

# Correlation between Bone Mineral Density and exercise habit

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## Introduction

Calcium is the main component of a bone matrix, and at the sometime, it is important nutrition in order to make a bone substantial. According to “Annual Report on Health and Welfare 1998–1999” announced by Ministry of Health, Labor and Welfare, the nations intake of nutrition reached the required amount or is overtaken, but on the other side, intake of Calcium is insufficient<sup>1)</sup>. Adding to that, it indicated their lack of exercise and worried because of the possibility of increasing “Life–style Related Diseases”. Furthermore, Ministry of Education, Culture, Sports, Science and Technology announced that the physical fitness of adolescence has been lower value than the standards, even though the value of their body characteristics have been increasing<sup>1)</sup>.

This study was held in order to search the correlation between osteoplasty of adolescence and exercise and grasp its situations.

## Material and Method

### Male subjects

Classified into three groups, A, B, and C. In group A, twenty–nine healthy subjects (aged (mean±SD) 18.97±1.07). In group B, ninety healthy normal subjects (aged (mean±SD) 19.4±1.32). And in group C, thirty–one healthy normal subjects (aged (mean±SD) 19.39±1.34).

### Female subjects

Classified into three groups, A, B, and C. In group A, forty–four healthy subjects (aged (mean ±SD) 19.61±1.6). In group B, fifty–two healthy normal subjects (aged (mean±SD) 19.54±1.25). And in group C, seventeen healthy normal subjects (aged (mean±SD) 19.29±0.96).

### Method

To comparative study, classified into three groups.

- Group A (non–exercise habit).
- Group B (having exercise habit).

- Group C (athletes).

And measured BMC (bone mineral content), BMD (bone mineral density) and BA (bone area) of a non-skillful forearm (radius and ulna) were respect with DXA (Dual energy X-ray Absorption with 8 mm distal site).

#### Material

DTX-200 DXA Bone Densitometer (OSTEOMETER A / S USA).

#### Results

Table 1 and 2 showed body characteristics of subjects.

Fig. 1 showed a comparison of BMC of males. The values of group B and C were significantly higher than group A, respectively ( $3.553 \pm 0.5$ ,  $3.675 \pm 0.54$  versus  $3.191 \pm 0.42$ ).

Fig. 2 showed a comparison of BMC of females. The value of group C was significantly higher than group A, respectively ( $3.08 \pm 0.3$  versus  $2.762 \pm 0.34$ ).

Fig. 3 showed a comparison of BMD of males. The values of group B and C were significantly higher than group A, respectively ( $0.51 \pm 0.06$ ,  $0.521 \pm 0.04$  versus  $0.473 \pm 0.05$ ).

Fig. 4 showed a comparison of BMD of females. The value of group C was significantly higher than group A, respectively ( $0.467 \pm 0.03$ , versus  $0.448 \pm 0.04$ ).

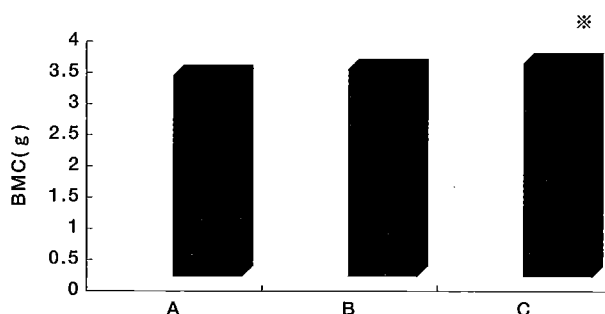


Fig. 1 Shows comparison of Bone Mineral Contents (BMC, Male)

\* $P < 0.05$  vs. group A

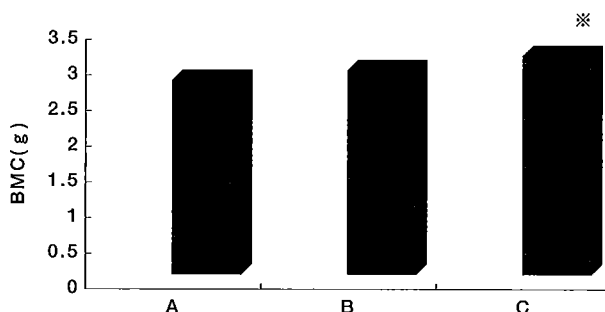


Fig. 2 Shows comparison of Bone Mineral Contents (BMC, Female)

