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EXTRACTION AND ANALYSIS OF EEG WAVES FOR THE STUDY OF ENHANCEMENT AND REJUVENATION OF BRAINWAVES THROUGH MEDITATION

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Abstract

Almost each and every individual are prone to stress nowadays. So a practice called meditation is done in order to train the mind according to the individuals various needs. The purpose of this research is to compare the brainwaves before and after non-directive meditation. Non – directive meditation is one of the modern meditation methods where the person's meditation focuses on his/her breathing but the subconscious mind wanders without any control. EEG is taken with portable RMS Maximus 24 electrode portable machine and acquired through Acquiring Software. Psychological task is given to subjects before and after doing meditation with the help of Psytask software. The brainwaves are analyzed and compared before and after meditation with Analysis software for subjects of age between 18 – 35 years. Final comparison shows the difference between the brainwaves by frequency analysis and by Simple stroop task which shows how there is a change in brainwaves because of the impact of meditation. This study indicates that through non- directive meditation the alpha and theta waves are enhanced and hence paves way for relief of stress and more concentration in this modern lifestyle.

I. Introduction

Stress is a natural response of human being which is developed because of various aspects of environment where the individual is present. In this modern lifestyle workplace stress is expected more nowadays. Stress untended will lead to mental and physical illness which leads to less productive work and unhealthy environment.

People come across different kinds of stress according to their surrounding environment. Mostly individuals are prone to acute stress which is typically caused due to the daily demands and pressure encountered by them such as anger, anxiety,

etc. Acute stress eventually becomes episodic when their unrealistic, unreasonable demands gets accumulated which brings too much stress to reach their goals. The most dangerous and unhealthy one is the chronic stress which may even tear the people life apart. It is caused due to long term exposure to stress factors which travel in life for a prolonged period. There are various physical and emotional disorders related to stress which leads to various problems in work place and also in family. Concentration is totally destroyed which eventually destroys the individual's career, name and fame. Even though yoga dates to pre-Vedic period recent studies and researchers have found that one main important way to relieve form this modern world stress and anxiety is by yoga and meditation. Both body and soul is kept under control, where mind relaxes and is relieved of stress. By doing meditation on a regular basis the concentration is been gradually increased. This research shows the difference which is acquired after yoga and meditation, the EEG signals which is been provoked after meditation, the raise is level of concentration with example. EEG is been extracted before and after meditation and eventually the increase in concentration is been shown with the help of physiological task practically.

II. Brain Wave Extraction

Synchronized electrical pulses from masses of neurons in the brain which communicates with each other are called brain waves. Our emotions and behaviors and other states which are the roots of our thoughts are been made an impact in the brainwaves. Alpha and Theta waves are considered as the one which is responsible for the concentration, relaxation and overall health issues. The Delta and Beta waves domination causes elevation in blood sugar level which causes hyperglycemia, weight gain, uneasiness, anxiety, etc. So in order to increase the alpha waves and replace stress with improved performance of mental and physical health through meditation on a regular basis. Exercise alters the brain chemistry by producing serotonin, dopamine which inturn will induce in production of Alpha and Theta waves.

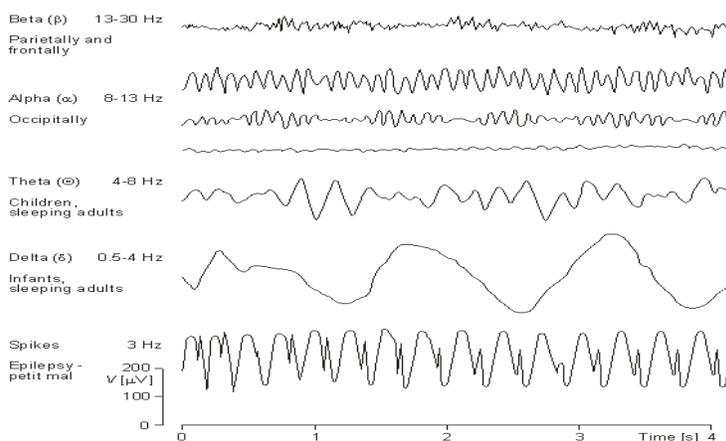


Fig. 1 Different waves of EEG.

II.a. Portable EEG Machine.

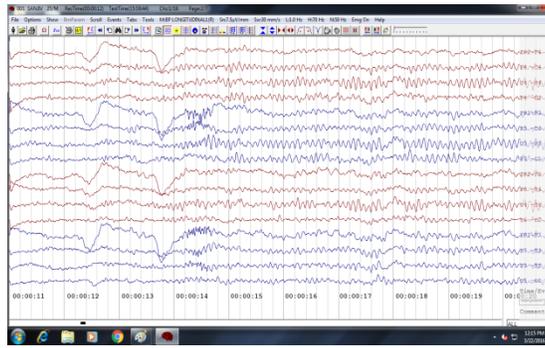


Fig. 2 Extraction of EEG.

