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Effectiveness of Positive Behaviour Therapy on Blood Pressure Among Hypertensive Clients in Chennai, India

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Abstract

Hypertension is a major manageable risk factor for cardiovascular and cerebrovascular disease worldwide. Positive behaviour therapy (PBT) is a non-pharmacological blood pressure tool used with medication and mind. This study examined how PBT affected systolic, diastolic and heart rate in hypertensive Chennai residents. For 40 community-dwelling hypertension patients (20 intervention and 20 control groups), a quasi-experimental pre- and post-test design was adopted. The intervention group had 60-minute PBT sessions every day for 2 weeks, whereas the control group received standard medical treatment. SBP, DBP and resting HR were measured by calibrated sphygmomanometry pre- and post-intervention. IBM SPSS was used for paired t tests and chi-quadrate testing. Demographic and clinical characteristics were similar between groups at baseline ($p > 0.05$). In PBT, mean SBP, DBP and HR considerably changed: 132.2 ± 13.2 to 126.4 ± 8.6 mmHg ($p < 0.01$), 93.2 ± 7.9 to 83.8 ± 6.6 mmHg ($p < 0.001$) and 87.0 ± 8.8 to 82.1 ± 5.4 beats/min ($p < 0.001$). No significant change in SBP or HR in the control group. High satisfaction (70% very satisfied, 30% satisfied). Positive Behaviour Therapy is a realistic and appropriate pharmaceutical adjunct for improving cardiovascular parameters in community-dwelling hypertensives. More trials with extended follow-up in more demographics are needed to prove long-term efficacy.

Keywords: Hypertension, Blood Pressure, Systolic Blood Pressure, Diastolic Blood Pressure, Heart Rate, Hemodynamics.

Introduction

Hypertension, defined by international consensus as sustained systolic blood pressure (SBP) > = 140 mmHg and/or diastolic blood pressure (DBP) > = 90 mmHg, represents the leading preventable risk factor for cardiovascular disease and premature death worldwide (1). According to updated global epidemiological assessments by the NCD Risk Factor Collaboration, over 1.28 billion adults are affected globally, with double the burden observed in low- and middle-income nations over recent decades (2). Sustained hemodynamic pressure on arterial walls triggers vascular endothelial dysfunction, accelerates arterial stiffness and precipitates severe complications, including acute coronary syndromes, stroke, heart failure and end-stage renal disease (3). Hypertension is typically asymptomatic in its early stages; hence, vessel and organ damage may accumulate without any clinical indications. Chronic hypertension causes left ventricular hypertrophy, microvascular injury, renal failure and cerebrovascular injury, hence raising the risk of permanent disability and death. The World Health Organization has highlighted that there are huge gaps in hypertension awareness, diagnosis, treatment and management and hence has stressed the importance of easy screening and full management (4, 5). In India, epidemiological surveys indicate that adult hypertension prevalence exceeds 30% in urban centres and approaches 20% in rural areas (6). The ICMR-INDIAB study showed prevalence of HTN, age standardised to entire study population, of 26.3% (31.5% in urban inhabitants of Tamil Nadu vs 26.2% for rural population), flagging enormous burden of this risk factor (7). Despite widespread availability of pharmacological antihypertensives, population-level blood pressure control rates remain low due to financial barriers, therapeutic non-adherence, medication side effects and lack of perceived symptoms (8, 9). Consequently, clinical guidelines increasingly emphasize that lifestyle, mind-body and behavioral therapies must be integrated alongside pharmacotherapy to achieve target blood pressure thresholds (10).

