The Relationship Between Basic Physical Fitness and Body Fat in +95kg Category University Judo Athletes

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1. Introduction

The saying "Shin-Gi-Tai" (Mental-Technical-Physical) is often used to describe the necessary ingredients of performance ability in Judo. In the past, we have proceeded in our research with the assumption that body structure as well as basic physical fitness are one important component to performance ability in Judo. Even from the single perspective of the performance abilities of Judo athletes, the basic physical fitness items described in 1) through 7) can be considered to have a high degree of validity as minimum essentials, from previous experimental results[1][2][3][4][5][6][7].

Moreover, (1) weight, which represents body bulk, has a high correlation with static muscular strength, and can be said to be an important area of basic physical fitness. But, the other side to this is that it also serves as a limited factor to Agility, muscular power and speed endurance. These are functional areas that are considered extremely important in recent competitive Judo, which is characterized by continuous attack and aggression, especially in international competition[5]. (2) There are significant differences in speed endurance within the weight categories, especially

between those with high and low body fat ratio[4]. (3) We know that the ratio of body fat increases remarkably from the —78kg category on the above[6].

Therefore, in this study, we examined the association among the 8 components comprising basic physical fitness and body fat, which is a structural component of weight, among university Judo athletes of the same weight class of +95kg.

2. Methods

(1) Items and Measurement Procedures

We have conducted repeated studies using a 52 item test of Basic physical fitness with university Judo athletes as subjects. These studies have spanned an 11 year period from 1984-1994, with 19 different conditions involving 702 subjects of different ages, nationalities, favorite techniques, weight, and weight category[1][2][3][5][6][7][8]. Regardless of these differences in conditions, the experimental results have shown the following;

1) The factor loading's are consistently high within weight and categories.

2) The items have significant factor loading's and communalities across the 19 studies.

3) The items have low correlations among other components.

4) The validity of the selected measurement items was tested[4].

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Accordingly we selected 10 items comprising 8 components we thought to be consistently important. These were as follows :

1) Body linearity＝Stature
2) Body bulk＝Weight
3) Body compsition＝Body fat (%)
4) Static muscular strength＝Back muscular strength,
Shoulder-arm muscular strength (pull)
5) Agility＝Side step
6) Leg muscular power＝Vertical jump
7) Speed endurance＝400m run
8) Extension flexibility＝Trunk extension
9) Dynamic balance＝Bass dynamic balance test.

These measurement items were repeatedly examined within the studies, and were measured here based on the consideration that they insured objectivity and validity in our measurements. Also, there are various ways to measure Body composition, and we used here the BI (Bioelectrical Impedance) method (SIF-891).

(2) Subjects

The subjects in this study were 63 members contained 22 top judo athletes in the +95kg category. They were participated 4 universities whose teams competed in and placed highest in the All Japan University Judo Championships. Their ranks ranged from first grade through third grade, and the average years in Judo career was 8.85 ± 2.42 years. These characteristics insured that the subjects participating in this study were fully representative of the characteristics of basic physical fitness in university Judo athletes.

(3) Methods of Analysis

Based on the measurement of the 8 components, 10 items described above, we divided 63 university Judo athletes in +95kg category into the following five Percent Body Fat (%) groups with relatively equal numbers of people : $18.5-24.0\%$ (n＝12), $24.1-27.0\%$ (n＝12), $27.1-28.9\%$ (n＝13), $29.2-32.0\%$ (n＝13), and $32.2-42.1\%$ (n＝13). We calculated means and standard deviations of the 10 basic physical fitness items separately for each group, ran ANOVA within the 5 groups, and examined the changes within the groups and relationship among the items.

3. Results

Table 1 shows means and standard deviations of the 10 basic physical fitness items of the each of five groups classified according to their Percent Body Fat (%), and the results of the ANOVAs. Figures 1 through 5 illustrate means and standard deviations on each item for each the five groups.

Results of the body weight each groups were shows in Fig. 1. Significant overall differences were not found among the five groups on stature, but weight increased as Percent body fat (%) increased and that was significantly different across the groups at 0.001 level. Weight especially increased significantly among 4th and 5th groups, which means Percent body fat was greater than 29.2%.

