ANALYSES OF TYPE A BEHAVIOR PATTERN IN JAPANESE COLLEGE ATHLETES

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Abstract

This study was designed to investigate the relationships between the tendencies of Type A behavior pattern (TABP) and daily sports activity for college students, under a hypothesis that daily physical training weakens the TABP tendencies. A total of 2587 students in Japanese colleges volunteered. They were divided into two groups ; an athlete group and a non-athlete group. KG's Daily Life Questionnaire was used to investigate the tendency of TABP. The athlete group showed higher TABP scores than those of the non-athlete group. Additionally, the higher competition level group showed higher scores of TABP than those of the lower level group. Contrary to the hypothesis, the athlete group showed higher TABP tendencies than those of the non-athlete group. This result might be caused by several factors, such as the nature of competition, high levels of stress involved in competitive sports and/or specific backgrounds of Japanese college sports clubs.

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key word : Type A, habitual exercise, KG's Daily Life Questionnaire, psychological and physiological stress

INTRODUCTION

Type A behavior pattern (TABP) is a concept that arose out of Friedman and Rosenman's⁸⁾ observations that certain behavioral attributes are associated with coronary heart disease (CHD). TABP is a major independent risk factor for CHD, and the risk is of similar magnitude as those of traditional factors such as high blood pressure, advancing age, elevated serum cholesterol, and cigarette smoking²⁴⁾. TABP is defined as a constellation of physiological and behavioral characteristics including such features as enhanced aggressiveness, hard driving competitiveness, and a chronic sense of time urgency. The converse, Type B behavior pattern, is defined as a relative absence of these characteristics⁷⁾. An additional behavior pattern has been categorized as Type C, which resembles Type B, although it includes such

psychological features as chronic anxiety⁷⁾.

There has been growing acceptance of the role of behavioral factors in the etiology, prevention and treatment of CHD²⁾. In a longitudinal study of almost 3200 healthy men, TABP individuals were shown to exhibit twice the risk of CHD as their easy-going Type B counterparts²⁶⁾. Although some studies have not found TABP to be associated with established CHD or severe risk factors²¹⁾, TABP is still regarded as an important behavioral risk factor. Considering these circumstances, early detection and intervention among healthy TABP individuals are important prevention methods. Several studies have been conducted to evaluate various means of modifying TABP. These methods include anxiety management training³⁴⁾, cognitive therapy¹³⁾, stress management²⁷⁾, and comprehensive treatment programs involving group psychotherapy and/or

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behavioral modification²³⁾. These treatments have demonstrated that some aspects of TABP can be successfully modified. In addition to these modifications, there is some evidence that components of TABP and cardiovascular reactivity to stress may be effectively lowered by beta-adrenergic blocking medications^{16,37)}. Although the mechanism has not been fully studied³⁰⁾, these findings suggest that certain TABP characteristics reflect heightened responses of the sympathetic nervous system¹⁷⁾.

Epidemiological studies have shown that physical activity is associated with lowered risk of CHD^{18,23)}. Particularly aerobic exercise is effective in reducing standard risk factors of CHD, such as blood pressure and plasma lipid profile^{14,31)}. In contrast to this direct evidence for preventing CHD, many studies have been conducted to investigate the effects of exercise on the modification of TABP^{1,3,19,28)}. Although the results have not always been consistent, habitual exercise has been shown to reduce individuals' self-report scores of TABP^{1,3)}, diminish overt signs of TABP^{3,11)}, and attenuate cardiovascular responses in TABP individuals^{3,4,32)}. Additionally, various types of exercise may influence the magnitude of the effect of TABP modification (e.g., the effect may be greater with aerobic exercises than with anaerobic ones)^{3,4)}.

This study was designed to investigate the relationship between the tendency of TABP and daily sports activity on college students, under a hypothesis that daily physical training weakens the TABP tendency. The following questions were investigated at Japanese colleges involving athletic and non-athletic students: 1) Do athletes who practice daily physical training have a lower proportion of TABP in comparison with non-athletes? 2) Is TABP tendency related to careers or levels of competition in athletes who continue higher levels of physical training? 3) Is

TABP tendency related to certain kinds of sport events? Answers to these questions were discussed from the standpoints of the psychological and physiological stress of competitive sports, and the lifestyle of Japanese college athletes.