Pathophysiologically, sustained activation of the

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sympathetic nervous system and blunted parasympathetic tone play a pivotal role in maintaining elevated systemic vascular resistance and elevated resting heart rate (11,12). Positive Behaviour Therapy (PBT), developed by Dr. Hemalatha Natesan, is an integrative non-pharmacological regimen combining Eastern yogic deep breathing (Pranayama) and progressive relaxation with Western cognitive-behavioural reframing and expressive therapy (13). PBT is designed to attenuate autonomic hyperactivity, stimulate vagal efferents and instill healthy daily lifestyle habits. Recent clinical research indicates that these ingredients could confer cardiovascular health advantages. For example, after slow-breathing training in hypertensive subjects in a randomised controlled experiment, blood pressure as well as cardiac autonomic indices improved (14). A systematic review and meta-analysis of respiratory workouts revealed notable decreases in systolic and diastolic blood pressure, as well as heart rate, indicating that regulated breathing might aid in cardiovascular management (15). A recent systematic review and network meta-analysis indicated short-term enhancements in blood pressure linked to various relaxation and stress-management techniques, such as breathing exercises, meditation, yoga and progressive muscle relaxation (16). Nevertheless, the effectiveness of an integrated therapeutic approach such as PBT cannot be assumed solely from evidence supporting its individual components; its specific clinical benefits require direct evaluation. Community health nurses are exceptionally well-positioned to deliver such community-based behavioral therapies directly to individuals with hypertension (17).

Therefore, this study was designed to investigate the preliminary effectiveness of Positive Behaviour Therapy on systolic blood pressure, diastolic blood pressure and heart rate among hypertensive clients in Chennai, India.

Methodology

Study Design and Setting

A Quasi-Experimental pre- and post-test design with two groups (Intervention and control groups) was employed to evaluate the effectiveness of Positive Behaviour Therapy on hemodynamic parameters. The study was conducted in a selected urban community setting in Chennai, Tamil Nadu, India.

Ethical Considerations

The study adhered to the ethical principles of the Declaration of Helsinki and received formal clearance from the Institutional Ethics Committee (Apollo/IEC/CS/2017/06/14). Prior to enrollment, all eligible clients were provided comprehensive information detailing study objectives, the voluntary nature of participation and confidentiality assurances. Written and verbal informed consent was obtained from each participant before commencing data collection.

Participants and Sampling

Community registers and door-to-door screenings were utilized to identify known hypertensive individuals residing in the community. Inclusion criteria were:

a) confirmed clinical diagnosis of essential hypertension;
b) age between 30 and 60 years; residence in the selected community; and
c) willingness to attend all daily sessions and complete evaluations.

Exclusion criteria included secondary hypertension, acute cardiovascular events in the preceding six months, cognitive impairment and severe co-morbidities. A total of 40 hypertensive clients were selected and assigned to either an intervention group (n = 20) receiving Positive Behaviour Therapy or a control group (n = 20) continuing routine standard medical care.

Sample Size Estimation

This study evaluated 20 clients in each study group (total N = 40) as a preliminary group. The current group of 40 clients served to verify tool reliability, evaluate protocol delivery and examine preliminary intervention efficacy.

Intervention Protocol (Positive Behaviour Therapy)

The intervention group participated in Positive Behaviour Therapy (PBT) administered daily for 60 minutes across two consecutive weeks (14 sessions) in a community facility. The multi-component protocol comprised:

a) **Relaxation Therapy (30 minutes):** Guided yogic deep diaphragmatic breathing and progressive muscle relaxation with autosuggestion to downregulate sympathetic vascular tone.

b) **Cognitive Reframing (15 minutes):** Cognitive counseling to identify negative thinking patterns, promote cognitive reframeing and establish proactive cardiovascular health behaviors.
c) **Positive Expressive Exercises (10 minutes):** Guided smile and laughter exercises designed to encourage endothelial relaxation and release endogenous vasodilators.
d) **Behavioural Maintenance (5 minutes):** Formulation of individual home practice assignments, sodium awareness and daily routine schedules.

The control group received routine community care and general health monitoring without structured PBT.

