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EFFECTIVENESS OF DRUMMING'S EDUCATIONAL TRAINING BY VIBRAIMAGE PSYCHOPHYSIOLOGICAL PARAMETER ANALYSIS

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Abstract: *There may be many ways of education and training that stimulate people's emotion to improve the effectiveness of education. Among them, the effectiveness of healing using percussion instruments(drum) is known to be very large. Experiment was conducted to analyze the healing effects for drumming through the use of the measuring instrument of VIBRASYSTEM that provides the measurement results of psychophysiological parameters by the non-contact measurement method of the state before and after the education and training using drum. By using the VIBRASYSTEM, we tried to show the effectiveness of healing through the percussion instrument by comparing and analyzing the difference between the normal state of everyday life and the psychophysiology of the subject through the training of the percussion instrument and the degree of psychophysiological change. In addition, this study confirmed that psychophysiological state measurement could be done by using VIBRASYSTEM. This study, which compares the state measured before the start of the training with the state after the training, showed that many psychological and physiological parameters have changed remarkably. There was also a significant change in emotional stability, concentration and vitality, and other specific parameters. At the same time, the measured results were found to be deeply related to the psychological emotional and mental health status of each subject.*

Keywords: *Percussion instrument(drum), VIBRASYSTEM, Psychophysiological parameters, Non-contact method*

1. Introduction

The development of biometric technology has opened up the new possibilities for developing new method to control human functional states in psychophysiology (emotion). However, the most of the existing biometric methods used the contact method. And the contact type measurement has the disadvantage, first, that the object is inconvenient, and second, that the error can be caused especially in the long-term contact type measurement and study. On the other hand, the relatively developed VIBRASYSTEM methods and technologies have the advantages that are able to acquire the human functional state information by non-contact type, to be easy to use, and to conduct economically efficient research [1, 2]. Not only human but also all organisms have the differentiated periodic processes according to individual frequency characteristics. This periodicity affects a variety of physiological processes that ensure the normal activity of the body organs, including heart rate, body temperature, arterial pressure, cell respiration, and mitosis of various cells [3, 4].

And the progress of these physiological processes is related to the state of the body organ. The asynchronous cycle process is represented by two key indicators: frequency and amplitude. It is possible to inform the psychophysiological state of a specific time

zone with a dynamic image that characterizes the frequency and amplitude of the point representing movement. This method is possible because all major physiological processes in humans have some correlation with each other.

As a result, the method of using VIBRASYSTEM can be said to measure the moving activity (micromotor property) non-contactly and transform the characteristics of micromovement into psychophysiological indicators that characterize human functional conditions [1, 2, 5]. The vestibular system is associated with all other functional systems of the body organ and makes it respond efficiently to pain, dynamic, and emotional changes [1, 2, 5].

The vestibular-emotional reflex function reflects the micromotion of the human head in a vertical free state through muscle contraction that supports the head in the motor system and makes it possible to change [1, 2, 3, 5]. In addition, all human anatomy is the same, and the vestibular response to the local changes in the state is the same in a particular situation.

Today, in the field of security technology, the characteristics of these human body organs are widely utilized, despite the universal debate, automatic functional state diagnosis of the dynamic micro movement analysis of living body is not widely applied due to the conservative tendency [1, 2, 3, 5].

In this paper, we will analyze the effectiveness of the drumming education and training by the accurate evaluation it through VIBRASYSTEM measuring machine that uses a head micromovement reflex reaction. The human state assessment includes the arithmetic expectation (average value) of micromovement parameters, the variable ratio (variability) with the parameter root mean square of arithmetic expectations, concentration and vitality and the various parameters provided by VIBRASYSTEM.

In the past, biometric variability was usually used to identify cardiovascular pathological aspects and study the reserved capabilities of body organ in the analysis of heart rate variability [4]. The integrated diagnosis information of heart rate variability parameter differs significantly from the vestibular system measurement information made by biorhythm and vestibular activity. the heart rate variability is the main body rhythm of the human organ, while the vestibular system is an important rhythm of psychophysiology, and its function is mainly determined by the activities of other functional systems.

