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Effect of counseling of nutrition and life style on the changes of POMS profiles of university female volleyball players

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The present study was carried out to investigate the changes of POMS profiles of university female volleyball players with or without counseling of nutrition and life style in competition season. Nine healthy female students were used as the subjects. They were divided into two groups; one was a 'counseling' group (C group) and the other was a 'no counseling' group (N group). For the subjects in 'with counseling' group, some advice were taken at the counseling with the results of questionnaire on daily diet habit and nutrition survey. An experimental period was for 6 weeks, which was devised into two periods. Survey of food intake, quantity of activities for 3 days and POMS test were undertaken three times; before experiment (BE), at the end of the 3rd week (ME) and at the end of the 6th week (EE). The mean profile of C group gradually became closer to the Iceberg profile. Factor T (Tension), D (Depression), and C (Confusion) seemed to decrease and Factor V (Vigor) and F (Fatigue) seemed to increase with the progress of experiment in C group. Especially, the significant difference was observed between BE and ME in factor V ($p<0.01$). POMS score at ME in C group slightly decreased compared with it at BE. As the conclusion, the management of a mental aspect is effective for prevention of the further aggravation of condition and promotion of the training effect. The results in this experiment shows that advice was effective about the style of daily life and a meal in order to improve the mental condition of athletes into the mental profile considered to be more suitable as athletes, and it suggests anew that instruction about daily life style and a meal is important for a mental improvement of athletes.

key words：POMS, Athlete, Conditioning, Counseling

It has been recognized that well-balanced diet is necessary for athletes to keep good conditions and to enhance their performances. But, it has been insisted up to now by many investigators that nutritional conditions of athletes were insufficient for their needs in real life and it is necessary to improve their life-style, especially, their food habit. Although diet-circumstance surrounding them, that is, coach's recognition, facilities for diet, economical condition, troublesomeness to buy foods or to cook them and so on is thought as the reason why they can not practice it actually, it seems that lack of consciousness for nutrition by athletes is the biggest problem after all. Then we undertook the experiment to investigate the effect of improving athletes' consciousness by counseling about their dietary habit and nutrition problem on the changes of their physique and exercise performance. Consequently, the results such as the athletes with counseling had larger body weight loss and higher elevations of vertical jump and anaerobic power than the other athletes without counseling were obtained[13]. In that experiment, POMS (Profile of Mood State) was simultaneously measured to confirm a psychological change based on the hypotheses that athletes' mood state will be improved to be suitable for competitors if their consciousness for their dietary habit become higher. In this paper, the results of POMS test were reported.

Materials and Methods

Nine female university students were used as sub-

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jects. They all belonged to university volleyball club. Their physical characteristics were shown in Table 1. As shown in Table 1, they were divided into two groups. One was counseling group (C group; n=5) and the other was non-counseling group (N group; n=4).

The protocol of this experiment was shown in Fig. 1. The investigation period was set for six weeks. The former three weeks from the end of off-season to the start of the league game were designed as the first period, which was a conditioning period for competition and the latter three weeks during the league game were designed as the second period, which was a tournament period. Food intake and quantity of activities were measured for 3 days three times in the experiment, that is, before the 1st period (BE; Before experiment), at the end of the 1st period (ME; in the Middle of Experiment) and at the end of the 2nd period (EE; End of Experiment). The subjects in C group took counseling on dietary problem and daily life style (physical activity, sleep and so on) by nutritional advisor at each time as shown in Fig. 1, referring to the results of above measurements. Dietary intake and the amount of activities were calculated by using computer software "Nutrition Consultation Room, Ver. 1" (Olympus Optical Co., Ltd.).

