

4-2. A STUDY OF THE INFLUENCE OF JUVENESCENT JUDO PRACTICE ON THEIR BODIES

Report 1 Characteristics of the Boy Judoists' Physical Fitness

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According to "The Report of Physical Fitness and Motor Ability Survey"⁹⁾ issued annually by the P. E. Bureau of Education Ministry, the children's physical fitness is declining, especially the muscle strength (i.e. grip strength and back strength). It is difficult to pinpoint the factors of this phenomenon, however, there must be some relation to the fact reported about the recent abnormal children's physical phenomenon.^{7,8)}

The main cause of decline of children's physical fitness suggested so far should be the lack of physical exercise. In order to avoid the lack of exercise among children at the developing stage, the sports activities are considered to be effective. However, as shown in Kashiwagi⁶⁾ and Akimoto¹⁾ reports, we also have to consider the fact that the excessive sports activities have very malignant influence on children's bodies.

The purpose of Judo practice in juvenescent is to put importance on the manners as well as the improvement of Judo techniques. The population of boy Judoists was once kept constant. However, it has recently been increasing with international development of Judo. It is important to instruct to practice Judo to the boys with thorough understanding of their physical characteristics of this period as well as the physiological characteristics of Judo practice. Accordingly, a special attention was made in this survey on the influence to the Judo-practicing boys' bodies in physical fitness and morphology.

Since the subjects are in the development period, "the nutritious effects"—their maturation effects must be considered. Ezaki⁵⁾ reports that in the case of elementary school boys, morphological superiority of the subjects is brought out by high nutritious standard rather than by the Judo practice itself. Asano²⁾ reports that in the longitudinal survey of junior high school students, the Judo practice has a wide influence on morphology and physical fitness. However, more studies should be made on whether the influence comes from physical exercise or simply the Judo practice.

In order to clarify these points, elementary school boys who practice Judo well, and junior high school students who have shown good physical performance were chosen as the subjects of this survey. Also soccer and basketball players under the same condition were added to the subjects in order to find out the Judoist's characteristics in the field of physical fitness.

I. METHOD

The subjects were grouped into Judoists, soccer players, basketball players, of each 5th and 6th graders and 7th and 8th graders. The number of the subjects of each group was 10-12 in each sports event and grade. The total number of the subjects was 133.

The selection standard of the subjects as Judoists was as follows: more than two-year Judo experience was required of elementary school subjects, and more than three-year Judo experience, everyday practice, and high score holder at the local tournament in Tokyo were required of junior high school student subjects. The soccer and basketball groups were selected out of those who met the same requirements as the Judo group. In comparison, the national average value¹²⁾ was adopted as the control group.

The measurement was made according to the regular method!¹⁰⁾ In morphology the measurement was made for the following 14 items: body height, body weight, sitting height, neck girth, chest girth, waist girth, wrist girth, abdomen girth, upper-arm girth (extension, flexion), forearm girth, thigh girth, calf girth, ankle girth, skinfold thickness (mid-brachium, subscapular). Rohrer's Index, total body fat, and lean body mass⁹⁾ were also calculated. The measurements of arms and legs were made for both left and right. In function, the measurements were made for the following 8 items: side step test, vertical jump, back strength, standing trunk flexion, step test, and vital capacity. The result was studied in comparison with each grade average and sports event.

II. RESULT AND DISCUSSION

Regarding the morphology and function, a comparative study was made as to 5th graders to 8th graders shown in Table 1-4. As shown clearly in Table 1, the group of 5th grade Judoists showed much conspicuous value than the control group in almost every item of morphological measurement. The difference of body height and sitting height between the Judo group and the control group was statistically significant at the 0.1 level of confidence. Still a larger difference was seen in comparison with the soccer group. It was statistically significant ($p < 0.05$). Regarding body weight, the same result was obtained. The average value of Judo group was 40.0 ± 8.55 kg, and that of the control group was 32.0 ± 5.42 kg. The difference was statistically significant ($p < 0.01$). Since there was no difference between both groups in skinfold thickness, the subjects of Judo group were not considered to be boys of obesity. Regarding total body fat, the Judoists group showed rather large value compared to soccer and baseball groups. However, the difference was statistically not significant.