High quality range of portable EEG machine Maximus 32 is been used to acquire EEG signals from the subject. It has 24 channels, USB powered machine, 32 channel video EEG and long time monitoring. Around 25 experimental subjects of about 18-35 age are been considered for analysis. EEG waves are been taken for the subjects and stored with the help of RMS acquiring software.



Fig. 3. Extraction of EEG from subjects.

II.b. Pre-Yoga Physiological Task

The subjects are exposed to do the given physiological task in Psytask software. In this research Simple stroop task is been used. Stroop test shows that our brains process seemingly conflicting information differently than they process more straightforward information. In other words, when we see the word 'red' written in the color red, we process the color of the word more quickly than if the word 'red' were written in green and we were expected to just name the color rather than the word. So if it is red left arrow, for blue down arrow and for green right arrow has to be pressed. First EEG is taken while the subjects are doing the physiological task and stored with their details for future use.

II.c. Post-Yoga Physiological Task

Second time EEG is taken to the same subjects who has undergone a period of doing yoga in a daily basis. The same psychological task of stroop test is given to them and EEG is taken and stored for further analysis and comparison.

III. Non-Directive Meditation

Many research studies indicate that doing yoga and meditation gives more room for memory and less stress. Here non-directive meditation is been done because the subjects let their mind wander and drift through their own thoughts, episodic memories, images and emotional processing. So when the subject's mind wanders there is increase activity in the parts of the brain which is more than doing directive meditation. Some of the yoga poses to relieve stress are Dhyana, Balasana, Nadi, Shodhana Pranayama, Sukhasana, Ananda Balasana, Padmasana, Savasana, Anjali Mudra, Agnistambhasana, etc.

IV. Comparison and Analysis of EEG

Finally both the EEGs are been analysed and compared for each subject which is taken before and after doing meditation.

Table 1. Stroop test results before meditation

Name	Age	Condition			Commission	Omission
		L	D	R		
Vasumathi	36	56	42	65	77.5	22.5
Kripa	29	65	34	75	69.1	30.9
Manoj	23	23	45	34	56.3	43.7
Vinothini	20	36	54	25	54.0	46
Sudha	19	26	34	83	60.0	40
Aravind	20	64	87	23	81.5	18.5
Debjothi	21	75	64	28	84.9	15.1
Bama	32	63	78	75	79.5	20.5
Amirthavalli	18	22	55	61	59.7	40.3
Mahendran	20	86	75	55	85.6	14.4
Thaniski	21	23	85	45	45.3	54.7

Table 2. Stroop test results after meditation

Name	Age	Condition			Commission	Omission
		L	D	R		
Vasumathi	36	56	42	65	84.5	15.5
Kripa	29	65	34	75	78.8	21.2
Manoj	23	23	45	34	66.0	34.0
Vinothini	20	36	54	25	73.2	26.8
Sudha	19	26	34	83	69.9	30.1
Aravind	20	64	87	23	92.2	7.8
Debjothi	21	75	64	28	90.7	9.3
Bama	32	63	78	75	85.6	14.4
Amirthavalli	18	22	55	61	67.3	32.7
Mahendran	20	86	75	55	94.2	5.8
Thaniski	21	23	85	45	71.9	28.1

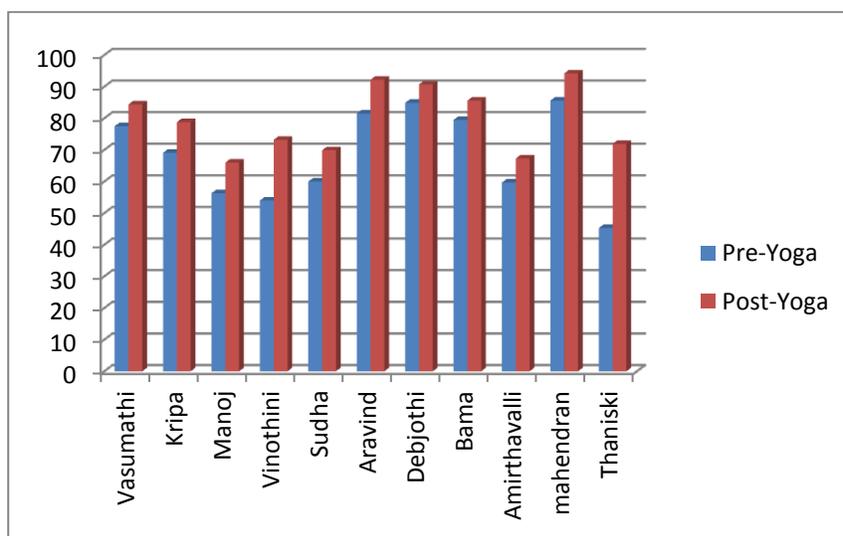


Fig. 4. Difference between the stroop test results.

