A STUDY OF THE EFFECT OF RELAXATION AND BIOFEEDBACK-ASSISTED RELAXATION ON PATIENTS WITH MILD HYPERTENSION

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Abstract

INTRODUCTION: Hypertension is one of the most prevalent chronic diseases worldwide. Because of its chronicity, hypertension requires life-long therapy. Many patients tend to discontinue therapy and seek alternative treatments. In this study, we evaluated the efficacy of two behavioral therapeutic techniques, namely relaxation and biofeedback-assisted relaxation in reducing blood pressure.

METHODS: Fifty-six mildly hypertensive men (aged between 30 and 60 years) who did not use any pharmacological treatment, took part in this study. The participants were randomly divided into three groups, relaxation (group one), biofeedback-assisted relaxation (group two) and control (group three). The treatment course consisted of ten sessions (every other day). Relaxation was performed in groups one and two for 15 minutes during each session. In group 2, for another 15 minutes at the end of each relaxation session, blood pressure was measured at 2- to 3-minute intervals and declared to the patient. Heart rate and blood pressure were measured and recorded before and after each session. In the control group, only blood pressure was measured at each session. Stress was measured using Malekpoor questionnaire with 67% validity. Anxiety was measured by Ketel's questionnaire. The patients filled stress and anxiety questionnaires before and after the study period (20 days).

RESULTS: Mean systolic and diastolic blood pressures decreased after the study period in groups one and two. There was a significant difference between groups one and three ($P<0.05$) and between groups two and three ($P<0.05$).

DISCUSSION: Relaxation and biofeedback-assisted relaxation techniques can reduce systolic and diastolic blood pressure, hence their benefits in the treatment of hypertension can be used in appropriate settings.

Keywords • Relaxation • Biofeedback-assisted relaxation • Anxiety • Stress • Hypertension

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Introduction

Many chronically hypertensive patients tend to avoid drug treatment. Weight reduction, limitation of alcohol and dietary salt intake, vegetarian diets and doing aerobics are among factors which can reduce essential hypertension. High-potassium and low-caffeine diets are also effective in hypertension control.[1]

The sympathetic nervous system is involved in development and continuation of hypertension. Therapeutic methods which reduce the activity of this component of the human nervous system may be effective in the treatment of hypertension.

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These include non-pharmacological methods, such as various behavioral treatments, weight reduction, and abstaining from certain types of foods which increase the activity of the sympathetic nervous system.[2] Meditation, yoga, and psychological methods may lower blood pressure to varying degrees. A combination of such methods may prove beneficial within the context of efforts to bring blood pressure under control and prevent its long-term complications.

Materials and methods

This controlled clinical trial was performed on male subjects aged between 35 and 60 years. The subjects were selected randomly from amongst 780 hypertensive patients registered in at least one of the hypertension screening programs implemented by Isfahan Cardiovascular Research Center. Seventy-one patients who refrained from taking medications for

TABLE 1. Results of Levin's test on the pre-assumption of variance equality in the three groups

Dependent variables	F	Degree of freedom, 1	Degree of freedom, 2	P
Diastolic pressure on 10^{th} session	1.903	2	35	P < 0.164
Systolic pressure on 10^{th} session	4.225	2	35	0.023
After anxiety test	0.264	2	35	0.769
After stress test	0.711	2	35	0.498
Heart rate on 10^{th} session	0.471	2	35	0.628

what they referred to as "personal reasons" were selected. 56 individuals agreed to participate in the trial. The subjects were randomly assigned to one of three groups. Group I, consisting of 19 patients were treated by relaxation. Group II consisting of 18 patients were treated with biofeedback-assisted relaxation. Group III consisting of controls only underwent blood pressure measurement. Stress was measured using Malekpoor questionnaire with 67% validity. Anxiety was measured with Ketel's questionnaire. At the start of each treatment session, the subjects' blood pressures were measured 2-3 times in supine position. Group I and II patients who were treated with relaxation were given special audiocassettes and instructed to perform the techniques 2-3 times at home daily. Muscular relaxation was performed in lying position for 15 minutes in each session. Blood pressure of group II subjects was taken at 2-3-minute intervals for 15 minutes after relaxation and verbally declared to the patients. A total of 10 relaxation/biofeedback-assisted relaxation sessions was arranged on an every-other-day basis.

