The subjects' anxiety mean score was 15.13 before the intervention, which was low in terms of the obtained score and anxiety level. Also, the Italian high school students' anxiety mean score was low, using the Hamilton anxiety questionnaire [27], yet in none of the studies, the students' (between 13 and 26 years old) anxiety mean score based on a self-report measure, showed a mild anxiety [8]. Inconsistency between the mentioned study and the present research could be due to the large age difference among the subjects (13 years). Besides, in another study, the students' anxiety mean score, ranging from 11 to 16, was extreme for both control and intervention groups [5], mainly due to crises during the maturity period and the criterion score for inclusion in the study, which was obtained as 45 for the test anxiety questionnaire (Sarason).

Using the 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 the second and fourth week of intervention, that is, the intervention group's anxiety mean score decreased after the second and the fourth week of the PMR program, yet, the control groups' anxiety

mean score increased after 2 and 4 weeks. In the study conducted by the researchers, whose objectives were to find the effectiveness of PMR in alleviating chronic schizophrenic patients' anxiety, similar to the present study, the control group's anxiety score increased and the intervention group's score decreased, that is, the score difference after the intervention was significant [28]. However, 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 [29]. 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 are to the university entrance exam, the more they will 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 increased 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 decreased and was significant. These results indicated alleviation in the intervention group's anxiety level and effectiveness of the PMR program. One study suggested that performing the PMR program for one week could result in a significant decrease in chronic schizophrenic patients' anxiety, yet the anxiety level increase was not significant in the control group [28]. Also, performing the PMR program twice a week alleviated the anxiety level significantly among females having unexpected pregnancy. Although the control groups' anxiety level decreased, the decrease wasn't significant [30]. In another study, the anxiety mean score of drug abusers, who were giving up, showed a significant decrease after 21 days of performing the PMR program while the control groups' anxiety mean score also decreased [18]. 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 performing PMR program, yet it decreased considerably after 3 months [29]. 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 the PMR program for 1 or 2 months [31]. The strengths of this study were the following, the large number of samples and



their availability, having measurable parameters, and appropriate duration for the intervention.

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

The results of the present study suggest that the PMR program could help the pre-university students to lower their anxiety level. As a result, it could be recommended as a safe, inexpensive, and easy way to alleviate students' anxiety. If schools provide the opportunity for students to perform the program during break times, it could lower 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.

## ETHICAL CONSIDERATION

Permission for this study was through the Ethical Committee of Shahid beheshti University of Medical Sciences. All students and their parents were informed of the purpose and design of the study. participants signed a written consent for their participation.

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## CONFLICT OF INTEREST

The authors declare that there was no conflict of interest regarding the publication of this paper.

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## AUTHORS' CONTRIBUTIONS

Study design: Tahereh Rozbahani, Manijeh Nourian; Statistical analysis of data: Tahereh Rozbahani and Azam Moslemi; revision of the Manuscript: Manijeh Nourian and Kiarash Saatchi; Tecnical and material support: Manijeh Nourian and Kiarash Saatchi.

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