



AN EXPERIMENTAL STUDY ON THE IMPACT OF BREATHING TECHNIQUES ON PSYCHOLOGICAL PARAMETERS AMONG HYPERTENSIVE INDIVIDUALS

Ms.Sriharini A, Ms.Rajaswathy R,

Student, Teacher

Department of Psychology,

Rathinam College of Arts and Science (Autonomous), Coimbatore, Tamil Nadu

ABSTRACT

Hypertension, also known as high or raised blood pressure, is a condition in which the force of blood against the artery walls is consistently too high. This study is to examine the effectiveness of Diaphragmatic Breathing and STOP Mindfulness Technique in reducing systolic and diastolic blood pressure and perceived stress among hypertensive patients. The population includes hypertensive patients of age 40 to 60 who has continuous rise in blood pressure due to prolonged stress. Diaphragmatic breathing and STOP mindfulness technique, both are breathing exercise which helps to maintain the stress, blood pressure, anxiety and so on. The aim of the study is to compare the effectiveness of Diaphragmatic breathing versus STOP mindfulness technique among hypertensive patients. Using experimental research design, 50 hypertensive patients were selected through purposive random sampling and divided into 2 experimental groups. Both groups undergoes 4 weeks mindfulness program with 2 different techniques for each. Standardized tools like Perceived Stress Scale and Brief Resilience Scale along with blood pressure will be administered. During the period of intervention weekly reviews been done along with direct observation. The result shows that there is a significant difference in reduction of blood pressure among hypertensive patients using non- pharmacological interventions like diaphragmatic breathing and STOP- mindfulness technique.

Key words: *blood pressure, hypertensive patients, diaphragmatic breathing, STOP mindfulness technique.*

INTRODUCTION

Hypertension is one of the most prevalent non-communicable diseases worldwide and is considered a major risk factor for cardiovascular morbidity and mortality. It is characterized by persistently elevated arterial blood pressure levels that can lead to severe complications if left untreated. Hypertension is often referred to as a “silent killer” because individuals may remain asymptomatic for long periods while progressive damage occurs in vital organs such as the heart, brain, kidneys, and blood vessels (World Health Organization [WHO], 2023). Persistent elevation in blood pressure significantly increases the risk of cardiovascular diseases including coronary artery disease, stroke, myocardial infarction, heart failure, and kidney dysfunction (Whelton et al., 2018). Due to rapid urbanization, lifestyle changes, increased psychological stress, and aging populations, the prevalence of hypertension has increased dramatically in both developed and developing countries (Mills et al., 2020).

Blood pressure refers to the force exerted by circulating blood on the walls of arteries as the heart pumps blood throughout the body. It is expressed using two measurements: systolic blood pressure and diastolic blood pressure. Systolic blood pressure indicates the pressure exerted when the heart contracts, whereas diastolic blood pressure represents the pressure when the heart relaxes between beats. According to international clinical guidelines, hypertension is diagnosed when systolic blood pressure is consistently equal to or greater than 140 mmHg and/or diastolic blood pressure is equal to or greater than 90 mmHg (Whelton

et al., 2018). Persistent hypertension can lead to structural changes in blood vessels and impair the functioning of vital organs, making early diagnosis and appropriate management essential.

Globally, hypertension affects more than one billion individuals and contributes significantly to cardiovascular disease burden. The World Health Organization (2023) reports that nearly half of adults with hypertension remain unaware of their condition. In India, hypertension has emerged as a major public health concern affecting both urban and rural populations. Studies estimate that approximately one-third of the adult population in India suffers from hypertension, with slightly higher prevalence in urban areas due to sedentary lifestyles, unhealthy dietary habits, and increased stress levels (Gupta & Xavier, 2018). Despite advancements in treatment, many individuals remain undiagnosed or inadequately treated, which increases the risk of severe complications.