Results of the back muscular strength in each groups were shown in Fig.2. No significant differences in each groups were found on back muscular strength and shoulder arm strength (pulling), however back muscular strength between 1st and 3rd groups and shoulder arm strength between 1st and 4th groups were significantly different. These scores decreased as Percent body fat increased. Based on previous work, weight represented by Body bulk, had high correlation with static muscular strength, but that was also a limiting factor to consecutive muscular power, agility, and so on. This study shows that static muscular strength remains same value above 24% of Percent body fat (%) (BI methods SIF-891).

As figure 1 shows, weight increased as Percent Body Fat (%) increased. We need to examine relationships between Percent Body Fat (%) and

Table 1　Mean and standard deviation between Five Groups.

Group Item		1 (18.5~24.0%) N=12	2 (24.1~27.0%) N=12	3 (27.1~28.9%) N=13	4 (29.2~32.0%) N=13	5 (32.2~42.1%) N=13	F
Percent body fat (%)	M	21.78	25.53	27.65	30.40	35.48	※
	SD	2.01	0.96	0.52	0.92	2.81	※
Stature (cm)	M	181.16	181.25	180.96	178.27	177.37	
	SD	7.85	3.37	6.12	5.96	4.23	
Body weight (kg)	M	107.78	114.25	115.54	128.62	126.44	※
	SD	6.71	5.00	6.68	10.17	12.79	※
Back muscular strength (kg)	M	220.17	198.33	195.31	200.85	198.69	
	SD	32.55	26.19	22.61	38.50	20.79	
Shoulder muscular (kg) strength pull	M	60.21	55.67	58.00	52.15	57.92	
	SD	7.41	6.29	6.97	7.23	14.29	
Side step (times)	M	47.58	44.50	42.69	43.54	42.08	※
	SD	2.09	2.93	4.66	5.79	5.39	
Vertical jump (cm)	M	54.25	52.08	50.23	49.77	49.77	
	SD	5.00	5.81	5.91	7.37	5.62	
400m run (sec)	M	78.01	85.07	88.50	91.49	95.80	※
	SD	5.57	6.23	9.53	7.16	11.10	※
Trunk extension (cm)	M	53.58	51.46	52.46	52.27	55.38	
	SD	7.12	5.00	7.16	7.61	4.52	
Bass dynamic balance Test (point)	M	88.50	86.83	86.78	81.77	77.23	※
	SD	7.63	5.79	9.88	7.37	14.40	※

each of other items the future. Results of the side step were shown in Fig. 3. Side-step was significantly different within the five groups at 0.005 level. Significant difference was found between 1st and other 4th groups, but not among these four groups. Significant differences in all groups were not found on vertical jump, but only the 1st and 5th groups were significantly different. Based on these results, agility and leg muscular power in + 95kg categories remained same if Percent body fat (%) was greater than 24%. Therefore, we assume levels of these factors are different at 24% as a border.

The 400m run in each groups were shown in Fig. 4. The ANOVA results show significant differences at the 0.001 level. Those differences were found between 1st and other groups, between 2nd and 4th & 5th groups, and between 3rd and 4th groups respectively. 400m run scores became worse as Percent body fat (%) increased from 1st to 5th groups. The results show no significant differences among five groups on trunk extension.

The results of dynamic balance test in each groups were shown in Fig. 5. The results of the ANOVA show significant group differences at 0. 001 level. The differences were found between 1st and 4th & 5th group, and between 2nd & 3rd groups and 5th group. As Percent body fat (%) increased, the scores of dynamic balance decreased.

4. Summ
Base
10 items
ness Test
gory from
was divid
(18.5—24.
(27.1—28.

(kg)

