

Effects of progressive muscular relaxation training on quality of life in anxious patients after coronary artery bypass graft surgery

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Background & objectives: Evidences suggest that relaxation therapy may improve psychological outcomes in heart patients. We evaluated the effect of progressive muscular relaxation (PMR) training in decreasing anxiety and improving quality of life among anxious patients after coronary artery bypass graft surgery (CABG).

Method: This study was an open uncontrolled trial. The sample included 110 anxious patients referred to the cardiac rehabilitation clinic of Tehran Heart Center, Tehran, Iran, during six weeks after coronary artery bypass graft (CABG). Patients were allocated to receive both exercise training and lifestyle education plus relaxation therapy (relaxation group; n=55) or only exercise training beside lifestyle education (control group or the recipient of usual care group; n=55). Duration of the relaxation therapy was 6 wk and in the case of usual care was 8 wk. Both the groups were followed up one month after completion of intervention. Anxiety and quality of life in the two treatment groups were compared.

Results: There were no significant differences in overall QOL, state anxiety and trait anxiety scores between the two groups before intervention. Significant reductions in state anxiety ($P<0.01$) and trait anxiety ($P<0.01$) levels were observed in relaxation group after intervention compared to control group. Women had high state anxiety and a low quality of life than men in the two groups before intervention. After intervention, there was no difference between men and women in the relaxation group.

Interpretation & conclusions: Our findings show that progressive muscular relaxation training may be an effective therapy for improving psychological health and quality of life in anxious heart patients.

Key words Anxiety - anxious patient - coronary artery bypass graft surgery - progressive muscular relaxation - quality of life

Cardiac surgery is known to be accompanied by postoperative anxiety¹. Patients experience anxiety and depression months after coronary artery bypass graft surgery (CABG)². Increased anxiety is correlated with poorer quality of life and worse long-term psychological outcomes³⁻⁵. Psychological

intervention reduces pain, severe anxiety, hostility and depression in these patients and thus improves quality of life (QOL)⁶. Relaxation therapy is a well established psychological therapy for alleviating psychological distress in patients with chronic illnesses⁷.

Among the various relaxation techniques available, progressive muscle relaxation (PMR) focuses on reducing muscle tone in major muscle groups. Each of 15 major muscle groups is tensed and then relaxed in sequence⁸.

Although, relaxation therapy had more advantages for heart patients, a few randomized controlled trials or meta-analyses of smaller studies have been conducted to assess the role of relaxation training on health outcomes in heart patients with psychological problems⁷. The existing studies have been mostly limited to surveys of potential benefits of relaxation on patients' physical indicators in pre heart operation. The present study was therefore undertaken to examine the effect of PMR programme on anxiety and quality of life of anxious patients who have undergone CABG in Iran.

Material & Methods

This study was performed at Tehran Heart Center, Tehran, Iran, during April-November 2007 as an open uncontrolled trial design. A sample of convenience included 110 patients referred to the cardiac rehabilitation clinic of Tehran Heart Center in during six weeks after CABG surgery.

The selection criteria were: patients' satisfaction to participate, CABG treatment, no history of a major comorbidity (*e.g.*, cancer, major neurological disorder) except for the risk factors of heart disease (*e.g.*, diabetes), no indication of receiving treatments for anxiety and depression, the age-range of 40 to 65 yr, moderate to severe anxiety score (the summation of in score >80 of state anxiety and trait anxiety score).

Of the 396 patients referred to the cardiac rehabilitation clinics during 2007, 76 patients had angioplasty treatment, 90 were of age 65 yr and above, 30 patients had valve surgery, and 200 with CABG surgery. Since small anxiety level was not threatening for patients, 61 patients having small anxiety (the summation of in score <80 of state anxiety and trait anxiety score) among 200 CABG patients were excluded. Further, 29 patients who had major comorbidity (*e.g.*, cancer) or receiving treatments for anxiety and depression were also excluded. Remaining 110 patients were randomly assigned to receive both exercise training and lifestyle education plus relaxation therapy (relaxation group; n=55) or only exercise training beside lifestyle education (control group or the recipient of usual care group; n=55).

The relaxation group received progressive muscular relaxation training for six weeks. Also, the two groups received the usual care (exercise training and lifestyle education) for 8 wk. All patients were followed up one month after intervention. The state/trait anxiety inventory and SF-36 questionnaire were used to collect data.

