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ANALYSIS OF POTENTIAL PROFILE CHANGES IN THE BRAIN DUE TO NOISE IN HYPERTENSION PATIENTS

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Abstract. This study aims to determine the relationship of the potential profile of the brain to noise so that it can affect changes in blood pressure. This research is a type of observational research conducted by treating hypertension and normal blood pressure test. The treatment given was to record brain waves that were given various disturbances of sound intensity levels of 100 dB, 110 dB and 120 dB with a single frequency = 12,000 Hz which was obtained from mosquito noise sources. Recording was done for 60 seconds for each treatment and the data was taken every 2 seconds on the results of the Electroencephalogram (EEG). The analysis used is the FFT test which is generated from the Electroencephalogram (EEG) recording through the programIworx Labscribeand paired t-test using the SPSS program. The results showed that with varying levels of sound intensity and frequency 12,000 Hz produced tetha (hypertension) and alpha (normal blood pressure) brain waves which produced serotonin hormones and caused dilation of blood vessels so that blood pressure decreased. The results of the t test showed that there was an effect on normal testes on diastole and no effect on systole.

INTRODUCTION

This study aims to determine the relationship of the potential profile of the brain to noise so that it can affect changes in hypertension. Another factor that affects blood pressure is physical activity, physical activity and daily activities greatly affect blood pressure. The higher the activity carried out, the higher the blood pressure. Emotions of fear, anxiety tend to make blood pressure rise. The older a person is, the higher the systolic pressure. Usually associated with the development of arteriosclerosis (Guyton and Hall, 1997). Stress state of mind also affects blood pressure during measurement.

In addition to the above factors, blood pressure is influenced by the environment, including; noise and heat stress (Suma'mur in Anang, 2009).

TABLE 1. Classification of Hypertension According to WHO *(Sani, 2008)*

Category	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Optimal	< 120	< 80
Normal	< 130	< 85
Normal-High	130-139	85-89
Grade 1 (Mild Hypertension)	140-159	90-99
Sub-group: border	140-149	90-94
Grade 2 (Moderate Hypertension)	160-179	100-109
Grade 3 (Severe Hypertension)	180	110
Isolated systolic hypertension (Isolated systolic hypertension) Sub-group: border	140 140-149	< 90 <90

Blood pressure is affected by noise related to intensity. The intensity I of a wave is the power carried through the area perpendicular to the energy flow:

$$I = \frac{P}{S} = 2\pi^2 \rho\, v f^2 A^2 \quad (1)$$

This relationship shows explicitly that the intensity of the wave is proportional to the square of the amplitude of wave A at any point and to the square of the frequency (Giancoli, 2001).

TABLE 2. Types of sound pressure levels (Ackerman, 1988)

Intensity Level (dB)	Example situation
0	Hearing threshold
20	Very quiet room
40	Lounge
60	People's voices speak normally
80	Radio rings loudly; lecture hall
100	Motor vehicles; factory machinery
120	Threshold of discomfort
140	Sick threshold
160	Mechanical damage to the lining of the ear

EXPERIMENTAL METHOD

Research Tools and Materials

The research tools used were digital sphygmomanometer, sound level meter, sound system, IWX/214 hardware, computer with IWORX Labscribe software, mosquito sound source, electrode, probe, connecting cable and headband.

The material used in this study is an electrolyte paste which functions to remove air bubbles between the skin surface and the electrode during recording.

Research Object

In this study, 16 adult female were used as sample data, consisting of 8 people with hypertension aged 47-57 years and 8 normal people aged 20-25 years. All the samples were selected randomly, for the sampel with hypertension were selected based on data from the Mulyorejo Health Center with the approval of the Surabaya City Health Office, while the sample with normal blood pressure were selected based on the results of the blood pressure.

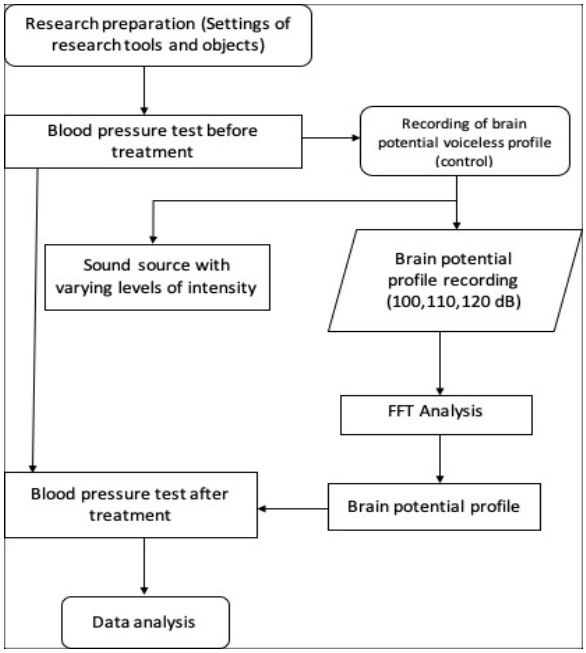

FIGURE 1. Research Scheme

RESULT AND DISCUSSION

TABLE 3. The results of the brain waves in the Hypertension test were dominant in the right tetha brain wave with changes in blood pressure

Sample	Blood Pressure	
	Before	After
	Systole/diastole	Systole/diastole
1	137/77	117/71
2	140/70	168/83
3	170/76	151/81
4	155/85	126/68
5	130/62	136/67
6	160/95	148/90
7	182/89	198/106
8	143/77	128/74

TABLE 4. The results in the normal test are dominant in the left Alpha brain wave with changes in blood pressure

Sample	Blood Pressure	
	Before	After
	Systole/diastole	Systole/diastole
1	110/64	102/67
2	111/70	100/62
3	101/77	100/67
4	100/60	75/55
5	100/70	80/55
6	102/68	92/62
7	120/77	108/68
8	120/83	118/82

TABLE 5. The results of the tension paired t test before and after treatment

Sample Types	Blood Pressure	P	description
Hypertension	systole	0.078	There is no relationship between blood pressure before and after the variation of the sound intensity level.
	diastole	0.128	There is no relationship between blood pressure before and after the variation of the sound intensity level.
Hypertension	systole	0.007	There is a relationship between blood pressure before and after the variation of the sound intensity level.
	diastole	0.002	There is a relationship between blood pressure before and after the variation of the sound intensity level.

The results of measurements of tension and brain recording due to noise with various intensity level sound 100 dB, 110 dB and 120 dB relationship can be analyzed. Where blood pressure is influenced by the intensity, frequency and duration of exposure. The higher the frequency, intensity and duration of exposure, the higher the pressure applied. By varying the intensity level at a frequency of 12,000 Hz, it will produce a potential profile of the brain that remains dominanton the right tetha brain waves. Right theta brain wave produces the hormone Melatonin which can widen blood vessels and ultimately lower blood pressure. And in normal testes, dominant in the left alpha wave produces serotonin and endorphin hormones which cause blood vessels to open wide, the heart rate to stabilize so that it can lower blood pressure. This is also influenced by the work of the parasympathetic nerves in the cerebral cortex (brain) which transmits parasympathetic impulses to the heart, causing the heart rate and output to decrease and blood pressure to decrease.

CONCLUSION

Based on the results of research and analysis that has been done, it can be concluded that the relationship between the potential profile of the brain and noise can affect changes in blood pressure. In patients with hypertension, the intensity level of 100dB, 110 dB and 120 dB with a frequency of 12,000 Hz produce a brain wave profile that is always dominant on the right tetha. And in normal testes, dominant in the left alpha wave so the blood pressure drops.

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