POMS (Profile of Mood States) test was done three times as shown in the Fig. 1, that is, at BE, ME and EE. Although POMS test was developed with a purpose of diagnosing a mental disease mainly by McNair et al.[24], this test has been often used to grasp the degrees of over training, of the fatigue during conditioning and of the will in the world of sport, too[20]. It is composed by the sixty-five questions. Each score from the question 1 to 65 is calculated in accordance with the fixed formula, and each value of Tension (T), Depression (D), Anger (A), Vigor (V), Fatigue (F) and Confusion (C) is obtained respectively. Then, value is transferred in the special chart for the POMS profile preparation, and the character of the mentality conditions is judged by that form (profile). Moreover, the score of these each factors is applied to the following formula, and POMS score is calculated as "POMS score = (T+D+A+F+C+100-V)". This score is used as the index that generally shows the degree of fatigue from deducting the value of V that shows activation from the total of the item of the minus factor. When this value is high, it can think that fatigue rises mentally. The score of each factor can't compare each factor on the POMS profile because the mark of the vertical axis is different in every item. The pattern of mood states associated with positive mental health has been termed the iceberg profile by Morgan[27], and is operationalized by scores on the six mood dimensions of the POMS[24]. Furthermore, this profile has been supported with various athletic samples[9-12,25,26,28,29]. Therefore, a pattern obtained in this study decided to be compared with this Iceberg profile. The comparison in each factor was handled aside from the profile analysis.

As for a statistical analysis, paired t-test was used in case of comparison in each group and non-paired t-test was used in case of comparison between both groups.

Results

The POMS profile of each subject in C group was shown in Fig. 2. Subject A showed the tendency of higher in factor D and of lower in factor V at BE and ME. At EE, however, factor D decreased and factor V obviously increased, and profile became almost the same as Iceberg profile. Subject B distinctively showed a high value of factor T throughout the experiment. The high value of factor F observed before experiment decreased at ME and EE, but conversely, factor C became comparatively high. Subject C showed distinctive high values in factor T, D and C and comparative low value in factor V before experiment. After that factor D and C decreased and factor V increased at ME. At EE, factor T decrease to the level of Ice-

Table 1. Physical characteristics of subjects.

Subjects		Age (yrs)	BH (cm)	BW (kg)	BMI
(C group) Counseling	A	20	154.0	52.6	22.2
	B	19	160.7	56.0	21.7
	C	21	164.0	54.0	20.1
	D	20	165.0	61.4	22.6
	E	19	169.3	61.4	21.4
Non-counseling (N group)	F	19	153.0	45.2	19.3
	G	19	158.0	54.0	21.6
	H	20	162.0	60.6	23.1
	I	19	165.0	60.6	22.3

BH; Body height,BW; Body weight,
BMI; Body Mass Index (BW(kg)/BH(m)^2)

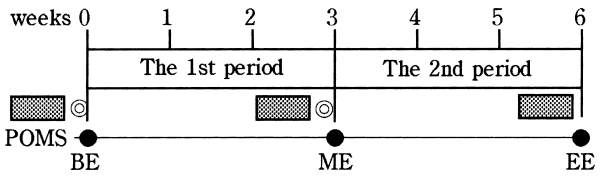

Fig. 1. Experimental schedule and method.

▒▒ Survey of food intake and quantity of activities for 3days.

◎ Counseling on dietary problem and daily life style.

BE; Before Experiment, ME; Middle of Experiment, EE; End of Experiment.

