

Original article

## Efficacy of two relaxation techniques in reducing pulse rate among highly stressed females.

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### ABSTRACT

The present study aimed at comparing the efficacy of two relaxation techniques on stressed females. 30 highly stressed female subjects were selected and randomly assigned to three groups (N=10 each) (a) group 1 receiving galvanic skin resistance biofeedback, (b) group 2 receiving progressive muscle relaxation training, (c) group 3 control. The stress level was determined using Comprehensive Anxiety Test Questionnaire. Pulse rate was measured before and after training on day 1 and day 10. Results indicate that progressive muscle relaxation training can significantly reduce high pulse rate as compared to other two groups

### INTRODUCTION

In the present lifestyle, stress and anxiety have become part and parcel of everyone's day to day life. Stress experiences often lead to various chronic health conditions such as hypertension and coronary heart disease [1], depression, and has been viewed as a potential danger in the personal growth of an individual. It can stem from unhealthy lifestyle as well as cut throat competition. Students are more prone to anxiety and often display characteristic symptoms of anxiety such as increased heart rate, dizziness, nervousness etc. Studies have been done in past to achieve relaxation using various techniques. The aim of our study was to reduce one of the symptoms of stress and anxiety level viz. high pulse rate, using two well known techniques, Progressive Muscle Relaxation and Galvanic Skin Resistance biofeedback, among the students and compare their efficacy.

In recent years, these techniques have been used successfully in the field of sports, health conditions such as hypertension, migraine, insomnia etc. Biofeedback training enables a subject to control his body responses such as heart rate and skin resistance by using either audio or visual feedback from the equipment. Progressive Muscle Relaxation (PMR) is a popular technique known for its muscle tension relieving effects and consists of a series of exercises involving tensing and relaxing muscle groups. This training enables the subject to relax voluntarily by passively relaxing muscles [2]. PMR therapy has also benefited post operative patients from pain [3]. Significant decrease was observed in respiratory rate of 54 college students when administered with PMR training of 30 minutes over 20 session [4]. Yogic relaxation in combination with GSR biofeedback has shown a reduction in systolic and diastolic blood pressure, after training of 30 minutes over a period of two months [5].

The present study was undertaken to compare the effectiveness of GSR biofeedback and PMR training in reducing

pulse rate. The stress level was assessed using Comprehensive Anxiety Test (CAT) questionnaire, the questionnaire being filled by each subject on day 1, before training commenced and on day 10, after the termination of the training session.

### METHODS

#### Subjects

Comprehensive Anxiety Test (CAT) questionnaire (National Psychological Corporation, Bhargava Bhavan, 4/230, Kacheri Ghat, Agra) was administered to a large number of females (undergraduate, post graduate, graduate and research scholars, N = 120) from Guru Nanak Dev University, Amritsar, India. Ultimately, 30 highly stressed females with higher anxiety scores were chosen for the study. Only those participants were selected who were free from any ailments, and were willing to be a part of the investigative study. Subjects were then randomly assigned to one of the two training groups: GSR biofeedback training (N = 10) and PMR training (N = 10) and the remaining 10 subjects were taken as control.

#### Procedure

The training was provided for 20 min for 10 consecutive days in a neat and quiet room, without any external noise or glaring lights, at the Sports Psychology Lab, Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar, India. Each subject was asked to fill a consent form and CAT questionnaire at the beginning of training session. An introductory session was provided to all the subjects before beginning with the study where they were acquainted with the procedure, application and the aim of the study.

#### GSR biofeedback training (Group1)

In the GSR biofeedback training group, each subject was trained to relax voluntarily using visual feedback from GSR machine (GSR Biofeedback 'Biotrainer' GBF-2000, Medicaid systems, 389, Industrial Area, Phase II, Chandigarh). Before commencement of training, the subject was made to sit comfortably on a chair, placed in front of GSR machine. Electrodes were fixed on the index and ring finger of the subject. Subject was then instructed to relax using visual feedback from the machine. Pulse rate was recorded by palpating the radial artery on right side for one minute, before and after 20 min of training on day 1 and day 10.

#### Progressive Muscle Relaxation Training (Group2)

It is a systematic technique developed by Dr. Edmund Jacobson (1938), used for achieving a deep state of relaxation [6]. At the beginning of training, pulse rate was recorded and the subject was made to lie comfortably on a couch with her eyes closed. She was instructed to listen and follow the instructions carefully. Training involved tensing the specific muscle groups of

body for 7-10 sec., followed by releasing them for 15-20sec. The sequence of muscle groups involved is given in Table 1. After 20 min of training, pulse rate was again recorded on day 1 and day 10.

Day 10	74.70±5.94*	65.9±6.33*	76.2±11.66 N.S
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\* p<0.05, \*\* p<0.001, N.S. = Non-Significant

Table 1 Instructions for Progressive Muscle Relaxation training

Muscle Group	Instructions
Hand	Clench your left hand and feel the tension Relax and let hand hang loosely. Same for right hand.
Wrists	Bend hand back, hyperextending your wrists. Relax.
Upper arms	Bend elbow towards your shoulders and tense biceps muscle. Relax.
Shoulders	Bring shoulders up toward yours ears. Relax, let your shoulders drop down.
Forehead	Wrinkle your forehead, raise your eyebrows. Relax.
Eyes	Close your eyes tightly. Relax.
Jaws	Clench your jaws tightly. Relax.
Tongue	Press your tongue against the roof of your mouth. Relax.
Mouth	Press your lips together tightly. Relax.
Neck	Turn your head so that your chin is over your right shoulder. Straighten and relax.
Neck and Jaws	Bend your head forward, pressing your chin against your chest. Straighten and relax.
Chest	Take a deep breath and hold it for 5 seconds, slowly exhale and relax.
Abdomen	Tighten your stomach muscles. Relax.
Back	Arch your back. Relax.
Thighs	Stretch your legs in front of you. Tighten your thigh muscles. Relax.
Hamstrings	Push your heels down into floor, tighten your hamstring muscles. Relax.
Calves	Point your toes toward your head. Relax
Feet	Curl your toes toward the bottom of your feet. Relax.