Hypertension is considered a multifactorial condition influenced by genetic, environmental, behavioral, and psychological factors. It is generally classified into primary (essential) hypertension and secondary hypertension. Primary hypertension accounts for nearly 90–95% of cases and develops gradually without a single identifiable cause (Carretero & Oparil, 2000). Several risk factors contribute to the development of primary hypertension, including obesity, high salt intake, lack of physical activity, smoking, alcohol consumption, and poor dietary habits (Whelton et al., 2018). Secondary hypertension, on the other hand, occurs due to identifiable medical conditions such as kidney disease, endocrine disorders, or the use of certain medications.

PERCEIVED STRESS

Among the various factors influencing hypertension, psychological stress has gained considerable attention as an important contributor. Stress triggers physiological responses through activation of the sympathetic nervous system and the hypothalamic–pituitary–adrenal (HPA) axis. This response results in the release of stress hormones such as adrenaline and cortisol, which increase heart rate and blood pressure as part of the body’s natural “fight-or-flight” response (McEwen, 2007). Although this reaction is beneficial in short-term situations, chronic stress may lead to sustained physiological activation and persistent elevation in blood pressure.

The concept of perceived stress plays a crucial role in understanding the relationship between psychological stress and hypertension. Perceived stress refers to the extent to which individuals evaluate situations in their lives as stressful or overwhelming. Individuals with higher perceived stress levels tend to exhibit greater cardiovascular reactivity, which may increase the likelihood of developing hypertension (Cohen et al., 1983). Therefore, interventions aimed at reducing perceived stress may contribute to improved blood pressure control among hypertensive individuals.

RESILIENCE

Another psychological construct that has gained importance in health research is resilience. Resilience refers to the ability of individuals to adapt positively to stress and adversity while maintaining psychological well-being. Individuals with higher resilience levels tend to demonstrate better coping strategies and lower vulnerability to stress-related health problems (Connor & Davidson, 2003). In the context of hypertension, resilience may act as a protective factor that helps individuals manage stress more effectively and reduce its physiological impact on cardiovascular functioning.

THEORETICAL PERSPECTIVES

Several theoretical models help explain the relationship between stress, coping, and health outcomes. The Stress and Coping Theory proposed by Lazarus and Folkman (1984) suggests that stress arises when individuals perceive environmental demands as exceeding their coping resources. According to this theory, individuals evaluate stressors through cognitive appraisal and adopt coping strategies to manage them. Ineffective coping mechanisms may lead to chronic stress and physiological consequences such as increased blood pressure.

Another important theoretical perspective is Hans Selye’s General Adaptation Syndrome, which describes the body’s response to stress in three stages: alarm, resistance, and exhaustion (Selye, 1956). During the alarm stage, the body activates physiological mechanisms such as increased heart rate and blood pressure. If stress persists, the body enters the resistance stage where it attempts to adapt to the stressor. Prolonged exposure to stress eventually leads to the exhaustion stage, during which the body’s adaptive resources become depleted and the risk of stress-related diseases such as hypertension increases.

NON-PHARMACOLOGICAL INTERVENTION

In addition to pharmacological treatments, non-pharmacological interventions play an important role in the management of hypertension. Lifestyle modifications including regular physical activity, healthy diet, weight control, and stress management have been widely recommended as part of comprehensive hypertension treatment (Whelton et al., 2018). Relaxation techniques, breathing exercises, meditation, and mindfulness

practices have gained increasing attention as effective strategies for reducing stress and improving cardiovascular health.

DIAPHRAGMATIC BREATHING

One widely used relaxation technique is diaphragmatic breathing, also known as deep breathing or abdominal breathing. This technique involves slow and controlled breathing using the diaphragm rather than shallow chest breathing. During diaphragmatic breathing, the abdomen expands while inhaling and contracts during exhalation. This breathing pattern stimulates the parasympathetic nervous system, which promotes relaxation and reduces physiological stress responses. Research indicates that diaphragmatic breathing can improve autonomic nervous system balance, reduce heart rate, and lower blood pressure levels (Hopper et al., 2019).

STOP-MINDFULNESS TECHNIQUE

Another promising approach for stress reduction is mindfulness-based intervention. Mindfulness refers to the practice of maintaining awareness of the present moment without judgment. Mindfulness techniques encourage individuals to observe their thoughts, emotions, and bodily sensations with acceptance and awareness (Kabat-Zinn, 2003). One simple and practical mindfulness strategy is the STOP technique, which involves stopping the current activity, taking a deep breath, observing internal experiences, and proceeding with greater awareness. This technique helps individuals pause and respond more effectively to stressful situations.

