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Brain Signals Analysis during Concentrated and Diluted Modes

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Abstract

One way of avoiding procrastination is by activating areas within the brain where we switch from one mode of thinking to another. Scientists say the primary cause of procrastination is that people tend to become uncomfortable when they are not sure what to do. However, the discomfort can be changed. Scientists have found that stimulating the brain from an unpleasant to a happy thought is possible by fooling the brain, even it is temporary. This study focuses on brain signals during people's interaction with non-familiar situations (diluted mode), monitors their performance during familiar activity (concentration mode), and analyzes their performance. Cerebral cortex signals are analyzed from the participant using electroencephalography (EEG). The brain can be trained to deal with unexpected scenarios that lead to frustration. This study can help improve a person's life by training their brain to take proper action to deal with their discomfort.

Keywords

Electroencephalography (EEG), Concentrated, Diluted, Relaxation,

INTRODUCTION

The human brain is much more complicated than a machine; it is intelligent and learns on a daily basis. The brain adapts to new things, from education; to the way one lives; to the way one may react in various situations. According to neuroscientists, the brain has two different ways or modes of thinking. The first of the two modes is the concentrated mode; this is when a person is focused. The second mode is the diluted mode, which is when a person diffuses information to discover new techniques to solve a problem. The brain cannot be in both modes at the same time. When people deal with familiar situations their brain is in concentrated mode; attempting to recognize and study patterns. As soon as they are faced with a new situation that requires a new approach to solve the problem, the brain switches to diluted mode. The brain attempts to generate a new solution by thinking in different ways. The brain absorbs new techniques to learn more ideas, solutions, and methods. This absorption helps to reduce frustration, struggle, and also improves skills in an efficient way. However, the brain needs training in order to control frustration. It does this by fooling the subconscious into switching modes in order to focus within the concentrated mode. By learning how to switch modes, the brain is implementing methods to approach mind power, increasing confidence to look at the problem from a different perspective.

Related Work

Researchers announced brain training improves access to different modes of thinking which helps to control frustration[1].When people are attempting to figure something out, they usually associate things that are familiar to them. Neuroscientists have detected that the diluted mode is

most powerful when the brain determines a new strategy with an unknown scenario. This mode of thinking changes the brain from relaxation to frustration status[2]. Psychologists confirm that the brain can analyze any sudden situation. The brain then gives better performance if it is familiar with the situation or a similar scheme[3].

Methodology

Participants

There were 10 participants in this study, including both males and females. Participants were all over twenty one. All participants voluntarily participated in the study and each signed a consent form. The participants were informed about the study and its procedure, as well as the aim behind the project before the study took place. Participant brain signals were recorded throughout the study using a monitoring device. First, the participants were asked general questions about themselves, then questions of a more personal nature. Next, the participants were instructed in methodologies of how to deal with unexpected situations. Finally, they were asked to repeat the procedure again. The data will compare the brain signals, as well as the time taken to answer questions before and after training.

Hardware

The hardware used in the study: Windows 7 pro as the PC's operating system installed on a powerful machine with Intel Core i7 CPU and 16 GB of memory, and BioRadio wireless device (USER UNIT). The metal electro wires were attached to the participants' cerebral cortexes on the surface without any open wounds. They were connected to a BioRaido device. The device sent the signal wirelessly via antenna. A USB Receiver was attached to the PC to capture the brain signals.

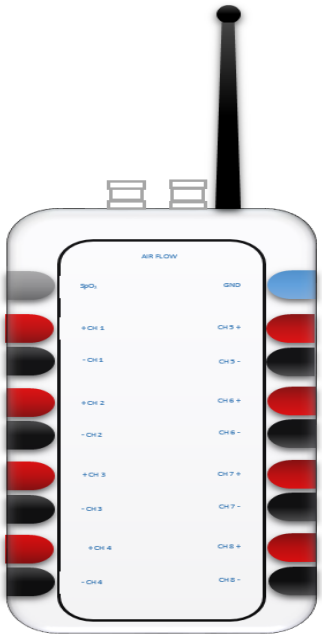

Figure 1: BioRadio 150 USER UNIT

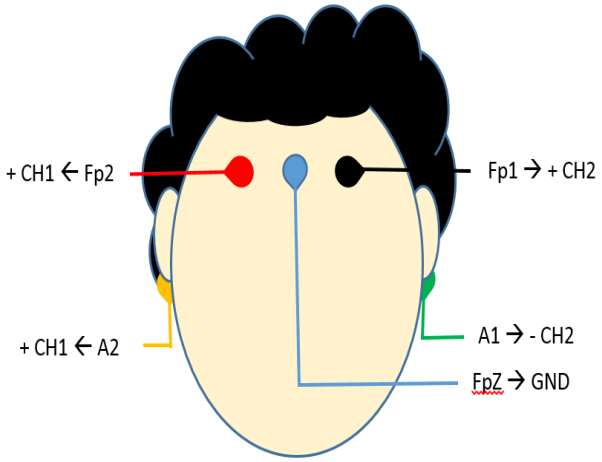

Figure 2: Place EEG wires

Software

The program software being used includes the MATLAB 2013a version 64bit that was used in implementation and simulation. BioCapture was used for reading the signals. Figure 3: Through BioCapture, USER UNITs could be changed for specific input data to read the brain signals. They store data and give the results of the signals received from participants.