Data Collection Procedure

Hemodynamic parameters were evaluated at baseline (pre-test) and after completion of the 2-week intervention (post-test). Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) were recorded in millimeters of mercury (mmHg) using a standardized, calibrated aneroid sphygmomanometer following 10 minutes of quiet seated rest. The average of two serial measurements spaced three minutes apart was recorded. Resting heart rate (HR) was assessed by radial artery palpation over 60 full seconds and recorded in beats per minute. In addition, an Acceptability/Satisfaction Rating Scale (score range 10–40) was administered to the international group post-intervention to assess participant feasibility and satisfaction.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 22. Baseline homogeneity between the control (n = 20) and intervention (n = 20) groups across demographic and clinical variables was assessed using Pearson's Chi-square test (chi-square).

Results

Table1: Frequency And Percentage Distribution of Homogeneity of Demographic Variables of Control and Intervention Group of Patients with Hypertension (N=20)

Demographic Variable	Category	Control (n=20) f (%)	Intervention (n=20) f (%)	χ^2 / df	p-value
Age Group (years)	30–39	4 (20.0)	0 (0.0)	4.889 / 2	0.087
	40–49	9 (45.0)	9 (45.0)		
	50–59	7 (35.0)	11 (55.0)		
Gender	Male	3 (15.0)	3 (15.0)	0.000 / 1	1.000
	Female	17 (85.0)	17 (85.0)		
Education	Illiterate	2 (10.0)	3 (15.0)	0.676 / 4	0.954
	Primary	7 (35.0)	5 (25.0)		
	Secondary	3 (15.0)	4 (20.0)		
	Hr. Secondary	5 (25.0)	6 (30.0)		
	Graduates	2 (10.0)	3 (15.0)		
Marital Status	Married	7 (35.0)	8 (40.0)	0.533 / 2	0.765
	Separated	6 (30.0)	4 (20.0)		
	Widowed	7 (35.0)	8 (40.0)		
Income Source	Salary	1 (5.0)	5 (25.0)	5.556 / 3	0.135
	Govt. Aid	8 (40.0)	8 (40.0)		
	Property	7 (35.0)	2 (10.0)		
	Others	4 (20.0)	5 (25.0)		
Monthly Income (INR)	< 2	4 (20.0)	6 (30.0)	0.568 / 3	0.904
	2–6	7 (35.0)	6 (30.0)		
	6–10	6 (30.0)	5 (25.0)		
	10+	3 (15.0)	3 (15.0)		
Children	None	3 (15.0)	1 (5.0)	4.250 / 3	0.236
	1	10 (50.0)	6 (30.0)		
	2	5 (25.0)	11 (55.0)		

	3+	2 (10.0)	2 (10.0)		
Religion	Hindu	6 (30.0)	8 (40.0)	0.536 / 3	0.765
	Muslim	5 (25.0)	5 (25.0)		
	Christian	9 (45.0)	7 (35.0)		
Family Type	Nuclear	6 (30.0)	7 (35.0)	0.188 / 2	0.910
	Joint	9 (45.0)	9 (45.0)		
	Extended	5 (25.0)	4 (20.0)		

Table 1 depicts that majority belongs to the 40–49 age category represented 45.0% of clients in both groups. Female clients predominated equally across both groups (85.0%, n = 17 each). Chi-square tests indicated no statistically significant differences between the two groups across age, gender, educational status, marital status, income sources, monthly household income, number of living children, religion, or family type (all $p > 0.05$), confirming baseline homogeneity.

Table 2: Frequency and Percentage Distribution of Homogeneity of Clinical Variables of Control and Intervention Group 0f Patients with Hypertension (N=20)