Mindfulness-based interventions have been shown to reduce stress, improve emotional regulation, and promote psychological well-being. Studies suggest that mindfulness practices may also contribute to improved cardiovascular health by reducing sympathetic nervous system activity and enhancing parasympathetic regulation (Loucks et al., 2015).

Although previous research has demonstrated the benefits of breathing exercises and mindfulness interventions individually, limited studies have compared these approaches while simultaneously examining psychological variables such as perceived stress and resilience. Therefore, the present study aims to evaluate the effectiveness of diaphragmatic breathing and the STOP mindfulness technique in reducing blood pressure among hypertensive patients using measures of perceived stress and resilience.

REVIEW OF LITERATURE

Several studies have examined the relationship between psychological stress and hypertension. Spruill (2010) reviewed the role of psychosocial stress in the development of hypertension and reported that chronic exposure to stress can contribute to sustained increases in blood pressure. The study highlighted that stress activates the sympathetic nervous system and increases the secretion of stress hormones, which may lead to long-term cardiovascular changes. Research has also explored the impact of perceived stress on health outcomes. Cohen et al. (1983) developed the Perceived Stress Scale to measure the degree to which individuals perceive life situations as stressful. Their findings indicated that individuals with higher perceived stress levels tend to experience greater psychological distress and physiological reactivity, which may contribute to cardiovascular problems such as hypertension.

The concept of resilience has also been widely studied in relation to health outcomes. Connor and Davidson (2003) developed the Connor-Davidson Resilience Scale to assess resilience levels in individuals exposed to stress. Their research demonstrated that higher resilience levels were associated with better coping abilities and reduced vulnerability to stress-related disorders. Several studies have investigated the effectiveness of diaphragmatic breathing exercises in improving cardiovascular health. Hopper et al. (2019) conducted a systematic review examining the impact of diaphragmatic breathing on stress and physiological responses. The review found that diaphragmatic breathing significantly reduced heart rate, cortisol levels, and blood pressure. The authors concluded that breathing exercises can promote relaxation and improve autonomic regulation.

Similarly, Ma et al. (2017) examined the effects of diaphragmatic breathing on stress and emotional regulation. Their findings indicated that slow breathing exercises reduced negative emotions and improved physiological relaxation responses, suggesting potential benefits for individuals experiencing stress-related health problems. Mindfulness-based interventions have also been widely studied in relation to hypertension. Hughes et al. (2013) conducted a randomized controlled trial to evaluate the effectiveness of mindfulness-based stress reduction among individuals with prehypertension. The results showed significant reductions in systolic and diastolic blood pressure among participants who completed the mindfulness intervention.

Another study by Loucks et al. (2015) reviewed the relationship between mindfulness and cardiovascular disease risk. The authors reported that mindfulness practices may improve self-regulation, reduce stress, and encourage healthy lifestyle behaviors, which collectively contribute to improved cardiovascular health. Research has also examined the combined effects of breathing and mindfulness techniques. Park and Han (2017) investigated the effects of meditation and breathing exercises on blood pressure responses. Their

findings indicated that both techniques improved autonomic nervous system regulation and contributed to reductions in blood pressure levels.

Overall, the reviewed literature suggests that psychological stress plays a significant role in the development and progression of hypertension. Studies also indicate that diaphragmatic breathing and mindfulness practices can effectively reduce stress and improve cardiovascular functioning. However, limited research has compared these techniques while also examining psychological variables such as perceived stress and resilience. Therefore, further research is needed to evaluate the comparative effectiveness of diaphragmatic breathing and the STOP mindfulness technique in reducing blood pressure among hypertensive patients.