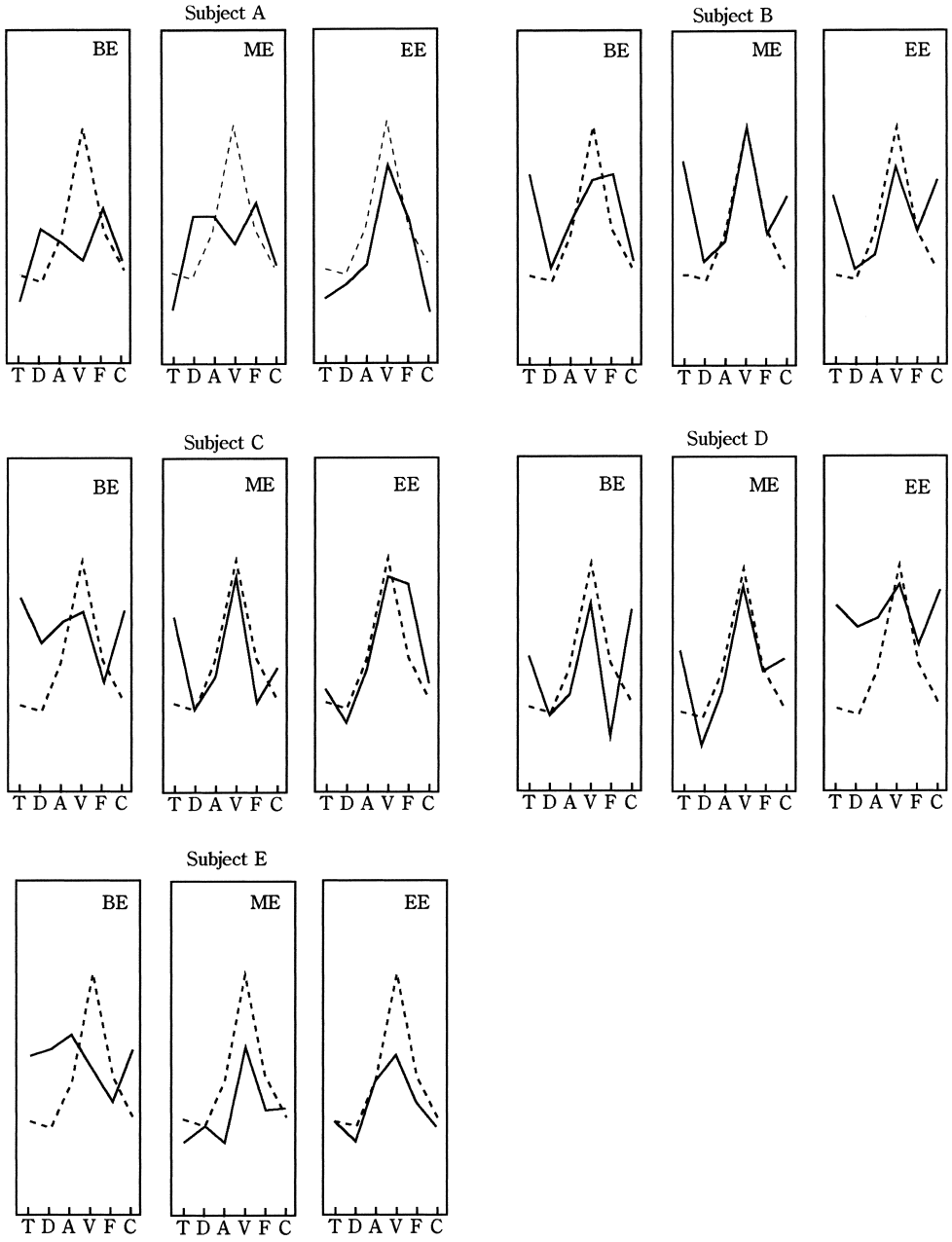

Fig. 2. Changes of POMS in each subject of C-group.

T: Tension, D: Depression, A: Anger, V: Vigor, F: Fatigue, C: Confusion
BE ; Before Experiment, ME; Middle of Experiment, EE; End of Experiment
——Profile of each subject
------Iceberg Profile

berg profile but factor F conversely showed conspicuous increase. The profile of subject D was characterized by a high value of factor V throughout the experiment, but other factors widely changed and unsettled throughout the experiment. At EE, factors of T, D and C were at the conspicuously high level. Subject E showed high values of factor T, D, A and C and low value of factor V before experiment. At ME, factor T, D, A and C decreased and factor V increased a little. At EE, the profile became almost the same as iceberg profile as a whole although factor V was still lower compared with it of iceberg profile.

The POMS profile of each subject in N group was shown in Fig. 3. Subject F showed a high values of factor T and C and a low value of factor A at BE. At ME, factor A increased at the level of Iceberg profile but factor D, F and C also became a remarkable high values in addition to factor T. The profile of Subject G was characterized by the low value of factor V before experiment. At ME, factor V remarkably increased but factor T increased and factor A decreased. At EE, the profile was almost the same as Iceberg profile although factor A and F were a little lower. Subject H showed almost the same profile as Iceberg profile from