Vibraimage method has a minimum correlation and records as many as 10 independent psychophysiological parameters, characterized by 3D motion movements in human head. By the arithmetical processing for these 10 parameters, a single coefficient that characterizes the human function state is determined, and the micromovement parameter measurement is made up of VIBRASYSTEM. VIBRASYSTEM consists of a standard camera with low temporary noise and PC equipped with VIBRASYSTEM software.

Vibraimage physical models include the articles that was invented by Victor Minkin and N. Nikolaenko (2008) [1, 2, 3], and the physical and thermodynamic model in Vibraimage technology was based on research by Victor Minkin and Libb Thims (2008) [1, 2, 3].

2. Objective and Measurement method

2.1. Objective

For each subject, the psychophysiological parameter values measured by VIBRASYSTEM were obtained from two testing groups according to the two conditions of the pre-training state and post-training state

Condition 1 — pre-training state

Condition 2 — post-training state

The viewpoint of the study is to compare the effectiveness by finding differences in meaningful psychophysiological parameters measured from VIBRASYSTEM in two states of each subject group.

In the measurement stage, we detected the visual differences in Vibraimage generated by VIBRASYSTEM and acquired the detailed measurement data in the psychophysiological state using the digital image processing technique in Vibraimage.

2.2. Experiment and Analysis method

The method used in VIBRASYSTEM testing equipment is remote sensing, non-exploratory, and does not apply any external radiation. There is no high/low frequency electromagnetic field around the testee. The spatial distribution of micromovement was measured on the surface of living objects (human) associated with changes in the nervous muscle tremors in amplitude/frequency spectrum and psychological emotional state. The measurement results are based on the psychophysiological parameters provided by VIBRASYSTEM and the analysis of measurement results using statistical processing to obtain numerical values of the characteristics of the psychological emotional state of the person.

From the statistically reliable independence and by obtaining the results of the study, it is to find the changes in the functional state between two groups.

The statistically recorded differences in Vibraimage parameters demonstrate the functional, physiological, mental, or physical changes that are characteristic of the target group.

In the analysis, human psychophysiological parameter variable V , average value M , mean square deviation S , concentration and vitality and emotional stability parameter were used on the basis of the following parameters.

T1: Aggression, T2: Stress parameter, T3: Tension parameter, T4: Suspect parameter, T5: Balance parameter, T6: Charisma (Charm) parameter, T7: Energy parameter, T8: Self-Regulation parameter, T9: Inhibition parameter, T10: Neuroticism parameter.

The above parameters have given the conditional names that conform to the various emotional human state. It is not necessary to accept these names literally because the individual parameter reflects the physiological aspects of the space and reflex micromovement of head and are calculated according to a specific formula.

The individual parameter calculation formula from T1 to T10 is made according to the micromovement characteristics so that the characteristics of the functional process, the motion energy, and all other characteristics generated in the body organs can be reflected up to 100%.

The T1 to T10 parameters were selected to record all micromovement in the head. The name of the individual Ti parameter represents the various psychophysiological characteristics according to Vibrimage application. The priority characteristic of all individual parameters is the parameter determination formula, not the name.

2.3. Detailed Measurement

This healing program is conducting the drumming's education and training and the healing service through the healing effect program using drum, which is organized by SEROTONIN Laboratory. The testees were 47 middle school students (35 females, 12 male) recruited from SEROTONIN Laboratory. The average age of middle school students was 14.2 years (standard deviation 0.74). The middle school students group had a two-night and three-day program at the National Youth Training Center in Cheonan city on December 2017. Two time measurements were performed at the stage of "before-training" and "after-training" in the drumming course. The measurement environment was installed so that VIBRASYSTEM operated by sitting across from one another between tester and testee. And its room was illuminated by the light on the ceiling under the enough lightness. The camera on VIBRASYSTEM was focused on the testee's face, and the tester sat on the other side of the testee so that the PC monitor screen was not visible to the testee. At the adjustment stage, the optimum amplification factor for the electrical channel was set and was constant during the measurement period. The video at the time of measurement was captured from a camera with 30 frames and, the measurement was performed continuously for each testee. The measurement time was 1 minute for each testee. Figure 1 shows the measurement method toward testee.

The testee was a quasi-stationary state (3) and sitting in a chair (2) and frontly on a laptop pc (2.7 GHz, RAM 8GB), monitor (4). VIBRASYSTEM acquired video clips with Logitek 920 Web Camera (1.3MP) (5). In VIBRASYSTEM record, the background of the monotone was placed on the back side of the testee to reduce background noise, and the head part of the testee was displayed on the screen as a whole.

