

YOGA, PRANAYAMA, THERMAL BIOFEEDBACK TECHNIQUES IN THE MANAGEMENT OF STRESS AND HIGH BLOOD PRESSURE

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The purpose of the study was to investigate the effectiveness of yoga relaxation, pranayama and thermal biofeedback techniques in the management of high blood pressure and stresses. The sample of the study consisted of 14 essential hypertensive patients. Seven of these patients underwent training in yoga and thermal biofeedback technique for a period of six months. Other seven patients served as comparison group. Results showed a significant reduction in the systolic blood pressure during treatment phases. Moderate reduction in the diastolic pressure was noticed, only when the thermal feedback was introduced. This also corresponded to significant reduction in the intake of anti-hypertensive drugs. Training in yoga and thermal biofeedback procedures were least effective in altering the perceptions associated with stressful experiences.

Recent findings in the field of medicine, physiology, psychology psycho-somatic medicine and other related studies (Million, Green Meagher, 1982) have shown that a person's life style including pattern of eating, smoking, taking alcohol, coping with everyday stresses, exercise, self-control plays an important role in health or illness. Role of stresses and the way individuals manage them have become predominant factors in the etiology of various diseases like cardiac heart diseases, cancer, sex related problems, headaches, backaches etc. The process of these diseases and its prognosis are also influenced by stresses, by coping patterns and various other personality factors.

Stress is defined best as a perceptual phenomenon arising from a comparison between the demand on the person and his ability to cope with it. An imbalance in this mechanism gives rise to the experience of stress and stress response. The strain response represents attempt at coping with the source of stress and this coping is both physiological

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and psychological. (Elevated blood pressure reflects one such somatic reaction to every day stresses.)

Yoga relaxation, pranayama, meditation and biofeedback procedures are some of the behavioural modes in ameliorating high blood pressure.

(Research evidence points out to the fact that, yoga techniques, specially savasana and breathing exercises have a positive effect in the reduction of blood pressure (Detey, 1975 ; Patel & North, 1973, 1975). Increased cardiac output, predominance of parasympathetic activity, thermo-regulatory efficiency with the yoga practices have been scientifically investigated (Udupa, 1975 ; Lakshikanthan, 1977 ; Selvamurthy et al., 1983). Biofeedback techniques are similar to yoga and they both basically involve regulation of psycho-physiological process. Heart, brain and vasculature are the three interconnected systems involved in the regulation of the arterial pressure. (Yoga techniques emphasising on the breathing process work on the respiratory system and in turn influence cardiac output, heart rate etc.) (Temperature feedback of the peripheral region aims to regulate the peripheral resistance) Even though these techniques are more a "somatic-oriented palliative" (Lazarus, 1974, 1975) ; they are holistic in their approach, because both the techniques mainly involve self-control and self-awareness. They aim to build up certain positive resources in the individual to withstand various emotional situations in life. (The present study aims to study the effectiveness of yogic relaxation, pranayama, and temperature feedback techniques in the management of high blood pressure and stresses.)

METHOD

(The sample of the study consisted of 14 essential hypertensive patients (seven in experimental group and seven in control group), attending outpatients at Hypertension Clinic, General Hospital, Madras.

They were diagnosed as essential hypertensives, by qualified physicians at the clinic. They were on anti-hypertensive drugs. This sample of patients ranging in age from 45 to 70 years, were free from any other abnormalities or pathological conditions. Initially 22 patients were selected satisfying all the criteria. Over a period of 9 months, 9 patients dropped out due to various reasons. 14 patients participated throughout the period of investigation.)

Tools of Investigation

Following tools were used in the collection of data

- (a) Case history
- (b) Blood pressure

- (c) Temperature monitoring
- (d) Stress questionnaire
- (e) Coping behaviour measure
- (f) Somatic symptom scale
- (g) Schedule of daily events, symptoms and medication intake

Case History

Here, the investigator gathered details, other than demographic, about onset of hypertension, present symptoms, family history, major life events, drugs taken, height and weight.

