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# THE EFFECTS OF FREQUENCY AND VOLUME OF TRAINING AND DIETS ON BONE MINERAL DENSITY IN FOOTBALLERS AND WRESTLERS

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**Abstract:**
Regular physical exercise supersedes physical pressure in the body and it stimulates bone growth. It provides benefits to general health and protects bone mass and especially increases bone mineral density. Based on these considerations, the aim of this study is to evaluate the bone mineral density of elite footballers and wrestlers. The effects of different training methods, the frequency and volume of training and protein, carbohydrate and vitamin intake on footballers and wrestlers bone mineral density was examined. This present study was conducted with a total of 90 volunteers and 30 wrestlers, at the age of 24-30, at the level of national team, 30 footballers and 30 sedentary participants. The measurements of bone mineral density was measured in two parts of body with the Dual Energy X Ray Absorbtiometry (DXA) method by using Densitometry and with the equipment GE LUNAR DPX-NT, Madison, USA (L1, L4 and femur). RESULTS: When the athletes who took part in the study were examined, AP spine bone mineral density was calculated as 1,41 gr/cm2 among the wrestlers, 0.63 gr/cm2 among the footballers, and -0,74 gr/cm2 among the control group and the values were statistically significant. Although all groups used vitamins, the difference in intakes was statistically found significant (p<0.05). Bone mineral density of wrestlers who train for longer durations with more mechanical loading to bone mass with anaerobic system and who take more vitamin, mineral and carbohydrate was found to be higher than those of footballers and sedentary group

**Keywords:** bone mineral density, physical activity level, diet

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## 1. Introduction

Bones are important as they carry the body and protect the organs. The outer layer of bones consists of cortical or intense tissue while the inner parts consist of spongiform tissue. The structure of both these tissues show variation according to the type, structure and function of the bone in which they appear (Thorsen et al., 1999, Gómez-Cabello, A. et al. 2015). In addition, bone features also show variety in terms of race, age and sex; and they also change from person to person (Pollock, N. et al. 2010).

The bone mass in female and male humans increases constantly until the age of 20-30 and reaches its peak at the age of 25 in females and at the age of 30 in males. Genetic makeup and sex have an important role in the peak bone mass. After the age of 25-30, when the bone mass reaches its peak, it reduces in both sexes, though very slowly at the beginning (Vicente 2006).

The recent recommendations about physical activity, physical convenience and healthy lifestyles are that a healthy bone skeleton involves the health of all other body systems. Since the average life span of people is increasing and since a substantial part of the world's population falls within a high age class, the importance of decayed and impaired skeleton systems has increased. Thus, at all ages, sports and physical activity play a key role in people's life. Thus, stress related fractures and sudden crash fractures have the potential to create serious problems especially for females. While these problems can result in temporary ailments and deprivation of sport in young and persons athletes, they generally result in unbearable aches and appearance deformations in older adults (Tüzün 1998).

Nowadays, many health problems can be treated with exercise. The protective importance of physical exercise is not only reducing bone loss and improving muscle strength, but also in reducing the risk of fractures. Regular physical exercise supersedes physical pressure in the body and it stimulates bone growth. It provides benefits to general health and protects bone mass and especially increases bone mineral density (Arıncı and Elhan 2001).

Among individual sports, wrestling can be defined as the struggle of subordination between two wrestlers using their intelligence, strength and technical skills without using any tool on a wrestling mat of a size stated in FILA rules (Aktümsek 2001).

In other words, footballers generally prepare for matches through trainings, which involve aerobic endurance, speed and agility, while wrestlers generally prepare by performing maximal power in static straining in their trainings, which requires anaerobic endurance. Physical activity and mechanic straining are important factors in determining bone mass, structure and power. The size of straining has a greater effect on bone mass than the number of straining periods (Tsuji et al., 1995).

Daily consumption of carbohydrates as compound, base carbohydrates and in powder form is important for healthy nutrition and sportive performance. Sportsmen use carbohydrates intensively since they delay tiredness at long trainings, which require stability (Güneş 2005).

Vitamin A adjusts the balance of osteoblast and osteoclast activities. With at it, the structure of the bone is damaged since osteoblasts cannot realize the synthesis of sufficient primary material. As it is known, the excess of vitamin A is also harmful as its deficiency (Aktümsek 2001).

Vitamin C is a variant of monosaccharide. While working as an antioxidant, vitamin C takes place in the reactions, which help the construction of protein collagens (Pehlivan 2005).Without it, dentin production in the teeth, bone and cartilage is disturbed and the bone is demineralized. With the increase in deficiency, some illnesses seen in bone fractures are observed (Solak 1999).