METHODS

A. Subjects

A total of 2587 (1951 males and 636 females) students from seven different colleges in Japan, including three physical education colleges, volunteered. After explanations of purpose and procedures of this study were completed and informed consent obtained, the questionnaire described below was initiated. The subjects ranged in age from 18 to 24 years old (mean $\pm$ SD : 19.4 ± 1.91 years). They were divided into two groups; an athlete group (2274 students) and a non-athlete group (control group : 302 students). The students who reported that they did not lead a physically active lifestyle were categorized as belonging to the non-athlete group, while the students who had belonged to college sports clubs (e. g., soccer, baseball, basketball, volleyball, tennis, track and field, swimming, etc.) were categorized as belonging to the athlete group. All of the students categorized in the athlete group reported that they had been physically active almost all of their lives and were currently participating in sports training at least five days per week. There were eleven students who could not be classified into either the non-athlete group or athlete groups. These students were abandoned from the analyses.

B. Procedures

To evaluate TABP tendency, several original methods have been developed in Japan^{29,35,36)}. The KG's Daily Life Questionnaire (KG questionnaire)³⁶⁾ used in this study is one of them. The KG questionnaire consists of 55 items (44 TABP

items and 11 irrelevant items), and subjects were instructed to choose one of three answers (Yes, ?, or No) for each question. In addition to a global TABP score, three sub-factors affecting scores are also provided; aggression-hostility (hostility item), hard driving-time urgency (hard driving item) and speed-power (speed item). The reliability and validity of the items in the questionnaire were shown to be excellent, as mentioned in the discussion section.

C. Classification of competition levels

The athlete group was classified into a higher competition level group and a lower level group according to levels of participation in competition. The higher competition level group was composed of athletes who had participated in national and/or international athletic meets, while the lower competition level group was composed of athletes who had participated in local and/or prefecture level of athletic meets.

D. Analyses of the KG's Daily Life Questionnaire (KG questionnaire)

The scores obtained by using KG questionnaire (TABP score) were standardized by T score. Subjects who showed more than 60 in this score were classified into the TABP higher score group (i. e., indicating strong TABP tendency), while those who showed less than 40 were classified into the TABP lower score group (i. e., indicating weaker TABP tendency). Three sub-factor scores; hostility item, hard driving item, and speed item, were classified similarly into higher score group (T score ≥ 60) and lower score group (T score ≤ 40) with the same method. The subjects who were categorized into the athlete group were instructed to list the following information; ¹⁾ sport event, ²⁾ career of sports, ³⁾ position of the game if possible, ⁴⁾ level of competition.

RESULTS

The TABP tendencies between the genders were compared. Means and SDs of TABP scores in all groups are shown in Table 1. The mean and SD of

Table 1. Comparison of Type A scores between males and females.

		Male	Female	t
		1955	621	
All subjects	N	1955	621	-0.026
	Mean	40.96	40.98	
	SD	11.32	11.39	
Athletes	N	1796	478	-0.260
	Mean	41.34	41.49	
	SD	11.13	11.25	
Non-athlete	N	159	143	-1.140
	Mean	37.20	38.72	
	SD	12.20	11.61	

all subjects were 40.96 ± 11.32 for males, and 40.98 ± 11.39 for females. The mean and SD of athletes were 41.34 ± 11.13 for males, and 41.49 ± 11.25 for females. The corresponding scores of the non-athletes group were 37.20 ± 12.20 for males and 38.72 ± 11.61 for females. No significant difference was obtained between males and females in these three groups respectively. For three sub-factors, the unpaired t test showed that the differences between two groups (all males and females) were not statistically significant except for the speed item (mean $\pm$ SD of speed item; 15.01 ± 4.01 for males, 14.24 ± 3.81 for females, as shown in Table 2). In addition, percentages of TABP higher score subjects were almost similar between males (16.13%) and females (16.85%). Considering these results, the data obtained from

Table 2. Comparison of Type A sub-factor scores between males and females.

	Male (N=1951)		Female (N=636)		t
	Mean	SD	Mean	SD	
Type A	40.96	11.32	40.98	11.39	-0.026
Hostility	19.87	6.91	19.73	6.93	0.401
Hard-Driv.	12.01	5.01	12.15	4.91	-0.51
Speed	15.01	4.01	14.24	3.81	3.77**

** : 0.01 level of significance

Table 3. Type A and its sub-factor scores of all subjects.

Type A	Type A score	
	Mean	SD
	40.97	11.30
Hostility	19.87	6.89
Hard-driving	12.04	4.97
Speed	14.80	3.96

males and females were analyzed together in all cases.

