



EFFECTIVENESS OF CLASSROOM LIGHTING COLORS TOWARD STUDENTS' ATTENTION AND MEDITATION EXTRACTED FROM BRAINWAVES

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Abstract

Education of students is associated with classroom environment in which consist of such as settlement order, air-conditioning, furniture, size of classroom and lighting color. The latter effectiveness on attention and meditation of students may not be measured through a survey simultaneously. Nowadays, attention and meditation levels of a students can be extracted from their brainwaves using brainwave detectors.

In this study, attention and meditation levels are extracted from the observed brainwaves of randomly selected two students when changing classroom lighting colors in the Department of Electrical and Energy Classroom of Uşak University.

The result shows that effectiveness of different classroom lighting colors are measured analyzed and evaluated toward students' attention and meditation levels simultaneously.

Key Words: Education, Classroom, Attention, Meditation, Brainwaves.

INTRODUCTION

In an educational environment there are a lot of factors which effect students. In particular, there are factors that affect motivation levels and their performance. These are such as settlement order, air-conditioning, furniture, size of classroom and lighting color.

The type of lighting source is a factor in students' performance. Sources that lighting emit x-rays, radiation, and radio waves is used in classrooms like fluorescent. These emissions reduce productivity, hyperactivity and so on (Sojoudi & Jaafar, 2012).

Lighting color is another factor in students' performance. Colors impress upon employees in industry as psychologically. In many cases carefully choice of colors have increased production five to ten percent and can reverse depressing and monotonous atmosphere and promoting positive feelings about the school and lessons (Papadatos, 1973) and unsatisfactory lighting have negative impacts on student performance (Yang, Becerik-Gerber, & Mino, 2013).

A study shows that every color has a wavelength that affects brain differently. Colors can impress your character and state of mind at the moment. For example, red can trigger more aggressiveness or engagement and positive emotions in different states of mind (Tokcan, 2009).

The lighting color effectiveness on attention and meditation of students may not be measured through a survey simultaneously. In this study, we worked on a method that can give us chance to measure the lighting color effectiveness on attention and meditation of randomly selected two students. Two brainwave detectors used for take raw data that has attention and meditation signal information of students under the influence of white, red and green colors lighting.

METHODS

In this study, attention and meditation levels are extracted from the observed brainwaves of randomly selected two students when changing classroom lighting colors in a classroom of the Department of Electrical and Energy at Uşak University. Students place brainwave detectors which name is Neurosky Mindwave Headset as shown in Figure 1 onto their heads. This detector sends brainwave raw data in the eight channel via wireless signal to the computers. The raw data has many information about level of delta, theta, lowAlpha, highAlpha, lowBeta, highBeta, lowGamma, highGamma, attention and meditation (Swanson, et al., 2009).

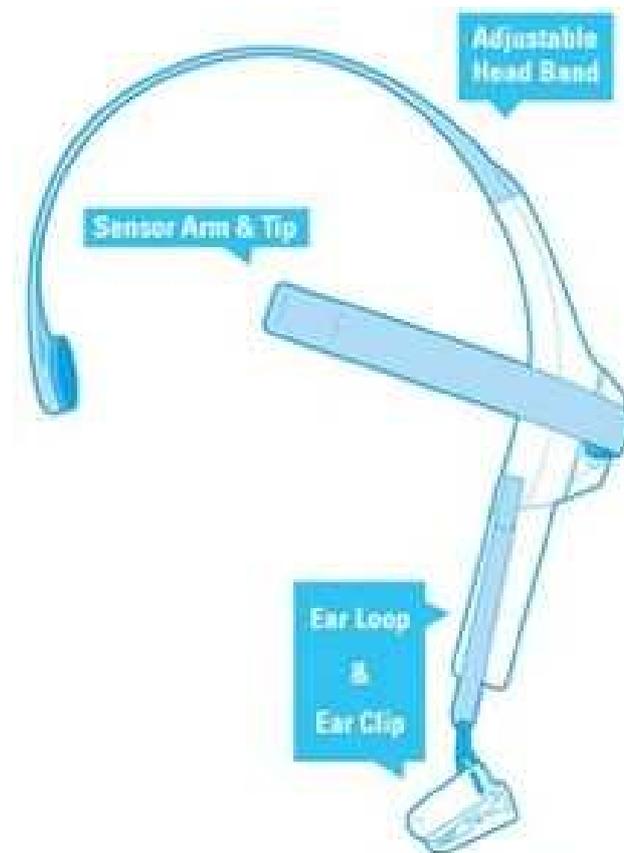


Figure 1: Neurosky Mindwave Headset (NeuroSky Electronic Press Kit, MindWave, 2014).