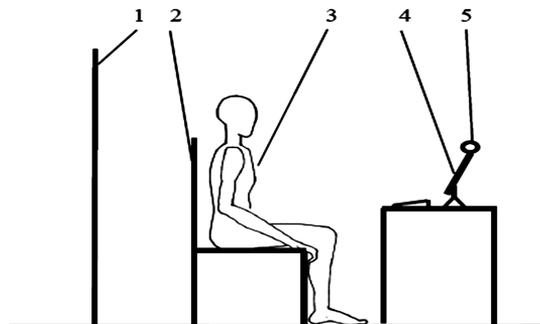


Fig. 1. Experimental measurement figure.

1 — Screen background, 2 — Chair, 3 — Experimental testee, 4 — PC, 5 — Web camera

A large deviation in the measurement result may be related to the lighting changes and the sudden movements of the testee. The psychophysiological state in individual case can be evaluated by VIBRASYSTEM's specific parameters such as Frequency Histogram and Information-Energy graph and etc.

3. Measurement Result

For 47 testees, the status of the pre-training and post-training was obtained using VIBRASYSTEM measuring system. The results of VIBRASYSTEM were able to obtain data on the average value (M) and variation (V) for ten psychophysiological parameter values (T1–T10), and concentration, vitality, and emotional stability.

The results of the statistical analysis of the data measured before and after drumming's education and training are as follows.

A Comparative Study on the Mean Values of Ten Parameters (M) in the Total (n 47) (Table 1-1).

T1, T2, T6, T7, T8, T10 parameters showed the significant differences before and after drumming's education and training (95% confidence interval).

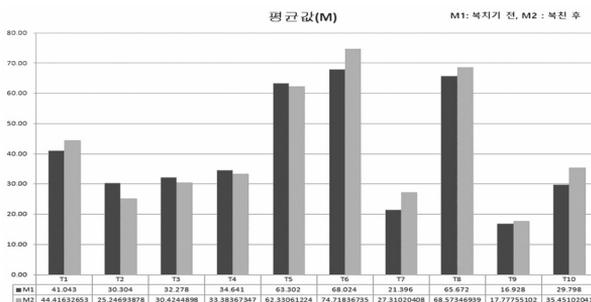
Table 1-1

Mean(M) value of comparatively statistical analysis

Paired Sample Test		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
T1 (m)	북을 치기 전 - 북을 친 후	-3.36	10.94	1.63	-6.65	-0.07	-2.06	47	0.045
T2 (m)	북을 치기 전 - 북을 친 후	5.01	6.60	0.98	3.03	7.00	5.10	47	0.000
T3 (m)	북을 치기 전 - 북을 친 후	0.74	9.54	1.42	-2.12	3.61	0.52	47	0.603
T4 (m)	북을 치기 전 - 북을 친 후	0.93	4.74	0.71	-0.49	2.36	1.32	47	0.195
T5 (m)	북을 치기 전 - 북을 친 후	1.08	13.65	2.04	-3.02	5.18	0.53	47	0.598
T6 (m)	북을 치기 전 - 북을 친 후	-7.06	14.15	2.11	-11.31	-2.81	-3.35	47	0.002
T7 (m)	북을 치기 전 - 북을 친 후	-5.62	8.31	1.24	-8.12	-3.13	-4.54	47	0.000
T8 (m)	북을 치기 전 - 북을 친 후	-2.97	9.59	1.43	-5.85	-0.09	-2.08	47	0.044
T9 (m)	북을 치기 전 - 북을 친 후	-0.52	3.99	0.59	-1.72	0.68	-0.87	47	0.387
T10 (m)	북을 치기 전 - 북을 친 후	-4.40	11.89	1.77	-7.97	-0.83	-2.48	47	0.017

Table 1-2

Mean(M) of Before/After comparison



A Comparative Study on the Variability (V) of 10 Parameters in the Total (n47) (Table 2).

T6, T7, 79 parameters showed the significant differences before and after drumming's education and training (95% confidence interval).

