

Does Music Therapy Reduce Blood Pressure in Patients with Essential Hypertension in Nigeria?

Michael Ezenwa

*Department of Psychology, Faculty of Social Sciences,
Nnamdi Azikiwe University, Awka. Anambra State,
Nigeria*

1. Introduction

Hypertension is a cardiovascular pathological condition characterized by relatively sustained elevated arterial blood pressure above normal tolerable limit. It refers to the condition wherein arterial blood pressure level is greater than the limit of normal range of 90 millimeter mercury, (Ezenwa, 2009). In fact hypertension occurs when the diastolic blood pressure {*period of relaxation of the heart*} is sustainably greater than 90 millimeter mercury (Mm Hg) and the systolic blood pressure (*period of contraction of the heart*) is greater than 135 mmHg {Guyton & Hall, 2000} However, other experts {Akinkugbe,1997, Boon & Fox,1998, Onwubere,2004} suggest a slightly higher systolic blood pressure of 140 mm Hg and diastolic of 90 mm Hg (140/90 mm Hg) for a diagnosis of the disorder. By blood pressure is meant the force exerted by the blood against the unit area of the vessel wall {Guyton & Hall, 2000} often measured in millimeter mercury {mm Hg}. It is that pressure against which the heart pumps.

The need to maintain acceptable blood pressure level is a basic condition for balance and maintenance of human life. At very high blood pressure, there is the risk of over-loading the heart compounded by possibility of bursting of minute blood vessels that supply the brain cells and other vital organs with possibility of endohemorrhagic complications and death. On the other hand, at low blood pressure level, inadequate supply could short-circuit the activities and life of vital organs including the liver, kidney and brain which will obviously lead to organ-system fatigue, collapse and eventual death. Therefore, just as an electronic device depends on adequate supply of electric current for optimal performance, the human body system requires regulated blood pressure level to maintain its homeostasis. This is assured through combined activities particularly of the heart, the kidney, the brain and the endocrine system.

Unfortunately, due to many systemic, hereditary, metabolic, dietary, environmental and/or Psychological factors that continuously impact on the capacity of these systems to maintain normal blood pressure, they occasionally become overwhelmed leading to development of hypertension.

2. Classification of hypertension

Hypertension can be classified in different forms depending on what is emphasized at a point in time. It could be categorized in terms of severity into borderline, mild, moderate or severe hypertension. Hypertension may also be collapsed in terms of pathological and clinical phases into benign, accelerated and malignant hypertension. Furthermore, it could be grouped by cardiac cycle into systolic and diastolic hypertension. Most importantly, hypertension could be understood in terms of etiology into primary or essential and secondary hypertension.

Primary or essential hypertension is the commonest type of hypertension accounting for 90-95% of all cases of hypertension in humankind {Guyton & Hall, 2000}, and is of interest to the present study. Secondary hypertension as the name implies, is hypertension secondary to some other conditions such as pregnancy and accounts for about 5-10% of all hypertension cases.

Essential hypertension is believed to run in families and is of unknown origin {Guyton & Hall, 2000}. However, it has been observed {Guyton & Hall, 2000} that patients with this disorder show characteristic inability of the kidney to excrete adequate quantities of salt and water at high extra cellular fluid levels when arterial blood pressure is high. The reason for this retention of salt and water until blood pressure becomes quite high in these patients is not known, although basic abnormalities in vascular changes in the kidneys are suspected {Guyton & Hall, 2000}.

Symptomatically, Hypertension has no signs at its early stage {Guyton & Hall, 2000, Ezenwa, 2009} but can be detected following routine medical examination that shows stably elevated arterial blood pressure level beyond acceptable normal limit. This asymptomatology of essential hypertension at the early stage makes its diagnosis often delayed thereby increasing possibility of complications and death from the disorder. Complicated hypertension may present with clinical features as headache, occasional confusional state, restlessness, easy fatigability, sweating, palpitations, recurrent backache, chest pain that disappears with rest among others.