In the figure 2, columns show number of subjects and rows show the raw brainwaves in the classroom lightning colors which are white, red and green. Sample rate of the brainwave sensor were chosen 512 sps (sample per second) and for each classroom lightning colors held in 15 minutes.

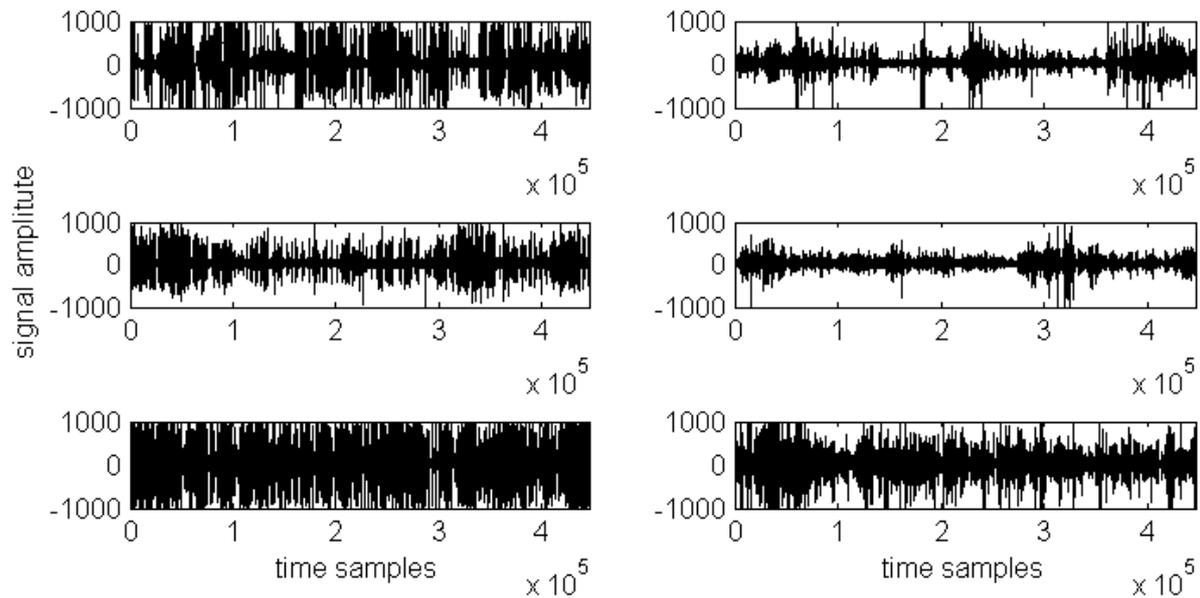


Figure 2: Raw Data of the Brainwaves of the Subjects

Attention and meditation levels of a students extracted from their raw data of the each brainwaves taken under the influence of white, red and green colors lighting and then the effectiveness of this classroom lighting colors are measured analyzed and evaluated toward students' attention and meditation levels simultaneously.

FINDINGS

The figure 3 shows the available attention level data which are extracted from the raw brainwaves of both subjects in the classroom lightning colors.

