

# The effect of mind and body coordination method on brain wave and physiological variables

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## Abstract

1. The result from the questionnaire regarding Initiation determined that on the day of competition all members, in order to decrease anxiety and mental tension, that some form of counter measure was undertaken.
2. With Axillary's temperature measurement, it was documented that there was a prevalent temperature increase with mind and body coordination method. From that result it was revealed that there is the possibility of advocating the relaxation reaction with the breathing method, progressive relaxation, Initiation, listening of music technique by the technique of controlling the activity of the autonomic nervous system <sup>59)</sup>.
3. In the aspects to the brain wave,  $\alpha$  wave content ratio increases particularly in the predominant activation effect in the right hemisphere of the brain. It is suggested that the mind and body coordination method that includes Initiation possibly raises the effect of relaxation.
4. From the analysis result of the J-Stress Arousal Check List and State-Trait Anxiety Inventory it was acknowledged that there was no change in the two factors of J-Stress Arousal Check List even after training however it was acknowledged with State-Trait Anxiety Inventory that there was a decrease in the trait anxiety scale and from that it is thought that the mind and body coordination method contributed to the decrease of the high anxiety in terms of personality aspect.

From the clinical psychology view port result mentioned above it is considered the useful physiological state of mind effect of mind and body coordination method making clear that one could obtain the clue which assures the anxiety reduction of the athlete who occurs with the competition setting. In addition to the result that was shown the woman player's counter measure and the use of Initiation was a refrained step immediately before competition.

The above-mentioned subject became clear at the time of research however when the result of this experiment is used as the basis furthermore leading to the improvement of exercise performance in competition, it brings to the attention that in order for control of competition anxiety to contribute the construction of the mind and body coordination method which is adapted by the individual athletes is important.

**Key words:** relaxation, alpha wave, axillary's temperature, J-Stress Arousal Check List (JSACL), State-Trait Anxiety Inventory (STAI)

## I. Introduction

In competitive sports, even with superior physical and technical skills, it is difficult to achieve the desired goals without psychological toughness. Excessive tension in the form of performance anxiety during competition can have

various impacts on the organs, inducing changes and lowering performance <sup>1)</sup>. Therefore, it is relevant that in order to achieve peak performance one must strengthen their psychological skill.

In earlier research the effectiveness of the strengthened psychological skill, which is the objective of the relaxation

training was reported.

This relaxation training with the use of music depends on closed eye response, breathing method, progressive relaxation method, autonomous training method which are the basis for the technique which contributes to the increase of self-control ability, reduction of the tension state, the decrease of anxiety and the improvement of motion performance <sup>2) 3)</sup>.

In the previous experiment by this researcher, it was recognized that after the skin temperature and brain wave examinations, the result was lessening of tension due to effectiveness of the relaxation training <sup>4) 5)</sup>.

At times of everyday practice prior to competition the implementation of the relaxation training increases, it is observed that to manage a series of relaxation training techniques just prior to competition there isn't enough time to achieve such techniques.

But in some structure or manner, it can be considered that many athletes are implementing counter measures against forms of anxiety and lack of confidence <sup>6) 7)</sup>.

Tokunaga <sup>6)</sup>, from the result of investigating the method of mood making prior to a tournament and midst of a tournament, the classification of the counter measure of anxiety is currently undergoing but from precedent relaxation training the physical-environmental counter measure listed have not been used. This physical-environmental counter measure calms down excitation by drinking water, going to the washroom, in addition to holding a good luck charm or performing an act of fortune and so on. From this holding a good luck charm or performing an act of fortune and so on is said to pray for the arrival of good fortune, it is said that manner of speaking in preparation of competition of the effects of Initiation on habit conversation it is a similar position of that of the personal ritual.

However, the connection of the current counter-measures and mental strain to lessening of anxiety has not been considered <sup>3)</sup>.

At this time with the introduction of a new Initiation into the relaxation training program it has been decided to proceed with an effective estimate.

During Initiation athletes are seen holding a good luck charm, praying, meditating, writing the kanji character for "human" and swallowing it (written in Japanese symbol; this is conveyed as a traditional act of attaining relaxation), being in a state of relaxation however there are only few cases of these results being researched.

With the above-mentioned, the change of the nervous system and physiological reaction from the psychological test of the heart rate, auxiliary temperature, brain wave and J-Stress Arousal Check List, State-Trait Anxiety Inventory was analyzed that the use of the mind and body coordination

method which adds Initiation was proven as a research purpose.

## II. Method

### 1. Research objective

The questionnaire survey regarding the execution circumstance of Initiation was on the register in the Department of Health and Sports School of Letters Mukogawa Women's University used 167 first-year students who is belong to a sports club, as the object. From the above-mentioned research the fact that difference between the male and female is recognized in the counter measure of the anxiety, it is rather something that makes the tendency of the female athlete in Initiation which is made clear in this research <sup>6) 7)</sup>.