3. Epidemiology of hypertension in Nigeria

Hypertension is a life long non-communicable disease (NCD) and the commonest cardiovascular disorder, Box & Fox (1998). Cardiovascular disease accounts for 30% of total global mortality rate from NCD-attributable disorders followed by cancers (13%) Chronic respiratory disease (7%) and diabetes (2%), (Peltzer, 2009). Globally, Chronic and non-communicable diseases are responsible for about 60% of all death cases, (Unwin and Alberti, 2006).

In addition, NCD impact negatively on the families, quality of life and productivity. The burden of the disease results in loss of income and opportunities with implications for low economic development (Peltzer, 2009).

In Nigeria, exact epidemiology of hypertension may be quite high, (Ezenwa, 2006) than possibly reported. This is because Hypertension related data may be inconclusive or at least under reported in Nigeria since usually only formal health sector may be reported. This stems from the fact that different paths to care exist in Nigeria whose activities are different

and not coordinated centrifugally. These include orthodox (allopathic) medicine which is the formal sector, homeopathic and similar-type medicine, traditional / indigenous knowledge system medicine and prayer healing homes. These different approaches operate independently, not only in their understanding of etiology, diagnosis and treatment of physical and mental disorders, but in other areas as procedure and practice, record keeping, charges, training and certification. For instance, while The Medical and Dental Council of Nigeria regulates orthodox medical training and practice, there is no board in Nigeria for regulation of the activities of the prayer house healers, despite the fact that these healers receive, admit (both on in-patient and out-patient bases) and offer intervention to people with different physical and mental disorders. On the other hand, while Allopathic Medicine has its arms separated into different professions such as investigation (Medical Laboratory Sciences), treatment (pharmacognosy, physiotherapy, psychology, surgery etc), the traditional healer has all these professions fused into one person. He /she is a physician, laboratory scientist, pharmacologist, nurse etc). Beyond the forgoing, there is no meeting point between these different approaches making health data collation always inconclusive. Given the forgoing, available statistics on epidemiology of hypertension in Nigeria derive from the formal (orthodox) sector only especially since these different paths to care differ in their diagnostic patterns.

Summarizing the Federal Government expert committee report on non-communicable diseases, Onwubere (2004) observed that not less than 4.33 million Nigerians over 15 years of age have hypertension of various degrees or severity (mild 2.8 million, moderate 0.85 million and severe hypertension, 0.64 million). He noted a national hypertension prevalence rate of 25 -30% with high incidence in people at the two extremes of economic spectrum and in urban than in rural communities. According to Box & Fox (1998), hypertension is the commonest cause of death in industrialized societies, occurring more in men than in women, and is of increasing importance in developing countries.

In an epidemiological study of the disorder in three communities in South West Nigeria, Copper, Rotimi, Kaufman, Muna and Mensah (1998; see also Copper Puras, Tracy, Kaufman, Ordunez and Mufunda, 1997) noted 7% prevalence rate among rural (Igboora-pa community) as against 17% rate in urban (Ibadan) settlers especially urban poor and salaried working class. They also noted almost 100% higher mortality rate in patients with hypertension when compared with those with normal blood pressure. Specifically, the authors reported 5.1% mortality rate among hypertension patients in comparison with 2.8% among people with normal blood pressure. Copper et al also (1998) observed that blood pressure rose moderately with age among participants resident in the rural communities studied unlike those that lived in the urban (Ibadan) center.

4. Challenges associated with contemporary management of essential hypertension in Nigeria; The problem

The major approach to the management of hypertension in Nigeria (and perhaps elsewhere) is the use of anti-hypertensive medications, (in addition to complimentary dietary control that ensures reduction of salt intake and consumption of green leafy vegetables). These drugs are basically either vasodilators that tend to widen the blood vessels in order to reduce resistance or diuretics that inhibit tubular re-absorption of salt and water with

consequent reduction in blood pressure. However, the pharmacological actions of these drugs are fraught with numerous side effects (A.D.A.M.2002).