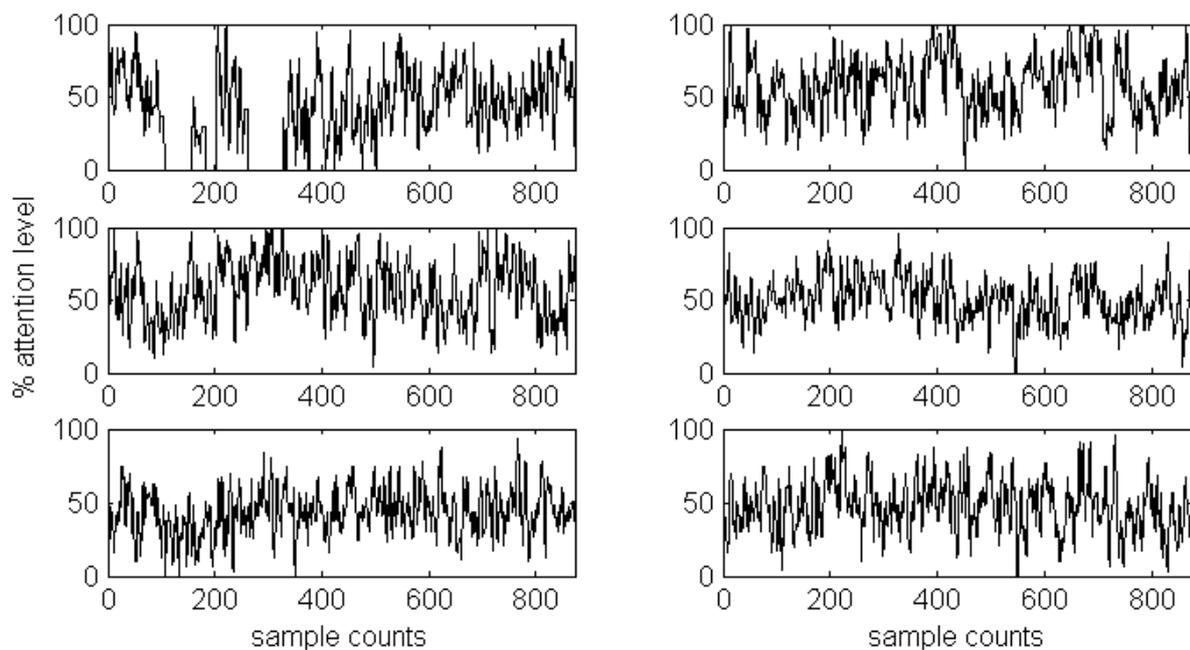


Figure 3: Attention Level of Both Subjects

The figure 4 shows the available meditation level data which are extracted from the raw brainwaves of both subjects in the classroom lightning colors.

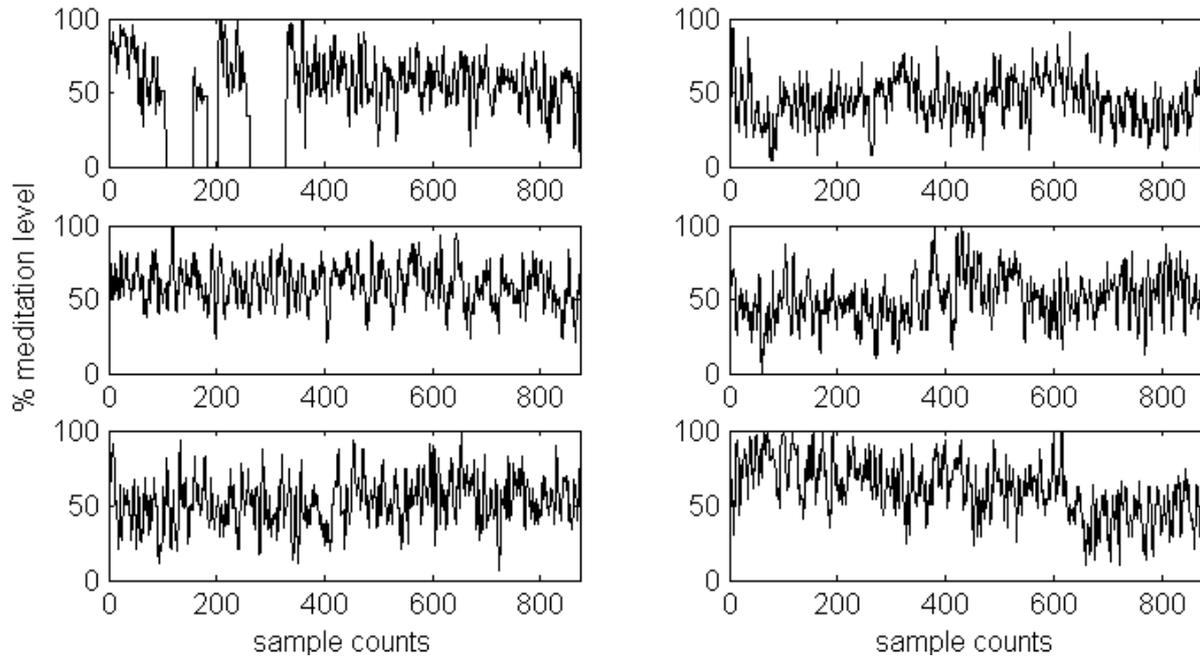


Figure 4: Meditation Level of Both Subjects

In the figure 5, the attention levels of both subjects was calculated as running averages in the classroom lightning colors. The window sizes of the running averages were chosen 250.