10 rhythmic sportive gymnast of Department of Health and Sports School of Letters Mukogawa Women's University (the average age:  $18.9 \pm 0.53$  years old) has been chosen as the subjects for the mind and body coordination method experiment. The Department of Health and Sports School of Letters Mukogawa Women's University Rhythmic Sportive Gymnastics Club is the 2006 and 2007 All Japan Rhythmic Sportive Gymnastic Competition's prize winners.

As a type of motion style, Rhythmic sportive gymnastics is classified as achievement/ conquest sports, these characteristics are classified as high risk of degree of difficulty and that it is required that 10 elements and performance contents are executed accurately. In addition to, female's team event (Simultaneity and harmony characteristics due to the cooperation of a group consisting of five individuals become the essential factors) given two minutes and thirty seconds and limited to one opportunity, due to the appraisal of the technical value and artistic value of their performance, midst of the performance committed errors such as falling of the hand tools were connected to large demerits therefore victory or defeat was very decisive. Therefore, compared to other factors to deal with failure, anxiety and nervousness were certainly more significant and to counter measure the effects Initiation and related execution circumstances were certainly noticeable <sup>2)~5)</sup>.

In order to verify the Initiation method result, a rhythmic sportive gymnast of Department of Health and Sports School of Letters Mukogawa Women's University was chosen as the subject to partake in the mind and body coordination method experiment. Due to the subject being a female, measurements regarding axillary's temperature heart rate, brain wave were taken into consideration of the menstruation period; the subject therefore was excluded from the experiment one week before and after the approximate ovulation day. In particular the influence of the adrenaline and the related hormone secretion, in the sympathetic nervous system in axillary's temperature,

resulted in a fluctuation in numeric value.

## 2. Research period

Year 2008, April ~ September

## 3. Research procedure

In early April, a paper survey was distributed to 167 recipients in order to investigate individuals' Initiation to counter measures of anxiety. At the same time, in order to verify the effectiveness of Initiation, an experiment was conducted with 10 rhythmic sportive gymnasts<sup>4)</sup> having higher competition anxiety by natural means. The experiment was conducted to measure each individual's heart rates, axillary's temperatures and brain wave signals. Furthermore, in order to conduct an experiment about the mind and body coordination method which targets the strengthening of tension, anxiety reduction psychological skill and how mind and body coordination method brings about change, an assessment of the analysis of a 6 month training exercise was executed and training before and after J-Stress Arousal Check List and State-Trait Anxiety Inventory.

### 1) Analysis

During the distribution of the paper surveys, request of name of their belonging club and athletes within their use of anxiety counter assessments regarding the physical and environmental counter assessment related to Initiation's execution contents on the day before competition and the day of competition were collected at the scene. Furthermore, it was possible for the athlete to select multiple replies and the athletes with no execution experience were instructed to answer nothing.

### 2) Experimental procedure of mind and body coordination method

The mind and body coordination method used in the experiment is a combination of a technique<sup>5) 8) 9)</sup> that has been proven and validated from a previously conducted research and the style of this Initiation has been picked up from this research. In the program closed-eye state (meditating), breathing method, progressive relaxation, Initiation (good luck charm, favorite towels, handkerchief, and stuffed dolls, etc), and listening of music indicators were individually conducted every three minutes each and each technique was repeated with the open-eye state.

The experiment is conducted in a psychology laboratory in duration of 25 minutes during the times of 17:00 and 18:00. The environmental condition of the experiment is as follows: Room temperature of 22~24 degrees Celsius, humidity of 40~65%, no presence of sun light, and the subject in a closed-eyed sitting in a chair state. The subject was requested to spend

twice as much time exhaling compared to inhaling during the breathing method.

During the progressive relaxation, the repetition of the tensioning and relaxing of the muscles of the hands, shoulders, feet and the rest of the body was executed.

The piece of music that was used for listening of music was a Classic Version Environment Music 'Feel at Ease', the tempo at 30~32 beats/minute (AILE Disc Production).

### 3) Axillary's temperature

The measurement of the axillary's temperature was taken with a clinical thermometer (OMRON Model MC-509).

The measurements were taken prior to the start of the experiment and immediately at the end of the experiment of the closed-eye relaxation state (meditating), breathing method, progressive relaxation, Initiation, listening of music which each technique was executed in three minutes.

### 4) Analytical process of the brain wave

The analytical device that was used to measure the brain wave was a multi purpose telemeter (Signact MT 11 NEC Model).

The analysis program that was used was a multi purpose organism information analysis program (Quick EEG<sup>®</sup> II for Windows Kissei Comtec Model).

For organism electrode installation the ECI Electro cap (Electrode System NEC Model) was used, the arrangement method of the electrode installation region was recorded by conforming to the advice of the electrode arrangement method of the International Brain Wave Academic Society's electrode guidance method (Fp1, Fp2, F7, F8, C3, C4, T5, T6, O1, O2, Fz, Pz), and having the inactive electrode placed on the ear lobe and having the electrical potential fluctuation between both electrodes was recorded. The brain wave zone was analyzed by time serial indication frequency mapping with the use of EEG Topography and the frequency analysis calculation of the content ratios (%) of the  $\theta$  wave,  $\alpha$  1 wave,  $\alpha$  2 waves. The brain wave amplitude strength converted the pulse into direct current and setting the time constant to one second the voltage value was set at  $\mu$ V.