\* $P < 0.05$  vs. group A

Fig. 5 showed a comparison of BA of males. The value of group C was significantly higher than group A, respectively ( $7.03 \pm 0.62$  versus  $6.75 \pm 0.6$ ).

Fig. 6 showed a comparison of BA of females. The value of group C was significantly higher than group A, respectively ( $6.58 \pm 0.39$  versus  $6.2 \pm 0.44$ ).

Table 3 showed a comparison of %BMD of males and females. The value of group A, B and C did not reach the average of %BMD of adolescence in Japan ( $81.76 \pm 8.79$ ,  $88.07 \pm 9.68$ ,  $90.00 \pm 7.78$ ).

And also showed a comparison of %BMD of females. The value of group A, B and C did not reach the average of %BMD of adolescence in Japan ( $92.39 \pm 9.02$ ,  $93.73 \pm 8.36$ ,  $97.35 \pm 5.89$ ).

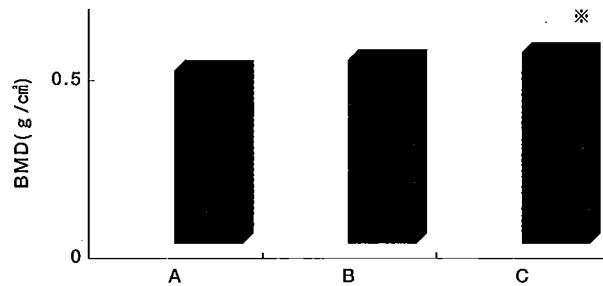


Fig. 3 Shows comparison of Bone Mineral Density (BMD, Male)

\* $P < 0.05$  vs. group A

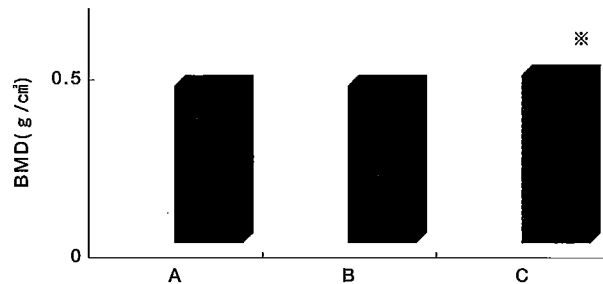


Fig. 4 Shows comparison of Bone Mineral Density (BMD, Female)

\* $P < 0.05$  vs. group A

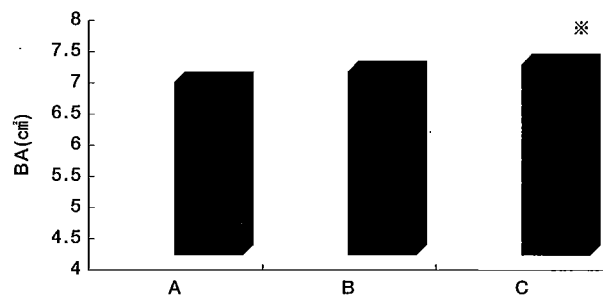


Fig. 5 Shows comparison of Bone Area (BA, Male)

\* $P < 0.05$  vs. group A

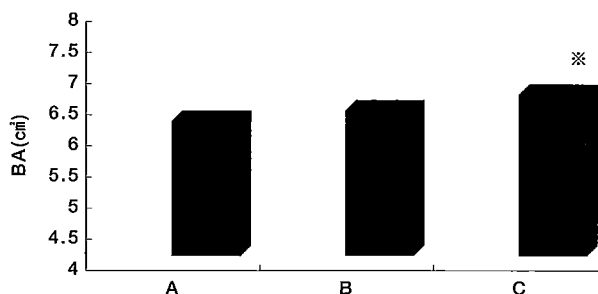


Fig. 6 Shows comparison of Bone Area (BA, Female)

\*P&lt;0.05 vs. group A

### Discussion

In this study, The each value of BMC increases depends on exercise habit. Exercises directly help to make the activated metabolism of human bodies, however, another investigation that we have done before shows different cases. Such as the long distance runners are quite lower values of BMC than other sports, especially Judo. Weight bearing exercise should effects directly on an osteoblast and a hormone that it means to increase the value of BMC<sup>(2-4)</sup>.