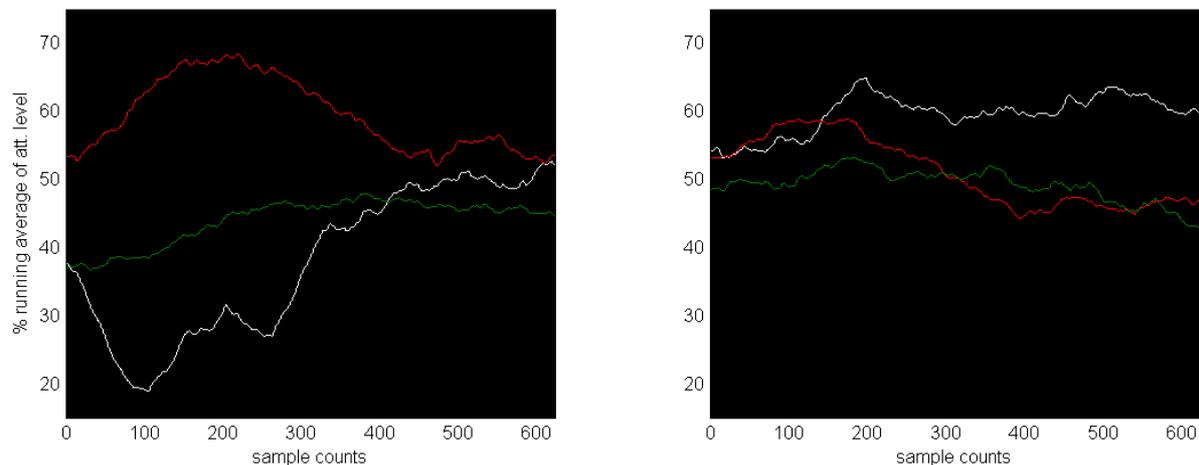


Figure 5: The Running Averages of Attention Level of Both Subjects

In the figure 6, the meditation levels of both subjects was calculated as running averages in the classroom lightning colors. The window sizes of the running averages were chosen 250.

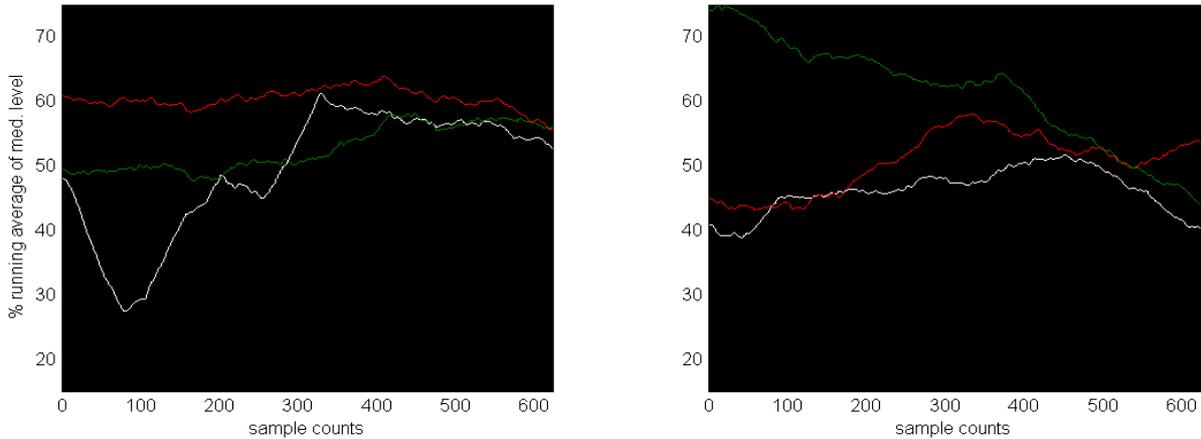


Figure 6: The Running Averages of Meditation Level of Both Subjects

In the figure 7, mean values in point by point were calculated of the sample counts of the running averages of attention and meditation levels of both subjects