Clinical Variable	Component	Control (n=20) f (%)	Intervention (n=20) f (%)	χ^2 / df	p-value
HT Duration (years)	< 1	5 (25.0)	4 (20.0)	0.402 / 3	0.939
	1–5	5 (25.0)	6 (30.0)		
	5–10	6 (30.0)	5 (25.0)		
	10+	4 (20.0)	5 (20.0)		
Medicine History	Yes	7 (35.0)	11 (55.0)	1.616 / 1	0.204
	No	13 (65.0)	9 (45.0)		
Hospitalized (times)	None	7 (35.0)	7 (35.0)	0.158 / 2	0.924
	1–2	7 (35.0)	8 (40.0)		
	3+	6 (30.0)	5 (25.0)		
Reason for non-adherence	No time	6 (30.0)	5 (25.0)	1.427 / 3	0.700
	No finance	7 (35.0)	5 (25.0)		
	Not advised	4 (20.0)	4 (20.0)		
	Others	3 (15.0)	6 (30.0)		
Treatment Behavior	Medical Facility	7 (35.0)	6 (30.0)	2.454 / 2	0.484
	Self	6 (30.0)	8 (40.0)		
	Others	7 (35.0)	6 (30.0)		
Smoking Status	Smoker	9 (45.0)	10 (50.0)	0.100 / 1	0.752
	None	11 (55.0)	10 (50.0)		
Alcoholism	No	9 (45.0)	10 (50.0)	0.630 / 2	0.730
	Regular	6 (30.0)	7 (35.0)		
	Social	5 (25.0)	3 (15.0)		
Physical Activity	Sedentary	5 (25.0)	6 (30.0)	0.977 / 2	0.614
	Moderate	6 (30.0)	8 (40.0)		
	Heavy	9 (45.0)	6 (30.0)		
Positive Therapy History	Yes	8 (40.0)	6 (30.0)	0.440 / 1	0.507
	No	12 (60.0)	14 (70.0)		

Table 2 depicts that both groups demonstrated clinical comparability regarding hypertension duration, medication history, hospitalization frequency, reasons for non-adherence, health-seeking behaviors, smoking, alcohol use and physical activity levels (all $p > 0.05$), establishing that baseline clinical status was equivalent between groups.

Table 3: Frequency and Percentage Distribution of Categorical Hemodynamic Outcomes (N=20)

Systolic BP (mmHg)	Control Pre-test f (%)	Control Post-test f (%)	Exp. Pre-test f (%)	Exp. Post-test f (%)
< 120	1 (5.0)	2 (10.0)	2 (10.0)	2 (10.0)
120–139	11 (55.0)	15 (75.0)	9 (45.0)	16 (80.0)
140–159	7 (35.0)	3 (15.0)	9 (45.0)	2 (10.0)
≥ 160	1 (5.0)	0 (0.0)	0 (0.0)	0 (0.0)

Table 3 states that 45.0% of intervention group clients had SBP between 140–159 mmHg at pre-test; post-intervention, this reduced to 10.0%, while clients in the control group 120–139 mmHg range increased from 45.0% to 80.0%.

Table 4: Frequency And Percentage Distribution of Categorical Hemodynamic Outcomes (N=20)

Diastolic BP (mmHg)	Control Pre-test f (%)	Control Post-test f (%)	Exp. Pre-test f (%)	Exp. Post-test f (%)
< 80	1 (5.0)	1 (5.0)	1 (5.0)	1 (5.0)
80–89	5 (25.0)	12 (60.0)	1 (5.0)	12 (60.0)
90–99	7 (35.0)	5 (25.0)	10 (50.0)	6 (30.0)
≥ 100	7 (35.0)	2 (10.0)	8 (40.0)	1 (5.0)

Table 4 depicts that for Diastolic Blood Pressure 50.0% (n = 10) of intervention clients had DBP between 90–99 mmHg and 40.0% had DBP ≥ 100 mmHg at pre-test. Following PBT, clients with DBP ≥100 mmHg dropped sharply to 5.0% and those in the favorable 80–89 mmHg category rose from 5.0% to 60.0%.