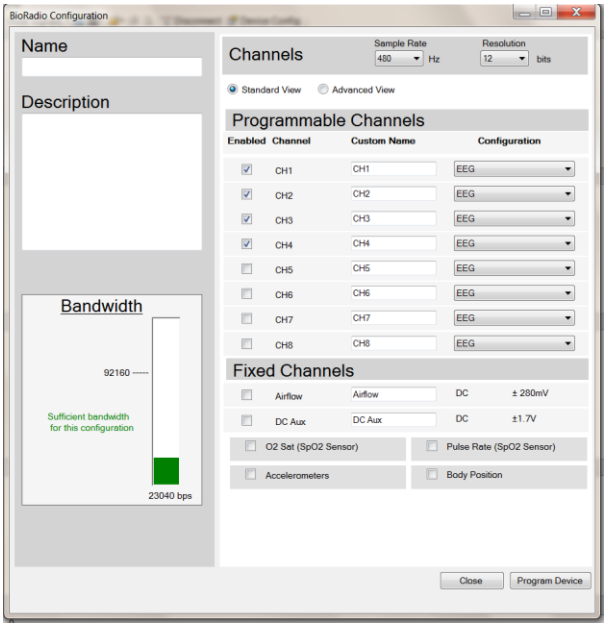

Figure 3: BioRadio Configuration

User Unit	
Number of Input	+ CH1, - CH1, + CH2, - CH2, GND.
Input Range:	± 750µV
Resolution:	12 bits
Noise:	< 2µV peak-to-peak (0.5 Hz – 100 Hz)
Sampling Rate:	480 samples per second per channel
CMRR:	>= 90 dB
Power Source:	2 AA
Input Impedance:	> 20 MΩ at 10 Hz
Filter Input Bandwidth:	0.5 Hz – 250 Hz (-3dB attenuation

Figure 4: USER UNIT Specification

Evaluation and Analysis

People were born alike, but their personalities are formed based on environment and life experiences. However, the brain is able to adopt new characteristics every time, so the person is not the same after facing different circumstances. In this study when participants were asked general questions, which had multiple possible answers the participants felt comfortable answering.[4,5] As soon as they asked narrow questions, their brain reacted and produced different signals that indicated the participants' brain switched from concentrated mode to diluted mode. This reaction might be due to the participants concern about the type of answer and that is similar behavior to procrastination in a real life situation [6].