The brain wave comparison from the currently conducted experiment was between the left and right vertex (top of head) (L.C3, R.C4), left and right occipital (L.O1, RO2), left and right of the rear of the head (L.T5, R.T6) and their 6 places of active electrodes. From these selective reasoning it was suggested that  $\alpha$  wave distribution on the occipital lobe and on the vertex, quantity appeared to be the predominant aspect over amplitude from the preceding research<sup>10)</sup>.

In addition, the analysis of the brain wave placed the  $\theta$  wave,  $\alpha$  1 wave,  $\alpha$  2 wave to be classified in wave number by zone mapping as well indication and frequency were classified

by zone that was calculated with the content ratio which was analyzed along with the reference level of the prior experiments normal closed-eyed state.

At this time the reason for removing the  $\beta$  and  $\delta$  waves from the analysis items was due to the analysis of the brain wave measurement from a psychological clinical stand point which made it the prime object. The  $\beta$  wave activity appeared to increase during psychological activities for example the state of stress and state of strength. The  $\delta$  wave increase was observed during the state of sleep which means it did not make it a relax indicator<sup>11)</sup>.

The measurement of the brain wave content ratio was calculated prior to the experiment and at each of the follow: closed eye relaxation (meditating), breathing method, progressive relaxation, Initiation, listening of music was each executed three minute intervals. Between two minutes and fifty seconds and three minutes immediately before the conclusion of the techniques, every ten seconds was the mean value.

5) The analysis of J-Stress Arousal Check List and State-Trait Anxiety Inventory during the training period

#### **(1) The Execution of the mind and body coordination method**

In order to examine how the mind and body coordination method with the goals of reduction of anxiety and anxiety, and strengthening of psychological skill, mind and body coordination method was executed at the frequency of once a week for duration of half a year.

The training period commenced from the second week in April until the third week in September however one week prior and after the Kansai Intercollegiate, West Japan Intercollegiate and National Intercollegiate were excluded within the training period.

From the technique implemented in the experiment, the mind and body coordination method is seen as a similar program however the training operating procedure was made the basis of the brain wave bio feedback. During closed eye relaxation(meditating), breathing method, progressive relaxation, every time the activity circumstance of the brain wave was presented to the subject, the average level of content ratio of the  $\alpha$  wave was recognized and having the result of the current experiment as the base, the execution method was tested to check the association and correction of whether the experiment was appropriate. During execution of the experiment it was implemented in a way to have the subject efficiently change of the  $\alpha$  wave content ration into a physical sensation, closed eye relaxation state (state of not thinking about anything, keeping the mind blank), breathing method (evenly timed exhale and inhale without consciously thinking about the process without

any excessive points), progressive relaxations (without any excessive assessment of bodily parts and methods) were given out as advice.

#### **(2) Regarding the analysis of J-Stress Arousal Check List and State-Trait Anxiety Inventory.**

In order to verify the result from mind and body coordination method, J-Stress Arousal Check List and State-Trait Anxiety Inventory and their respecting psychological aspects were analyzed and compared two times at the period immediately before in early April and immediately after the training period in early September.

① The characteristic and execution method of J-Stress Arousal Check List

The J-Stress Arousal Check List according to Cox and Mackey (1981) conforms to the Stress Arousal Check List which is a test created by Hatta<sup>12)</sup>, the objective of the test is to inspect an individual's method of handling of circumstances of stress and its deterioration and harmful alterations. It is considered that stress has 2 structural factors, the first factor being a stress factor and the second factor being an awaking factor. The first factor is an individual's appreciation of physical and psychological social circumstance requirements and its perception, the second factor is an individual's physical and psychological social circumstance and its conflict with the autonomic nervous systems activity and how it is at the focus of expressing an individual's physical activity<sup>12)</sup>.

In the inspection paper it was agreed on with a total of 30 items, there were 18 corresponding items that were stress factors and 12 corresponding items that were awakening factors, the result was decided on and accomplished with the criteria of score conversion. Due to the expected time of execution of 5 ~ 6 minutes and having inspection included within the scope it was indicated to have a completion time of 6 minutes.

② The characteristic and execution of the State-Trait Anxiety Inventory

State-Trait Anxiety Inventory is based on Spielberger's (1966) "The Trait and State Model of Anxiety" and Mizuguchi, Shimonaka, & Nakasato<sup>13)</sup> whom have separated anxiety into two range and have formed an inspection method of characteristic anxiety and conditional anxiety. Trait anxiety is considered a natural anxiety of personality and is always in conflict with the anxiety scale.