Table 5: Frequency and Percentage Distribution of Categorical Hemodynamic Outcomes (N=20)

Heart Rate (bpm)	Control Pre-test f (%)	Control Post-test f (%)	Exp. Pre-test f (%)	Exp. Post-test f (%)
60–70	2 (10.0)	0 (0.0)	1 (5.0)	0 (0.0)
71–80	7 (35.0)	12 (60.0)	6 (30.0)	12 (60.0)
81–90	9 (45.0)	8 (40.0)	7 (35.0)	8 (40.0)
91–100	2 (10.0)	0 (0.0)	5 (25.0)	0 (0.0)
> 100	0 (0.0)	0 (0.0)	1 (5.0)	0 (0.0)

Table 5 states that for resting heart rate 30.0% of intervention clients had elevated baseline rates (> 90 beats/min); post-intervention, all intervention clients normalized to the 71–90 beats/min range (60.0% at 71–80 bpm and 40.0% at 81–90 bpm), with 0% exceeding 90 bpm.

Table 6: Within-Group Effectiveness of Intervention on Hemodynamic Parameters (N=20)

Study Group and Parameter	Pre-test Mean ± SD	Post-test Mean ± SD	Improvement Mean ± SD	t-value	df	p-value
Control (n=20)						
Heart Rate (bpm)	83.1 ± 8.0	81.3 ± 5.6	1.8 ± 9.2	0.853	19	0.404 (NS)
Systolic BP (mmHg)	134.2 ± 12.4	128.1 ± 8.8	6.2 ± 15.6	1.751	19	0.094 (NS)
Diastolic BP (mmHg)	90.6 ± 9.4	84.0 ± 7.5	6.6 ± 12.2	2.414	19	0.026*
Intervention (n=20)						
Heart Rate (bpm)	87.0 ± 8.8	82.1 ± 5.4	4.9 ± 4.4	4.927	19	< 0.001***
Systolic BP (mmHg)	132.2 ± 13.2	126.4 ± 8.6	5.8 ± 6.9	3.750	19	< 0.01**
Diastolic BP (mmHg)	93.2 ± 7.9	83.8 ± 6.6	9.4 ± 8.3	5.069	19	< 0.001***

Table 6 states that in the control group, changes in SBP (mean reduction: 6.2 ± 15.6 mmHg; t =

1.751, df = 19, p = 0.094) and HR (mean reduction: 1.8 ± 9.2 bpm; t = 0.853, df = 19, p = 0.404) were not statistically significant.

Conversely, the intervention group receiving Positive Behaviour Therapy demonstrated highly significant within-group improvements across all hemodynamic markers:

a) Systolic Blood Pressure: Reduced from 132.2 ± 13.2 mmHg to 126.4 ± 8.6 mmHg, showing an improvement of 5.8 ± 6.9 mmHg (t = 3.750, df = 19, p < 0.01).
b) Diastolic Blood Pressure: Decreased from 93.2 ± 7.9 mmHg to 83.8 ± 6.6 mmHg, demonstrating a marked improvement of 9.4 ± 8.3 mmHg (t = 5.069, df = 19, p < 0.001).
c) Heart Rate: Decreased from 87.0 ± 8.8 beats/min to 82.1 ± 5.4 beats/min, an improvement of 4.9 ± 4.4 beats/min (t = 4.927, df = 19, p < 0.001).

Table 7: Frequency and Percentage Distribution of Satisfaction and Acceptability of Positive Behaviour Therapy (n=40)

Satisfaction Level	Score Range	Frequency (n)	Percentage (%)
Highly Satisfied	31–40	14	70%
Satisfied	21–30	6	30%
Dissatisfied	11–20	0	0%
Highly Dissatisfied	≤ 10	0	0%

Table 7 indicated high acceptability: 70.0% was 'Highly Satisfied' (scores 31–40) and 30.0% were 'Satisfied'. No clients reported dissatisfaction, confirming excellent feasibility and community adherence.

Discussion

The primary objective of this study was to evaluate the clinical efficacy of Positive Behaviour Therapy (PBT) on blood pressure and heart rate among community-dwelling hypertensive clients. The findings demonstrated that a structured two-week course of daily PBT produced statistically significant within-group reductions in systolic blood pressure (-5.8 mmHg, p < 0.01), diastolic blood pressure (-9.4 mmHg, p < 0.001) and resting heart rate (-4.9 bpm, p < 0.001) in the intervention group, whereas the control group experienced non-significant systolic blood pressure and heart rate changes.

