

Relationship of High-intensity Training and Body Mass Index in Japanese Students

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ABSTRACT

Background: There has been a rapid and continuing increase in life expectancy in most countries. This increase in life expectancy has not necessarily meant an increase in healthy life years, but rather extra years of illness risk. This, together with the epidemic of obesity, which is showing an upward shift into older age groups, signifies a double disease burden in the near future. Physical exercise is particularly important as one of the habits with the most influence in the control of obesity. **Purpose:** There were not enough data between obese (body mass index [BMI]>25) and high-intensity physical training for health checking the diagnosis. The purpose of this study was to investigate of the blood in the obese students with high-intensity training performed as Sumo, Japanese-style wrestling. **Materials and Methods:** A total of 25 top-level male Sumo wrestling player as volunteer who belong to college Sumo association in Japan (mean \pm SD; age: 21.04 ± 0.98 ; height 174.0 ± 0.06 cm; weight 116.52 ± 24.28 kg; and BMI 38.31 ± 7.45 kg/m²) and compare eight volunteer students without fitness practices (mean \pm SD; age: 21.50 ± 2.27 ; height 162.0 ± 0.09 cm; weight 57.03 ± 9.15 kg; and BMI 21.44 ± 1.25 kg/m²) participated in this study. It was performed examination of the blood below: Cholesterol, total protein, and glycoalbumin. Values are a mean \pm standard deviation. **Results:** It was clearly significant difference in BMI between Sumo group and normal student. However, there were normal limits in cholesterol (Sumo: 181.64 ± 28.49 mg/dl, normal student: 176.57 ± 25.87 mg/dl), total protein (Sumo: 7.48 ± 0.38 g/dl, normal student: 7.53 ± 0.35 g/dl), and glycoalbumin (Sumo: $11.74 \pm 0.81\%$, normal student: $11.45 \pm 2.48\%$) for all subjects. There was no significant difference between Sumo group and students without fitness habits in blood test. **Conclusion:** It was performed high-intensity exercise training as integrated resistance and aerobic training to keep health conditions. Overall, physical activity had a highly effective prescription for the prevention and management of health conditions.

Key words: Body mass index, glycoalbumin, high-intensity training, obesity

INTRODUCTION

Metabolic syndrome is a cluster of interrelated risk factors, visceral obesity, dyslipidemia, hyperglycemia, and hypertension. It was well known these medical conditions increase susceptibility to cardiovascular disease (CVD) and type 2 diabetes. Clinical intervention studies in obese people have also revealed that

regular aerobic exercise training clearly improves risk factors for metabolic syndrome.^[1]

Obesity is an established risk factor for CVD. Exercise training has specifically been reported to induce changes in blood lipids and lipoproteins in other nonobese populations, including reductions in total cholesterol, low-density lipoprotein cholesterol and triacylglycerols, and increased

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high-density lipoprotein cholesterol.^[2] Moreover, it was reported structured exercise training that consists of aerobic exercise, resistance training, or both combined is associated with a HemoglobinA1c reduction in patients with type 2 diabetes.^[3] For this reason, it was well known cross-sectional data indicated that the high levels of cardiorespiratory fitness were associated with low prevalence of metabolic syndrome for response to weight reduction.^[4] However, it was only a little known that it was the effect of high-intensity exercise training on metabolic syndrome improvement in obese individuals.

Sumo, Japanese-style wrestling, has long been a traditional sport in Japan. Most sumo wrestlers were deliberately overweight to win their matches. Furthermore, Sumo was a typical high-intensity exercise sports integrated resistance and aerobic training in 2–3 h daily. It was seem to abnormal metabolism at least in Japanese obesity guideline. There were not enough data between obese (body mass index [BMI]>25) and high-intensity physical training for health checking the diagnosis. The purpose of this study was to investigate of the blood in the obsess students with high-intensity training performed as Sumo.