Regarding the girth value, the Judoists group showed very large values in neck girth, upper-arm girth (right extension, right flexion), thigh girth, and calf girth. Judo training and natural process of development are considered to be among the contributing factors of the girth growth, however, it can safely be said that Judo training has more influence on the development of girths.

In function Judo group showed larger values in vital capacity, side step test, back strength, and grip strength. It can be understood that they showed larger value in vital capacity and muscle strength because of their large physique and heavy body weight. However, the result that they showed the very high value in the side step test should be marked. This result showed some difference from Ezaki's report⁵⁾ that there was no difference between the Judo and control groups of elementary school boys in side step test. However, the result cannot be explained simply because of the small value of skinfold thickness, but it indicates the possibility of increasing the agility by Judo training.

The same thing can be said in vertical jump, for there was no difference among the four groups. However, in step test Judo group showed significantly low score ($p < 0.01$), which meets with grown-up Judoists, and this will be the subject to be studied in the future. However, attention should be paid to the report¹¹⁾ that the dominance of margin scope of circulatory system cannot be simply discussed only from the step test.

Regarding the 6th grade subjects, they showed the same tendency in morphology as the 5th graders as shown in Table 2. However, in function they showed some difference. The Judo group showed larger value in vital capacity and muscle strength tests. In side step test there was almost no difference from the control group. Instead, in step test there was no big difference between both groups. The percentage of body fat decreased in the 6th grade ($15.40 \pm 3.26\%$), while that of the 5th

Table 1 MORPHOLOGICAL COMPARISON OF 5TH GRADERS

	Body height (cm)	Body weight (kg)	Rohrer's Index	Sitting height (cm)	Neck Girth (cm)	Chest Girth (cm)	Abdomen Girth (cm)	Waist Girth (cm)	Forearm Girth(cm)		Upperarm Girth(cm)	
									(right)	(left)	(right ext.)	(right flex.)
Judo (N=11)	145.2	40.0	129.4	77.9	30.1	71.1	62.5	65.4	21.4	21.4	21.8	23.7
	S.D.4.98	8.55	18.39	2.58	1.92	7.36	8.19	7.86	1.56	1.69	2.34	2.51
Soccer (N=11)	140.2	32.6	119.1	75.1	27.7	65.8	57.8	59.8	20.2	19.4	19.6	21.2
	S.D.5.76	2.74	12.90	3.05	0.90	2.40	3.82	3.81	0.84	0.93	1.48	1.39
Base ball (N=10)	145.4	37.6	121.7	78.5	29.5	69.4	60.3	63.2	20.8	20.3	20.9	22.5
	S.D.9.09	5.93	9.04	4.18	1.37	3.64	3.68	5.13	0.85	0.81	1.17	1.14
Control	137.4	32.0	123.6	74.3	27.6	66.4	57.0	66.1	19.1		18.2	19.7
		5.42	12.90	3.18	1.30	5.06	3.96	4.06	1.18		1.36	1.59
	<N=976>	<N=976>	<N=17>	<N=974>	<N=103>	<N=974>	<N=103>	<N=103>	<N=103>		<N=103>	<N=103>
	Upperarm Girth(cm)		Wrist Girth(cm)		Thigh Girth(cm)		Calf Girth(cm)		Ankle Girth(cm)		Skinfold thickness (mm) (Mid-brachium + Subscapular)	Total body fat (%)
	(left ext.)	(left flex.)	(right)	(left)	(right)	(left)	(right)	(left)	(right)	(left)		
Judo	21.5	23.2	14.6	14.7	44.5	43.6	30.7	30.8	19.9	19.7	18.5	17.09
	1.96	2.17	0.75	0.75	4.36	4.02	2.83	2.93	1.65	1.65	9.95	6.26
Soccer	19.0	20.8	13.6	13.3	41.1	40.1	28.5	27.9	18.6	18.4	16.7	15.98
	1.53	1.42	0.40	0.59	2.00	2.29	1.12	1.19	0.84	0.88	7.61	4.72
Base ball	20.6	22.3	14.0	14.0	44.4	43.5	31.0	30.8	19.9	19.5	17.7	16.45
	1.13	1.04	0.60	0.62	2.73	2.81	2.36	2.25	1.23	1.36	4.66	2.86
Control				37.6		28.91	26.5	26.5			18.9	
				2.08				1.75				
					<N=232>			<N=103>				
	Total body fat	Lean body mass		Step Test	Vital Capacity	Side Step Test	Vertical Jump	Back Strength	Grip strength(kg)		Trunk extension	Standing trunk flexion
	(kg)	(%)	(kg)	(point)	(cc.)	(point)	(cm)	(kg)	(right)	(left)	(cm)	(cm)
Judo	7.28	82.91	32.68	60.2	2445.5	41.2	35.8	73.1	22.3	22.5	47.5	7.1
	4.88	6.26	4.29	7.95	357.68	3.04	4.13	14.01	4.01	2.97	6.71	5.71
Soccer	5.16	84.12	27.38	66.0	1927.3	40.3	35.7	62.7	20.0	18.7	45.3	5.1
	1.93	4.68	1.95	8.04	298.76	4.56	4.63	6.48	2.95	1.25	4.05	2.97
Base ball	6.22	83.55	31.35	58.8	2120.0	40.1	39.6	68.7	23.0	22.2	44.7	5.9
	1.54	2.86	4.89	6.11	402.00	5.87	5.82	9.43	3.15	2.68	5.24	3.53
Control				66.6	1857.0	38.12	33.9	58.7	18.7		45.5	8.0
				10.97	278.00	5.52	6.03	14.08	4.67		6.88	4.99
				<N=937>	<N=228>	<N=975>	<N=976>	<N=975>	<N=952>		<N=973>	<N=971>