RESEARCH GAP

Hypertension is a major global health concern and a significant contributor to cardiovascular diseases and premature mortality. Although pharmacological treatments are widely used to manage hypertension, many individuals continue to experience uncontrolled blood pressure due to lifestyle factors and psychological stress (Mills et al., 2020). Stress has been identified as an important factor influencing the development and progression of hypertension because prolonged stress activates physiological responses such as the sympathetic nervous system and the hypothalamic–pituitary–adrenal axis, which can result in sustained elevation of blood pressure (McEwen, 2007). Consequently, non-pharmacological approaches that focus on stress management are increasingly recognized as important components in the treatment of hypertension. Previous research has shown that relaxation techniques such as diaphragmatic breathing can help regulate the autonomic nervous system and promote relaxation, thereby reducing blood pressure levels (Hopper et al., 2019). Similarly, mindfulness-based practices have been reported to improve emotional regulation and reduce psychological stress, which may contribute to better cardiovascular functioning (Loucks et al., 2015). However, most studies have examined breathing techniques and mindfulness interventions separately, and limited research has compared their effectiveness in reducing blood pressure. In addition, psychological factors such as perceived stress and resilience have received relatively little attention in hypertension intervention studies. Higher perceived stress has been associated with increased cardiovascular risk, whereas resilience may help individuals cope more effectively with stress and protect against adverse health outcomes (Cohen et al., 1983; Connor & Davidson, 2003). Despite their importance, few studies have examined how stress-reduction techniques influence both physiological outcomes and psychological variables simultaneously. Therefore, there is a need for research that compares the effectiveness of diaphragmatic breathing and the STOP mindfulness technique in reducing blood pressure among hypertensive patients while also assessing changes in perceived stress and resilience. Such research may provide valuable insights into simple and accessible strategies that can support the comprehensive management of hypertension.

RESEARCH METHODOLOGY

AIM

The aim of the present study is to examine the effectiveness of diaphragmatic breathing versus the STOP mindfulness technique in reducing blood pressure among hypertensive patients using perceived stress and resilience scales.

OBJECTIVES

- To evaluate the effectiveness of diaphragmatic breathing in reducing blood pressure among hypertensive patients.
- To examine the effectiveness of the STOP mindfulness technique in reducing blood pressure among hypertensive patients
- To compare the effectiveness of diaphragmatic breathing and STOP mindfulness technique in reducing blood pressure, perceived stress, and improving resilience among hypertensive patients.

HYPOTHESIS

H1- There will be a significant difference between diaphragmatic breathing and STOP mindfulness techniques in reducing blood pressure among hypertensive patients.

H2- The interventions will significantly reduce perceived stress and improve resilience levels among hypertensive patients.

VARIABLES

Independent Variables

- Diaphragmatic breathing technique
- STOP mindfulness technique
- Perceived stress

Dependent Variables

- Blood pressure levels (Systolic and Diastolic)
- Resilience
- Heart rate

TOOLS

- **Perceived Stress Scale** developed by Sheldon Cohen and his colleagues Thomas Kamarck and Raymond Mermelstien (1983)(short version 10 items)
- **Brief Resilience Scale** developed by Burce.W.Smith, Jeanne Dalen, Kathryn Wiggins, Erin Tooley, Paulette Christopher, and Jennifer Bernard (2003)(6 items)

SAMPLE METHIOD

- Purposive Sampling method
- Sample size – 50
- Population – hypertensive patients

RESEARCH DESIGN

- Quantitative research
- Experimental intervention study
- Quasi- experimental study(comparative study)

INTERVENTION

- Pre test
- Group1- diaphragmatic breathing
- Group2 – STOP mindfulness technique
(4 weeks- weekly once review as daily homework)
- Post test

INCLUSIVE CRITERIA

Participants will be included in the study if they:

- Are diagnosed with hypertension.
- Are aged between 30 and 60 years.
- Are willing to participate in the study.
- Are able to understand and follow the instructions of the interventions.
- Provide informed consent for participation.

EXCLUSIVE CRITERIA

Participants will be excluded if they:

- Have severe cardiovascular complications or other serious medical conditions.
- Are currently practicing regular meditation, yoga, or breathing techniques.
- Have severe psychiatric disorders.
- Are unable to participate in the intervention sessions.