This study was approved by the medical ethics committee of Tehran Heart Center, Tehran, Iran. All patients were informed about the study and a written consent was taken from all participants. None of the participants refused to take part in the study.

Assessment of quality of life and anxiety: The state/trait anxiety level was measured by using the Spielberger's State-Trait Anxiety Inventory (STAI) The STAI scale consists of 40 statements describing various emotional states, which have been adopted into Persian⁹ and its reliability and validity are acceptable. The state anxiety scale consists of 20 statements that evaluate how respondents feel right now, at this moment, using a four-point scale. The trait anxiety scale consists of 20 statements that assess how people generally feel and use a four-point scale. The reliability estimate for state STAI through Cronbach's α was 0.82 and for trait STAI was 0.92 in the present study.

Quality of life was measured by SF-36 instrument. The SF-36 scale comprises 36 items covering eight domains: physical function (10 items), role limitation caused by physical problems (4 items), body pain (2 items), mental health (5 items), role limitations caused by emotional problems (3 items), vitality-energy (4 items), general health perception (5 items) and social functioning (2 items). In addition a single item that provides an indication of perceived change in general health status over a one year period. Montazeri *et al*¹⁰ adapted this scale to Persian. Test-retest correlation coefficient was 0.76 with a 2 wk interval. Higher score indicates a better QOL.

PMR training programme: The PMR method followed previously standardized and validated procedures of Bernstein and Borkovic based on a classic muscle relaxation programme by Jacobson¹¹. This technique involved systematically relaxing the major muscle groups of the body with the goal of physical and mental relaxation. The progressive muscular relaxation training provided for the experimental group included twelve 40 min group education sessions over 6 wk. Patients were divided into five groups (consisting of 11 patients in each group). The first session of the training

was an introductory group discussion of anxiety after CABG, as well as a rationale and a general description of the purpose of relaxation. In the second session, the subjects were taught as to how to relax and contract the muscles of the right hand and forearm, right biceps, left hand and forearm, left biceps, forearm, upper section of cheeks and nose, lower section of cheeks and nose, neck and throat, chest, shoulders and upper part of back, abdominal region and stomach, right thigh, right calf, right foot, left thigh, left calf and left foot (16 groups). One booklet consisting of mechanisms and benefits of relaxation was given to patients. They were requested to practice the technique at home twice a day and record relaxation experiences in specific form. They were also requested to bring their forms in the future sessions. A relaxation audio CD which provided a helpful guide for at-home practice was given to them. From the third to twelfth session, patients only performed progressive muscular relaxation. Finally, at-home practice was reviewed at the start of each weekly session, permitting discussion of problems and encouragement to practice. According to analysis of recording forms of PMR exercises distributed among patients, all subjects practiced PMR at home 3 times per day on average.

The usual care of cardiac rehabilitation clinic included exercise training (3 days/wk for 8 wk) and educational sessions (3 times in the 8 wk with focus on lifestyle modification). The two groups received the usual care for 8 wk.

Statistical analysis: Statistical analysis of data was performed with SPSS software (English version). The homogeneity of baseline data in socio-demographic variables was analyzed by both the Chi-square test and independent sample t-tests. Differences in quality of life domains, state anxiety and trait anxiety scores between, before and after intervention were tested using student's t test for paired sample. Differences in quality of life, state anxiety and trait anxiety between the groups were tested using independent sample t-tests. The independent sample t test was performed to obtain correlation between genders with state anxiety, trait anxiety and QOL. The One-way ANOVA was utilized to obtain correlation between educational situations or marital status and dependent variables. Correlation of age with independent variables was analyzed through Pearson correlation analysis in both groups. The data were expressed as mean \pm SEM. $P < 0.05$ was considered significant.

Results

The average age of participants in the two groups was 59 (56 ± 6.4 yr in the control group and 56.05 ± 7.2 yr in the relaxation group). In the control group, 69.1 per cent patients were men and 30.9 per cent women. In the relaxation group, 74.5 per cent patients were men and 25.5 per cent women. The level of education showed that major of patients in the two groups (36.4% in the control group and 43.6% in the relaxation group) were graduates; 41.3 per cent of patients were employed in the two groups. Majority of patients (81.8% in the control group and 92.7% in the relaxation group) were married. There were no significant differences between the two groups in socio-demographic variables. No significant differences were found for overall QOL (in addition to all their domains) and state/trait anxiety between the two groups before intervention. Results indicated that the relaxation group reported a significantly lower state anxiety ($P < 0.01$) and trait anxiety level ($P < 0.01$) compared to the control group after intervention (Table I). Also, all domains of QOL in the relaxation group were significantly more compared to the control group after intervention (Table II). Correlation of genders with each of overall QOL, state anxiety and trait anxiety showed that women had high state anxiety and a less QOL ($P < 0.05$) than men in the two groups before intervention. Women in the relaxation group had no significant differences than men in state anxiety, trait anxiety and QOL after intervention (Table III). On the contrary, the significant differences between the genders in the control group remained stable in three variables of overall QOL, state anxiety and trait anxiety scores ($P < 0.05$) after intervention. In both the groups, before and after the intervention, there was no significant association among age, marital situation and education level with each of these variables: state anxiety, trait anxiety and QOL.