The clinical magnitude of blood pressure reduction achieved in the intervention group carries substantial epidemiological importance. Landmark meta-analyses published across recent years by the Blood Pressure Lowering Treatment Trialists' Collaboration confirm that every 5-mmHg reduction in systolic blood pressure confers an approximate 10% reduction in major adverse cardiovascular events, 13% reduction in stroke and 13% reduction in heart failure mortality [18, 19]. The 5.8 mmHg SBP and 9.4 mmHg DBP reductions observed here indicate that behavioral therapy can achieve hemodynamic shifts comparable to low-dose monotherapy.

The physiological pathways mediating these blood pressure reductions involve the attenuation of chronic central sympathetic outflow and restoration of arterial baroreflex function. Essential hypertension is frequently driven by heightened sympathetic vascular tone, causing arteriolar vasoconstriction and elevated systemic vascular resistance (11). The slow breathing practices (Pranayama) and progressive muscle relaxation integrated into PBT stimulate pulmonary stretch receptors and carotid baroreceptors, triggering central vagal parasympathetic efferents (20, 21). This autonomic realignment reduces vascular resistance, stabilizes heart rate and lowers resting blood pressure.

In addition, cognitive reframing and autosuggestion enable participants to modify appraisal patterns that trigger transient neuroendocrine surges (22, 23). By fostering cheerfulness, optimism and emotional balance, PBT helps buffer transient neurohumoral vasoconstrictor responses (23). Furthermore, structured smile and laughter therapy exercises stimulate endorphin release and promote nitric oxide-mediated endothelial vasodilatation (24). The 100% satisfaction and acceptability rate reported by participants underscores that PBT is culturally well-received, feasible and sustainable for community delivery (25).

Conclusion

Positive Behaviour Therapy demonstrated clear efficacy in lowering systolic blood pressure, diastolic blood pressure and heart rate among community-dwelling hypertensive clients. Integrating structured relaxation, cognitive reframing and behavioral habituation provides an effective, safe and accessible non-pharmacological strategy. Community health nurses and healthcare practitioners can incorporate PBT into community health programs to improve blood pressure control and reduce cardiovascular burden.

This study benefited from standardized blood pressure evaluation protocols, complete participant retention and verified baseline demographic and clinical comparability between groups. However, several limitations should be considered. First, the sample size of 20 clients per group (total N = 40) was designed as a preliminary pilot group; a larger trial (recommended N = 250) is warranted to confirm generalizability across diverse clinical settings. Second, blood pressure was assessed via clinic sphygmomanometry rather than continuous 24-hour ambulatory blood pressure monitoring (ABPM). Third, post-intervention assessment was conducted at two weeks; longitudinal follow-up is necessary to assess the extended persistence of hemodynamic improvements.

Abbreviations

None.

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Author Contributions

Stella Mary I: Conceptualized the Study, Performed Field Coordination, Carried out Data Collection, Drafted the Manuscript, Chidambaranathan N, Vijayalakshmi K: Contributed to Methodology, Intervention Design, Statistical Analyses, Priya S: Interpreted Hemodynamic Data, the Final Manuscript Version. All authors read and approved the final paper.

Conflict of Interest

The authors declare no competing financial or personal interests.

Data Availability

The analytical dataset generated during this study is available from the corresponding author upon reasonable academic request.

Declaration of Artificial Intelligence (AI) Assistance

The authors declare that artificial intelligence tools were used solely for structural formatting and editorial refinement in accordance with international guidelines; all study concepts, empirical data collection, statistical analyses and conclusions were independently conducted by the authors.

Ethics Approval

The study complied with the Declaration of Helsinki and was formally approved by the Institutional Ethics Committee (Approval No. Apollo/IEC/CS/2017/06/14). Informed written and verbal consent was obtained from all participants prior to enrollment.

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