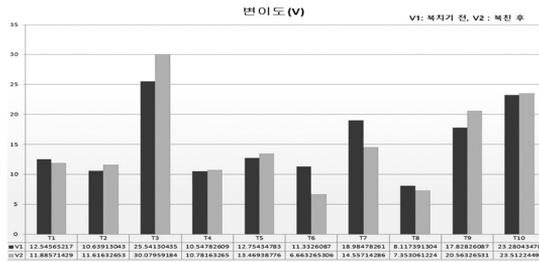
Table 2-1

Variability (V) of Before/After comparison

Paired Samples Test		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
T1 (m)	복을 치기 전 - 복을 친 후	0.68	5.65	0.84	-1.01	2.38	0.81	47	0.422
T2 (m)	복을 치기 전 - 복을 친 후	-0.34	6.71	1.00	-2.36	1.68	-0.34	47	0.736
T3 (m)	복을 치기 전 - 복을 친 후	-3.14	14.17	2.11	-7.40	1.12	-1.49	47	0.144
T4 (m)	복을 치기 전 - 복을 친 후	-0.06	7.99	1.19	-2.46	2.34	-0.05	47	0.960
T5 (m)	복을 치기 전 - 복을 친 후	-0.61	11.69	1.74	-4.13	2.90	-0.35	47	0.727
T6 (m)	복을 치기 전 - 복을 친 후	4.91	8.87	1.32	2.25	7.58	3.72	47	0.001
T7 (m)	복을 치기 전 - 복을 친 후	4.14	10.86	1.62	0.88	7.41	2.56	47	0.014
T8 (m)	복을 치기 전 - 복을 친 후	0.83	5.09	0.76	-0.70	2.36	1.09	47	0.281
T9 (m)	복을 치기 전 - 복을 친 후	-2.41	6.71	1.00	-4.43	-0.39	-2.41	47	0.020
T10 (m)	복을 치기 전 - 복을 친 후	0.20	9.21	1.37	-2.57	2.96	0.14	47	0.887

Table 2-2

Variability (V) of Before/After comparison



A Comparative Study on Vitality, Psychophysiology Energy, Emotion stability in the Total (n47) (Table 3).

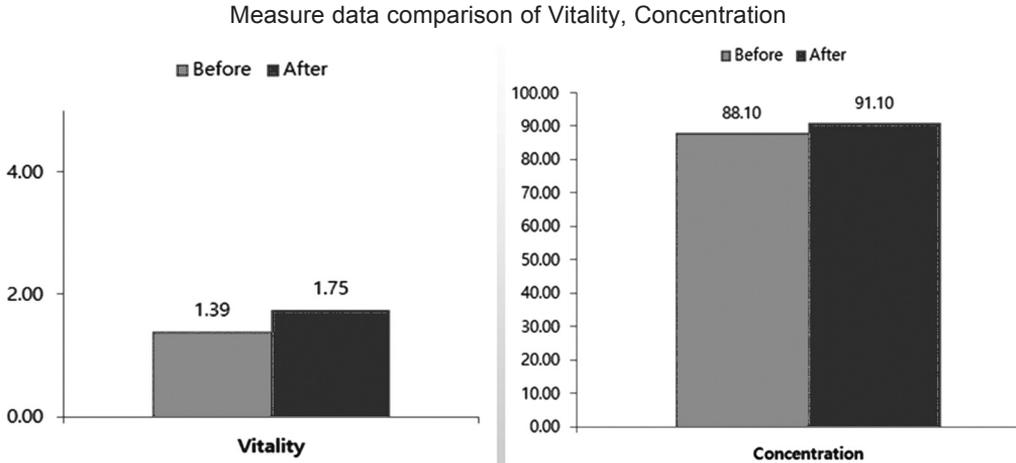
Table 3

Comparison of Vitality, Psychology Energy, Emotion stability

Paired Sample Test		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
활력도	복을 치기 전 - 복을 친 후	-0.27	0.52	0.08	-0.42	-0.11	-3.42	47	0.001
정신에너지 (최소값)	복을 치기 전 - 복을 친 후	-0.48	0.91	0.14	-0.75	-0.20	-3.50	47	0.001
정신에너지 (최대값)	복을 치기 전 - 복을 친 후	-0.58	0.91	0.14	-0.86	-0.31	-4.30	47	0.000
정서안정성	복을 치기 전 - 복을 친 후	6.70	12.72	1.90	2.88	10.52	3.53	47	0.001