| | 10.17 | 12.79 |

140 —

135 —

130 —

128.62

125 — 126.44

6.68

120 —

5.00

115 — 115.54

6.71

114.25

110 —

107.78

105 —

※

100 —

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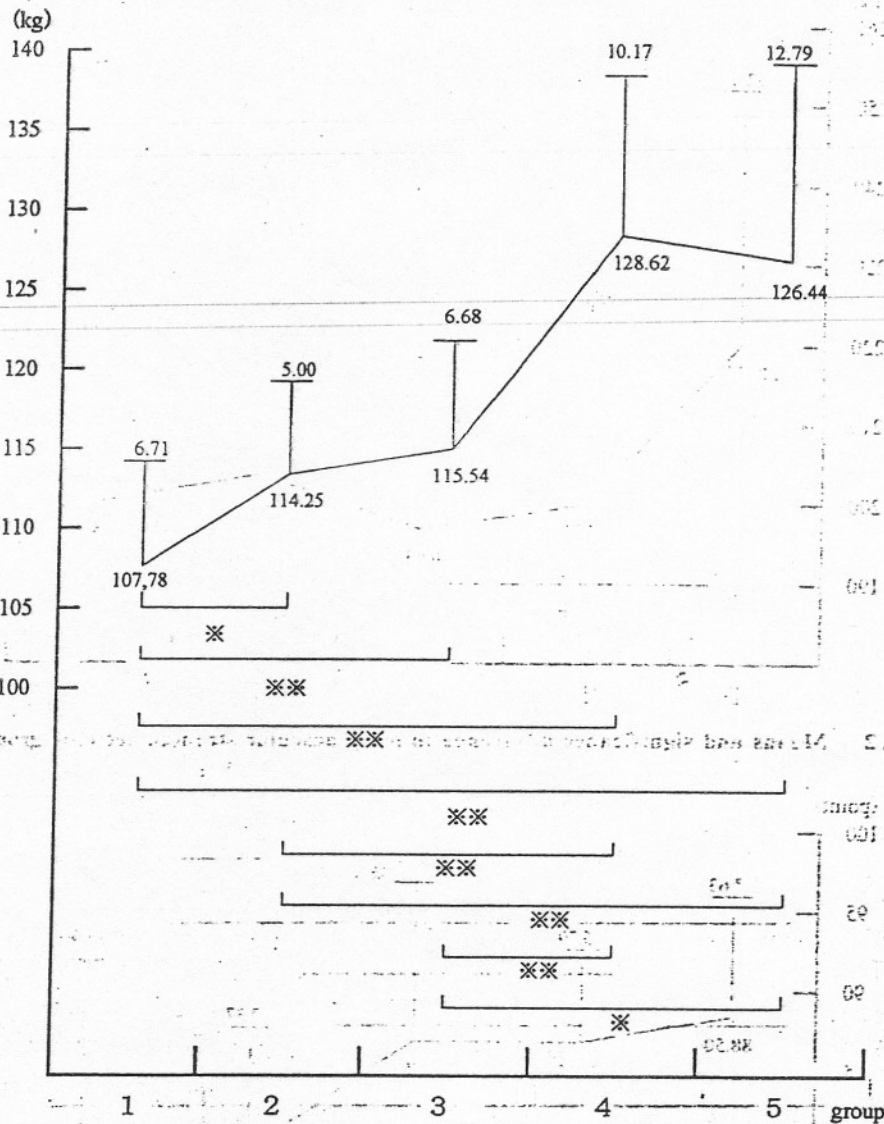
1   2   3   4   5   group

Fig. 1 Means and sigificance difference in body weight between groups.

4. Summary

Based on measurement of 8 components and 10 items of the Physique and Basic Physical Fitness Test among 63 Judo athletes in +95kg category from four universities, Percent body fat (%) was divided into the following groups ; 1st group (18.5—24.0%), 2nd group (24.1—27.0%), 3rd group (27.1—28.9%), 4th group (29.2—32.0%), and 5th group (32.2—42.1%). We obtained the following conclusion based on the examination of the differences within the five groups of Percent body fat (%) and relationship between basic physical fitness and body fat.

(1) Weight increased in +95kg category as Percent Body Fat (%) increased.