The table below shows some instances of different groups of antihypertensive medications and their known side effects (A.D.A.M., 2002)

Serial number	Drug group	Side effects
1	Loop and Thiazide diuretics	Depletion of body's supply of potassium with consequences for development of arrhythmias and other pathological conditions
2	Beta-blockers	Increase in incidence of type 2 diabetes, depression, fatigue, lethargy, nightmares.
3	Calcium-Channel Blockers	Flushing, constipation, accumulation of fluid in the feet (Pedal edema), impotence.
4	Angiotensin converting enzyme (ACE) inhibitors	Allergic reaction, irritating cough, low blood pressure, potassium retention in kidney which increases the risk of cardiac arrest when at high level.
5	Angiotensin receptor blockers	Fatigue, nasal congestion, elevated potassium blood levels and abnormal kidney function

Table 1.

In addition to the foregoing, antihypertensive drugs are associated with sexual dysfunction (Philips, 2000). Beyond side effects, drug treatment of hypertension may nearly be contraindicated in complicated hypertension co-morbidity with tertiary stage nephritis, diabetes mellitus, liver function disease etc.

More importantly, the use of chemotherapy in the management of hypertension harbors the possible risk of death from over dose, under dose, fake and expired medication especially in developing countries where regulation of product standards may be weak.

Finally, the economic burden imposed by prolong use of antihypertensive medication may be very challenging to indigent patients and families, the unemployed and/ or the elderly. All these factors have obvious negative outcomes for occupational, social and family adjustments as well as overall quality of life of the essential hypertension patients.

It is against the foregoing serious demands associated with pharmacological management of essential hypertension that the present study sought to examine the possible therapeutic roles of music in the management of the disorder.

5. Non-pharmacological agents and essential hypertension

A number of studies have suggested that non-drug based methods of intervention(including music therapy) have therapeutic effects on vital signs of patients with different disorders such as anxiety or essential hypertension, (Stoudenmire, 1975, Kim and Lee, 1989, Rasid and Parish, 1998,). Recently, Ezenwa, (2009) investigated the effect of relaxation therapy on arterial blood pressure of patients with essential hypertension and found significant reduction in their systolic and diastolic blood pressure following 30minutes

exposure. The result of the study and similar others formed the main basis to investigate the possible contributions of music therapy in the management of essential hypertension.

Music is a set of organized sound that pleases the ears and sense of balance. The use of music in different settings is as old as man. In times past and today, music is used to entertain and motivate people in competitive activities such as during games (football, wrestling, running etc). It is also used in religious contexts for worship and meditation purposes as well as during solemn moments such as funerals, festivals, marriages and similar special events.

However, of great importance to the present paper is the use of music as a therapeutic agent. In the Bible, (1st Samuel, 19:9-10) it was reported that when evil spirit came upon Saul, David would play the Lyre and evil spirit would depart from him. Campbell (1998) articulated the effects of music therapy(in particular classical music by Wolfgang Amadeus Mozart) to include restoration of learning disorders, vocal and auditory handicaps, listening disabilities as well as alteration of mood, enhancement of creativity and health.

Conversely, Burns, Labbe, Williams and McCall (1999) assigned subjects to four different groups of classical, hard rock, self- selected relaxing music and no music group. Using subjects' relaxation level, skin temperature, muscle tension and heart rate as measures, they found that skin temperature decreased for all the conditions while classical, self selected relaxing music and no music group reported significant increases in feelings of relaxation. However, in a study on the effect of music intervention on anxiety patients awaiting cardiac catheterization, Hamel (2001) found a statistically significant reduction in anxiety in the test group unlike in the control, reflected in significant reduction in heart rate and systolic blood pressure. Cardigan, Caruso, Haldeman, McMamara, Noyes, Spadofora, and Carrol (2001), found music therapy to have significantly reduced blood pressure, respiratory rate and psychological distress among cardiac patients on bed rest. However, result from patients on bed rest may differ from hypertensive patients that are active occupationally. In addition, the study was done ten years ago and in a different country from the present one.