Ministry of Health, Labor and Welfare announced the number of the potential patients for osteoporosis in Japan is increasing<sup>1)</sup>. The results in this study, Athletes of both male and female sowed significantly higher volume, however, they were under this condition that the measurement of both males and females was not up to nation-wide average of BMD. The fall of BMC in youth suggests the danger of causing the osteoporosis<sup>(3),5)</sup>. Not only intake necessary nutrition, but also taking some exercise in daily life can be direct stimulation to an osteoblast and increase bone

Table 1. Body characteristics of each group of the male subjects

	Age	Height (Cm)	Weight (kg)	FM (kg)	LBM (kg)	%Fat (%)	TBW (kg)
Group A	18.97±1.07	171.56±6.02	59.45±8.83	8.63±3.74	50.84±5.8	13.91±4.07	37.22±4.24
Group B	19.40±1.32	171.38±6.05	63.53±13.23	11.26±7.99	51.90±6.36	16.56±6.88	38.10±4.58
Group C	19.39±1.34	171.32±5.71	63.62±11.66	10.05±4.83	53.29±7.27	15.21±5.05	39.04±5.29

Values are means±SD. (Group A ; n=29, Group B ; n=90, Group C ; n=31).

Table 2 Body characteristics of each group of the female subjects

	Age	Height (Cm)	Weight (kg)	FM (kg)	LBM (kg)	%Fat (%)	TBW (kg)
Group A	19.61±1.60	158.52±6.09	51.05±6.01	12.26±4.01	38.79±3.54	23.58±5.69	28.39±2.59
Group B	19.54±1.25	158.73±4.63	51.28±7.10	12.35±4.53	38.96±3.88	23.53±5.27	28.51±2.84
Group C	19.29±0.96	159.72±5.63	56.35±9.42	15.76±5.17	40.59±4.68	27.37±4.59	29.72±3.44

Values are means±SD. (Group A ; n=44, Group B ; n=52, Group C ; n=17).

Table 3. Percent BMD of male and female subjects

	Male	Female
Group A	81.76±8.97	92.39±9.02
Group B	88.07±9.68	93.73±8.36
Group C	90.00±7.78	97.35±5.89

Values are means±SD. (Group A ; n=29, Group B ; n=90, Group C ; n=31).

composure by acting endocrine hormone and work for the increasing of BMD, effectively<sup>4)</sup>.

However it is an interim report, adding to research into the nutrition-intake, this study shows that it is going to be meaningful to research on the correlation between osteoplasty and exercise habit and the body characteristics.

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### Abstract

The purpose of this study was to seize the conditions of bone mineral density (BMD) in adolescence. The bone mineral density (BMD) and bone mineral content (BMC) of a non-skillful forearm were Measured respect with DXA (Dual energy X-Ray Absorption with 8 mm distal site), and were classified the subjects into three groups, A, B and C to comparison. The group A does not have exercise habit, the group B has exercise habit, and the group C was athletes. In this study, the measurement BMD ( $\text{g} / \text{cm}^2$ , %) and BMC (g) showed higher volumes in the group C than the others ( $p < 0.05$ ), respectively. And the maximal BMD and BMC were found in the exercise with mechanical stresses, such as judo and basketball. Despite the group B showed higher volumes than group C, these were not good enough to reach the averages of adolescent's in Japan. These results suggest that takes in the exercise habit, weight bearing and the resistance exercise, are effective on the metabolism of a bone structure.