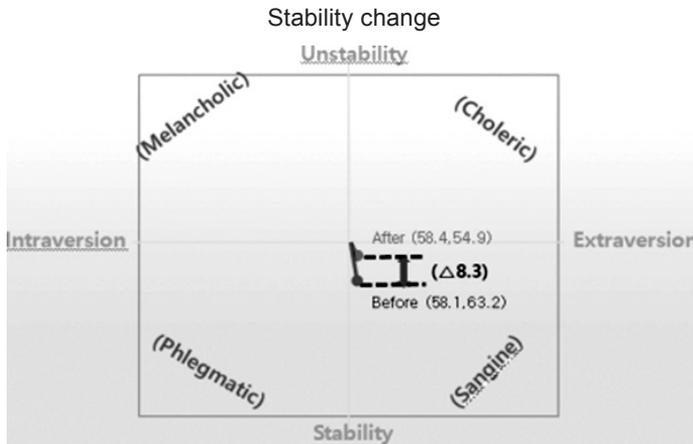
From Table 3 and 4, the index of Vitality and Concentration wa increased slightly (Table 4).

Table 4



In addition, after drumming’s education and training, the emotional stability was decreased by 8.3 (13% points) as shown on Table 5, and this means that they came to close to neutral state furthermore (50% is neutral) after drumming train. The applied rule base was followed by Dr. Hans Eysenck’s theory published on “Dimension of Personality” [9].

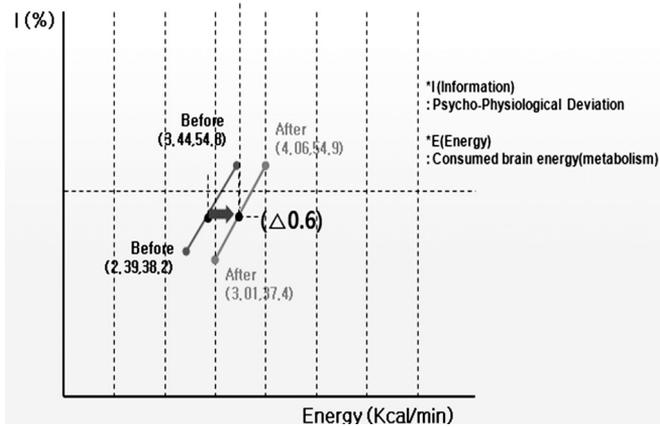
Table 5



The change in metal energy was shown on Table 6 as below. The amount of mental energy consumption was increased by about 0.6 kcal/in. In other words, the increase in mental energy consumption means that mental and physical activity has increased and the metabolic process has become more concentrated, as indicated above Table 4.

Table 6

Comparison of Mental energy consumption change



In this study, the results of the measurement before and after the study showed that the change of positive emotion especially in T6, T7, T8 was greater than the change of negative emotion especially in T1, T2.

As a result, it was found that there was a very important psychophysiological change between the pre and post — training status of drumming's education and training.

In addition, the study was able to clearly and objectively identify changes in some functional states apart from the physiological, psychological, or emotional causes, although the effects of drumming's education and training vary slightly depending on the characteristics of each individual testee.

4. Conclusion

By using VIBRASYSTEM, we were able to easily and quickly measure the psychological emotional state of a person, and we were able to record changes in the state of the person after the education and training of the drum as well as the normal and quiet psychological emotional state of the person.

In the conducted study, the effectiveness of drumming's education and training was very positive in various psychophysiological conditions and, the result proved to be very effective.

The differences between the two conditions are remarkably marked by psychophysiological parameters. The significant differences were so evident in T1 (Aggression), T2 (Stress), T6 (Charisma), T7 (Energy), T8 (Self-Regulation), T10 (Neuroticism).

The degree of vitality and concentration increased and then, was improved as well. The distribution of the positive emotion variation was increased. In addition, since the measuring device of VIBRASYSTEM is measured by non-contacting method, it has been proven that it can be easily and conveniently measured for the effectiveness analysis of drumming's education and training.

At the same time, this study was able to objectively and efficiently identify changes in all functional conditions apart from the physiological, mental, or emotional causes, although the effects of drumming's education and training differ slightly depending on the characteristic of each testee.

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