In another instance, Smolen, Topp and Singer (2002) studied the effect of self selected music on anxiety ,heart rate and blood pressure among ambulatory patients undergoing colonoscopy. They assigned thirty two subjects randomly to either an experimental group who listened to music during the colonoscopy or standard procedure no music group. Furthermore, physiological signs of anxiety including blood pressure and heart rate were measured at four points during the procedure. The researchers reported a significant group by time interaction on the physiological signs of anxiety as well as significant decreases in heart, systolic and diastolic blood pressure among the patients. However, the participants of the study were not known hypertensive patients and they chose their music of choice unlike in the presents study.

6. Music therapy and human physiology

Music varies a great deal. The differences in characteristics of music play out in the different uses to which music can be put. It may also reflect cultural, historical, personality and the

unique promptings and the circumstances of the particular artist/composer. These differences can form a basis for distinction of classes of music. Thus, based on rhythm, it can be divided into high and low rhythmic music. It can also be distinguished into geographical and social-cultural backgrounds thus; African traditional music, Asian / Oriental traditional music, European traditional music etc. In general, music can be classified using broad characteristics into Classical, Rock, Reggae, Disco, Blues, and Country. Despite the types of music, it has one effect or the other on its listener.

Music therapy is the employment of organized sound in a purposeful therapeutic manner, (Ezenwa , 2006). Due the characteristics, sequential, logical, and predictable nature of music, it tends to generate a sense of harmony . This harmony so generated tends to mobilize the individual towards activation (arousal) in the case of high rhythmic music, or demobilization or relaxation in case of low rhythmic music (Ezenwa 2006). In this sense, through appealing to the cognitive domain, music can activate the stimulation of the appropriate hormonal system to either increase the basal metabolic rate or decrease the physiological system depending on the tonal or rhythmic pattern of the music and the listener's perception of it.

In order to provide some empirical evidence to demonstrate the critical contribution of music therapy in the management of essential hypertension, the present author conducted a clinical trial as presented below.

For the purpose of the study, interest was limited to the comparative effects of a classical music by Ludwig Von Beethoven; violin concerto in D, op. 61, second movement entitled *Larghetto*, on patients with essential hypertension.

7. Justification for the present study

As can be deduced from the foregoing the current dominant pharmacological method of managing hypertension is associated with severe side effects that affect patients in various ways. These may include medical complications, disruption in family, social and occupational adjustments, in addition to economic burden of illness, all of which predict negative outcomes for the patient and generally poor quality of life.

In order to address these short comings and to provide an alternative or at least a complimentary therapeutic approach that is comparatively inexpensive, devoid of side effects, is not prone to overdose, faking or adulteration, the present study sought to explore the effects of classical music, *larghetto*, on arterial blood pressure of patients with essential hypertension.

8. Objectives of the study

This paper sought to answer the following research questions;

1. Will music therapy be effective in significantly reducing the systolic blood pressure of essential hypertension patients?
2. Will music therapy be effective in significantly reducing the diastolic blood pressure of essential hypertension patients?

To test the validity of the foregoing questions, 10 (5 male and 5 female) known essential hypertension patients attending Ebonyi State University Teaching Hospital Abakaliki, Ebonyi State Nigeria, (now Federal University Teaching Hospital Abakaliki following its take over by the Federal Government of Nigeria in May 2011) who met the eligibility conditions for participation in the study formed the participants. Their ages ranged from 40 to 65 with a mean age of 54 and standard deviation of 9.2. Marital status showed that they were all married.

Inclusion into the study was by cumulative addition in which all candidates who met the selection criteria were included. These criteria included that patient was interested in the study on voluntary basis, had the time to participate, had hypertension as his/her main diagnosis, did not have laboratory or other investigations to do following consultation and had no obvious medical/ family/occupational emergency that needed his/her immediate attention and that patient must be an out-patient.