Blood pressure measurement was performed with a Quinton-412 cuffed sphygmomanometer using Korotkov's method. Systolic and diastolic blood pressure, heart rate, stress and anxiety scores, and data relating to intervening factors such as age, sex, number of offspring, hypertension awareness, level of education, family history of hypertension, and heart rate in the first session were analyzed using SPSS software.

Results

Initially, Kolmogorov-Smirnov test was used to verify that data curves were normal.

Levin's Test of Equality of Error Variance was then used to confirm the equality of the variances of dependent variables, except for diastolic blood pressure (P=0.023) (Table 1).

TABLE 2. Variance analysis results (MANOVA): Effect of type of treatment on diastolic blood pressure (dependent variable) and intervening variables

Dependent variable	Test power	Effectiveness	P value	t	Regression coefficient
Groups 1 & 3	0.726	0.299	P<0.05	-2.670	-0.779
Groups 2 & 3	0.519	0.154	P<0.05	-2.091	-0.662
Age	0.162	0.040	P>0.05	-1.006	-1.9E-02
Occupation	0.050	0.000	P>0.05	0.032	-03E6/20
Number of offspring	0.261	0.073	P>0.05	1.373	0.104
Anxiety pretest	0.175	0.045	P>0.05	1.062	1.8E-02
Stress pretest	0.142	0.034	P>0.05	0.913	1.6E-02
Prior knowledge of hypertension	0.239	0.066	P>0.05	-1.298	-0.302
Education	0.565	0.169	P<0.05	-2.211	0.188
Family history of hypertension	0.051	0.000	P>0.05	0.075	1.9E-02
Heart rate on first session	0.128	0.029	P>0.05	0.843	-2.1E-02
Diastolic pressure on first session	0.060	0.004	P>0.05	0.302	3.5E-02
Systolic pressure on first session	0.087	0.1014	P>0.05	-0.587	-6.2E-02

TABLE 3. Variance analysis results (MANOVA): Effect of type of treatment on systolic blood pressure (dependent variable) and intervening variables

Dependent variable	Test power	Effectiveness	P value	t	Regression coefficient
Groups 1 & 3	1.00	0.585	P<0.05	-5.821	-2.519
Groups 2 & 3	1.00	0.560	P<0.05	-5.527	-2.594
Age	0.050	0.000	P>0.05	0.018	5.1E-04
Occupation	0.065	0.006	P>0.05	0.371	0.107
Number of offspring	0.513	0.152	P>0.05	2.077	0.234
Anxiety pretest	0.120	0.026	P>0.05	-0.803	-2E-02
Stress pretest	0.358	0.103	P>0.05	1.662	4.2E-02
Prior knowledge of hypertension	0.146	0.035	P>0.05	-0.933	-0.322
Education	0.089	0.015	P>0.05	0.602	7.6E-02
Family history of hypertension	0.059	0.003	P>0.05	-0.286	-0.106
Heart rate on first session	0.058	0.003	P>0.05	0.286	9.8E-03
Diastolic pressure on first session	0.341	0.098	P>0.05	-1.613	-0.275
Systolic pressure on first session	0.683	0.212	P<0.05	2.539	0.399

Variance analysis was performed and MANOVA was used to assess the above-mentioned data. The results are shown in Tables 2 and 3. As seen in Table 3, systolic blood pressure was significantly different between the relaxation and control groups after eliminating intervening variables ($P<0.05$). This test has a power of 1.00 and eta-squared (η^2) equals 0.58, i.e. 58% of individual differences of systolic blood pressure at the conclusion of the treatment course are due to the difference between the relaxation and control groups. A significant decrease in systolic blood pressure was also seen in group II (biofeedback-assisted relaxation) following the treatment course ($P<0.05$). Here, the power of test is 1.00 and eta-squared (η^2) equals 0.56, i.e. 56% of individual differences of systolic blood pressure can be attributed to biofeedback-assisted relaxation.