Blood Pressure

Systolic and diastolic BP of the patients were taken every week by the attending physician in the clinic. Sphygmomanometer was used to assess the blood pressure. BP was always taken in the same room and at the same time. Physicians checking the BP were unaware of the training programme. BP was taken during the baseline, therapeutic intervention and after the training period.

Temperature Monitoring

Digital temperature monitor and finger thermistors were used to record the peripheral temperature of the subjects undergoing therapy. Temperature was recorded during baseline, feedback sessions. This temperature feedback was used as an aid to relaxation process.

Stress Questionnaire

This questionnaire was constructed by the investigators for the purpose of the study. Items for the questionnaire were pooled from the presumptive stressful life events scale (PSLE) by Gurmeet Singh et al (1983). The questionnaire consisted of 52 items ranging from mild stresses (least affecting everyday affairs), moderate to severe stress (which affects the adjustment and efficiency of the person). Respondents not only said 'yes' or 'no' for their experiences of their stresses in past one year, but also they indicated their level of control over these negative situations. They indicated on a 3 point scale about complete, partial or no control over stressful situations. In the same questionnaire, they were asked to rate their reactions to these stressful situation on bi-polar adjectives. This questionnaire was tried out on a sample of 80 normal subjects. Test-retest reliability on a sample of 30 subjects was 0.96. And this questionnaire had a high content validity rating given by three judges.

Coping Behaviour Measure (Anne Jalowiec, 1980)

This questionnaire measured the coping patterns used in stressful situations. This consists of 40 items which indicate problem oriented or emotion oriented coping pattern as described by Lazarus and his colleagues. Coping pattern expressed by the individual on a 5 point scale can be rank ordered with respect to its frequency of preference. Test-retest reliability of the measure was 0.79. This scale was successfully used in Indian studies (Harinikumari, 1985).

Somatic Symptom Scale

This consisted of 30 items referring to various somatic ailments. This questionnaire was compiled by the investigators for the present research purpose. It evaluates the frequency of occurrence of symptoms. Test-retest reliability was 0.70. Content validity for the scale was empirically supported as items for the instrument was based on extensive review of earlier somatic symptom scales.

Schedule of Daily events, symptoms, medication intake

Group of patients attending the therapy sessions were asked to keep a structured record of the significant events, how they reacted to it and also the consequences of the events. They also recorded the symptoms they had experienced and the medicines taken by them for the day.

Procedure

The 14 hypertensive patients of this study were attending out-patient clinic at General Hospital, Madras. The investigator met each patient and with the help of clinicians gathered clinical reports. Each subject's case history was taken. Investigator briefed each patient about the study, and obtained the willingness to participate. The total sample of the subjects were randomly (odd and even number basis) assigned to experimental and control conditions. The subjects were also matched for sex, age, length of illness and socio-economic status.

(The first phase of the study consisted of baseline period, involved 7 weeks of BP assessment. The questionnaires were individually administered to each of the patients at the clinic. The responses to this questionnaire formed the pre-training or baseline data for the study.)

(In the second phase, all the patients who were assigned to training condition, were appraised briefly about the nature of training, time of sessions and all their doubts and reservations against therapy were

cleared. Seven essential hypertensive patients underwent the training in yoga asanas, pranayama and thermal biofeedback. Remaining seven patients served as comparison group.)

(The experimental group subjects practiced selected breathing techniques and asanas as taught by the first investigator, some of the postures were : Breathing with arm movement; Apanasana, Ekapada apanasana, extended exhalation, Shavasana, Shitali, Omkara and Nadishodhana pranayam were also taught. Thermal feedback was added in the 2nd phase of the treatment to aid yoga relaxation.) During the feedback session first five-ten minutes were pre-training self-control session where the subjects practiced to raise the finger temperature. 2nd Phase involved the feedback session. Where visual feedback of the finger temperature was given. Finally another self-control session of five- ten minutes were given. This enabled the patients to get used to the instrument and also enabled the investigators to obtain the baseline reading of finger temperature. (Altogether, 17 therapy sessions were given to each patient. These patients were met twice weekly and therapy was given for a period of 6 months.)

The control group patients were met once a week in the clinical setting to record their BP and to have general talk with them. They received same amount of attention as the experimental group subjects in the clinical setting.