PROCEDURE

First, permission will be obtained from the relevant authorities to conduct the study. Participants who meet the inclusion criteria will be selected using purposive sampling and informed consent will be obtained from them. The participants will then be divided into two groups: one group will receive diaphragmatic breathing training and the other group will receive training in the STOP mindfulness technique. Before the intervention, a pre-test assessment will be conducted to measure blood pressure, heart rate, perceived stress, and resilience using the sphygmomanometer, Perceived Stress Scale (PSS), and Brief Resilience Scale. After the baseline assessment, participants will receive training in their respective interventions. The diaphragmatic breathing

group will be guided to practice slow and deep breathing using the diaphragm, while the second group will be trained to practice the STOP mindfulness technique, which involves stopping, taking a breath, observing internal experiences, and proceeding with awareness. Participants will be asked to practice the techniques regularly for a specified period. After completing the intervention period, a post-test assessment will be conducted using the same tools to measure any changes in blood pressure, perceived stress, and resilience. The pre-test and post-test scores will then be compared to evaluate the effectiveness of the intervention

RESULT

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
HR	.095	50	.200*	.970	50	.236
DI	.158	50	.003	.943	50	.018
SY	.193	50	.000	.937	50	.010
PS	.088	50	.200*	.972	50	.282
BR	.112	50	.162	.948	50	.029

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

STOP- MINDFULNESS TECHNIQUE

Paired Samples Test

Paired Differences

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	HR - HR2	-11.32000	19.00596	3.80119	-19.16528	-3.47472	-2.978	24	.007
Pair 2	DI - DI2	.12000	18.55918	3.71184	-7.54085	7.78085	.032	24	.974
Pair 3	SY - SY2	5.00000	18.34848	3.66970	-2.57388	12.57388	1.363	24	.186
Pair 4	PS - PS2	.92000	5.42310	1.08462	-1.31855	3.15855	.848	24	.405
Pair 5	BR - BR2	-.14680	1.26158	.25232	-.66755	.37395	-.582	24	.566

DIAPHRAGMATIC BREATHING

Paired Samples Test

Paired Differences

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	HR - HR2	5.84000	9.71545	1.94309	1.82966	9.85034	3.006	24	.006
Pair 2	DI - DI2	10.20000	13.72042	2.74408	4.53649	15.86351	3.717	24	.001
Pair 3	SY - SY2	1.36000	3.40196	.68039	-.04426	2.76426	1.999	24	.057
Pair 4	PS - PS2	12.56000	7.34892	1.46978	9.52651	15.59349	8.545	24	.000
Pair 5	BR - BR2	-1.60800	1.25667	.25133	-2.12673	-1.08927	-6.398	24	.000

DISCUSSION

The present study was conducted to examine the effectiveness of breathing techniques on physiological parameters among individuals with hypertension. Hypertension is one of the most common cardiovascular conditions and is associated with increased risk of heart disease, stroke, and other health complications. In recent years, non-pharmacological interventions such as relaxation training, meditation, and breathing exercises have gained importance as supportive approaches for managing blood pressure and improving overall physiological functioning. In the present study, variables such as heart rate, systolic blood pressure, diastolic blood pressure, pulse rate, and breathing rate were measured before and after the breathing technique intervention to determine its effectiveness. The analysis of the collected data using paired sample statistics and paired sample t-tests revealed differences between the pre-intervention and post-intervention values of the physiological parameters. These findings suggest that the breathing technique intervention had an observable impact on the participants' cardiovascular and respiratory functioning. Breathing techniques are known to influence the autonomic nervous system by enhancing parasympathetic activity and reducing sympathetic arousal. This physiological shift promotes relaxation and helps regulate bodily functions such as heart rate and blood pressure.

The results indicated improvement in heart rate levels following the intervention. A reduction or stabilization of heart rate after practicing breathing exercises may occur because slow and controlled breathing improves vagal tone and reduces physiological stress responses. When individuals practice deep and rhythmic breathing, oxygen exchange in the body becomes more efficient, which can lead to improved circulation and cardiovascular stability. Similarly, changes were observed in systolic and diastolic blood pressure following the intervention. Breathing techniques may contribute to the reduction of blood pressure by decreasing peripheral vascular resistance and improving autonomic regulation. Slow breathing also helps in reducing stress-related hormonal activity, such as the release of adrenaline and cortisol, which are known to elevate blood pressure levels. Therefore, the reduction observed in blood pressure parameters may indicate the positive role of breathing techniques in supporting hypertension management.