As seen in Table 2, the difference in diastolic blood pressure between groups I, III, and controls after elimination of intervening variables is significant ($P<0.05$). Here the power of test is 0.72 and eta-squared (η^2) equals 0.23, i.e. 23% of individual differences of diastolic blood pressure following the treatment course are due to relaxation. There was also a significant difference between groups II and III, where the power of test is 0.52 and eta-squared (η^2) equals 0.15, i.e. 15% of individual differences of diastolic blood pressure are due to the difference between relaxation and control groups. As seen in Tables 2 and 3, there was no significant difference between groups II and III in respect of diastolic blood pressure. Neither was there any significant difference between the relaxation and biofeedback-assisted relaxation groups in respect of systolic blood pressure.

Discussion

Various hypotheses have addressed the effect of behavioral treatment methods on blood pressure. These methods have been shown by some studies to have no significant effects in treatment of hypertension.[3]

However, a considerable number of studies have confirmed the beneficial effects of such methods, either as primary treatment for hypertension, or as an auxiliary treatment in combination with drug therapy to reduce dosage.[1-7] Walsh (1997) studied the effects of relaxation and biofeedback-assisted relaxation methods on blood pressure in 24 patients. He found that both methods significantly reduced blood pressure and that the two methods were not significantly different. Pulse wave was used in the latter study as biofeedback.[8]

Aivazyan (1988, Russian) studied 117 mildly hypertensive patients. After a course of treatment with biofeedback-assisted relaxation, the patients were followed for a period of twelve months.

The study found that biofeedback-assisted relaxation had the greatest therapeutic effect compared to other behavioral treatment techniques, and this effect was directly related to blood pressure prior to treatment and inversely related to the duration of hypertension.[9] The study used respiratory biofeedback.

Behavioral treatment methods applied to hypertensive and normal individuals may have physiologically different outcomes.

Mc Grady (1997) observed that cortisol levels decreased following biofeedback-assisted relaxation in hypertensive individuals, but remained unchanged in control subjects who had normal blood pressure.[10]

The present study aimed to assess the efficacy of relaxation and biofeedback-assisted relaxation methods in controlling hypertension. As seen in Tables 2 and 3, both methods induced significant reductions in blood pressure, anxiety and stress, and their effects were almost equal, with no significant difference between the two methods. Hence, it can be concluded that the method of biofeedback-assisted relaxation used in this study apparently had little effect in controlling hypertension. A look at the underlying physiopathology of hypertension and the mechanism of behavioral treatment methods indicates that such methods mediate their effect via reducing the activity of the sympathetic nervous system, increasing cortisol levels and reducing stress and anxiety; relaxation and biofeedback-assisted relaxation work through similar mechanisms, thus their combined use in the treatment of hypertension cannot be expected to have an additive effect.[6,11-13] However, biofeedback-assisted relaxation probably affects other aspects of therapy and its combined application with relaxation may increase the odds of success in controlling hypertension.

Canino (1994) studied the effect of relaxation and biofeedback-assisted relaxation on two groups of mildly hypertensive patients. Mean blood pressure decreased significantly in both groups after six months.[14] Buby (1990) found biofeedback-assisted relaxation to be effective in reducing blood pressure, but this reduction would be more prominent provided the subjects participated in at least three relaxation sessions prior to treatment with biofeedback-assisted relaxation.[15] Following a 10-session treatment course with biofeedback-assisted relaxation, Paran (1996) found that this method led to slight improvement in hypertension control, reduced dosage of antihypertensive drugs, and decreased anxiety in patients.[16] Biofeedback-assisted relaxation can be applied in different ways. This method is based on the theory of conditional learning as recognized in basic psychology. It involves instruction of the patient to recognize and control physiological processes. This is usually achieved by presenting the subject with visual or verbal feedback information on physiological parameters, such as blood pressure, heart rate, etc. Understanding this information, the patient gradually learns how to bring these physiological states under control.[17]

As clearly evident from the definition of biofeedback, various methods could be used to provide subjects with biofeedback information; among these mention can be made of visual and thermal methods, as well as those using electrocardiography or galvanic skin response, etc;[17] there is no limitation in developing more innovative methods.

Relaxation and biofeedback-assisted relaxation are both useful methods in decreasing blood pressure, and reducing the stress and anxiety of primary hypertensive patients.

These methods can be applied, both as primary antihypertensive treatments in cases of slight hypertension or as auxiliary treatment in combination with antihypertensive medications.

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