(After the training sessions both the groups of patients completed all the questionnaires. The questionnaires were administered by another research worker who was unaware of the therapy programme. These questionnaires were administered individually three weeks after the completion of the training.)

DISCUSSION

(There was a significant reduction in the mean systolic pressure during relaxation phase, by 5.71 mmHg. Compared to baseline period, a decrease of 6.93 mmHg in SBP during feedback session was significant. Training in yoga, pranayama and thermal biofeedback was moderately effective in reducing systolic blood pressure.) However, the magnitude of reduction obtained in this investigation was smaller compared to the earlier studies (Patel & North, 1975; Krist & Engel, 1975 ; Benson et al, 1971, 1975).

Table 1

Average Systolic BP and Diastolic BP during Baseline and Treatment Phases (Trained Group)

	Baseline	Treatment I Yoga Alone	Treatment I TBF+Yoga	Mean Difference	't' Value
Mean SBP	154.08	148.32	147.14	-5.71	2.31 **
Mean DBP	102.50	99.32	97.44	-3.71	1.19 NS
				-5.05	1.91 **

(** : P < .01 level. * P < 0.5 level. NS : not significant)

Table 2

Average SBP and DBP of Trained and Untrained Group of Hypertensive Patients

	Trained Group	Untrained Group	Mean Difference	't' value
Mean SBP	149.36	152.16	+ 2.86	2.69 **
Mean DBP	99.68	100.12	+ 0.44	6.06 NS

(** : p < .01 level. N S : Not significant)

(The mean diastolic pressure reduced by -5.05 mmHg, during feedback phase, which was significant.) Again here, the magnitude of reduction was smaller.

(Yoga exercises involving breathing techniques and relaxation have their main effects on heart functions and higher control processes, which in turn influence vasculature.) The systolic pressure directly related to heart contractility seems to be more influenced by yoga exercises. Temperature feedback aids the patient to lower peripheral resistance. Thus, relaxation technique practiced by the patient helps him to lower sympathetic tone, resulting in peripheral dilation and increased skin temperature. This signal is feedback to the individual visually, thus, (the patient is trained to produce an "active" inhibition of normal sympathetic activity, which facilitates vaso-dilation) (Green et al., 1977). Diastolic pressure is indicative of peripheral resistance and is more related to the vasculature. (Temperature feedback training during relaxation, reduces peripheral resistance thus helps in lowering diastolic BP.)

(The findings in this investigation point out that yoga relaxation in conjunction with the thermal feedback helps in obtaining clinical improvement in the essential hypertensives.) Both the techniques are effective in reducing the blood pressure, but temperature feedback seems to be more effective in reducing diastolic blood pressure.

The trained group of patients did not differ significantly from untrained patients in their experiences of stresses and the affective associations related to them (Table 3).

Table 3

Mean Number of Stresses expressed by Trained and Untrained Group of Hypertensives

	<i>Trained Before</i>	<i>Group After</i>	<i>Untrained Before</i>	<i>Group After</i>	<i>t' value</i>
Mean Value	11.2	11.14	6.8	9.4	NS

NS : Not Significant

Level of Control over Stress Situation
(in terms of percentage)

	<i>Trained Group</i>		<i>Untrained Group</i>			<i>Chi-Square</i>	
	<i>Complete control</i>	<i>Partial control</i>	<i>No control</i>	<i>Complete control</i>	<i>Partial control</i>		<i>No control</i>
Before	10	65	65	2	23	50	0.61 NS
After	6	64	65	4	42	38	7.53 *

NS : Not significant * : P < 0.5

Negative Responses to Stress

	<i>Trained Before</i>	<i>Group After</i>	<i>Untrained Before</i>	<i>Group After</i>	<i>t' Value</i>
	18.28	13.71	8.57	15.42	NS

NS : Not significant

Similarly, the level of control experienced over stress situations did not improve significantly for hypertensive patients with therapy. However, there was a marked 'loss of control' experienced by untrained group on post test measures. Analysis of the case history of each patient revealed that the onset of hypertension is related

to major life events such as retirement, joblessness, financial loss, health problems, family conflicts etc. Analysis of daily events schedule showed that whenever there was a significant event at home, such as conflicts, worry over future, financial problems, marriage etc, it resulted in episodic rise in BP. The findings confirmed that stresses and strains play an important role in the onset of hypertension and episodic rise of BP (Hambling, 1955; Rahe et al, 1967).