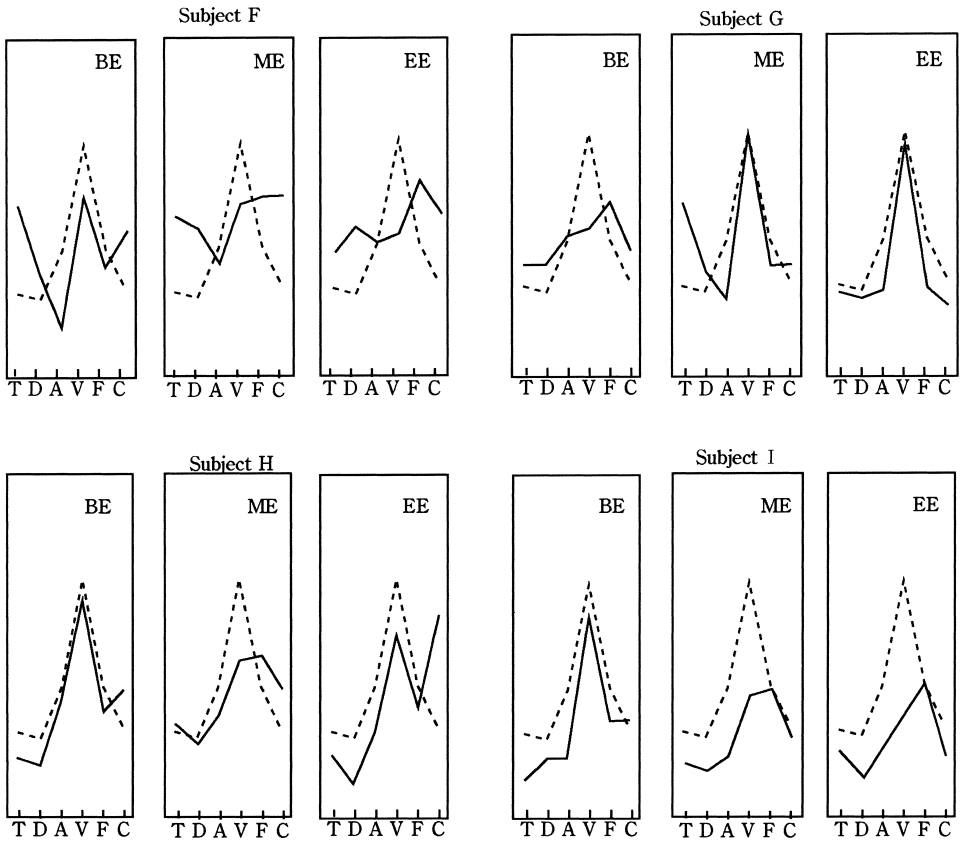

Fig. 3. Changes of POMS in each subject of N group.

T: Tension, D: Depression, A: Anger, V: Vigor, F: Fatigue, C: Confusion
BE; Before Experiment, ME; Middle of Experiment, EE; End of Experiment
——Profile of each subject
------Iceberg Profile

beginning of experiment, but at ME, factor V remarkably decreased. At EE, factor C conspicuously increased. The profile of subject I was almost the same as Iceberg profile at the beginning although factor T, D and A were a little lower. Factor V, however, also decreased at ME and EE.

The mean profile of each group was shown in Fig. 4. In C group, factor T, D and C were higher and factor V was lower than those of Iceberg profile, respectively. But factor D and C decreased and factor V increased from ME to EE and then the profile of C group gradually became closer to the Iceberg profile. The profile of N group showed no remarkable changes throughout the experiment.

The values in each factor were compared within the three times of measurements (BE, ME and EE) (Fig. 5). Factor T, D, and C seemed to increase and factor A and V seemed to decrease with the progress of experiment in C group. The significant difference was observed between BE and ME in factor V ($p<0.01$). On the other hand, in N group there were no meaning changes besides factor V seemed to decrease slightly.

The results of POMS score were shown in Fig. 6. POMS score at ME in C group slightly decreased compared with it before experiment, and it was kept at the same level after that. On the other hand, in N group it seemed to increase at ME compared with that before experiment and to decrease at EE after that. There were no significant differences with the progress of experiment in each group.

Discussion

It was reported that the mood state of athletes widely varied during conditioning and just before competition, by influencing some factors such as training method, nutrition and diet habit, sleep and so on.