Conditional anxiety is something that develops from acknowledgement appraisal which confronts with psychological stress which is caused by outside factors and also in situations judged to be harmful then in a short period induced an anxiety state, and how anxiety affects the anxiety scale is

Table 1 Investigation results regarding initiation

Before competition				The day of competition			
	category	n	%		category	n	%
1. image and image training	B	26	15.6	1. take specific food and drink	C	26	15.6
2. good and sleeps	C	16	9.6	2. image and image training	B	21	12.6
3. early and sleeps	C	15	9.0	3. take a deep breath	B	16	9.6
4. listening of music	C	14	8.4	4. knock on a physical part	A	15	9
5. think about nothing	B	13	7.8	5. jump	A	12	7.2
6. take specific food and drink	C	12	7.2	6. Listening of music	C	12	7.2
7. maintenance check and preparations for tool or uniform	C	8	4.8	7. do maintenance	B	11	6.6
8. lucky charm and goods	C	4	2.4	8. lucky charm and goods	C	9	5.4
9. shave hair cutting hair and a nail	C	3	1.8	9. decide way of moving	C	7	4.2
10. talk with a friend	C	3	1.8	10. promote a big voice to with a circle	B	7	4.2
11. finish evacuation	C	3	1.8	11. confirming movement	A	6	3.4
12. take a bath slowly	C	3	1.8	12. encourage / talk with a friend	C	6	3.4
13. eat well	C	3	1.8	13. Think to be succeed	B	6	3.4
14. relax a feeling	B	3	1.8	14. do stretch and up	A	6	3.4
15. put on favorite underwear in the body	C	3	1.8	15. decide turns to wear such as wearing clothes / shoes	C	5	3
16. Reading and writing (email ro letter)	C	3	1.8	16. fired up	B	5	3
17. limiting an intake of specific food and drink	C	2	1.2	17. which is in one's world ; falling silent	B	4	2.4
18. read a book and comics	C	2	1.2	18. Check of tool	C	4	2.4
19. having an aim	B	2	1.2	19. Think to be same as an exercise	B	4	2.4
20. praying	B	2	1.2	20. writing the kanji character for "human" and swallowing it	B	3	1.8
n = 167				(repetition answer)			

A...body counter measure  
 B...mental counter measure  
 C...other physical and environmental counter measures

questioned <sup>13)</sup>.

This inspection method when deciding the result of excluding anxiety for the sake of psychotherapy is beneficial as objective data.

In the inspection paper it was set up so that twenty questions were to measure and address the degrees of the quality and the state of items of anxiety, the results to have been translated into a score and decided on by the general appraisal gradual standard. There is no time restriction put into place for the execution of the experiment however being able to have replies within five to seven minutes, this including the inspection process, the completion time was specified to fifteen minutes.

4. Analysis

The values that are shown in Figure 1 and Table 2, 3 are average values that have been through analysis of variance using SPSS 12.0 J for Windows and the values that had reached significance were analyzed by analysis of variance and Tukey's test using SPSS 12.0 J for Windows. Significance from analysis of variance and Tukey's test was at 5%.

From Figure 2 and 3 the values shown are average values

from before and after the experiment, Significance were analyzed by *chi*-square tests using SPSS 12.0J for Windows which the end result was at 5%.

III. Results and Discussion

1. Investigation results regarding initiation

In order for an athlete active in the competition setting to cancel out anxiety and stress, the athlete is conducting various practical counter measures.

Tokunaga<sup>6)</sup> investigated using university students as experiment objects to execute the counter measure of anxiety and using factor analysis the existence of thirteen factors was made clear. From the first factor to the thirteenth factor the following were selected: ① Physical Relaxation, ② Performance training, ③ Activation (Instigation), ④ Self Implication, ⑤ Psychological Relaxation, ⑥ Image Training of Performance, ⑦ Psychological Focus, ⑧ Breathing Adjustment, ⑨ Cooling off of Excitation, ⑩ Dependence on Others, ⑪ Positive Conversation, ⑫ Change of Environment (Environmental Control), ⑬ Performing an act of fortune. From these factors and respective features the body counter

measure (①,②), mental counter measure (③,④,⑤,⑥,⑦,⑧), other physical and environmental counter measures (⑨, ⑩, ⑪, ⑫, ⑬) are classified into three major categories<sup>6)7)</sup>.

From investigation regarding the execution tendency of the counter measures, ③ activation was significant with both males and females, next with ① physical relaxation, ⑦ psychological focus, ⑥ image training of performance, ④ self implication were reported in significant numbers. Due to seeing a significant difference in execution in characteristic differences in gender, it was implied the females feature was ⑩ dependant on others<sup>6)</sup>.

Concerning the execution responsiveness of the counter measure of anxiety, for the previous experiment the individual conducting the experiment chose female students as the subject for investigation purposes but from the above-mentioned report it is clear that the responsiveness somewhat differs. The ratio which uses the image rehearsal and the method of being similar in Initiation and the performance of an act of fortune on routine differed largely<sup>4)</sup>.