Table 2 MORPHOLOGICAL COMPARISON OF 6TH GRADERS

	Body height (cm)	Body weight (kg)	Rohrer's Index	Sitting height (cm)	Neck Girth (cm)	Chest Girth (cm)	Abdomen Girth (cm)	Waist Girth (cm)	Forearm Girth(cm)		Upperarm Girth(cm)	
									(right)	(left)	(right ext.)	(right flex.)
Judo (N=10)	152.8	47.3	129.9	81.5	31.4	76.5	66.2	66.3	23.5	22.9	23.7	25.1
	S.D.10.35	12.23	13.49	6.21	2.32	7.62	7.29	7.57	2.36	2.66	3.12	2.67
Soccer (N=11)	149.3	39.1	117.3	80.3	29.7	70.9	59.8	63.0	20.7	20.4	21.0	23.0
	S.D.5.60	4.61	9.08	4.54	1.60	4.29	3.75	3.17	1.23	1.07	1.82	1.66
Base ball (N=10)	151.8	41.6	117.5	80.0	29.7	72.3	61.9	65.6	21.0	20.8	21.2	23.0
	S.D.6.66	8.70	9.13	4.27	1.51	5.20	4.37	4.82	1.70	1.56	1.83	2.15
Control	142.7	35.5	127.7	76.7	27.7	68.9	58.7	68.4	19.5		18.4	19.9
	S.D.6.47	6.54	14.27	3.46	1.28	5.67	4.26	4.14	1.28		1.54	1.60
	<N=971>	<N=970>	<N=18>	<N=970>	<N=56>	<N=965>	<N=56>	<N=56>	<N=56>		<N=56>	<N=56>
	Upperarm Girth(cm)		Wrist Girth(cm)		Thigh Girth(cm)		Calf Girth(cm)		Ankle Girth(cm)		Skinfold thickness (mm) (Mid-brachium + Subscapular)	Total body fat (%)
	(left ext.)	(left flex.)	(right)	(left)	(right)	(left)	(right)	(left)	(right)	(left)		
Judo	23.1	24.8	15.8	15.8	47.3	46.2	31.6	32.1	21.1	20.9	16.0	15.40
	2.91	2.95	1.29	1.30	6.20	5.92	4.89	2.90	2.10	1.79	5.29	3.26
Soccer	20.0	22.0	14.4	14.3	44.5	42.8	31.4	30.4	19.9	19.6	15.5	15.13
	1.56	1.51	0.77	0.59	3.10	2.94	2.74	2.46	1.58	1.54	5.80	3.52
Base ball	21.0	22.8	14.7	14.6	45.0	44.1	30.3	31.1	20.4	20.2	14.4	14.40
	2.15	2.26	1.41	1.15	3.97	4.61	4.21	2.96	1.33	1.23	5.11	3.11
Control					42.4		30.0	27.2			22.3	
					4.31			2.06				
					<N=113>			<N=56>				
	Total body fat	Lean body mass		Step Test (point)	Vital Capacity (cc.)	Side Step Test (point)	Vertical Jump (cm)	Back Strength (kg)	Grip strength(kg)		Trunk extension (cm)	Standing trunk flexion (cm)
	(kg)	(%)	(kg)						(right)	(left)		
Judo	7.46	84.62	39.80	63.5	2970.0	40.1	40.2	82.4	28.1	27.0	46.7	7.6
	3.22	3.27	9.60	10.89	588.30	3.05	7.01	19.72	7.73	6.91	4.73	4.69
Soccer	5.96	83.96	32.81	67.8	2327.3	41.4	43.3	72.0	25.4	24.3	48.1	6.5
	1.66	3.95	3.85	8.07	424.46	3.17	6.55	11.02	3.48	4.22	5.09	4.19
Base ball	6.22	85.61	35.39	62.0	2395.0	40.4	43.5	75.2	27.5	27.7	46.9	4.0
	2.92	3.11	5.95	5.98	532.19	4.03	5.77	10.50	5.91	6.75	5.32	3.16
Control				66.8	1953.0	41.2	37.6	67.9	21.3		46.8	7.8
				11.78	284.00	5.32	6.05	16.88	4.97		6.84	4.77
				<N=932>	<N=222>	<N=940>	<N=943>	<N=976>	<N=961>		<N=976>	<N=966>