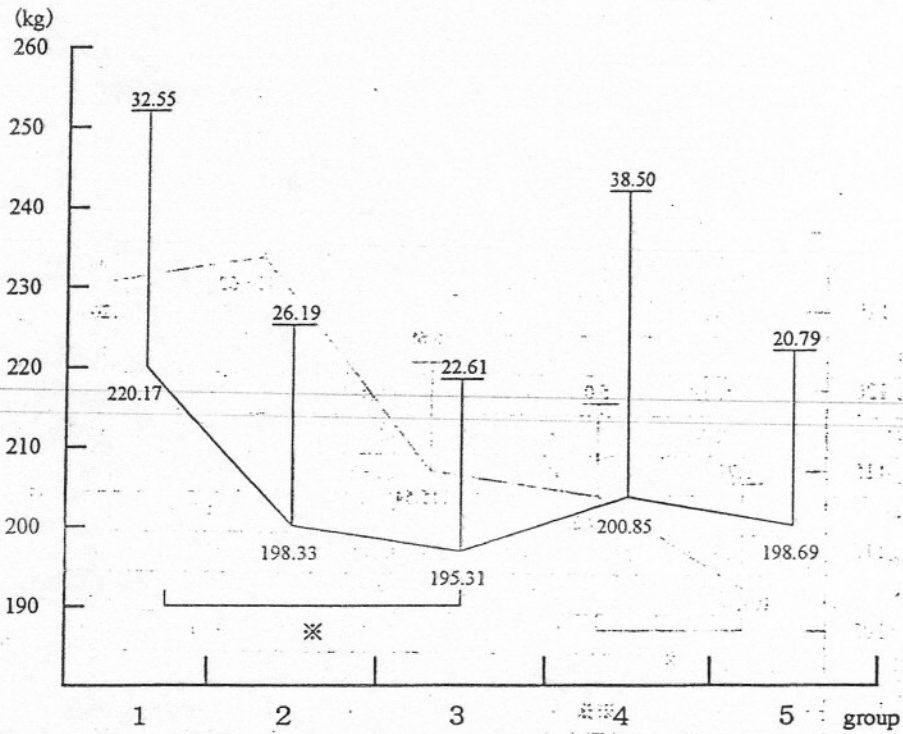(2) Speed endurance represented by 400 m run

(kg)

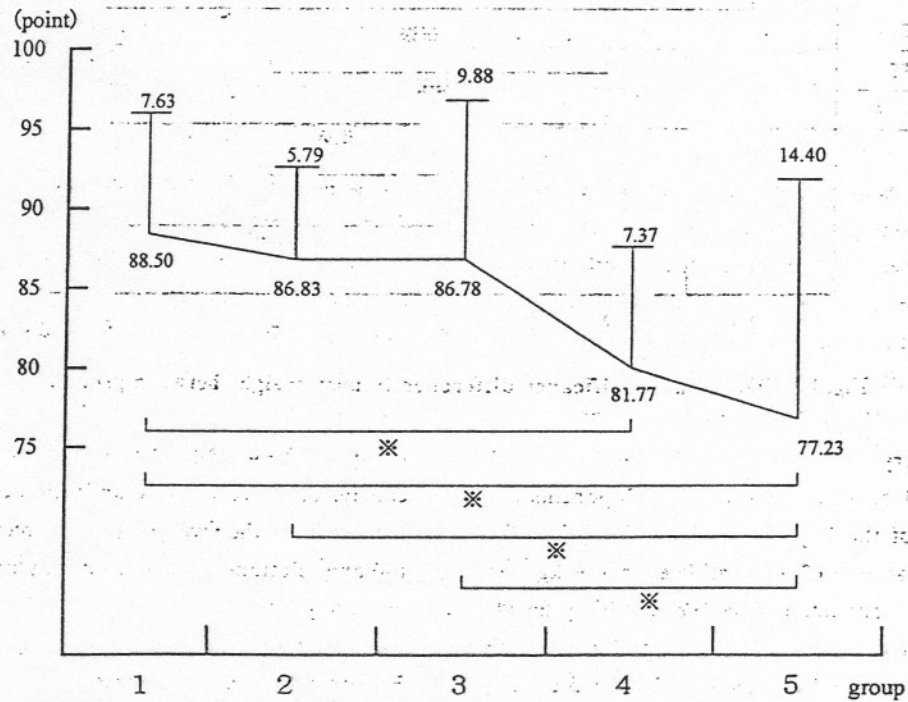Fig. 2　Means and significance difference in back muscular strength between groups.

