COMPARISON OF BRAINWAVE PATTERN FOR ALPHA STATE BETWEEN SMOKERS AND NON SMOKERS AFTER MOTION TECHNOLOGY

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Abstract- This paper presents a research project to compare the brainwave pattern for alpha state of smokers and non smokers of UiTM student with correlation to motion technology. Twenty one samples were observed before and after the motion treatment by using EEG equipment. A short interview was carried out for each respondent to confirm the results. It was found that generally motion treatment produced a significant improvement in terms of reducing the smoking habit.

Keywords: EEG (Electroencephalogram) and BOSS™ (Brain Optimization and Synchronization System)

1. INTRODUCTION

Smoking is not just a bad habit, but it also bad for the health. Medical research has determined that smoking is a major contributing factor towards many health problems, particularly lung cancer, emphysema, and cardiovascular disease [1]. It is difficult to quit smoking. People try at least 2 to 3 times before they can finally quit smoking. There are some methods to stop smoking: get support and encouragement, learn new skills and behavior, do something to reduce your stress such as exercise, and reading [2]. Brain is a key to mental and physical health and well-being of human being and it is the most central complex organ of human body. Brainwaves are the rhythm of the brain. They are electrical signals or patterns generated by brain cell (neurons) and other brain structures. When a large number of neurons beat together in synchrony, they create a strong rhythm or pattern called wave signal that can be detected on the scalp surface by electrical monitoring equipment (EEG).

1.1 Electroencephalogram (EEG)

Electroencephalography is a study of changing electrical potential of the brain. The apparatus used to measure this electrical potential of the brain is called electroencephalograph, and the tracing or the printout of the measured brainwave forms is electroencephalogram. The electroencephalograph measures brainwaves of different frequencies within the brain [3]. Electrodes are placed on specific sites on the scalp to detect and record the electrical impulse within the brain. The peak-to-peak amplitude of the potential can picked up from the scalp is normally from $100\mu Vp$-p. EEG can be used to detect and localize brain lesions, aid studying epilepsy, assist in sleep pattern and in diagnose the brain disorder and others [4].

The signal from EEG is usually been described in terms of frequency band, ranging from the most activity to the least activity; *beta* (β), *alpha* (α), *theta* (θ), and *delta* (δ). Frequency brainwaves are divided into four main groups also referred to as "brain state" as show in Table 1 [1].

Table 1: Brain state followed by the range of frequency

Brain State	Frequency (Hz)	Meaning
Beta	13-30	A person is awaken and alertness condition.
Alpha	8-12	A person is awakened and truly relaxed. It is also associated with relaxed concentration and faster learning.
Theta	4-7	A person is feeling depressive and tired. It brings forward heightened receptivity, flashes of dreamlike imagery and long-forgotten memories.
Delta	2-3	A person is in deep sleep. Waves are large and slow.

1.2 Brain Optimization and Synchronization System (BOSS™)

Brain Optimization and Synchronization System, BOSS™ is and experimental method that is designed to relax the physical body and synchronize the electrical activity of the brain through horizontal motion therapy. It is a valuable tool to stimulate, optimize and enhance the performance of brain through slow rhythmic rotation [1].

Brain synchronization is very important in controlling moods, emotions and maintaining optimal physiological balance. These shown that memory and cognitive functioning are enhanced when the left and right brain hemispheres are working together. BOSS™ "teaches" the brain to use both side [5].

The rhythmic 360° rotation while a person is lying comfortably on a bed generates a pleasant comfortably centrifugal force, which causes ions within the person own bio-energy field to become aligned above the base of the spine. The electrolyte components of the water based cerebrospinal fluid are capable of piezoelectric activity. Accordingly, mechanical motion action upon this fluid creates pressure, and therefore generates piezoelectric energy. The result is that mechanically induced centrifugal motion achieves electrical invigoration of the spinal fluid. On addition, lying flat allowing the natural wave the distribution of gravity, cerebrospinal fluid to increase, naturally generating piezoelectric charge within this brain-stimulating fluid.

During treatment, sample lied down on the rotation bed. The bed rotated clockwise and countersclockwise at speed of 3.5 rotation per minute (RPM). A typical session last for 30 to 45 minutes [6]. During the process, the movement of the ions establish the polarity, generating the necessary electromagnetic charges. The charge is transmitted in pulses to the mid-brain, which controls emotion, mood and information processing and coordination of left and right brain functions. The effectiveness of motion technology includes improves concentration, relaxation, smoke reduction and enhances overall performance of individual and brain hemispheric synchronization [3].