After training in yoga, pranayama and thermal biofeedback, there was a marked shift in the coping preference towards problem oriented coping (Table 4). The emotionally oriented (or affective oriented) coping mechanism ranked by the trained group hypertensives are "Yoga, meditation and biofeedback" as a stress relief device and "Taking support of religion." These two strategies are palliative measure aimed at reducing distress associated with emotional situations. This finding confirms the views of Lazarus (1974) that taking action during stressful situations, fosters mastery and control over situations. Hence, problem oriented coping is more adaptive. The findings in this investigation reveals, that even though trained group of hypertensives had no control over stressful situations and were unable to manipulate the external situation they had taken recourse to stress relief devices relaxation, pranayama etc.

And this enabled them realise the need for more problem - orientated coping. Similarly, untrained group hypertensives in the light of their lack of control over situations, have been opting more and more of affective oriented coping as their effort is more towards emotional regulation. For them the stressful situations were more threatening and uncontrollable. Findings confirm that awareness of lack of control results in reappraisal of situations and tendency towards problem oriented coping efforts (Lazarus, 1974).

There was a significant decrease in the mean number of symptoms (-8) for trained group. The increase in somatic symptoms (6.42) for the untrained group of hypertensives was significant. The results are in line with the findings of Datey et al (1975) that training in yoga reduces somatic complaints. The nature of the symptoms reported by the hypertensive patients reflected the tension level in their body. They experienced very frequently, palpitations, breathlessness headache, fatigue, restlessness, insomnia, difficulty to relax etc. Subjective reports of the patients obtained after each therapy session and after the completion of training revealed that they all derived positive benefits from the therapy sessions.

They were found to be more 'alert', 'brisk', 'peaceful' after practice. These reports are in tune with other studies on yoga relaxation techniques (Patel & North, 1975, Blanchard et al, 1977).

This also supports the view that psychological intervention with

essential hypertensive patients have no deleterious effects (Blanchard, 1977).

Table 4

Coping Method most preferred by Trained and Untrained Group
(Based on Rank Preferences)

	<i>Trained Group</i>		<i>Untrained Group</i>	
	<i>Problem oriented coping</i>	<i>Affective oriented</i>	<i>Problem oriented</i>	<i>Affective oriented</i>
Before	5	16	6	5
After	8	2	4	8

'U' = 110 (P < 0.01)

Table 5

Mean Number of Somatic Symptoms reported by
Hypertensive Patients

<i>Trained Group</i>		<i>Untrained Group</i>	
Before	After	Before	After
16.7	8.71	9.42	13.85
Mean difference = -8		Mean difference = + 6.42	
't' value = 4.61 **		't' value = 3.23 **	

(** P < .01)

Total Frequency of Symptoms Reported

	<i>Trained Group</i>			<i>Untrained Group</i>		
	<i>High</i>	<i>Moderate</i>	<i>No Symptoms</i>	<i>High</i>	<i>Moderate</i>	<i>No Symptoms</i>
Before	13	103	94	28	38	141
After	10	51	149	97	40	56
Chi Square	24.6 **			7.16 **		

(P < .01 level)

Expectancy of the positive effect of yoga and pranayama practice might have had its influence, but they were not given any positive

suggestions about the therapy. They were not asked to discontinue the medicines but to keep them constant. The patients were not told about the benefit of asanas or breathing.

CONCLUSIONS

Yoga relaxation, pranayama and thermal biofeedback techniques are beneficial in the management of high blood pressure. They can be behavioural adjuncts to drug therapy. The effect of these is seen immediately at the physiological level. To achieve the maximum benefits of these techniques at the cognitive and at the personality structure, there is a need for longer duration of training, compliance with treatment instructions and a multi model coping skills training.

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