Vitamin D organizes the calcium metabolism. Calcium, transferred to blood, is again transferred to the bones with the help of vitamin D. Thus, the bones are stiffened. Low bone density puts the sportsman at high risk for fractures and injuries that may lead to the end of a sports career (Pehlivan 2005).

Wrestlers at sporting events, which generally last for a short time, use static muscular contractions, a high pressure on bones and to a greater extent anaerobic energy system. Footballers dominantly use their aerobic energy systems and dynamic muscle contractions. As a result, it is thought that they work with such straining during trainings.

Knowing the influence of specific training styles of footballers and wrestlers with different training forms and their protein, carbohydrate and vitamin intake on bone structure and development is important for acquiring more efficiency in their active sport life, preventing injuries related to bone tissue and maintaining a high quality and healthy life in the future.

Wrestlers generally train and compete with static (isometric) loadings and intensively with their anaerobic energy system. On the other hand, football players train and compete with dynamic (isotonic) loadings and with longer loadings that use their anaerobic and aerobic energy systems. There are differences with regards to physical and physiological features and metabolic loadings of wrestlers and football players. It is known that different loading types show a different muscular development in sportsmen. There are few studies that examine the effects of training with static and dynamic loadings on bone mineral density.

In this context, clearly explaining the effect of the types of static and dynamic exercises on bone mineral density can offer new approaches for doctors, people receiving physical therapy and in rehabilitation, training scientists, coaches, and athletes.

Furthermore, the effect of eating habits on bone mineral density is also explored in the present study.

Based on these considerations, the aim of this study is to evaluate the bone mineral density of elite footballers and wrestlers.

## 2. Material and Method

### 2.1 The Grouping and Selection of Subjects

90 participants, between the ages of 19 and 20, took part in this study. The subjects were divided into three equal groups. Each group consisted of 30 persons. The first group consisted of wrestlers, the second of footballers and the last of sedentary subjects, who served as control. The wrestlers and the footballers were selected from athletes who had had an active sport life for 4 years at the elite level of elite. Athletes without a history of injury for the last six months were included into the study. All participants signed a written consent form. The control group, which consisted of 30 sedentary people, was chosen from people who had the same physical features.

### 2.2 Survey

A survey was distributed to the chosen athletes before bone screening and with the goal to determine whether athletes had any drawbacks or not. The survey was conducted as of an individual interview by the same interviewer.

### 2.3 Measurement of Body Weight and Height

The body weight of the participants was measured with a precision scale measuring 0-150kg weight (BMI) while they were in their shorts, t-shirts and bare feet.

### 2.4 Measuring of Bone Mineral Density (BMD)

Bone mineral density was measured in two parts of the body with the Dual Energy X Ray Absorbtiometry (DXA) method using Densitometry and with the equipment GE LUNAR DPX-NT, Madison USA (L1, L4 and femur). The measurements were randomly made by the same paramedics. In the measurements of both parts, Bone Mineral Density (BMD) measured in gr/cm$^2$ and the z-scores according to NIHANES/USA reference population values were analyzed. All measurements were made in August during the teams' preparation camps.

### 2.5 Statistical Analysis

In the statistical analysis, the Mann-Whitney U test in two-grouped comparison and the One Way ANOVA, Kruskal Wallis and Correlation tests in three grouped comparisons were used. The results were evaluated at 0.01 and 0.05 significance levels.
According to the results obtained from bone densitometry, the Z score was defined as the standard deviation by comparing it to the patient's bone mass' age and type. For clinical diagnosis, the classification based on the WHO's bone mass measurement was used (WHO Technical Report Series,. 1994).

## 3. Findings

**Table 1:** The Comparisons of Wrestling, Football and Control Groups' Age, Height and Weight

| | Branch | N | Mean | Std. Deviation | P |
|---|---|---|---|---|---|
| **Age (year)** | Wrestling | 30 | 22,24 | 1,62 | ,141 |
| | Football | 30 | 22,09 | 1,76 | |
| | Control Group | 30 | 21,47 | 1,28 | |
| ***Height (cm)** | Wrestling | 30 | 172,83 | 6,25 | ,024* |
| | Football | 30 | 177,33 | 6,68 | |
| | Control Group | 30 | 176,43 | 6,81 | |
| **Body Weight (kg)** | Wrestling | 30 | 72,03 | 13,52 | ,634 |
| | Football | 30 | 70,16 | 6,66 | |
| | Control Group | 30 | 71,23 | 14,23 | |

*P<0,05

In Table 1, no statistically significant difference is seen in the proportions of wrestlers', footballers' and control group's age, weight, while a statistically meaningful difference is observed in their height value (0,05).