(point)

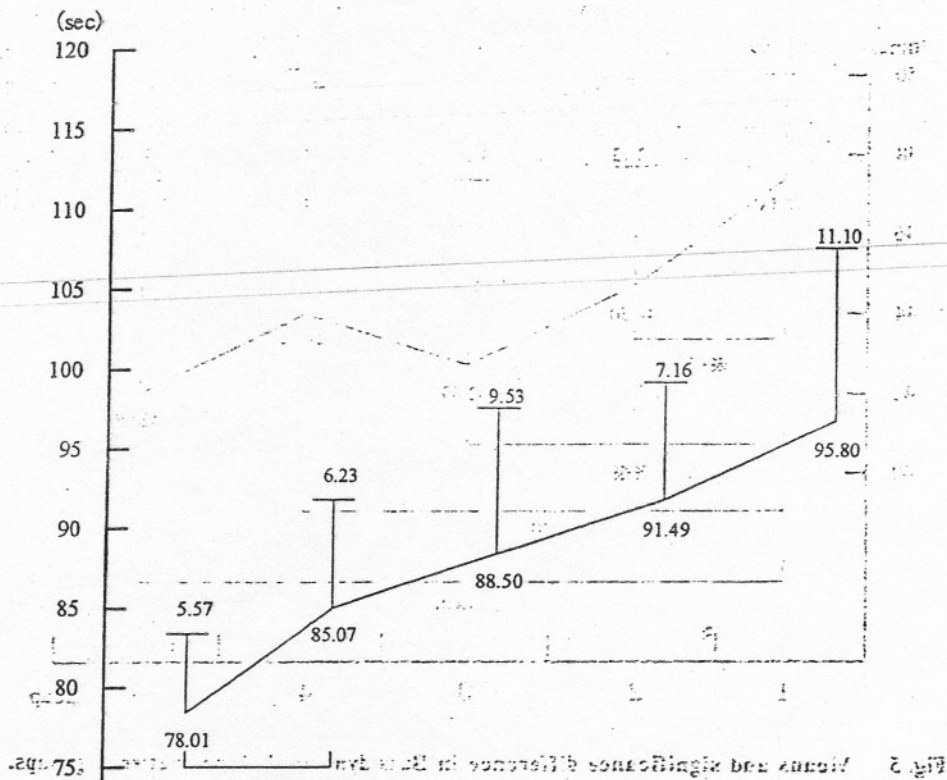Fig. 3　Means and significant difference in side step between groups.

Fig. 4   Means and significance difference in 400m run between groups.

became less as Percent body fat (%) increased.

(3) The ANOVA results showed the significant differences in agility in each groups represented by side step. Differences were found between 1st and other four groups, but not among these four groups. Level of basic physical fitness including agility and muscular power represented by

vertical jump would be assumed to change at 24% of Percent body fat (%) as a border.

(4) Dynamic balance represented by Bass dynamic balance test decreased as Percent body fat (%) increased. These findings offered importance suggestion to the training methods of basic physical fitness to improve performance abilities among
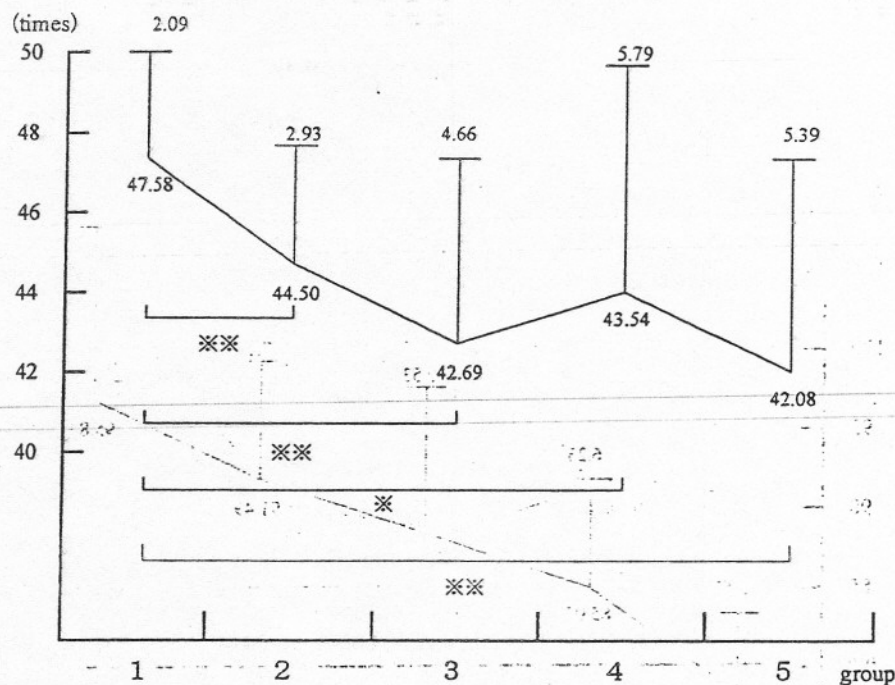
Fig. 5　Means and significance difference in Bass dynamic balance between groups.