In this case, in this research to verify the reliability of the result of the previously conducted survey, the execution tendency regarding the counter measure of anxiety was reexamined.

From Table 1 the classification of Initiation and its contents of the day prior to the tournament and the day of were illustrated.

From the day before the result of the image training of mental counter measure had the most replies. From the current investigation of image training and its specific contents mobilizing all senses such as eyesight and muscle movement, these senses represent conditions of motion accomplishment, image of the best play, image of maneuvers, image of equipment and image rehearsal from past experiences<sup>6)14)</sup>. From imaging clear and precise images, the body reacted the same way as it would in actual situations and from the stimulus of muscles from the cerebrum, it is considered that many athletes utilize this.

Next with the most response, items regarding to physics and environmental counter measures such as meals (intake of special food and drink), sleep, bath time, aspects of life such as recreation were listed, it can be said that for a sports game/tournament having a physically condition body was brought to attention.

In addition, in undertaking relaxation with listening of music and being at a state of meditation was also listed.

It should pointed out that from the result of investigating students who replied with 'Do Nothing', those who executed image training in the past 'there was no effect' is the intention.

According to previous research reports, image training is

a top athlete's strength but in times of undeveloped technique, with sufficient physical training there is indication of simply executing the training that is the basis of training. Therefore not attaining the precise form and motion rhythm in technique, even with image training is it suggested that there is no relation in reaching suitable performance<sup>15)</sup>.

An issue from the coach's side that is pointed out is mental guidance.

Again, an issue from the coach's side that was indicated was guidance to the psychological aspect. In order to guide Mental training, having the knowledge of mental management and sports psychology and the state of mind support and its guidance of mental management is needed but because actual condition in the knowledge of information and the application practice on site is insufficient and either the fact of empiricism and its guidance can not be refused<sup>16)</sup>.

Next, on the day of the sports event the specifications of the objective and environmental counter measures, it was seen that the consumption (and/ or intake of rice ball) was mostly undertaken. As a matter of fact, due to a reason that the method of consuming and/or the intake of carbohydrates when in play of sports events showed a release of power in an athlete.

Image training and taking of deep breaths, physical contact on regions of the body which is affected by physical means are classified as psychological and physical measures that have been listed. It can be said that intentionally an individual having holding a good luck charm, prior to a sports event that individual copes with anxiety and assures stability mentally and increases the ability of self control.

When both days are compared, on the day of the sports event it is often seen that the athlete to have good luck charm of physical body counter measure, performing an act of fortune, routine and Initiation.

With performing an act of fortune, 'to wear socks or shoes starting with the right foot' or the intake of specific food and drinks (for example eating deep fried breaded pork cutlets [tonkatsu-the 'katsu' has the meaning of 'win' in Japanese]) or having a routine of an individual method in sports (for example consistently checking the strings on a tennis racket for the tennis player) or in Initiation: writing the kanji character for "human" and swallowing it, holding a good luck charm, the athletes are preparing for the sports event.

From the results, on the day of the sports event in order to handle the anxiety from the game the players were coping by executing the counter measure of the cooling down of excitation caused by activation, mind and body relaxation<sup>2)6)</sup>.