2. METHODOLOGY

This project consists of the following method:

2.1 Data collection from sample

There were 21 samples undergoing 5 sessions of treatment. The EEG signal was captures before and after treatment using WaveWare program. The signal was measured by placing electrodes at both ears and on the forehead. The brain signal can be seen on the computer showing a bar graph of the amplitude (μVp-p) and the frequency (Hz) as shown in Figure 1 and Figure 2. The left brain, shown on the left in bar chart and another side was right brain. The value of the signal in volt can be measured by moving a vertical reference line. This is done using Microsoft Visual Basic 6.0 and these data is analyzed using Microsoft Excel.
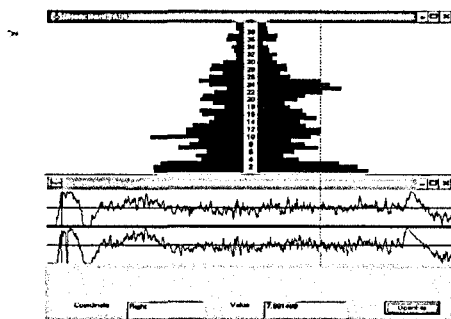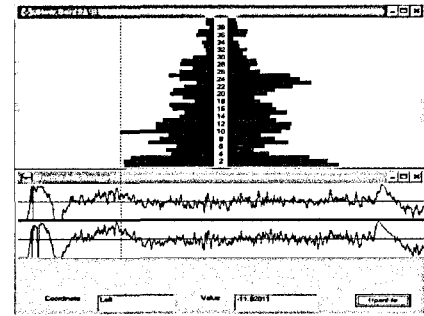

Figure 1

Figure 2

2.2 Analysis Data

The analysis data that been taken and the result obtained from the EEG measurement signal and questionnaire will show in the plotting of graph.

3. RESULTS AND DISCUSSION

Data that obtained from the questionnaires and brain signal measurement were divided into two parts. There are five sessions for every treatment, so the improvement during the treatment can be seen.
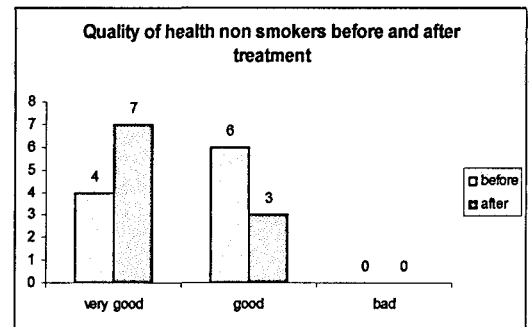
3.1 Part 1 (Questionnaire)

Figure 3: Quality of health non smokers before and after treatment

Figure 3 shows the quality of health for non smoker before and after treatment. Before the treatment, most of samples had good health condition, which was 33% but after treatment, graph shows that 67% of the samples had very good health condition.

Comparing before and after the treatment, it were found that samples that experienced good health had increased and changed to very good condition. In conclusion, motion treatment represents a significant improvement in quality of health.
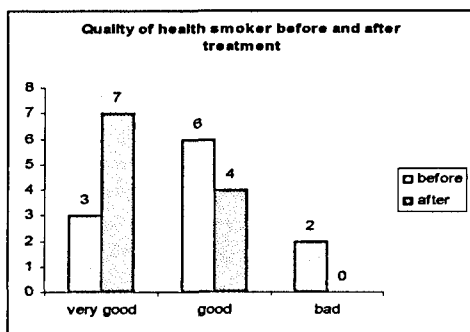
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Figure 4: Quality of health smokers before and after treatment

Figure 4 shows the quality of health for smoker before and after treatment. Analysis for health smoker before the treatment shows that most of samples had good condition which is 55% of samples. There were 27% of samples that had very good health condition followed by 18% of samples had bad health condition. Analysis for health after treatment shows that most samples had very good condition which is 64% of samples, 36% of samples have good condition and 0% of sample of bad condition.

Comparing before and after treatment, about 37% of samples showed an increment at very good health condition after treatment. About 19% of good condition samples had a decreased in health condition whereas 18% of bad health condition samples had an increase in health condition.

Figure 4 showed the most of samples significant improvement in terms of quality of health. Samples that have already completed 5 session treatment showed an improvement from bad to very good health. As conclusion, quality of health will be increased as the smoking habit is decreased.