Discussion

More than 40 per cent of CABG patients are anxious after discharge¹². Although, anxiety exerts a profoundly negative effect on QOL and adversely influences the outcomes of ischaemic heart disease from many standpoints, including recurrent hospitalization, an increased incidence of ischaemic events, and higher mortality¹³, yet is not much investigated¹⁴. This study demonstrated significant effects of PMR plus exercise training and lifestyle education on reduction of anxiety scores and increase of quality of life domains of

Table I. Comparison of state anxiety, trait anxiety, total score of anxiety before and after intervention in relaxation and control group

Variables	Control group (n=55)		Relaxation group (n=55)	
	Before intervention	After intervention	Before intervention	After intervention
State anxiety	48.6 ± 10.5	44.9 ± 4.1*	50.7 ± 8.6	34.9 ± 1.4**†
Trait anxiety	48.2 ± 9.2	45.3 ± 10.6*	49.6 ± 9.1	38 ± 1.2 **†

Values are mean ± SD

Result of paired t-test for paired sample; $P^* < 0.05$, $** < 0.001$ compared to pre-intervention values

Result of Independent sample t test; $P^† < 0.01$ compared to the control group

Table II. Comparison of quality of life before and after intervention in patients of relaxation and control group

Variables	Control group (n=55)		Relaxation group (n=55)	
	Before intervention	After intervention	Before intervention	After intervention
Physical functioning	54.7 ± 17.8	68.7 ± 17**	59.4 ± 21.2	85.6 ± 13** †††
Role physical	19 ± 25.4	34.5 ± 30.6*	21.3 ± 24.2	47.2 ± 30.3 **†
Body pain	43.4 ± 24.2	55.7 ± 24.2*	40.5 ± 22.9	71.8 ± 17.7 **†††
General health	59.2 ± 17.8	62.3 ± 20.2	61.1 ± 18	78.1 ± 15.2 **†††
Vitality	47.1 ± 17.8	51.2 ± 20.3	42.5 ± 20.9	66.6 ± 18.8 **†††
Social functioning	54.5 ± 25.2	64.7 ± 28.2*	52.5 ± 27.4	81.3 ± 22.8 **††
Role emotional	29.7 ± 29.1	47.2 ± 6.6*	27.8 ± 28.5	74.5 ± 31.4 **†††
Mental health	56 ± 19.7	57.8 ± 20.8	51.7 ± 21.4	76.3 ± 16 **†††

Values are mean ± SD

Result of paired t-test for paired sample; $P^* < 0.05$, $** < 0.001$ compared to pre-intervention values.

Result of Independent sample t test; $P^† < 0.05$, $†† < 0.01$, $††† < 0.001$ compared to the control group

Table III. Correlation of sex with each of state anxiety, trait anxiety, and overall quality of life in the two groups before and after intervention

Variables	Control group (n=55)		Relaxation group (n=55)	
	Before intervention	After intervention	Before intervention	After intervention
State anxiety	45.7 ± 9.2 (M)	42.6 ± 8.4 (M)	47.7 ± 7.7 (M)	35 ± 10 (M)
	55.2 ± 10.6 (W)*	50.1 ± 12.8 (W) *	55.5 ± 10.6 (W)*	34.8 ± 13.3 (W)
Trait anxiety	45.8 ± 7.8 (M)	42.1 ± 8.8 (M)	48.7 ± 8.6 (M)	38.6 ± 9.1 (M)
	53.5 ± 10 (W)*	52.3 ± 11.1 (W)*	52.2 ± 9.9 (W)	36.2 ± 9.9 (W)
Overall QOL	93.5 ± 26.5 (M)	116.7 ± 31.3 (M)	95.9 ± 27.5 (M)	144.9 ± 31.4 (M)
	71 ± 16.1 (W)*	97 ± 31.2 (W)*	69.7 ± 22.5 (W)*	134.8 ± 34.7 (W)