**Control group (Group 3)**

In this group, subject was made to sit quietly for 20 min. Pulse rate was recorded before and after 20 min session, on day 1 and 10. For each group, CAT questionnaire was filled by each subject before training on day 1 and after training on day 10 to assess changes in stress levels of the subjects after receiving 10 days of training.

**RESULTS**

The data were analyzed using SPSS (version 11). The results from ten sessions of all the three groups i.e. GSR biofeedback, PMR training and control groups on day 1 and day 10, are represented in Table 2. Intragroup and intergroup comparisons were analyzed using paired t-test and unrelated t-test respectively. One way ANOVA and post hoc tests were done for results on day 1 and 10.

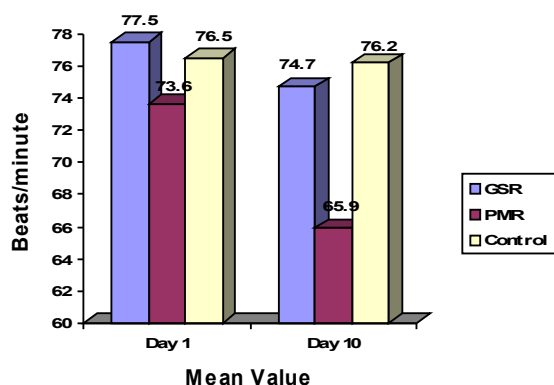
Table 2 Post training mean values of pulse rate for all the three groups on day 1 and day 10<sup>a</sup>.

	Group 1	Group 2	Group 3
Day 1	77.50±8.73	73.60±4.19	76.5±9.68

<sup>a</sup> Data are expressed as mean ± S. D.

Both GSR biofeedback and PMR training groups showed significant differences in mean pulse rate values on day 10 as compared to day 1 (Table 2). No significant results were found in control group. Group 1 pre-post training comparison of mean pulse rate on day 1 and day 10 (Table 3) [7] showed a significant decrease in post training values of pulse on day 1 as compared to pre training results while other two groups failed to show significant results. On day 10, both GSR biofeedback and PMR training group were efficient enough to cause a significant reduction in post training pulse values. Control group did not show any significant change after 10 days of training.

Figure 1: Intergroup post training comparison of mean pulse rate values on day 1 and day 10



A comparison of post training mean pulse rate values ( Figure 1 ) among three groups showed that PMR training group had the lowest post training mean value, suggestive of the efficacy of PMR training in relieving anxiety and reducing high pulse rate which is a common symptom of an anxious state of mind. Intergroup comparisons revealed that significant differences in mean pulse rate existed between GSR and PMR training groups on day 10 only. One way ANOVA analysis also suggested significant differences between groups on day 10 only (F = 4.389, p<0.05). CAT scores were reduced by 59.27% in GSR biofeedback group and by 50.48% in PMR group after 10 days of training.

**DISCUSSION**

Stress has longer been associated with various health conditions, such as cardiovascular diseases, hypertension, migraine etc, predominantly in younger generations, such as students, sports persons, performers, and employees in public sector. High pulse rate is associated with a stressed and anxious state of mind. Present study examines the efficacy of two relaxation techniques in reducing high pulse rate, among stressed female students, in short span of time, using simple instructions. PMR method has shown significant improvement in blood pressure, heart rate and anger in pregnant women with bronchial asthma [8]. Various methods of biofeedback assisted relaxation have been perceived well in

treatment or management of several chronic health conditions such as cardiovascular diseases [9] and migraine [10]. Pulse rate along with CAT score were evaluated before and after the application of these techniques.

Intergroup comparisons reveal that both GSR ( $t = 6.03$ ,  $p < 0.001$ ) and PMR ( $t = 8.20$ ,  $p < 0.001$ ) training groups showed significant reduction in pulse rate after 10 days of training. These findings are consistent with the earlier work done using PMR technique. Singh et al (2000) studied the effect of PMR training on pulse rate and electrodermal responses of boxers [11]. It was found that pulse rate decreased by 11.21% and electrodermal responses increased by 35.51% after 45 min of relaxation training. Jeong (2004) found that PMR therapy was effective in reducing physiological stress responses such as pulse rate and EMG [12]. PMR training leads to a reduction in the sympathetic nervous system activity and an increase in vagal activity, thus lowering the pulse rate. Post hoc tests are also suggestive of PMR training to be most beneficial method for lowering the high pulse rate after 10 days of training. PMR training enables the subject to relieve muscle tension thereby reducing the stress and anxiety levels. This is in accordance with work done by Borkovec et al. (1987) who treated patients with anxiety disorders using PMR training for 12 sessions and found significant reduction in anxiety, measured by psychiatric assessor-rating [13].

## CONCLUSION

On the basis of present study, it can be concluded that all the subjects belonging to training groups (i.e. GSR biofeedback and PMR training) were able to reduce the high pulse rates by using their respective techniques. However, PMR training was found to be more effective than GSR biofeedback training in reducing the pulse rate and anxiety scores. Thus, both training groups are equally efficient in causing relaxation, with PMR group having a slight upper edge than GSR biofeedback group. This study can further be extended on to patients suffering from anxiety and cardiovascular disorders as well as in private sector employees, aged people, army and sports personnel and so forth. These techniques are very simple and can be easily used voluntarily on experiencing tense situations to be relieved from stress and anxiety.

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