Mean and SD of TABP scores of all subjects (including males and females, athletes and non-athlete groups) was 40.97 and 11.30 respectively. Subjects who obtained more than 60 as the T score, i. e. over 52.27 of TABP score, were classified as in the higher score group, while those who obtained less than 40 as the T score, i. e. under 29.67, were classified as in the lower score group. This resulted in a distribution of 406 higher score subjects and 413 lower score subjects. In regard to the three sub factors of TABP, the means and SDs were 19.87 ± 6.89 for hostility item, 12.04 ± 4.97 for hard driving item, and 14.80 ± 3.96 for speed item respectively (Table 3).

A. Comparison of TABP scores between athlete and non-athlete groups

For the athlete group, there were 368 TABP higher score subjects (16.18%) and 330 lower score subjects (14.51%). For the non-athlete group, there were 38 TABP higher score subjects (11.86%) and 84 lower score subjects (26.25%) (Fig. 1). The means of TABP scores were 41.49 ± 11.14 for the athlete group and 37.95 ± 11.86 for the non-athlete group (Fig. 2). The unpaired t test showed that the difference between these two groups was statistically significant ($t=5.17$ $p < 0.01$). On the hostility item, 19.04% of the athlete group and 15.03% of the non-athlete group were classified into the higher score group (Fig.3a). On the hard driving item, 15.43% of athletes and 10.63% of non-athletes were classified into the higher score group (Fig.3b). On the speed item, 17.59% of athletes and 11.86% of non-athletes were classified into the higher score group (Fig.3c). As shown in Table 4, the athlete group had higher scores of three sub-factors of TABP than the non-athlete group. Student's t tests indicated that these differences were all statistically

Fig 1. TABP high score and low score subjects for athlete and non-athlete groups.

Fig 2. Comparison of mean TABP score between athletes and non-athlete groups.

significant.

B. Relationships between TABP scores and difference of competition level or sport events

1. TABP scores and competition levels

The athlete group was classified into higher competition level group (485 athletes) and lower level group (1635 athletes) according to their levels of participation in competition. There were 115 higher TABP score athletes (23.71%) among the higher competition level group and 231 higher TABP score athletes (14.13%) among the lower level group. The means of TABP scores of these groups were 44.19 ± 11.13 for the higher level group and 40.62 ± 11.07 for the lower level group.

Fig 3. Comparison of high score subjects in athlete and non-athlete groups according to TABP sub-factors.

Table 4. Type A scores and percentages of TABP high score and low score subjects for athlete and non-athlete groups.

		Type A score of KG's Daily Life Questionnaire			
		Type A	Hostility	Hard-D	Speed
Athlete	Mean	41.49	20.04	12.27	14.97
	SD	11.14	6.84	4.93	3.95
Non-athlete	Mean	37.95	18.69	10.77	14.04
	SD	11.86	7.18	5.12	4.03
t		5.17**	3.21**	4.98**	3.82**
		Percentage of subjects (%)			
		Type A	Hostility	Hard-D	Speed
Athlete	High score	16.18	19.04	15.43	17.59
	Low score	14.51			
Non-athlete	High score	11.86	15.01	10.63	11.86
	Low score	26.25			

** : 0.01 level of significance

Table 5. Comparison of Type A score and Percentage of TABP high score subjects between higher and lower competition level groups.

	N	Mean	SD	t	High score subjects(%)
Higher competition level G.	485	44.19	11.13	6.22***	23.71
Lower competition level G.	1635	40.62	11.7		14.13

*** : 0.001 level of significance

Table 6. Comparison of Type A and its sub-factor scores between higher and lower competition level groups.

	N	Mean	SD	t	High score subjects(%)
Hostility					
Higher competition level G.	485	21.15	6.74	4.09***	
Lower competition level G.	1635	19.72	6.81		
Hard-driving					
Higher competition level G.	485	13.59	4.72	6.84***	
Lower competition level G.	1635	11.86	4.93		
Speed					
Higher competition level G.	485	15.49	3.78	3.69***	
Lower competition level G.	1635	14.75	3.97		

*** : 0.001 level of significance

The unpaired student's t test showed that this difference was statistically significant ($t=6.22$, $p<0.001$, table 5). For three sub-factors, the higher competition level group showed higher scores of TABP than the lower level group on all three sub-factors. The unpaired t tests indicated that there were significant differences between these two groups in regard to these sub-factors (table 6).