MATERIALS AND METHODS

It was computed BMI as the ratio between weight (kg) and height (m²). It was participated volunteer 25 top performance male Sumo wrestling players who belong to university association of Sumo in Japan (mean ± standard deviation [SD]; age: 21.04 ± 0.98 years old; height 174.0 ± 0.06 cm; weight 116.52 ± 24.28 kg; and BMI 38.31 ± 7.45 kg/m²) and compared eight volunteer students without fitness habits (mean ± SD; age: 21.50 ± 2.27 years old; height 162.0 ± 0.09 cm; weight 57.03 ± 9.15 kg; and BMI 21.44 ± 1.25 kg/m²) as control group participated in this study [Table 1]. Sumo wrestling students meant a student who has been an average BMI value of 25 or more and has carried out 2 h/day short time high-intensity exercise at least 5 times per week. The control group meant a general college student who did not have exercise habits. It was performed an examination of the blood below: Albumin, albumin/globulin ratio, glycoalbumin, cholesterol, and total protein. All data were corrected their optionally. Experimental data were expressed as mean values with standard deviation. Data were tested using *t*-tests. Statistical significance was considered at *P* < 0.05 using the SAS university edition.

RESULTS

There was a significant difference in the BMI value between the sumo wrestling and control groups [Table 1]. However, they were not a significant difference that total protein, albumin to globulin ratio and cholesterol experiment between two

Table 1: Characteristics of subjects

Item	Sumo wrestling player	Control (without fitness practices)
Total number of subjects	25	8
Age	21.01±0.98	21.50±2.27
Hight (cm)	174.0±0.10	162.0±0.10
Weight (kg)	116.52±24.28	57.03±9.15
BMI (kg/m ²)	38.31±7.45*	21.44±1.25

Data presented as mean±SD. **P*<0.05

Table 2. Result of blood exam

Item of Measure	Sumo wrestling player	Control (Without fitness habits)
Cholesterol (mg/dL)	181.64±28.49	176.57±25.87
Total protein (g/dL)	7.48±0.38	7.53±0.35
Albumin(g/dL)	4.67±0.32	4.78±0.25
Albumin/Globulin ratio	1.67±0.20	1.78±0.19
Glycoalbumin (%)	11.74±0.81	11.45±2.18

Data presented as mean±SD

groups [Table 2]. There were reference values in cholesterol (sumo wrestling: 181.64 ± 28.49 mg/dL and control student: 176.57 ± 25.87 mg/dL), total protein (sumo wrestling: 7.48 ± 0.38 g/dL and control student: 7.53 ± 0.35 g/dL), albumin to globulin ratio (sumo wrestling: 1.67 ± 0.20 and control student: 1.78 ± 0.19), and albumin (sumo wrestling: 4.67 ± 0.32 mg/dL and control student: 4.78 ± 0.25 mg/dL) for all subjects. There was no significant difference between Sumo wrestling and normal student.

DISCUSSION

This study was to investigate the effect of high-intensity and short time exercise in obesity. Body mass index (BMI) of any group was to significant difference. In spite of over 30 value of BMI, all sumo subjects were metabolism of a normal healthy level, especially glycoalbumin and cholesterol. However, this study has some limitations. Our findings applied primarily to overweight and sumo wrestling student-athlete. Therefore, the external validity of our data is limited. Most of our subject's sumo wrestling student were too large femoral region to measure by commercial weight and body composition analyzer. Moreover, there was over the tolerance level of calorie calculator system by photo due to their own meal service [Figure 1].

Among obesity, the internal organs fat type obesity which fat collects in a stomach predisposes hyperlipidemia, diabetes,



Figure 1: Typical meal service called Chankonabe, hot pot dish eaten mainly by professional sumo players. It contains a variety of foods such as meat, fish, and vegetables with large bowl rice

and the high blood pressure. Even if it was a player of the amateur university sumo club which was not professional, it was guessed by this result that they have much quantity of skeletal muscle activity and cardiovascular function. However, it was reported that 96 professional sumo wrestlers significantly had a higher incidence of diabetes, gout and high blood pressure than a healthy people.^[5] It was necessary for them to increase more weight to become strong. Hence, further study is necessary to keep their health condition.

CONCLUSION

This study suggests that, for overweight and obese student with sumo training, a high intensity physically active daily life and maintenance of metabolism function can be useful in the primary prevention of metabolic syndrome.

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AUTHOR'S CONTRIBUTION

Takeshi Sato and Mizuki Nakajima conceived the concept of the study. Yousuke Takeishi designed the study, developed the integrative conceptual framework, and collected and analyzed the data. Aya Ozeki wrote the manuscript. Sakura Tanaka assisted in data interpretation and critical revisions.

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