Table 3 MORPHOLOGICAL COMPARISON OF 7TH GRADERS (J. H. Sch.1)

	Body height (cm)	Body weight (kg)	Rohrer's Index	Sitting height (cm)	Neck Girth (cm)	Chest Girth (cm)	Abdomen Girth (cm)	Waist Girth (cm)	Forearm Girth(cm)		Upperarm Girth(cm)	
									(right)	(left)	(right ext.)	(right flex.)
Judo (N=11)	163.5	58.9	133.9	87.2	34.9	84.1	72.2	73.8	24.9	24.9	25.7	28.9
	S.D.7.61	10.05	14.45	3.95	1.68	6.56	8.41	7.82	1.62	1.87	2.94	2.57
Soccer (N=12)	154.0	42.4	114.8	81.6	30.5	72.5	62.0	64.4	21.8	21.3	21.3	23.0
	S.D.8.63	8.08	9.21	4.62	1.88	6.11	4.96	4.58	1.41	1.47	1.70	2.47
Base ball (N=12)	159.1	46.5	115.1	85.6	32.5	75.2	61.5	66.9	23.3	22.9	22.7	25.5
	S.D.5.79	6.04	8.84	3.36	2.62	4.16	4.76	4.48	1.65	1.92	1.72	1.73
Control	150.7	41.3	122.8	79.6	29.1	72.5	60.1	70.8	20.4		19.8	21.3
	S.D.7.97	7.95	15.35	4.78	1.48	6.35	4.06	4.02	1.25		1.39	1.62
	<N=959>	<N=959>	<N=19>	<N=958>	<N=57>	<N=956>	<N=57>	<N=57>	<N=57>		<N=57>	<N=57>
	Upperarm Girth(cm)		Wrist Girth(cm)		Thigh Girth(cm)		Calf Girth(cm)		Ankle Girth(cm)		Skinfold thickness (mm) (Mid-brachium + Subscapular)	Total body fat (%)
	(left ext.)	(left flex.)	(right)	(left)	(right)	(left)	(right)	(left)	(right)	(left)		
Judo	25.9	28.2	16.2	16.2	50.7	50.2	36.2	34.8	22.3	22.0	25.3	19.8
	2.69	2.34	0.82	0.79	4.08	3.50	4.34	2.39	1.08	1.19	11.66	6.49
Soccer	20.3	22.2	14.4	14.3	44.5	44.1	31.2	30.9	20.3	20.0	13.2	11.2
	1.91	1.94	0.89	0.91	4.28	4.02	2.50	2.47	1.55	1.56	3.14	13.68
Base ball	22.0	24.5	15.2	15.3	45.6	46.2	33.2	33.0	20.5	20.6	13.1	13.1
	1.84	2.03	1.08	1.05	3.11	2.96	2.08	1.95	1.18	1.15	2.79	1.53
Control					42.2		28.6	28.6			26.2	
					4.38			2.15				
					<N=161>			<N=57>				
	Total body fat (kg)	Lean body mass (%) (kg)		Step Test (point)	Vital Capacity (cc.)	Side Step Test (point)	Virtual Jump (cm)	Back Strength (kg)	Grip strength(kg)		Trunk extension (cm)	Standing trunk flexion (cm)
									(right)	(left)		
Judo	11.9	80.2	47.0	62.6	3309.1	42.3	50.2	106.9	40.6	40.3	49.9	10.0
	4.98	6.49	7.55	8.34	536.75	4.14	8.58	26.19	9.81	7.20	5.16	6.47
Soccer	5.7	86.8	36.7	75.5	2575.0	38.9	40.4	68.6	26.4	24.5	46.5	7.6
	1.76	1.68	6.40	7.85	519.82	3.12	4.41	19.54	6.11	5.04	2.72	3.22
Base ball	6.1	86.9	40.4	76.5	3166.7	37.5	49.3	88.9	34.1	34.1	48.9	7.6
	1.32	1.53	4.94	18.24	424.90	2.93	5.54	17.13	5.16	5.16	6.98	5.26
Control				68.5	2293.0	38.8	43.0	85.3	26.5		49.6	8.6
				12.69	388.00	5.01	7.26	21.93	6.77		7.90	4.94
				<N=956>	<N=218>	<N=908>	<N=912>	<N=976>	<N=897>		<N=975>	<N=973>