**Table 2:** Comparison of Athletes' Weekly Training Numbers and Daily Training Hours

| | N | **Weekly Training Number** (day) **(x ± sd)** | **Duration of Daily Training** (hour) **(x ± sd)** |
|---|---|---|---|
| **Wrestling** | 30 | 5,70 ± 0,749 | 3,32 ± 0,802 |
| **Football** | 30 | 4,60 ± 0,563 | 2,40 ± 0,707 |
| **P** | | 0,000* | 0,000* |

*P<0,01

In Table 2, it is seen that there is a statistically meaningful difference between wrestlers' and footballers' number of weekly training days and daily training hours.

**Table 3:** Athletes' Bone Mineral Measurements and Z Scores

| | Wrestling | Football | Control |
|---|---|---|---|
| **BMD** | 24,00 ± ,574 [a] | 22,00± ,342 [b] | 22,76 ± ,628 [ab] |
| **SBMD** | ,41 ± ,028 [a] | 1,31 ± ,022 [b] | 1,14 ± ,025 [c] |
| **SZ** | 1,41 ± ,230 [a] | ,63 ± ,181 [b] | -,74 ± ,206 [c] |
| **FBMD** | 1,38 ± ,029 [a] | 1,30 ± ,021 [b] | 1,15 ± ,028 [c] |
| **FZ** | 2,15 ± ,230 [a] | 1,49 ± ,159 [b] | ,39 ± ,224 [c] |

P< 0,05

**Note:** The letters in the same line show that there were differences among groups.

**Table 4:** Comparison of the groups' protein, carbohydrate and vitamin intake

| | | Protein | | Carbohydrate | | Vitamin | |
|---|---|---|---|---|---|---|---|
| | | Yes | No | Yes | No | Yes | No |
| **Wrestling** | n | 14 | 16 | 14 | 16 | 18 | 12 |
| | % | 46,7 | 53,3 | 46,7 | 53,3 | 60,0 | 40,0 |
| **Football** | N | 7 | 23 | 5 | 25 | 11 | 19 |
| | % | 23,3 | 76,7 | 16,7 | 83,3 | 36,7 | 63,3 |
| **Control** | N | - | 30 | - | 30 | 9 | 21 |
| | % | - | 100 | - | 100 | 30,0 | 70,0 |
| **P** | | | ,000** | | ,000** | | ,047* |

*P<0,05 **P<0,01

Table 3 shows that there are differences between wrestlers, footballers and the control group with respect to their protein, carbohydrate and vitamin intake. The statistical significance for this difference is p<0,01 for protein and carbohydrate intake and p<0,05 for vitamin intake.

**Table 5:** The Relation between Bone Mineral Density and the Athletes' Daily Training Duration and Number of Trainings per Week

| | | SBMD | SZ | FBMD | FZ | Weekly Training Numbers | Daily Training Duration | Branch |
|---|---|---|---|---|---|---|---|---|
| **SBMD** | Pearson Correlation | 1 | 1,000** | ,746** | ,750** | ,567** | ,548** | -,620** |
| | Sig. (2-tailed) | , | ,000 | ,000 | ,000 | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **SZ** | Pearson Correlation | 1,000** | 1 | ,746** | ,751** | ,567** | ,546** | -,616** |
| | Sig. (2-tailed) | ,000 | , | ,000 | ,000 | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **FBMD** | Pearson Correlation | ,746 | ,746** | 1 | ,998** | ,497** | ,499** | -,535** |
| | Sig. (2-tailed) | ,000 | ,000 | , | ,000 | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **FZ** | Pearson Correlation | ,750** | ,751** | ,998** | 1 | ,502** | ,496** | -,540** |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | , | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **Weekly Training Numbers** | Pearson Correlation | ,567** | ,567** | ,497** | ,502** | 1 | ,671** | -,635** |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | , | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **Daily Training Duration** | Pearson Correlation | ,548** | ,546** | ,499** | ,496** | ,671** | 1 | -,743** |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | ,000 | , | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **Branch** | Pearson Correlation | -,620** | -,616** | -,535** | -,540** | -,635** | -,743** | 1 |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | ,000 | ,000 | , |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |

** Correlation is significant at the 0.01 level (2-tailed).

**Table 6:** The Relation between Bone Mineral Density and Protein, Carbohydrate and Vitamin in Sportsman

| | | SBMD | SZ | FBMD | FZ | Weekly Training Numbers | Daily Training Duration | Branch |
|---|---|---|---|---|---|---|---|---|
| **SBMD** | Pearson Correlation | 1 | 1,000** | ,746** | ,750** | ,567** | ,548** | -,620** |
| | Sig. (2-tailed) | , | ,000 | ,000 | ,000 | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **SZ** | Pearson Correlation | 1,000** | 1 | ,746** | ,751** | ,567** | ,546** | -,616** |
| | Sig. (2-tailed) | ,000 | , | ,000 | ,000 | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **FBMD** | Pearson Correlation | ,746 | ,746** | 1 | ,998** | ,497** | ,499** | -,535** |
| | Sig. (2-tailed) | ,000 | ,000 | , | ,000 | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **FZ** | Pearson Correlation | ,750** | ,751** | ,998** | 1 | ,502** | ,496** | -,540** |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | , | ,000 | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **Weekly Training Numbers** | Pearson Correlation | ,567** | ,567** | ,497** | ,502** | 1 | ,671** | -,635** |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | , | ,000 | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **Daily Training Duration** | Pearson Correlation | ,548** | ,546** | ,499** | ,496** | ,671** | 1 | -,743** |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | ,000 | , | ,000 |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |
| **Branch** | Pearson Correlation | -,620** | -,616** | -,535** | -,540** | -,635** | -,743** | 1 |
| | Sig. (2-tailed) | ,000 | ,000 | ,000 | ,000 | ,000 | ,000 | , |
| | N | 90 | 90 | 90 | 90 | 60 | 60 | 90 |

** Correlation is significant at the 0.01 level (2-tailed).

## 4. Discussion

In the present study, the bone mineral density of wrestlers and footballers at the elite level, and a control group was measured. Moreover, the effect of frequency, volume of training and diets on bone mineral density was investigated. In terms of arithmetic age, the average age of wrestlers was 22.24 years, that of footballers was 22.09 years and that of the control group was 22.47years. The arithmetical average of their body weight was 72.03 kg for the wrestlers, 70.16 kg for the footballers, and 71.23 kg for the control group. The average height was 172.83cm for wrestlers, 177.33cm for footballers, and 176.43cm for the control group. While no statistically meaningful difference in age and weight was observed among the wrestlers, the footballers and the control group, a statistically meaningful difference ($p<0.05$) was observed in their height. This was due to the fact that the wrestlers were shorter than the footballers and the control group, which can be attributed to the features of these sport branches.

The participants' bone mineral densities were measured at two different points in the body, the AP spine and femur. The average AP spine bone mineral density was 1.41 gr/cm$^2$ in the wrestlers, 0.63 gr/cm$^2$ in the footballers, and -0.74 gr/cm$^2$ in the control group. The average bone mineral density as measured in the femur was 2.15gr/cm$^2$ in the wrestlers, 1.49gr/cm$^2$ in the footballers, and 0.39 gr/cm$^2$ in the control group. Thus, a statistically significant difference was observed in the bone mineral densities of the three groups ($p<0.05$). In other words, the wrestlers have a higher bone mineral density in both the AP spine and femur than the footballers and the control group, and the footballers have a higher bone mineral density in both the AP spine and femur than the control group.

Wrestlers complete their match in a short time. Specific to their sport, they train by doing anaerobic endurance exercises while footballers engage in aerobic and anaerobic straining equally in their matches. These straining features lead to different bone mineral density. In other words, the wrestlers strain bone tissue more than the footballers in both their matches and trainings. Consequently, the bone mineral density of the wrestlers is higher than the footballers and the control group.

When the daily hours of training were examined, it was found that the wrestlers trained an average of 3.32 hours and the footballers 2.40 hours per day. These differences between the groups hours of training was statistically significant at $p< 0.01$.

When the participant groups were asked how many days they trained, the average was 5.70 days for the wrestlers, and 4.60 days for the footballers. This shows that the wrestlers trained one day more than the footballers. The differences between the number of training days were statistically significant ($p<0.01$).

The correlation test performed shows that the number of training sessions per week and the duration of a training session affected bone mineral density. Differences were statistically significant at $p< 0.01$.

The fact that wrestlers train more times per week and that their training has a longer duration indicates that the wrestlers strain their bone tissue more than the footballers. Consequently, the wrestlers have a higher bone mineral density than both the footballers and the sedentary group. In other words, the number of trainings per week and the duration of trainings affect bone mineral density in a positive way.