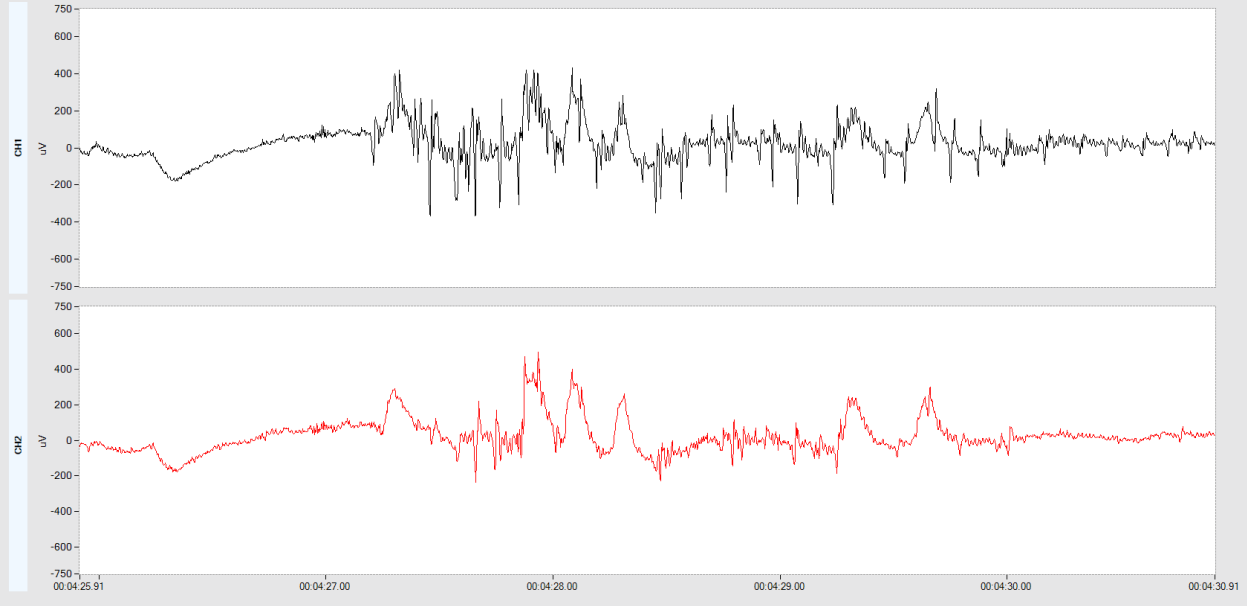

Figure 5: Brain Signal before Training

The brain always refers to life experience and knowledge to deal with similar circumstances. The brain possesses information that helps people to control their frustration and to switch their brain mode[7,8]. Investigators gave advice to participants on how to overcome surprise questions, which caused their struggle[9]. Figure 6 shows brain signals are less scrambled when comparing their signals before they received tips on how to deal with surprise situations.

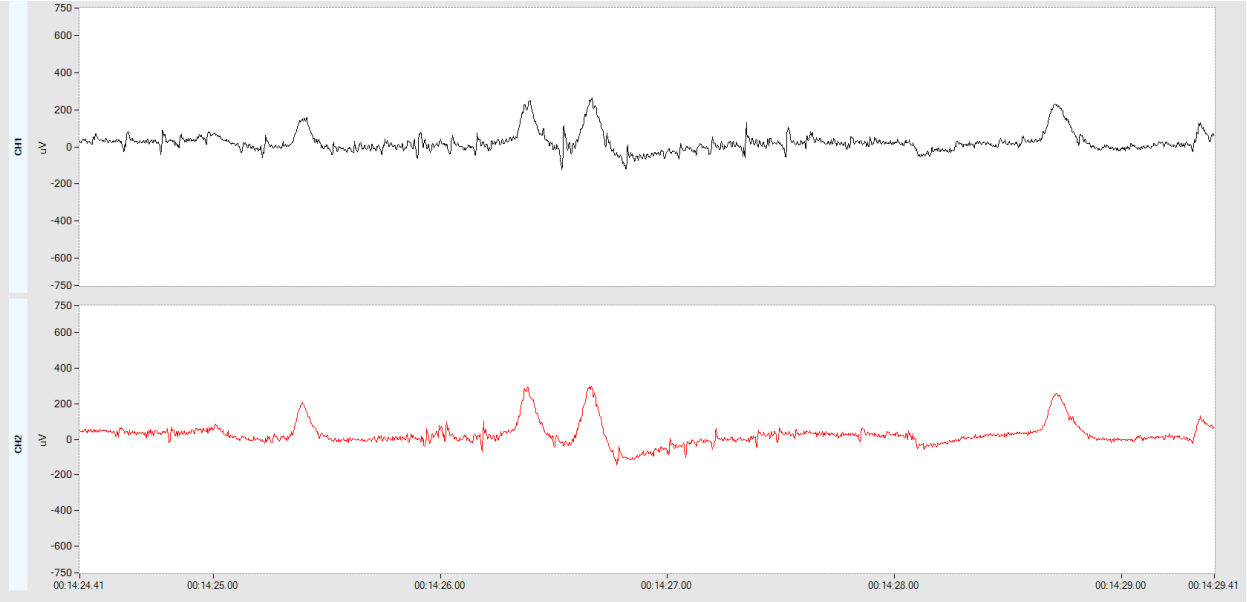

Figure 6: Brain Signal after Training

Result

Accessing different modes of thinking requires training. By default, people's brains are in concentration mode, and they transform to diluted mode when their brain invents a new idea, or thinks of a different solution. The results of the study show that while participants were relaxing, their brain signal produced ± 200 µV, and that is considered an average voltage. When they are out of their comfort zone, the brain signal frequency increases to almost twice as high as the normal status due to lack of confidence, frustration, or knowledge. However, when participants gain some guidance and knowledge their chance of mastering their fear of a surprising situation will escalate.

Conclusions and Future Directions

Studying brain signals in different modes helps us to understand the factors of procrastination and the delay of taking action when thinking. It also helps us comprehend the brain, how it functions, and to solve the mystery of different modes. This will give us insight on how to improve our lives by accessing modes to reduce frustration and increase confidence. Studying brain behavior and understanding it in depth leads to better advice, and training to prevent procrastination of a powerful mind

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