Stress Management through Biofeedback Training

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Abstract. According to a recent survey, most elementary and secondary school students nationwide are stressed out by their academic records. Furthermore most of high school students in Korea have to study under the great duress. Some of them who can't overcome the academic stress finalize their life by suiciding. A study has found that it is one of the leading causes of stimulating the thought of committing suicide in Korean high school students. Main content of this research is to implement an EEG based music therapy. Music therapy can help the student deal with the stress, anxiety and depression problems. To do so we will develop EEG-based human emotion recognition algorithm. Proposed training program works as a therapist. By using this brain training program, student can manage the stress easily without the help of expert.

Keywords: Brain Training, EEG, Music Therapy.

1 Introduction

According to a recent survey, most elementary and secondary school students nationwide are stressed out by their academic records. Furthermore most of high school students in Korea have to study under the great duress[1]. Some of them who can't overcome the academic stress finalize their life by suiciding. A study has found that it is one of the leading causes of stimulating the thought of committing suicide in Korean high school students. It is a serious social problem in Korea. So it is necessary to reduce the high school student's suicide rate. There have been many studies to handle stress. Among them a new groundbreaking method about stress management called biofeedback training [2],[3]. Brain training with biofeedback changes the brain's neurophysiological and biochemical set up and eventually changes the brain's response to stress effectively [4],[5],[6],[7]. But most of the biofeedback training is conducted by expert instructor in professional organization. According to brain training research paper, prolonged training is more effective method than intensive training doing in professional organization. But the existing brain training program is not proper for students for their stress management because they must spend most of the time in school. So it is necessary to develop an another brain training program for Korean students to reduce the stress. I have been interested in human brain since middle school student and I will major in brain science in university. Recently portable EEG (Electroencephalography) is developed and it gives us an easy and
portable way to monitor brain status and manage it through biofeedback training. Research result will made a large contribution toward solving a high school student's suicide problem in Korea.

![Fig.1. Stress type of high school student in Korea](image)

2 Experiment

Experiment will be progressed as following steps. We recruit 30 students who are under the stress from academic record and want to join the experiment. Participants will be divided into 2 groups namely experimental group and control one. We interview about their stress and they fill out a stress-questionnaire. Next we will construct EEG with student's brain map. This gives us an overview of the brain's functional state and indicates the level of stress. We will request the experimental group to listen the music at least 30 minutes everyday during 4 weeks. Because individual’s music preference is different, we will develop training program which automatically switch to another music when the user can’t feel relaxed.

EEG recording was done for 90 seconds with a sampling rate of 128 Hz using 2 channels. EEG was recorded simultaneously and the each frequency bands (delta, theta, alpha, and beta) was calculated. The EEG data was collected in a relaxed position with eyes closed. At first students of experimental group listen to classic music for ten minutes. If Alpha wave is increased then he or she listens to the classic music continuously. But in inverse case the application switches the music to another one. The application repeats this process until the increasing of experimenter’s Alpha wave.

3 Experimental result

After 4 week's training we evaluate EEG before and after training using statistical method whether proposed training program is efficient. Table 2 shows the change of Alpha wave according to music stimulation.
Fig. 2. Alpha wave of before training

Table 1. Mean and Standard deviation of each group before training

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>St.dev.</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>4.18484</td>
<td>0.606782</td>
<td>-0.506827</td>
<td>0.308303</td>
</tr>
<tr>
<td>Control group</td>
<td>4.319353</td>
<td>0.829694</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Because P value 0.308303 > 0.05, two groups are homogenous. There is no difference between experimental group and control group (After training)

Fig. 3. Alpha wave of before training

Table 2. Mean and Standard deviation of each group after training

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>St.dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group</td>
<td>4.7958</td>
<td>0.415609</td>
</tr>
<tr>
<td>Control group</td>
<td>4.319353</td>
<td>0.829694</td>
</tr>
</tbody>
</table>

We can interpreter this result that music treatment is effective to the students who are suffering from stress from studying.

4 Summary and Discussion

Our proposed personalized music treatment system has following advantages.
According to research paper, 82 percent of the entire stress is caused by studying and this kind of situation will not change easily. Our proposed application will be very useful to the students who are under the stress of studying.

Through this research we will develop a brain training program for students. Because it is designed for stress management, it can be applied to anyone who is suffering from any kind of stress.

Students medical spending on relieving stress of studying will be increased as a competitive society progress. This situation also lead to a budget deficit of national health insurance. Our proposed system causes not only decreasing of individual medical spending but also helpful to government to overcome the current financial difficulty.

Finalize their life by suiciding is one of the most serious problem in Korea. Because proposed application reduces their stress, it will be very helpful to prevent suicide.

Future work is as follows.
1. Current system initially plays classic. Because each person’s music preference is difficult we will survey more deeply what kind of music is more friendly to each person.

References