LETTER TO THE EDITOR

A STUDY TO COMPARE THE EFFECTIVENESS OF GSR BIOFEEDBACK TRAINING AND PROGRESSIVE MUSCLE RELAXATION TRAINING IN REDUCING BLOOD PRESSURE AND RESPIRATORY RATE AMONG HIGHLY STRESSED INDIVIDUALS

Sir,

Stress is a state of physiological or psychological strain caused by adverse stimuli, physical, mental or emotional; internal or external that tends to disturb the functioning of an individual. It may manifest in the form of anger, depression, guilt, frustration as well as physiological responses such as muscular tension and increased heart rate. In recent years, various relaxation techniques have been recommended to alleviate stress and anxiety. These techniques have also been used successfully in the field of sports primarily to enhance recovery from training and competition, to manage anxiety and improve performance (1). They have been suggested to act by increasing the concentration, enhancing the motor skills and improving the ability to handle arousal and stress (2). Of these techniques, biofeedback training as well as Progressive Muscle Relaxation (PMR) has gained popularity as an effective tool in various health conditions, ranging from hypertension to epilepsy (3). Biofeedback training enables the subject to control his body responses such as heart rate and galvanic skin resistance (GSR). Paran and Yaniv observed an improvement in blood pressure and a decrease in medication after the application of biofeedback assisted relaxation (4).

Progressive muscle relaxation is a popular technique, known for its muscle tension relieving effects. It consists of a series of exercises involving tensing and relaxing various muscle groups in the body. In the present study, we evaluated the effect of PMR training and GSR biofeedback training in reducing the blood pressure and respiratory rate of stressed female students of age group 18–27 yrs. Their stress level was assessed using Comprehensive Anxiety Test questionnaire.

Comprehensive Anxiety Test (CAT) questionnaire (National Psychological Corporation, Bhargava Bhavan, 4/230, Kacheri Ghat, Agra) was administered to about 120 females (undergraduate, post graduate, graduate and research scholars) from Guru Nanak Dev University, Amritsar, India. The questionnaire had 90 questions to be answered as yes or no. Out of the 120 females, only those whose anxiety scores were greater than 40 (i.e 40 questions answered as yes) and percentile greater than 70 were selected for the study. Ultimately, 30 highly stressed females with high anxiety scores, who were free from any ailments and not undergoing any kind of medication treatment were chosen for the study. Of these subjects, 20 were randomly

assigned to one of the two training groups: GSR biofeedback training (n = 10) and PMR training (n = 10). The remaining 10 subjects were taken as control.

The training was provided for 20 min daily for 10 consecutive days. The entire training session was conducted at the Sports Psychology Lab, Department of Sports Medicine and Physiotherapy, Guru Nanak Dev University, Amritsar, India. Informed written consent for participating in the study was taken from all the subjects. Paired t-test was applied for analyzing the pre and post session results. Unpaired t-test was used to find the difference in readings of the subjects of two training groups versus control group and also for the differences between the readings of subjects of two training groups.

In the GSR biofeedback training group (group 1), before the commencement of training, the subject was made to sit comfortably on a chair, placed in front of GSR machine (GSR Biofeedback 'Biotrainer' GBF-2000, Medicaid systems, 389, Industrial Area, Phase II, Chandigarh). The electrodes were fixed on the index and ring finger using velcrotape and the subject was instructed to relax voluntarily using visual feedback from the machine. Blood pressure was measured using sphygmomanometer (Novaphon-300, DSIDC, Shed No. 5, Jhilmil Industrial Area, Delhi-110095) with conventional method and respiratory rate was recorded by observing the movement of chest wall for one minute.

Progressive Muscle Relaxation training is a systematic technique used for achieving a deep state of relaxation. Technique developed by Dr. Edmund Jacobson (5) was used for the study. In this group, (group 2), 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 15–20 sec. In control group (group 3), subject was just made to sit quietly for 20 min. Blood pressure and respiratory rate were recorded in all three groups before and after 20 min session, on day 1 and 10.

Post training mean values of systolic blood pressure (SBP), diastolic blood pressure (DBP), and respiratory rate for all three groups on day 1 and day 10 are given in Table I, while Table II and Table III

TABLE I : Post training mean values for all the three groups on day 1 and day 10[a].

	Group 1		Group 2		Group 3	
	Day 1	Day 10	Day 1	Day 10	Day 1	Day 10
SBP	112.2±9.81	114.2±6.95	113.5±10.49	109.0±10.07*	114.10±8.52	110.4±6.38
DBP	68.2±9.01	63.6±4.40	73.6±8.63	66.2±5.76**	66.6±6.73	63.0±3.55
RR	18.4±1.57	15.4±3.53*	16.1±3.34	15.2±3.04	18.60±4.29	19.4±2.83

[a]Data are expressed as mean±S.D.
*$P<0.05$, **$P<0.001$
SBP = Systolic blood pressure, DBP = Diastolic blood pressure, RR = Respiratory Rate.

shows pre and post session values of SBP, DBP, and respiratory rate for all three groups on day 1 and day 10 respectively. 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 day 10.