## 2. Change of axillary's temperature and heart rate

Primary physiological fluctuation factor such as body

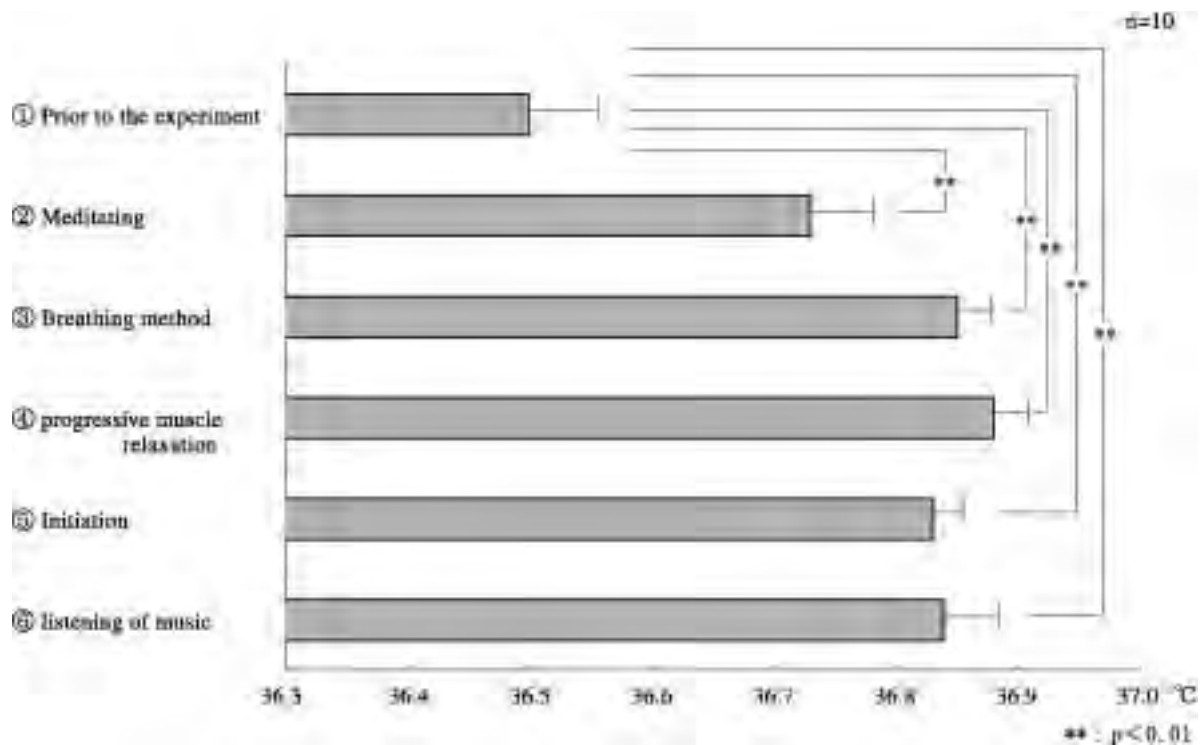


Figure 1 Change of axillary's temperature

temperature fluctuates within days and according to reference levels of comprehensive clinical research the axillary's temperature of young females in their twenties was at 36.4°C in the afternoon. The average value of the subject prior to the experiment is 36.5°C therefore there was no difference in reference level. The significant of 1% was acknowledged from the result of the analysis of discrepancy of the axillary's temperature from mind and body coordination method. Each technique showed predominant axillary's temperature rise by comparison with the results prior to the experimentation especially in the breathing method and progressive relaxation, Initiation and listening of music the temperature increased to 36.8°C (Figure 1).

Due to the muscle relaxation, the section rank of the body increased in temperature, the autonomic nervous system and related sympathetic nervous system activities were oppressed, it is meant that it was the movement into the state of deep relaxation<sup>9) 17)</sup>.

Next, the reference level<sup>18)</sup> of the heart rate is set at 78.3 beats/min., the heart rate of the subject prior to the experiment was 70 beats/min. below the mean value as well the value of the progressive relaxation was seen as lower right after the experiment. Prior to the experiment and to the mind and body coordination method the analysis of discrepancy of the heart rate was conducted without any significant noted. As a result in the aspect of the heart rate the influence with the use of mind

and body coordination method was meditating and listening of music when compared with the mean value before the experiment the heart rate decreased to 66 beats /min.

To summarize the above, the possibility of axillary's temperature to impel the relaxation reaction was thought to be a possibility<sup>5)</sup> however with no change in the heart rate and not conducting the analysis of the adrenaline that monitors the function of the sympathetic nervous system and the relation of the hormone secretion<sup>10)</sup> from the option of the two indicators the result showed no affirmation of proof the result of mind and body coordination method.

### 3. The analytical result of the brain wave content ratio

The state of closed eye relaxation of that of an adolescent individual, the  $\alpha$  1 and  $\alpha$  2 waves of the awakening brain waves are set as basic rhythm. Amplitude of 50  $\mu$  V was seen promptly at the sine wave rhythmic wave, the presence of increase and decrease in fluctuation, and from prior research was surfaced at frontal lobe and at the vertex<sup>5)</sup>. Normally, the  $\alpha$  1 wave is associated with the  $\theta$  wave and at the awakening state the conscious level is low and from the mental and physical stimulus regarding reactivity decreased from a relaxation state. Also the  $\alpha$  2 wave and  $\beta$  wave having a mutual action-related relationship, the activity ready condition of the cerebral adrenal cortex a high awakening level was acknowledged.

Table 2 Comparison of brain waves ( $\alpha 1$ )

		① prior to the experiment		② Meditating		③ Breathing method		④ progressive muscle relaxation		⑤ Initiation		⑥ listening of music		Results of Statistical analysis		
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	p	Tukey's test
L	C3	3.94	1.62	20.26	12.54	14.23	10.03	12.66	8.31	18.79	13.01	18.29	9.35	3.70	**	①<②③⑤⑥
	O1	6.22	1.55	16.14	12.04	9.61	4.02	13.12	12.83	14.77	12.35	13.98	9.54	1.44	ns	
	T5	4.46	1.92	22.88	15.09	17.74	11.31	15.06	14.68	22.15	13.84	23.97	13.46	3.40	**	①<②③⑤⑥
R	C4	4.48	4.51	22.87	14.28	15.38	10.18	15.69	9.82	20.07	16.32	18.66	10.21	3.08	*	①<②③④⑤⑥
	O2	5.91	3.88	17.37	11.03	11.17	6.06	14.19	9.34	16.49	17.56	14.79	9.93	1.60	ns	
	T6	5.13	3.26	28.08	17.15	18.74	11.42	17.27	12.57	22.84	18.03	21.24	12.26	3.34	*	①<②③④⑤

n = 10 \* : p < 0.05, \*\* : p < 0.01 < : p < 0.05

Table 3 Comparison of brain waves ( $\alpha 2$ )