The above tables and chart shows the difference and how after doing meditation the correct answers (commission) chosen by the subjects increases which means that eventually the concentration of subjects has been increased.

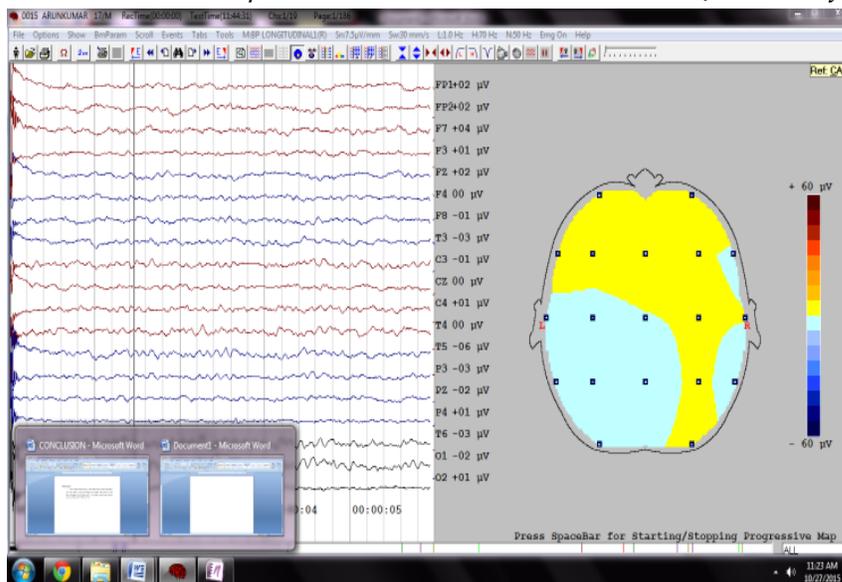


Fig. 5. Tomography of Brain.

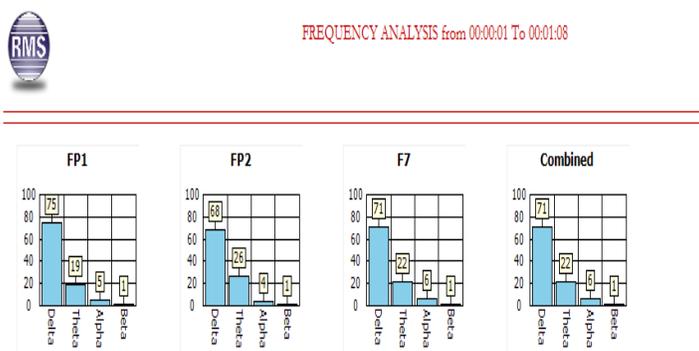


Fig. 6. Alpha waves before mediation.

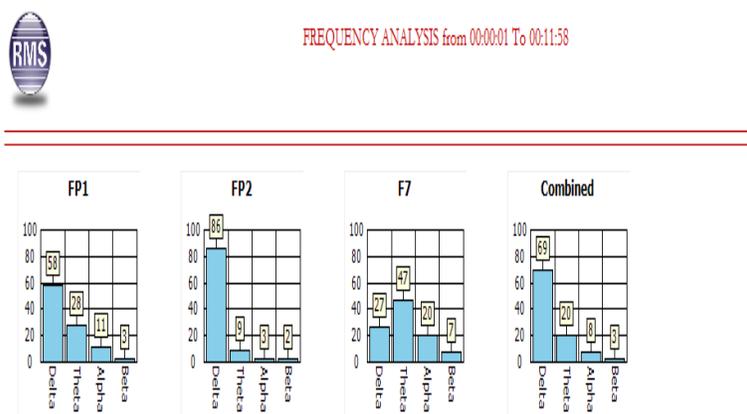


Fig. 7. Frequency analysis of alpha waves after meditation.

Time limitation is been set for both EEGs and that particular wave form of EEG is been taken and analyzed separately for frequency analysis. Each waves like Alpha, Beta, Gamma, Theta have different frequencies and this could be got from the

EEG waveform for each subject. It clearly shows that there is an increase in Alpha waves after meditation which eventually shows that the concentration of subjects has increased.

V. Conclusion

Stress is something which we develop on our own which could be avoided if the individual has strong willpower. Meditation paves way for this to attain peacefulness to both body and mind that is physically and emotionally. By this research we infer that EEG waves have been acquired and analyzed for a set of people which shows a serious development in brainwaves enhancement.

The Alpha waves need to be developed in order to achieve concentration, relieve stress, anxiety, increase memory, etc. This research could be further developed by analyzing the EEG waves for different emotions and implying the same for brain machine interference mechanisms.

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