Generally, it have been reported by many investigators that regular exercise can improve psychological mood state, especially, when mood state is unfavorable prior to initial training[5, 23, 35, 36, 46, 47]. We also observed that university students who spent comparatively active life with exercise achieved better patterns of POMS than the other students who spent inactive life[33]. However, in case of athletes, many factors such as pressure for win, impatience, restlessness, overuse induced by high-volume training before competition and so on often drive them into a psychological negative mood state. Morgan et al.[28] indicated that mood disturbances increased with greater training loads in swimmers and

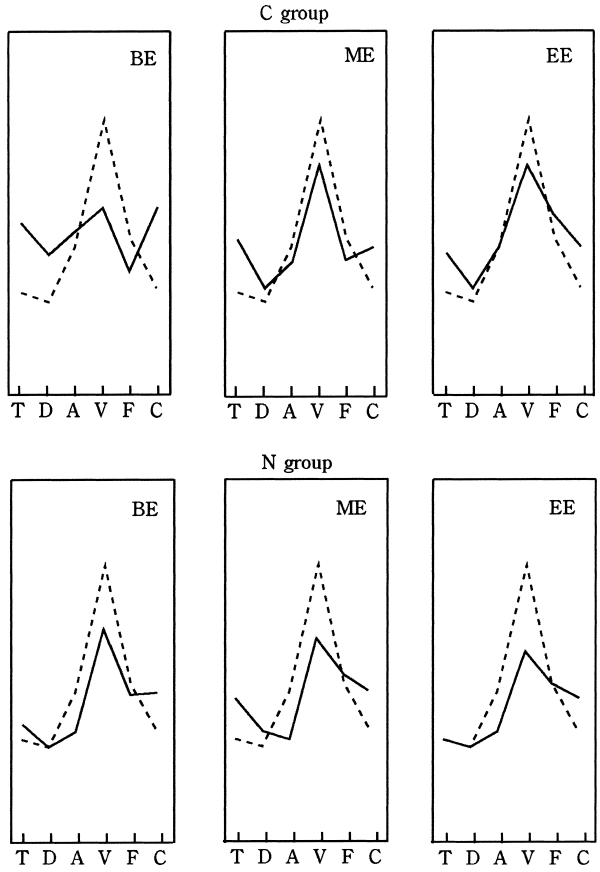

Fig. 4. Comparison of POMS Profile between C and N groups.

T: Tension, D: Depression, A: Anger, V: Vigor, F: Fatigue, C: Confusion

BE; Before Experiment, ME; Middle of Experiment, EE; End of Experiment.

——Profile of each subject

------Iceberg Profile

wrestlers by the POMS. And Murphy et al.[34] also reported that high-volume training loads increased fatigue, anger, and anxiety by using a series of psychological measures, including the POMS. The other investigators have also reported that mood disturbance can increase when training loads are increased too greatly[2, 8, 15, 17, 19, 30, 37, 40, 41, 44-45]. Especially, Druckman et al.[8] and Silva[45] suggested that psychological features such as mood disturbance appeared to be sensitive indicators of the onset of overtraining. And it was pointed out by many investigators that the overtrained athlete may finally experience a typical clinical depression, signaling burnout[15, 17, 19, 44].

Many articles[1, 4, 6, 16, 18, 21, 22, 35, 39, 43] suggested that meal composition and dietary habit affected the mood state. Keith et al.[16] observed in their study that low-carbohydrate diet in conjunction with training and exercise adversely affected the mood state of trained female cyclists as compared with middle-and high-carbohydrate diets. Kreider et al.[18] found that the carbohydrate-supplemented group had a change (pre vs. post) in time to maximal exhaustion following training while reporting less postpractice psychological fatigue. Wells et al.[50] studied the effect of fat content in diet to mood state and found that a change in dietary fat content from 41 to 25% energy may have adverse effects on mood. Lloyd et al.[21-22] pointed out that there were the meaningful relationships between meal composition, habitual choices and postprandial mood changes.