heavy weight class athletes. In the future, we would like to collect larger samples and examine characteristics of basic physical fitness that are necessary for Judo athletes including basic physical fitness structure, body composition, relationship among each items, and so on.

The summary of this study was presented in the "1996 International Scientific Congress" at the 11 July 1996, Dallas Texas U.S.A.

REFERENCES

1) Iida, E., Matsuura, Y., Aoyagi, O., Takeuchi, M., Tanaka, H., Yoshioka, T, and Komata, K.: Test Batteries of Fundamental Physical Fitness for College Judoists Japan Journal of physical Education 29 (1): 35-42, 1984. (in Japanese)

2) Iida, E., Matsuura, Y., Takeuchi, M., Tanaka, H., Ueguchi, T., Takagi, C., Yoshioka, T, and Nishijima, N.: Factorial Structure and Test Construction of Physical Fitness for College Judoists 1986 Seoul Asian Games Scientific Congress Proceeding: 570-79, 1986.

3) Iida, E., Matsuura, Y., Takeuchi, M., Ueguchi, T, and Chinsung-Dong.: Comparative Study on Physical Fitness Between Korean and Japanese College Judoists. 1988 Seoul Olympic Scientific Congress Proceeding: 773-80, 1988.

4) Iida, E., Matsuura, Y., Takeuchi, M., Nakajima, T, and Tanaka, H.: The Study on Measurement Items for the Diagnosis on College Judoists Research Journal of Budo 27 (2): 37-44, 1995. (in Japanese)

5) Nakajima, T., Iida, E., Matsuura, Y., Takeuchi, M., Tanaka, H. Inagaki, A, and Ueguchi, T.: A Comparison of the Factor Structure of Basic Physical Fitness among University Judoists of Different Weight Categories Research Journal of Budo 28 (1): 1-12, 1995.

6) Nakajima, T., Takeuchi, M., Matsuura, Y., Iida, E., Tanaka, H. Komori, F, and Kashiwazaki, K.: The Relationship between body Fat and Fundamental

大学柔道選手95kg 超級の基礎体力と
体脂肪との関連について

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　国際大会，全日本学生柔道優勝大会に出場した選手を含む4大学，95kg 超級柔道部員63名を対象として体格・基礎体力テスト8要素10項目の測定結果より，セルコ社製 BI 法(SIF-891)による，Percent body fat (%) について各群の人数がほぼ等しくなるように，即ち18.5〜24.0%（N=12），24.1〜27.0%（N=12），27.1〜28.9%（N=13），29.2〜32.0%（N=13），32.2〜42.1%（N=13）の5群の下位標本に分類し，体脂肪率群間の差異を求め，基礎体力と体脂肪率との関連について検討した結果，次のような結論が得られた。

1) Percent body fat （%）の増加とともに体重も増加する。
2) 400m 走で代表される瞬発的持久性は Percent body fat （%）の増加とともに顕著に低下する。
3) Side Step で代表される敏捷性，垂直跳びで代表される瞬発力は，Percent body fat （%）24%を境にこれらの基礎体力要素のレベルが分かれると推測された。
4) Bass dynamic balance test で代表される動的平衡性は，Percent body fat （%）の増加と共に劣る。

　以上の結果より重量級選手の競技力として必要な基礎体力のトレーニング法に重要な示唆が得られた。今後更に被検者を多く各階級別について，その基礎体力の構造，身体組成，各項目間の相関等々柔道競技における選手の基礎体力の適性について検討して行きたいと思っている。