Values are mean ± SD

M, men; W, women

Result of Independent sample t test; $P^* < 0.05$ compared to men

anxious patients after CABG compared with only exercise training besides lifestyle education (usual care). Dixhoorn and White¹⁵ found that relaxation training enhances recovery from an ischaemic event, independency of the effect of psycho-education and of exercise. They explained that relaxation therapy can enhance recovery after a cardiac ischaemic event and encompasses all domains of rehabilitation. Our

findings were consistent with many earlier studies, which evaluated the effects of PMR training on morbid conditions. Yildirim and Fadiloglu¹⁶ found that PMR training can improve QOL and decrease state anxiety and trait anxiety in dialysis patients. Cheung *et al*¹⁷ evaluated the effect of PMR on anxiety and quality of life after stoma surgery in colorectal cancer patients. They denoted that the use of PMR significantly

decreased state anxiety and improved quality of life in the experimental group, Davison *et al*¹⁸ demonstrated that 7 wk PMR therapy reduced trait anxiety in Caucasian male with borderline hypertension. They suggested that PMR training is a cost-effective intervention which needs minimal training. It could easily be offered to those patients who would like to use it as part of the specialist care provided to patients with chronic disease.

Tsai¹⁹, evaluated the long-term effect of an audio-visual relaxation training (RT) treatment involving deep breathing, exercise, muscle relaxation, guided imagery and meditation compared with routine nursing care for reducing anxiety in Chinese adults with cardiac disease. He found that RT significantly decreased state anxiety in the treatment group as compared to the control group. Bastani *et al*⁹ showed that applied relaxation caused significant reduction in state anxiety level in the experimental group. Collins & Rice²⁰ in a pre-post control study observed the short term effects over 6 wk of PMR and guided imagery on adults with cardiovascular disease in rehabilitation following a myocardial infarction (MI) or CABG surgery, and showed no difference in state anxiety in the experimental and control group, but depression was reduced in the experimental group. They suggested that more instruction sessions on the relaxation method may result in more positive outcomes.

The present results showed that trait anxiety score decreased significantly in the relaxation group as compared to the control group. These findings were different from an earlier study²¹ indicating that trait anxiety is part of one's personality make up, therefore, more resistant to change. In this study group discussion about anxiety and relaxation experiences were used besides PMR in the relaxation group, which may have contributed to the effects on trait anxiety. Some studies have found that group education appears to provide psychological benefits and a supportive atmosphere^{22,23}. Participation at group education sessions may increase social support among participants for health behaviour change. Also, trait anxiety as personality traits are good predictors of occurrence of emotional distress before and after CABG²⁴, and can also be a predictor of occurrence of state anxiety afterward²⁵.

Significant improvement was noted in all the components of the quality of life measures in the

relaxation group as compared to the control group similar to those reported earlier^{26,27}.

In the present study physical functioning (one domains of QOL) showed significant improvement in the control group after intervention. This finding showed that the usual care (exercise training plus life style education) had significant effect on this component of QOL. But adding PMR to the usual care improved this component of QOL much more.

Improvement in all components of quality of life and reducing state anxiety and trait anxiety were not statistically different between men and women after participating in PMR training. However, in the control group, women had more state/trait anxiety and low overall QOL than men before and after the intervention. Duits *et al*²⁸ found that women had significantly higher trait and state anxiety throughout both the pre- and post-operative cardiac surgery phases. Westin *et al*²⁹ reported that women had a poorer quality of life one month and one year after bypass surgery or angioplasty than males. These data affirm that women should be routinely encouraged to participate in PMR programme after CABG.

Although, the results of our study are promising, there are certain limitations. The limitations were a small sample size, use of a sample of patients who referred themselves for cardiac rehabilitation, use of self-reports forms for measuring frequency of home practice of PMR, short duration of follow up, and absence of a placebo control. Randomized trials are needed to better define the role of various relaxation methods to safely improve psychological outcomes and enhance the quality of life among specific subgroups of coronary heart patients particularly older females and patients having external health locus of control or low level of self efficacy.

In conclusion, adding PMR training to cardiac rehabilitation care after discharge may improve psychological outcomes of patients with clinical levels of anxiety. Identification of anxious patients after CABG is important for health care practitioners and effective psychological interventions need to be implemented into cardiac rehabilitation clinics.

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