The present study aimed at evaluating the effect of two training techniques on blood pressure and respiratory rate of the stressed individuals. Since no significant results were found for pre training sessions in all three groups on day 1 and day 10, comparisons were done between pre and post session as well as post training values of parameters on day 1 and day 10.

Comparison of post training values of blood pressure on day 1 with day 10

indicated that PMR group (group 2) showed significant differences for SBP (P<0.05) and DBP (P<0.001). Other two groups failed to show any significant results for post training values of blood pressure on day 1 and day 10 (Table I). Pre and post session comparison of blood pressure values of GSR biofeedback group (group 1) on day 1 revealed significant reduction in SBP values (P<0.05) while no effect was observed for DBP while on day 10, both SBP and DBP values showed significant differences in pre and post session values. Results indicate the effectiveness of GSR biofeedback training in reducing blood pressure after training session. PMR group showed significant reduction in pre-post session values of SBP and DBP on day 10 only. Control group (group 3) did not show significant results on both day 1 and day 10 (Table II and Table III).

TABLE II : Pre-Post session comparison of mean values on day 1[a].

	Group 1		Group 2		Group 3	
	Pre session	Post session	Pre session	Post session	Pre session	Post session
SBP	114.8±8.75	112.2±9.81*	116.4±11.46	113.5±10.49	115.2±9.10	114.1±8.51
DBP	71.4±9.43	68.2±9.01	72.8±10.84	73.6±8.63	67.3±7.86	66.6±6.73
RR	22.6±2.17	18.4±1.57**	20.7±4.05	16.1±3.34**	20.0±4.21	18.6±4.29

[a]Data are expressed as mean±S.D.
*P<0.05, **P<0.001
SBP = Systolic blood pressure, DBP = Diastolic blood pressure, RR = Respiratory Rate.

TABLE III : Pre-Post session comparison of mean values on day 10[a].

	Group 1		Group 2		Group 3	
	Pre session	Post session	Pre session	Post session	Pre session	Post session
SBP	117.0±7.31	114.2±6.95*	113.4±11.58	109.0±10.07*	113.2±6.81	110.4±6.38
DBP	65.8±5.69	63.6±4.40*	68.8±6.81	66.2±5.76*	65.6±4.08	63.0±3.55
RR	20.5±3.34	15.4±3.53**	19.9±9.6	15.2±3.04**	21.3±5.12	19.4±2.83

[a]Data are expressed as mean±S.D.
*P<0.05, **P<0.001
SBP = Systolic blood pressure, DBP = Diastolic blood pressure, RR = Respiratory Rate.

Only group 1 showed significant reduction in post training values of respiratory rate (P<0.05) on day 10 as compared to day 1 (Table I). Significant reduction in pre-post session values of respiratory rate was observed in group 1 and group 2 on both day 1 (P<0.001) and day 10 (P<0.001). Control group did not show any significant changes. Statistically significant differences were observed on intergroup comparison between GSR biofeedback and control group (t = 2.79, P<0.05) and between PMR and control group (t = 3.19, P<0.05).

The present study shows that PMR training resulted in significant improvement in both SBP and DBP and GSR biofeedback training led to a reduction in post training values of respiratory rate after 10 days of training. These results are also supported by their pre and post session comparisons. No significant changes were observed in control group. During stressed conditions repeated hypothalamic stimulation by emotional stimuli leads to an increase in blood pressure, respiratory rate and anxiety. These relaxation methods led to a reduction in sympathetic nervous system activity and reduced stress and anxiety. Previous studies have also supported these results. PMR training has shown improvement in blood pressure, heart rate, and anger in pregnant women with bronchial asthma (6). Significant decrease was observed in respiratory rate of 54 college students when administered with PMR training of 30 minutes over 20 sessions (7). Various methods of biofeedback assisted relaxation have been perceived well in treatment or management of several health conditions such as cardiovascular diseases (8), insomnia (9), migraine (10, 11). 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 (12). Hypertensive patients receiving biofeedback assisted relaxation and relaxation training for 15 minutes training led to a significant reduction in blood pressure (13).

Present study has shown PMR training to result in significant decrease in blood pressure whereas GSR biofeedback training showed a decrease in respiratory rate. Both techniques are simple and easy to use. These can be well adopted by people who face stressful work conditions. The limitation of this study includes its relatively short duration and lack of follow up to assess the long term effects of these techniques. These techniques can be combined with other therapeutic interventions for treating other clinical conditions.

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