The findings also showed variation in pulse rate and breathing rate after the intervention. Practicing structured breathing exercises can improve respiratory control and promote calm physiological functioning. Slow breathing patterns encourage deeper inhalation and exhalation, which enhances lung efficiency and oxygen supply to the body. This may lead to better regulation of pulse and breathing rhythm, contributing to overall physiological balance. The results of the present study are consistent with earlier research findings that highlight the effectiveness of breathing exercises in improving cardiovascular health. Many studies have reported that relaxation-based interventions, including breathing practices, can reduce stress levels, lower blood pressure, and improve heart rate variability. Therefore, the findings of this study further support the use of breathing techniques as a beneficial complementary strategy in the management of hypertension.

However, certain limitations should be considered when interpreting the results. The study was conducted with a limited sample size and over a relatively short duration of intervention, which may influence the extent to which the findings can be generalized to a larger population. Additionally, factors such as lifestyle habits, medication usage, diet, and physical activity were not strictly controlled during the study period and may have influenced the physiological outcomes. Despite these limitations, the study provides useful evidence that breathing techniques can have a beneficial effect on physiological parameters associated with hypertension. Regular practice of such techniques may serve as a simple, cost-effective, and accessible approach to promote relaxation and support cardiovascular health. Future studies with larger sample sizes, longer intervention periods, and controlled experimental designs are recommended to further explore the long-term effectiveness of breathing techniques in hypertension management.

CONCLUSION

The present study was carried out to evaluate the effectiveness of breathing techniques on physiological parameters among individuals with hypertension. The analysis of the data indicated differences in variables such as heart rate, systolic blood pressure, diastolic blood pressure, pulse rate, and breathing rate before and after the intervention. These findings suggest that practicing breathing techniques may contribute to improvements in cardiovascular and respiratory functioning. Controlled breathing exercises are known to promote relaxation and enhance the balance of the autonomic nervous system, which may help in regulating blood pressure and heart rate. Overall, the results of the study indicate that breathing techniques can be considered a useful non-pharmacological approach in the management of hypertension. Regular practice of such techniques may support physiological stability and improve overall well-being. Although the findings are promising, further research with larger samples and longer intervention periods is recommended to confirm the effectiveness of breathing techniques and to better understand their role in promoting cardiovascular health.

LIMITATIONS

Small Sample Size - The study included a limited number of participants, which may reduce the ability to generalize the findings to a larger population of individuals with hypertension.

Short Duration of Intervention - The breathing technique was practiced for a relatively short period, which may not fully reflect the long-term effects of the intervention on physiological parameters.

Limited Variables Assessed - The study focused only on selected physiological variables such as heart rate, systolic blood pressure, diastolic blood pressure, pulse rate, and breathing rate. Other psychological or lifestyle factors were not examined.

Lack of Control Over External Factors - Factors such as diet, physical activity, medication use, and stress levels were not strictly controlled, which might have influenced the results.

Absence of a Control Group - The study did not include a control group for comparison, making it difficult to determine whether the observed changes were solely due to the breathing intervention.

Variability in Participant Practice - Participants may have differed in how accurately or consistently they practiced the breathing techniques, which could have affected the outcomes.

SUMMARY

The present study focused on examining the impact of breathing techniques on physiological parameters among individuals with hypertension. Measurements such as heart rate, systolic blood pressure, diastolic blood pressure, pulse rate, and breathing rate were recorded before and after the intervention. The analysis of the data showed noticeable changes in these physiological variables following the practice of breathing techniques. The results indicate that controlled breathing exercises may contribute to better regulation of cardiovascular and respiratory functions. These techniques can therefore be considered a simple and supportive non-pharmacological approach in the management of hypertension. However, the findings should be interpreted carefully due to certain limitations such as the small sample size and the short duration of the intervention. Further studies with larger samples are recommended to strengthen the evidence.

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