The instruments used in the study included a DVD player (Thompson Ampli DVD DTH2150A) measuring 485x108x345mm manufactured by Thompson India private limited in May 2004, with serial number 0329. Other instruments were compact disc plate containing Ludwig Van Beethoven's violin concerto in D.OP. 61 entitled second movement (Larghetto), plain sheets of paper, stethoscopes and mercury sphygmomanometer for measuring and recording systolic and diastolic blood pressure of the participants. There were also human facilitators (physicians and nurses) who assisted the researcher with selection, measurement and recording of the blood pressure of the patients before and after the exposure to the independent variable.

Execution of the research was done using the following procedure. Approval for the study was got from ethics and research committee of Ebonyi State University Teaching Hospital Abakaliki. Two consultant physicians were contacted for their assistance in releasing their patients for the study. The Head Resident Doctor in Internal Medicine Department was also contacted for his co-operation and logistic support in patient enrollment. The co-operation of the Nurses on duty was also sought. Effort was however made **not** to disclose the actual purpose of the study to the assisting doctors and nurses in order to prevent experimenter-related bias.

After recruitment of the participants, they were taken to the conference hall of the Hospital which was located in a relatively quiet area of the institution. As they all came into the hall, they were addressed thus: *You are please required to sit down. The doctors will simply take your blood pressure after which you will listen to a piece of music for 30mins. Your blood pressure may be taken from time to time. Thank you for your time with us.*

To ensure relaxation of the participants, they were encouraged to introduce themselves to the group. The facilitators (the doctors and nurses) were already known to the patients.

Matched subjects design was used in the work, while matched T- test statistics was employed for data analysis since baseline and post test blood pressure readings of same group were compared.

The result of the study was presented thus:

Type of blood pressure(BP)	Baseline	Post test	Cal. T value	Table T value	DF	P<_.01	10 minutes post test BP
Systolic	144	133	3.97	2.26	9	3.25	128
Diastolic	96	82.5	5.71	2.26	9	3.25	80

Based on values in table 1 above, a statistically significant mean difference ($p < .01$) was noted between pre-treatment systolic blood pressure reading ($M=144$) and post treatment value ($M=133$) indicating that the classical music decreased systolic blood pressure level of essential hypertension patients. This reduction was found to have decreased further ($M=128$) when the BP was taken 10 minutes post test period.

Table 2. Summary table of means of systolic and diastolic blood pressure of essential hypertension patients.

The table above also showed that the diastolic blood pressure of the participants manifested a statistically significant mean difference between baseline BP value ($M = 96$) and post test BP value ($M= 82.5$) at $P < .01$. This showed that the treatment reduced diastolic blood pressure of essential hypertension patients. This reduction was also progressive ($M= 80$) as noted when the BP was taken 10 minutes post treatment period.

The key findings of this study included that the classical music significantly reduced both systolic and diastolic blood pressure of the essential hypertension patients that participated in the study.

These findings are consistent with other studies. Salmore & Welson (2000) found music therapy to have significantly reduced the vital signs (including the blood pressure) of patients in gastrointestinal laboratory endoscopy. In addition, the therapy has been found to reduce state anxiety in patients with myocardial infarction (white, 1992), reduced systolic and diastolic blood pressure, respiratory rate and psychological distress in cardiac patients on bed rest, Cardigan, Caruso, Haldeman, McNamara, Noyes, Spadafora and Carroll, 2001). Campbell (1998) observed that 10 minutes exposure to Mozart's Sonata for two pianos in D major, K448, (a type of classical music) resulted in eight to nine scores higher on spatial intelligence test by 36 undergraduates at the University of California. He explained that vibrating sound formed patterns and created energy fields of resonance and movement in surrounding space. As human beings absorb these energies, *'they subtly alter breath, pulse, blood pressure, muscle tension, skin temperature and other internal rhythms'*.