To shortening a sleeping time during conditioning also affect athlete's conditions physically and mentally. Sleep deprivation leads to impairment in performance, loss of efficiency and deterioration in mood states such as tension, depression, aggression, fatigue, confusion and vigour[14]. Dinges et al.[7] suggest that cumulative nocturnal sleep debt had a dynamic and escalating analog in cumulative daytime sleepiness and that asymptotic or steady-state sleepiness was not achieved in response to sleep restriction. On the relation between sleep loss and athletic performance and mood state, Rodgers et al.[42] observed that although the lack of sleep had no effect on muscle strength, work performance decreased significantly and concluded that the interference of mood, perception of effort, or even the repetitive nature of the tasks decreases the ability of individuals to maintain a constant level of work output although sleep-deprived individuals may have the physiological capacity to do the work. Furthermore, some other studies[3, 31-32, 38, 48-49] also recognized that although sleep loss of 4-60 hours does not significantly impair the ability to exercise, sleep-deprived subjects still report that the exercise feels harder to accomplish than normal.

Consequently, athletes have to take care of these factors and to keep good conditions mentally as well as physically, in order to obtain training effects and to bring their ability into full play at competition. In the present study, we examined the mood state of university female volleyball players who had a competition six weeks later. It had most interest for us to survey the changes of their mood state for six weeks, especially, to compare the mood states in the cases with and without counseling at that period.

As shown in Fig. 1, We checked food intake and quantity of activities three times throughout the experiment, at initial, 3 week later, and 6 week later and counseled two times at initial and 3 week later, referring to the results of food intakes, physical activities, and some other questions on sleep and physical conditions. Although the details of counseling on each subject were not reported here, the problems common to all could be obtained as follows. From nutrition survey, it was found that energy intake was comparatively high than recommended intake level for them, that diet contained lot's of greasy food, and that intakes of vegetables and dairy products were comparatively

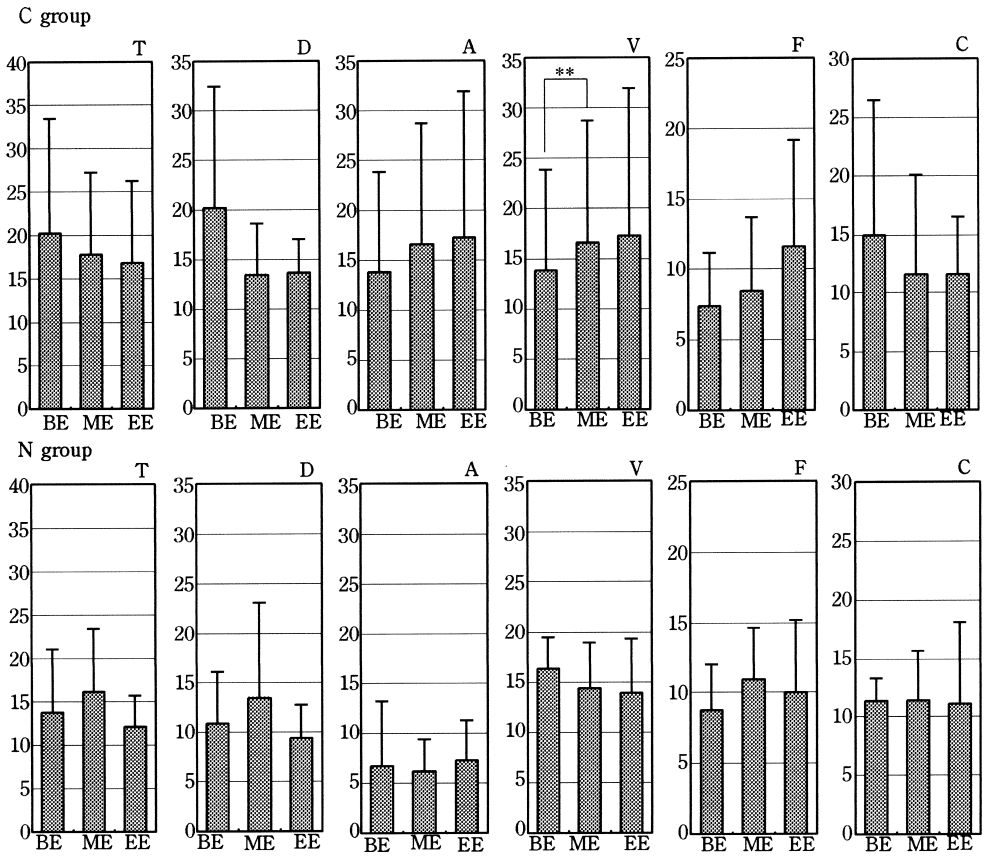

Fig. 5. Changes of POMS Profile in each category of C and N groups.