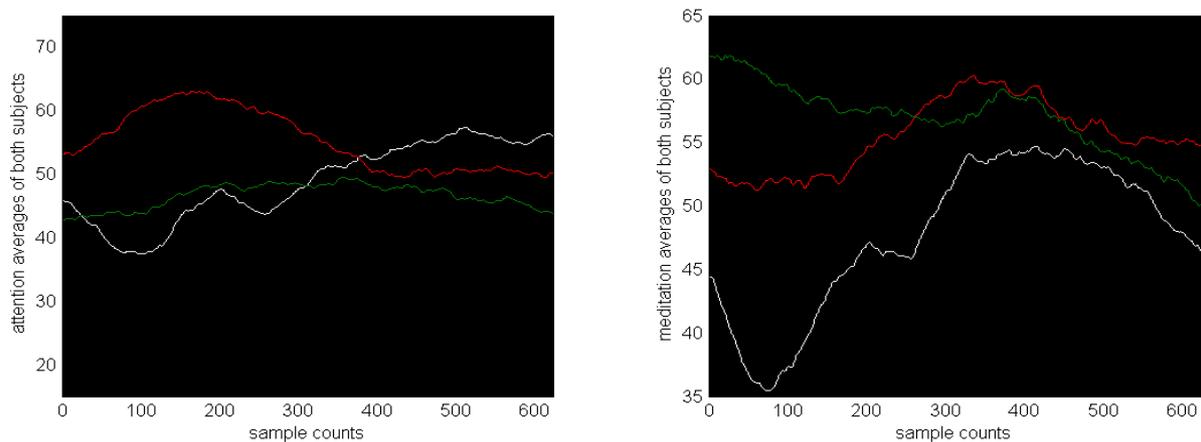


Figure 7: Averages of Attention and Meditation Levels of Both Subjects

The Figure 8 shows mean values of the attention levels of the both subjects through the lightning colors. This result shows that attention level of both subjects is higher in red lightning color of the classroom in compare with white and green colors.

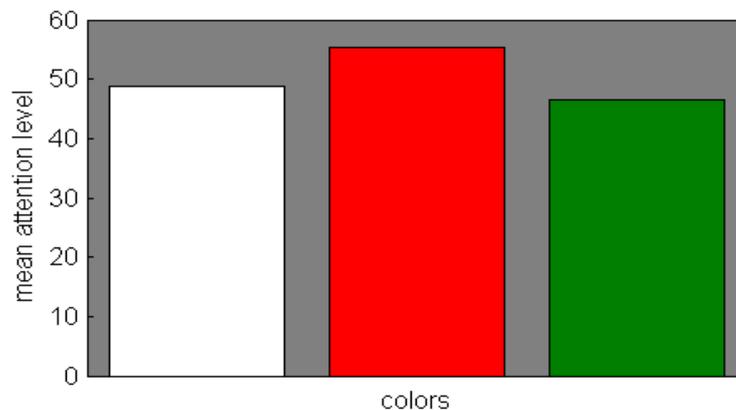


Figure 8: Mean Attention Levels Through Lightning Colors

The Figure 9 shows mean values of the meditation levels of the both subjects through the lightning colors. This result shows that meditation level of both subjects is higher in green lightning color of the classroom in compare with white and red colors.

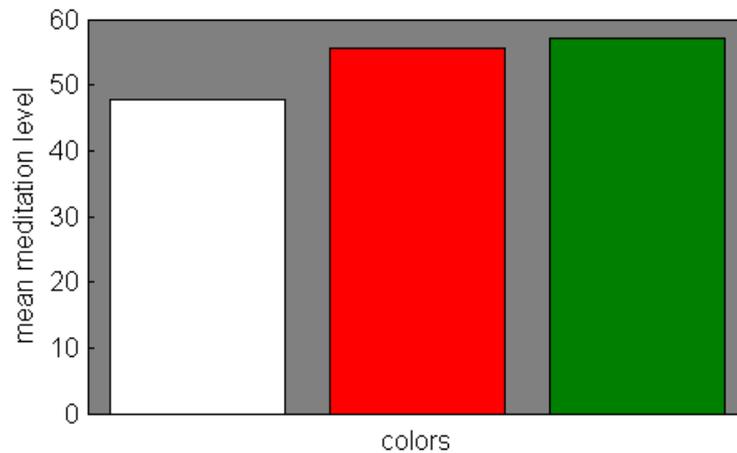


Figure 9: Mean Meditation Levels Through Lightning Colors

DISCUSSION AND CONCLUSION

This study shows that changing of attention and meditation levels are also depends on student personal characteristic. Because in figure 5 shows that attention level is higher in red lightning color for one subject, on the contrary the level is higher in white lightning color for the other subject. We can see like this situations for meditation levels when check the figure 6. For one subject meditation level higher in the red lightning color, but for the other subject meditation level higher in the green lightning color.

Each classroom lightning color effects student's attention and meditation levels separately. In our study, green lightning color push up the meditation level of students, and red lightning color push up the attention level of students in total.

Optional lightning colors may be used instead of monotype lightning color in the educational buildings. Educators can select which lightning color is suitable for their learning activity.

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