One possible explanation of this effect of music therapy is the fact that music as an auditory stimulus, is a form of sound energy that reverberates in balance, logic and harmony. These characteristics of music tend to have a strong irresistible appeal to the ear which compels attention from the listener to the music. By consciously or unconsciously surrendering to the sound of music, the listener is automatically tuned to the rhythm, the driving force of music which gradually changes the mood, feeling, physiology and consequently the vital signs of the individual listener. In low rhythmic music, these vital signs reduce significantly.

A major implication of this study is the fact that music therapy, a non-pharmacological agent, significantly reduced systolic and diastolic blood pressure of the participants and as such could be useful in the management of essential hypertension. This is very important

against the background that chemotherapeutic management of essential hypertension is associated with side effects that affect treatment outcome and overall quality of life of the patients. Music therapy is inexpensive, accessible, and is not associated with side effects.

It is important to observe that small sample size is a common difficulty in clinical studies and this tends to limit the extent to which the study can be generalized. This work is not an exception to this limitation. Many patients who could have participated in the study did not meet the eligibility criteria. Future studies in this area may target large sample size and perhaps record possible changes in the blood pressure over longer length of time. This may determine the half life of the therapy and as such the dose.

However, it is interesting to note that only 30minutes exposure to music therapy could significantly reduce the blood pressure of known essential hypertension patients and this reduction did not only remain stable but reduced further as shown by blood pressure readings taken 10 minutes post treatment. There is therefore the need for physicians to consider the use of music therapy independently or at least as a complimentary therapeutic option. When used as a complimentary therapy, it may reduce the amount of antihypertensive drugs patients require thus contributing to reduced side effects and better treatment outcome

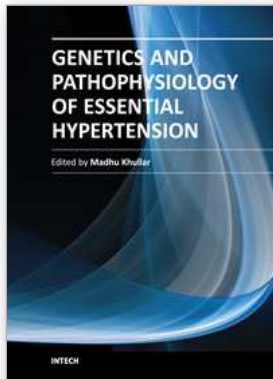
9. Conclusion

A look at the foregoing suggests that music therapy could be an important factor in the management of essential hypertension. This finding agrees with other literature in the area and therefore justifies the need for a paradigm shift from the present dominant and often exclusive use of chemotherapy in the management of essential hypertension. Music therapy is inexpensive, accessible, convenient and devoid of known side effects. The integration of music therapy, even as an adjunct therapy in the management of essential hypertension, is expected to improve access to treatment, eliminate adverse drug interactions or reactions and consequently improve overall treatment outcome with great implication for better quality of life for the essential hypertension patients.

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Genetics and Pathophysiology of Essential Hypertension

Edited by Prof. Madhu Khullar

ISBN 978-953-51-0282-3

Hard cover, 236 pages

Publisher InTech

Published online 09, March, 2012

Published in print edition March, 2012

This book, authored by renowned researchers in the field of Hypertension Research, details the state of the art knowledge in genetics, genomics and pathophysiology of Essential hypertension, specifically the genetic determinants of hypertension and role of gene variants in response to anti-hypertensive therapy. Two chapters describe mitochondrial mutations in Essential hypertension and in hypertension associated Left ventricular hypertrophy, one chapter reviews in detail the global gene expression in hypertension, and an up to date treatise on pathophysiology of resistant hypertension is detailed in another chapter. Other topics included in the book are end organ damage, baroreceptor sensitivity and role of music therapy in essential hypertension.

How to reference

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Michael Ezenwa (2012). Does Music Therapy Reduce Blood Pressure in Patients with Essential Hypertension in Nigeria?, Genetics and Pathophysiology of Essential Hypertension, Prof. Madhu Khullar (Ed.), ISBN: 978-953-51-0282-3, InTech, Available from: <http://www.intechopen.com/books/genetics-and-pathophysiology-of-essential-hypertension/does-music-therapy-reduce-blood-pressure-in-patients-with-essential-hypertension>

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