		① Prior to the experiment		② Meditating		③ Breathing method		④ progressive muscle relaxation		⑤ Initiation		⑥ listening of music		Results of Statistical analysis		
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F	p	Tukey's test
L	C3	7.89	6.28	21.31	15.92	24.80	14.62	19.45	15.47	24.50	16.34	25.41	16.48	2.05	ns	
	O1	12.71	7.29	22.97	16.54	24.32	19.99	22.25	14.37	23.10	14.51	23.63	20.68	0.73	ns	
	T5	10.41	8.89	24.59	20.08	29.22	20.81	19.42	16.71	23.67	12.36	27.55	20.54	1.57	ns	
R	C4	6.31	4.26	21.63	15.35	24.10	13.42	19.77	11.34	20.13	14.19	25.06	12.55	3.01	*	①<②③④⑤⑥
	O2	9.64	6.36	25.88	19.69	24.62	20.06	22.65	13.17	20.09	18.22	28.15	23.96	1.36	ns	
	T6	9.16	7.48	28.37	19.34	29.02	19.41	23.09	14.67	22.39	19.86	30.27	22.68	1.91	ns	

n = 10 \* : p < 0.05 < : p < 0.05

From the comparison of the  $\alpha 1$  wave Table 2, a significant of 1% level in the electrode region of the L.C3 of the cerebral left hemisphere and the L.T5 was recognized and also a prevalent increase in content ratio was seen. Similarly, a significant of 5% in the R.C4 and R.T 6 in the cerebral right hemisphere was recognized and in the vertex and side of the head it was seen that the cerebral activation effect and a prevalent increase of the  $\alpha 1$  wave it can be said that the degree of relaxation and the degree of comfort changed.

With the comparison of the  $\alpha 2$  wave Table 3, it was observed somewhat predominantly from the content ration of the cerebral left hemisphere at the time of the third breathing method and listening music that significant was recognized with no electrode region.

However, within the right cerebral hemisphere a significant of a 5% level in R.C4 was recognized and also a prevalent increase of the content ratio. From the result the territory of the  $\alpha 2$  wave widened in the right vertex, the tendency of conversion of the  $\alpha 2$  wave from the  $\alpha 1$  wave was observed; from the cerebral activation effect the authenticity of the result of the increase of the mind and body coordination method reaction was indicated.

When assigned to the electrode region of the both cerebral hemispheres, the appearance of  $\alpha$  wave same as the indication of earlier research became the vertex, the result was the

concentration on the side of the head<sup>5)</sup>.

Next with the comparison of the  $\theta$  wave, it is evident of significant of the electrode region in both cerebral hemispheres was not acknowledged and that the there was no difference in the result of the content ration prior to the experiment of the closed-eyed relaxation and Initiation in the left cerebral hemisphere.

The predominance of the increase of the  $\alpha 1$  wave's content ratio increased at a calm influence of the cerebral left hemisphere was thought from the complete result from the above. It is suggested as seen at a competition setting the following anxieties exist: 'To be aware of the result of the tournament', 'To be aware of others', 'To be aware of failure', these contribute to the decrease of pressure. Furthermore it is thought that the possibility of constructing a state in which the body activation concerning the rise of the predominant content ratio of the  $\alpha 1$  and  $\alpha 2$  waves of the right hemisphere relaxes is recognized.

However, due to a left-right functional different has been acknowledged in the cerebral hemisphere from examining the synchronization focus of the brain activity, it is thought from a brain wave study perspective that the left brain was controlled by movement. The cause is from trying to adjust the time distribution of inhale and exhale consciously, from progressive relaxation which processes execution of region verification,



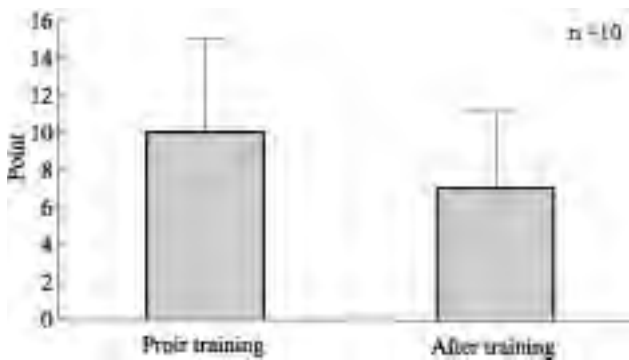


Figure 2-1 Change of J-SACL(stress factor)