2. TABP scores and sport events

The sport events that had large populations (over 70) were following ten events, i. e. soccer (322), baseball (294), basketball (241), track and field (216), tennis (149), kendo (142), volleyball (134), judo (102), swimming (84) and skiing (72) respectively. Percentages of higher and lower TABP scores of these groups were shown in Table 7. The sport event that showed the highest percentage of TABP higher scores was skiing

Table 7. Type A score and Percentage of TABP high score and low score subjects for several sports events.

	N	Type A score		F	Percentage of subjects	
		Mean	SD		High score	Low score
Soccer	322	41.51	11.60	F=2.43** p<0.01	16.77	15.84
Baseball	294	40.68	10.58		14.29	13.61
Basketball	241	41.48	11.45		17.84	15.77
Track and Field	216	41.38	11.14		16.20	14.35
Tennis	149	39.56	11.15		12.75	18.12
Kendo	142	41.42	10.44		14.79	11.97
Volleyball	134	41.24	11.65		17.16	17.16
Judo	102	42.63	10.17		18.63	11.76
Swimming	84	43.38	10.77		17.86	8.33
Skiing	72	46.07	11.42		29.17	12.50

(29.17%). Similarly, the second and third were judo (18.63%) and swimming (17.86%). The lowest percentage of TABP higher scores was found in tennis (12.75%). The means of TABP scores ranged from a lowest of 39.56 (tennis) to a highest of 46.07 (skiing). An analysis of variance showed that there were statistically significant differences ($F = 2.43, p < 0.01$). For the three sub-factors, similar results were obtained.

3. Differences of TABP scores between contact and non-contact sports

The sport events that have a possibility of body contact (soccer, basketball, judo and kendo) were chosen as the contact sports. There were 807 athletes belonged to contact sports. On the contrary, baseball, track and field, tennis, volleyball, swimming, and skiing were chosen as the non-contact sports. There were 949 athletes who belonged to non-contact sports. The athletes who showed higher TABP score included 137 contact sports athletes (16.98%) and 155 non-contact sports athletes (16.33%). The means of TABP scores were 41.62 ± 11.17 for the contact sports and 41.39 ± 11.13 for the non-contact sports. The unpaired *t* test showed that this difference was not significant statistically.

4. Differences of TABP scores between aerobic and anaerobic sports

Differences of the TABP tendencies between aerobic and anaerobic sports were analyzed. Sprinters (64 athletes) among track and field athletes were selected as an anaerobic sports group, while long distance runners (21 athletes) were selected as an aerobic sports group. The athletes who showed higher TABP scores were five sprinters (23.80%) and eight long distance runners (12.50%). The means of TABP scores were 43.80 ± 12.86 for sprinters and 40.93 ± 9.27 for long distance runners. The unpaired student's *t* test showed that this difference was not significant.

DISCUSSION

A . Reliability and validity of the KG's Daily Life Questionnaire

Generally, TABP characteristics have been evaluated by the Structured Interview (SI)⁶⁾ or by questionnaires represented by the Jenkins Activity Survey (JAS)¹²⁾. Although SI was commonly used in early studies in this field to evaluate TABP characteristics, recently JAS has been used more frequently because of its convenience and universality, especially when lots of subjects should be handled. Several questionnaires have been established in the US to evaluate TABP characteristics in individuals^{5,10,12)}. These methods have also been used in testing Japanese in several studies. However there are some difficulties involved in applying these methods to Japanese, because the cultures and societies of these two countries are different. Therefore, several original methods, including the KG questionnaire used in this study, have been developed in Japan^{29,35,36)}. According to basic studies, e. g. item analyses, calculation of reliability coefficients, and scattergram drawings, the KG questionnaire consisting of 44 items of TABP and 11 irrelevant items was developed. This questionnaire provides a global TABP score and scores for three factors ; hostility, hard driving and speed items. It was reported that test-retest reliability coefficients obtained in each factor of this questionnaire were 0.83 for global TABP, 0.81 for hostility, 0.75 for hard-driving and 0.86 for speed items. After testing reliability, construct validity was investigated by several evaluations. These results showed that this questionnaire had sufficiently high construct validity³⁶⁾.

These types of questionnaires discussed in this paper may be necessary to accumulate data concerning CHD, since the concept of TABP has been established based on the relationship to CHD³⁶⁾.

The authors showed a significant relationship between TABP tendency as studied by using KG questionnaire and the magnitude of response on the sympathetic nervous system²²⁾. These results are considered to support the validity using of the KG questionnaire as a means of testing the relationship to autonomic functions, in addition to supporting the suggestion that the risk of diseases represented by CHD was higher for TABP individuals than Type B individuals.