Table 4 MORPHOLOGICAL COMPARISON OF 8TH GRADERS (J. H. Sch.2)

	Body height (cm)	Body weight (kg)	Rohrer's Index	Sitting height (cm)	Neck Girth (cm)	Chest Girth (cm)	Abdomen Girth (cm)	Waist Girth (cm)	Forearm Girth(cm)		Upperarm Girth(cm)	
									(right)	(left)	(right ext.)	(right flex.)
Judo (N=11)	167.2	67.0	142.6	90.3	35.9	89.0	76.7	79.6	26.5	26.1	28.4	31.2
	S.D.5.26	12.53	22.55	2.79	2.28	6.61	8.98	9.80	1.90	1.78	3.45	3.13
Soccer (N=12)	166.3	53.7	116.6	88.5	33.4	80.5	65.2	69.1	23.8	23.4	22.3	26.0
	S.D.4.68	5.61	9.55	2.55	1.05	4.26	3.14	3.90	1.16	1.08	3.35	2.30
Base ball (N=12)	162.3	51.3	120.0	86.8	33.0	79.7	66.5	69.0	23.7	23.5	23.8	26.2
	S.D.6.37	4.80	7.12	3.93	1.60	2.92	2.45	3.16	1.03	0.9	1.20	1.49
Control	157.8	47.0	112.9	83.1	30.9	76.0	62.7	76.4	21.6		21.0	22.9
	S.D.7.66	8.16	12.97	5.23	2.15	5.82	4.59	5.55	1.66		2.02	2.22
	<N=984>	<N=983>	<N=12>	<N=976>	<N=216>	<N=977>	<N=216>	<N=216>	<N=216>		<N=216>	<N=216>
	Upperarm Girth(cm)		Wrist Girth(cm)		Thigh Girth(cm)		Calf Girth(cm)		Ankle Girth(cm)		Skinfold thickness (mm)	Total body fat
	(left ext.)	(left flex.)	(right)	(left)	(right)	(left)	(right)	(left)	(right)	(left)	(Mid-brachium + Subscapular)	(%)
Judo	27.9	30.1	16.7	16.9	55.5	54.9	37.5	37.3	22.7	22.5	24.3	19.3
	3.26	3.28	1.31	1.10	5.78	5.51	3.78	3.16	1.73	1.27	11.21	6.23
Soccer	23.0	25.6	15.4	15.4	48.8	48.2	34.2	33.7	21.7	21.4	15.6	14.5
	1.85	2.25	0.84	0.76	3.14	2.85	2.08	2.03	1.22	1.28	6.50	3.52
Base ball	23.2	25.6	15.4	15.4	49.0	49.5	33.7	34.0	21.1	21.0	15.5	14.4
	1.35	1.36	0.77	0.73	2.00	1.99	1.31	1.36	0.80	0.87	2.45	1.31
Control					43.7		31.9	29.9			24.7	
					4.62			2.36				
					<N=131>			<N=216>				
	Total body fat	Lean body mass		Step Test (point)	Vital Capacity (cc.)	Side Step Test (point)	Vertical Jump (cm)	Back Strength (kg)	Grip strength(kg)		Trunk extension (cm)	Standing trunk flexion (cm)
	(kg)	(%)	(kg)						(right)	(left)		
Judo	13.6	80.7	53.4	52.3	4081.8	41.5	52.5	123.7	45.7	44.0	47.5	9.3
	6.90	6.23	6.59	7.68	363.86	3.68	6.43	16.59	6.00	6.52	5.11	4.46
Soccer	8.0	85.7	45.9	66.0	3641.7	42.5	52.7	105.9	41.4	38.2	53.5	7.7
	2.74	3.29	3.54	5.84	413.24	3.91	7.19	16.60	5.89	4.46	9.17	8.46
Base ball	7.4	85.6	43.8	66.9	3466.7	40.0	52.0	103.5	38.0	37.4	48.4	7.7
	1.08	1.31	3.97	7.13	414.996	1.96	3.67	16.42	5.68	5.47	5.50	5.95
Control				69.0	3114.0	41.1	48.8	99.6	32.4		51.6	10.0
				11.71	469.00	4.71	8.29	23.74	7.00		8.42	5.04
				<N=966>	<N=212>	<N=969>	<N=970>	<N=994>	<N=966>		<N=994>	<N=989>