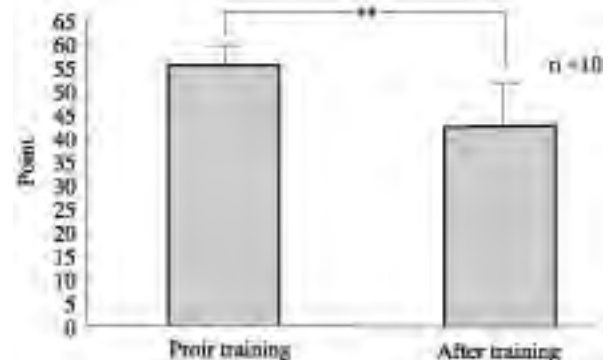


Figure 3-1 Change of STAI(trait anxiety)

\*\* : p < 0.01

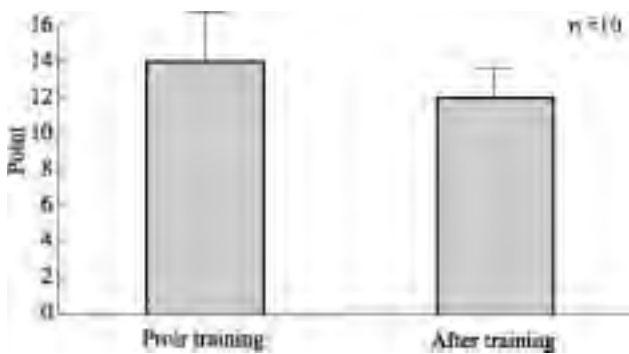


Figure 2-2 Change of J-SACL(awaking factor)

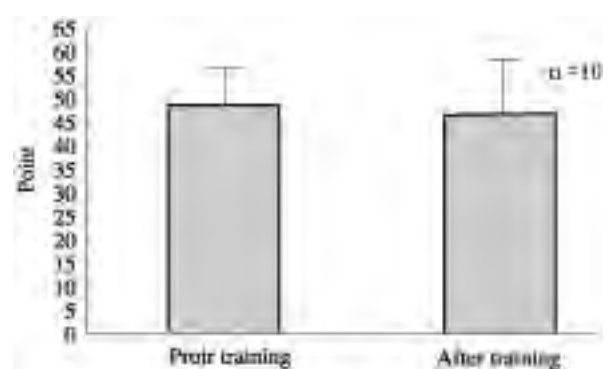


Figure 3-2 Change of STAI(state anxiety)

tension relaxation and its procedure also consciously is considered.

Due to the above, in order to self control the reinforcement of the  $\alpha$  wave and the control of the  $\beta$  wave, skill of the mind and body coordination method procedure is assured by training in the long term in order not to fall to conscious excess it can be said that it is required <sup>11) 19)</sup>.

4. Change of the psychological aspect which was examined from the analysis of J-Stress Arousal Check List and State-Trait Anxiety Inventory

From Figure 2-1 and 2-2, taking a look at the analysis result of J-Stress Arousal Check List, the stress factor and development factor after the end of training a low value of was seen with the mind and body coordination method but there were no significant difference that were recognized.

However, in terms of the stress factor after completion the average value was decreased by 6.8 points, the average score which was appraised there was a slight stress condition of a healthy working adult which was instructed by Hatta <sup>12)</sup> is shown. From this score more than 10 points was appraised as psychological stress, it is guessed that prior to training the tendency of the stress condition deteriorated and/or a harmless

conversion occurred.

Furthermore, awakening factors such as physics and psychological social circumstances deals with the activities of the autonomic nervous system which is at the center of physical body activity, in situations where the factor score of less than -7, the case is made of the stress circumstance which surrounds that individual who seeks help of others. A healthy working adolescent's average score is appraised at 3.9 points <sup>12)</sup> however before and after training the mean value is seen higher than the average score. From this it is thought that due to sports activity and its characteristics, the effects of the positive aspects are influential and are shown higher than the vital force notion.

When an appraisal is done from two factors, the stress factor score was high prior to training, the tendency of the increase in the awakening factor score is considered a psychological associated stressor, it is said that the feature is the strong signal state of the weariness impression <sup>12)</sup>.

As a result there was no significant due to the analysis was not recognized. Due to the original comprehensiveness of the body vital force impression, assuming that there is harmful stress loads evident it is determined that any problems are deemed small.

Next Figure 3-1, presents the significant of 1% level in the trait anxiety scale of the State-Trait Anxiety Inventory is recognized. High anxiety has become a clinical issue and with a decision reference level at more than 45 points, right after training the result has shown that the mean value at 42.7 points, it is seen that individual's nature character quality and its value as an anxiety element has decreased<sup>13)</sup>.

Taking a look at a knowledge level and how it influences an individual's character quality, it is thought that it brings psychological transfiguration. However with this said Figure 3-2 there is a decrease in the state anxiety scale after training but no significant is recognized along with a high anxiety state.

That is to say, the stimulus has developed into a role in competition events to utilize defensive functions to overtake tension, this has been the significance of when caution is given the situation falls to a situation which is acknowledges the fact that the strength of anxiety increases. Regarding the increase strength of the state anxiety, due to the result of mind and body coordination method there is no change in the state anxiety. From the decrease of the trait anxiety, the decrease of the anxiety trend related to the character aspect and the result of training is recognized.

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