T: Tension, D: Depression, A: Anger, V: Vigor, F: Fatigue, C: Confusion
BE; Before Experiment, ME; Middle of Experiment, EE; End of Experiment.
Significance**; $p < 0.01$ between BE and ME in C group.

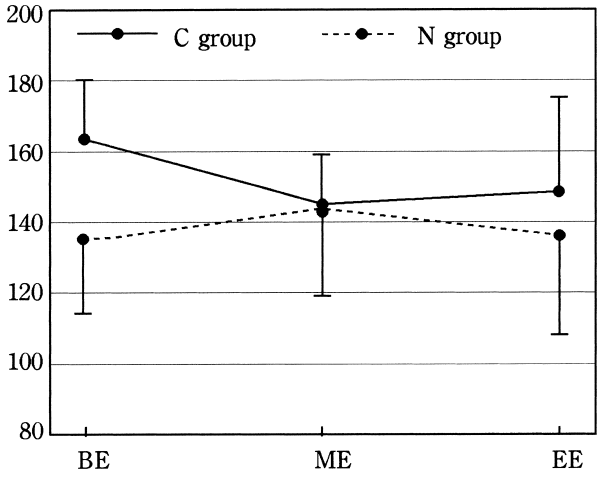

Fig. 6. Comparison of POMS Score between C and N groups.

BE; Before Experiment, ME; Middle of Experiment, EE; End of Experiment

low. Furthermore, they took drinks that contained sugar too much. From life style survey, it was found that breakfast was sometimes skipped, that the time to get meal was irregular and that the hours of sleep were comparatively short. And most of subjects answered that they felt to be fatigued easily. We gave some advices to improve above problems to the subjects in C group. As a follow-up survey after counseling was not conducted this time, it was unsure whether they put our advice into practice or not in their daily life. But we got the feeling that their recognitions for conditioning before competition were surely raised through their behaviors and remarks to us.

In the present study, the profiles of mood state of subjects in C group definitely became closer to iceberg profile which was needed for athletes at the end of experiment compared with those before experiment except in subject D (Fig. 2). Subject D has a tendency to become a little nervous as a competition is approaching close at hand. Factor V and F were almost the same level as iceberg profile but the other factors were definitely different from it. It meant that he needed some cares as mental measures individually. In N group, the tendency to improve the profiles was not found except that subject G got a good profile just before competition (Fig. 3). Comparing the mean value in each group to iceberg profile, the profile of C group obviously became closer to iceberg profile at the end of experiment than that before experiment. On the other hands, the profiles in N group hardly changed among the three profiles at the initial, in the middle

and at the end of experiment (Fig 4). Each factor in POMS profile had a large deviation and each score in C group was comparatively higher than that in C group. It means differences among individuals. The significant difference was found in factor V of C group. Although there were no significant differences in other comparisons, it was observed that factors T, D, and C had a tendency to decrease and factors A, V and F had a tendency to increase toward the end of experiment in C group on the whole. Factors besides factor V mean a negative condition of mood state. Although it was no good for mood state during conditioning that factor A and F had a tendency to increase, those factors became closer to iceberg profile as the result of increase. It was noteworthy that factor V had a tendency to be higher from the initial to the final of experiment, in particular, with a significant difference between at the initial and in the middle of the experiment. POMS score, which means a kind of index to show fatigued state, decreased in the middle of experiment compared with that at the initial, but with no difference. These results suggested that the counseling in this experiment was effective enough to improve their mood states suitable for athletes during conditioning for competition.

Although the athletes tend to think the physical aspect as important aiming at the competition, it is important to pursue a mental change simultaneously. The management of a mental aspect is effective for prevention of the further aggravation of condition and promotion of the training effect. The results in this experiment shows that advice was effective about the style of daily life and a meal in order to improve the mental condition of athletes into the mental profile considered to be more suitable as athletes, and it suggests anew that instruction about daily life style and a meal is important for a mental improvement of athletes.

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