grade was $17.09 \pm 6.26\%$, which may indicate the improved result of step test.

In the comparison of morphology between 5th and 6th graders, the Judo group showed significantly large value in almost every item against the control group. The Judo group showed larger value against the soccer group in almost every item, and there was almost no difference from the baseball group.

Since the soccer and baseball groups are much bigger in morphology than the control group, they had the tendency to show almost the same pattern as that of the grown-up group even in the juvenescent sports.

In junior high school, the Judo group showed remarkably big difference from other groups especially in morphology. In the case of the 7th graders shown in Table 3, Judo group showed predominant figures to the control group in every item except waist girth. The same can be said in comparison to the soccer and baseball groups.

As one of the selection standards of the subjects, the ones with good scores were chosen. It can safely be suggested that even the 7th graders who have very good physique can obtain good scores, however, there has been no report made, in Ebashi's study, that such a big difference is observed among junior high school students.

The total body fat of the Judo group was 19.8%, the soccer group was 13.2%, and the baseball group was 13.1%. The difference was statistically significant ($p < 0.01$). The 7th graders seem to have the obesity pattern closer to the grown-ups'. Judo practice may have influence on some of their predominant morphological characteristics.

This investigation has revealed the following tendency of elementary school subjects in function: the Judo group showed superiority to the vital capacity, muscle strength, and side step test, in step test they were inferior to the control group, and in virtical jump, the Judo group obtained the best score.

Since Judoists' lower limb muscles are trained, the training effects are to be recognized especially in the agility and the muscle power. As the involvement of circular system in the muscle endurance power increases, Judoists have a hard time in endurance movement, such as a step test. There was no big difference in trunk extension and standing trunk flexion, however, in total the Judo group showed better scores. Among the 8th graders the same type of difference as 7th graders was seen in the morphology in comparison with other groups. The Judo group showed much larger value in almost all items than the soccer, baseball, and control groups.

At the 8th grade level no difference in function was seen in side step test and virtical jump. The reason why no difference was seen in the 8th graders from other groups, while the superiority in the tests was clearly recognized among the 7th graders, was that probably the leg muscles strength could not catch up with the increase of body weight. It is rather contradictory to the result that no change in total body fat was relatively recognized between the 7th and 8th graders.

III. SUMMARY

The following findings were obtained by measuring morphology and physical fitness in order to find out the Judo practice on young boys' bodies in juvenescent effects.

(1) The physique of Judo group consisting of the 5th, 6th, 7th, and 8th grades was far above the national average.

(2) The percentage of body fat of the Judo group was larger than other groups, and it was much larger in junior high school students than elementary school boys.

(3) In the step test the Judo group showed lower socres.

(4) In vital capacity and muscle strength, both elementary and junior high school boys in the Judo group were superior to other groups. The result seems to come from Judo training and nutritious effects.

(5) In the side step test and virtical jump, the Judo group at some grade levels were superior

to other groups. This is largely due to Judo training.

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