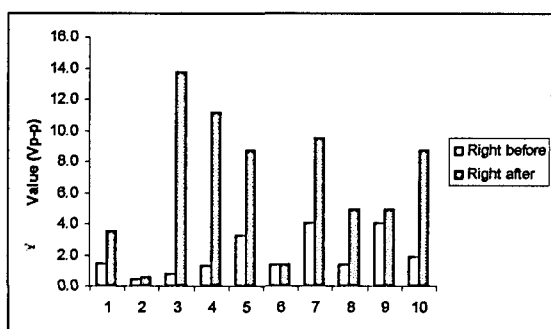## 3.2 Part II (EEG Measurement Data)

Figure 5: The value of alpha state on the right side for non smokers before and after treatment

Referred to figure 5, the graph shows that after a treatment the values of alpha state on the right side had increased. After the treatment the values of sample that were having alpha states increased 42% from 29% to 71%.
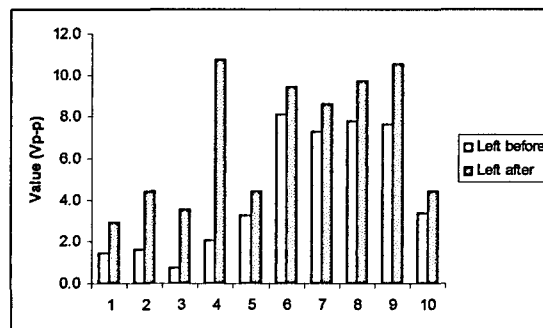

Figure 6: The value of alpha state on the left side for non smokers before and after treatment

According to figure 6, the graph shows the values of alpha state on the left side had an increased after taking the treatment. After the treatment the numbers of samples that were having alpha states increased 34% from33% to 67%.
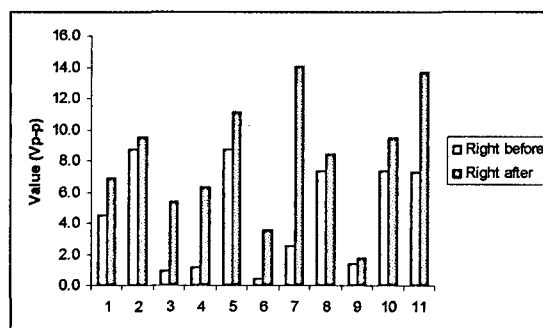

Figure 7: The value of alpha state on the right side for smokers before and after treatment

Figure 7 shows that after a treatment the values of alpha state on the right side of brain had increased. After the treatment the values of sample that were having alpha states increased 22% from 39% to 61%.
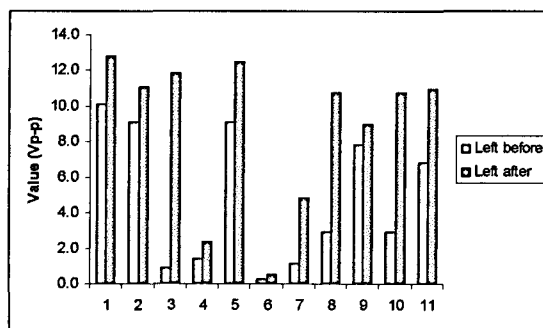

Figure 8: The value of alpha state on the left side for smokers before and after treatment

From figure 8, after a treatment the values of alpha state on the left side of brain had increased. After the treatment the values of sample that were having alpha states increased 12% from 44% to 56%.

Comparing smokers and non smokers before and after treatment of alpha state, there were 42% of non smokers had an increase the value of alpha state and 22% of smoker increased the value of alpha state on right side. Beside that, there were 34% of non smokers had an increase on value of alpha state and 12% of smokers had an increase the alpha state on left side. Therefore, there were 10% of samples had an increase the values of alpha state on the right and left side of the brain respectively. The analysis shows before the treatment, average of non smokers only use right dominant but after treatment there are shown that non smokers also used the both side of brain. Beside that, the values of alpha state on left side for smokers had increased but in a small percentage.

In summary, after the 5 sessions of motion treatment, average of 50% of samples showed the improvement in the alpha state. The treatment has improved the health condition of the samples, so it can give benefits for student to stop smoking.

4. CONCLUSION

In comparing the brainwave of smokers and non smokers after motion treatment on the students based on the questionnaire, there is 37% increment in quality of health. The average of EEG measurement shows 50% of samples have improvement in alpha state.

As a conclusion, this shows that the motion treatment improved the quality of health and the values of alpha state. The values of alpha state for smokers had increased as well as non smokers after doing the treatment. However, the effectiveness of the treatment may decrease if the duration of days between one treatment to another is long. In fact, courage is still the most important factor to quit smoking.

5. FUTURE RECOMMENDATION

In the future, it is recommended that for effectiveness of motion treatment, the duration of days from one treatment to another should not exceed one week. Additional treatments may increase the effectiveness of motion treatment. Room with sound proves is needed to achieve the best result.

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7. REFERENCES

[1]   http://en.wikipedia.org/wiki/Smoking

[2]   http://stop-smoking.bestlooks.org.uk/Smoking

[3]   Norazimah binti Ramli, Industrial Practical Training Report, 2006

[4]   Norhanisa binti Kimpol, *Evaluation of UiTM Student Academic Potential with Correlation to Motion Technology*, 2006

[5]   www.brainwaves.com/html

[6]   Innovation Technologies and Energy Medicine (ITEM), *BOSS^{TM} Practitioner's Manual*, 2003