B. Comparisons of TABP scores between athlete and non-athlete groups

In this study, the analyses of TABP scores of the athlete group showed that it included a larger percentage of TABP higher score subjects and a smaller percentage of lower score subjects. The mean of TABP scores for the athlete group was significantly higher than that of the non-athlete group. Contrary to the initial hypothesis, these findings indicated that athletes familiar with some sports had greater TABP tendencies than subjects in the non-athlete group. Similar tendencies were obtained on three sub-factors of TABP. Additionally, the higher competition level group showed higher scores of TABP and sub-factors than the lower level group.

The results obtained in this study might relate to several factors. First, it is considered that the characteristics essential to success in competitive sports are similar to some features of TABP. Namely, the typical TABP person always has high aspiration for success⁷⁾ and is highly competitive, achievement-oriented, impatient, feels pressured for time and tends to be fast-moving²⁰⁾. Similarly, athletes typically have an aspiration to become higher level players than they are at present or in comparison to other players. This limitless improvement directivity that resembles the features of TABP is the essence of competitive sports (and at the same time is a different feature from a heal-

thy exercise program that is controlled safely). Second, there is a difference in the psychological and physiological stress levels between health oriented exercise and competitive sports. It is considered that athletes who participate in a competitive sport tend to perceive greater levels of psychological and physiological stress both in training and athletic situations than non-athletes. Suarez & Williams³³⁾ showed that various psychological and physiological stresses that lead to anxiety and hostility are the main elements of TABP, although there are some differences among individuals. Additionally, this tendency has also been shown in animal experiments¹⁵⁾. Therefore, various stresses occurring among athletes in competitive sports might be related to their great TABP tendency. Third, it may be considered that some specific backgrounds of college sports clubs are related to the results in this study. For instance, college athletes are required to spend time efficiently, because they must do well both in studies and in club activities within a restricted period, and most Japanese college sport club members are required to move quickly and vigorously in everyday life, because of their norms for group behavior and/or the existence of a strict pecking order.

Empirical evidence has shown that exercise can modify TABP^{1,3,19,28)}. However, competitive athletes might be in environments that further TABP tendencies rather than weaken them, because of the reasons described above. In consequence, it is suggested that the modification of TABP may be affected by not only physical exercise itself but also by various factors of psychological stress associated with exercise.

C. Comparisons of TABP scores among several categories of sports

In this study, the analysis of variance showed that there were statistically significant differences

among sport events. The highest percentage of higher TABP scores was found in skiing. The second and third highest were in judo and swimming respectively. The lowest percentage of higher TABP scores was found in tennis. The competitions in skiing, judo, and swimming are completed within a restricted short period, compared with the other sports such as tennis and baseball which are continued for a relatively long time. It can be considered that athletes who participate in their individual games for a long time are required to perform under conditions of stabilized ability and mental concentration during the games. In contrast, athletes of skiing, judo, and swimming are required to perform at their maximum ability with high mental concentration within a short period. There is a possibility that the characteristics of each sport event might influence the TABP tendency of athletes.

More recently, it appears that two aspects of TABP are especially important; hostility and undesirable large psychophysiological responses²⁵⁾. Therefore, it was hypothesized that the contact sports groups would show greater TABP tendencies, because the athletes belonging to contact sports need to fight with the other persons directly. However, as shown in these results, no significant difference of TABP tendencies was observed between the contact and the non-contact sports groups. Both in the contact and non-contact sports, athletes in a game need to be calm in order to attain high performance levels. It was suggested that athletic contact or fighting against opponents and hostility or anger should be thought in a different dimension.

Since several empirical studies indicate that aerobic exercise can modify TABP³³⁾, TABP tendencies between aerobic and anaerobic sports were analyzed in this study. Sixty four sprinters were selected as representatives of the anaerobic sport group, while twenty one long distance run-

ners were selected as representatives of the aerobic sport group. The athletes who indicated higher TABP scores comprised 23.80% among sprinters and 12.5% among long distance runners. Additionally, the means of TABP scores were 43.80 ± 12.86 for sprinters and 40.93 ± 9.27 for long distance runners. Sprinters tended to show higher TABP scores than those of long distance runners. However, according to the small number of the subjects, this difference was not significant statistically. Further examination with a larger number of subjects may be needed in order to clarify this point.

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