The investigation of literature supports the findings of our study. Ağaşcıoğlu et al. (Ağaşcıoğlu et al. 1997) examined the relation between exercise duration and bone mineral density, and found that a group of male basketball players and a group of female basketball players that trained for over 450 hours per year had very similar bone mineral densities. In addition, all the male basketball players in a group whose total training time was over 2000 hours had a higher bone mineral density value than a group of male basketball players that trained under 2000 hours totally. This group was compared with a group of female basketballers with the same training, and it was found that the bone mineral density of the male basketball players was higher than that of the female group. However, the groups of male basketball players and female basketball players who trained less than 2000 hours were found to have similar bone mineral densities.

Snead found that in sports such as artistic skating and gymnastics, which involve high straining, the athletes' bones are protected from osteoporosis (Snead et al 1992). Wilks et al. point out in one of their studies that the mechanical straining on middle distance and long distance running increases bone mineral density in athletes. Additionally, they state that this increase is higher in females than in males (Wilks et al. 2009).

He et al. conducted their research on 1169 males between August 2003 and December 2005. They divided their subjects into 3 groups, the first of which trained often, the second group of which trained occasionally, and the third of which never trained. As a result, they found that physical activities increase bone mineral density in males' L2 and L4 lumbar spine (He et al. 2008).

Sivrikaya states that athletes who engage in sports which require strength are found to have a higher bone mineral density in the lumbar spine, femur and arm than their controls. He also ranks athletes with respect to bone mineral density noting that weight-lifters have the highest bone mineral density, followed by pitchers, runners, footballers and swimmers (Sivrikaya 2000).

Pigozzi et al. stated that bone mineral density decreases in years, and that such problems as morbidity, mortality, dysfunction and deformity can be prevented with regular exercise during adolescence (Pigozzi et al. 2009).

In a similar study, Obradovic et al. studied 28 swimmers, 32 footballers and a control group during puberty. The swimmers trained 8-12 hours per week, the footballers trained 10-15 hours per week depending on their branches, and the control group exercised 1,5 hour per week. After these trainings which continued for a year, it was seen that there was a meaningful difference among the groups in terms of body mass index, but no differences were observed in terms of bone mineral density (Obradovic et al. 2009).

Madsen et al. found that the athletes who have a part in weight shouldering branches have higher bone mineral density in the part of total lumbar spine and cervix of femur than sedentary control group at the same age (Madsen et al.1998). Sing et al. expressed that resistance exercises affect bone mineral density in females in a positive way (Sing et al. 2009).

The groups involved in this study were asked about their intake of proteins and protein granules and it was found that 46.7% of the wrestlers used protein and carbohydrate containing ergogenic supplements, and that 23 % of the footballers used protein containing ergogenic supplements, and 16.7% used carbohydrate containing supplements. The wrestlers were found to use more protein and carbohydrate containing supplements than the footballers. The controls were found not to use any protein or carbohydrate containing supplements. The differences among the groups' use of supplements were statistically significant ($P<0.01$).

When the vitamin intake of the groups was compared, 60% of the wrestlers, 36.7% of the footballers and 30% of the control group were found to use vitamins. Although all groups used vitamins, the difference was statistically significant ($p<0.05$). Bielohuby et al. conducted a 4-week experiment on growing mice and found significant differences in the bone development and bone mineral density of mice fed normally and mice fed with a low protein and low carbohydrate containing feed. Considerable decreases in the body growth in length and BMD were observed in the mice on a low protein and carbohydrate diet when compared to those on a normal diet (Bielohuby et al. 2010).

In a study by Holm et al. it was found that an increased protein intake has a positive effect on bone development in post-menopausal women (Holm et al. 2008).
Ballard and colleagues also found that an increased protein intake combined with light exercise results in an increase in the BMD of men and women (Ballard et al. 2006). Moschonis et al. applied a Ca and vitamin D3 diet on 66 post-menopausal women for 30 months and found a substantial increase in their BMD and their total spine (Moschonis et al. 2010).

The inspection of these literature findings show, that carbohydrate, protein and vitamin (calcium and vitamin D) intake have a positive contribution on BMD. In our study group, it is seen that the wrestler take more carbohydrate, protein and vitamin than the other two groups. The influence rate of protein, carbohydrate and vitamin intake of groups over BMD is at 0.05 level statistically. Correlation test applied in our study show that protein, carbohydrate and vitamin intake has a significant effect on

BMD. Naturally, this situation led BMD of wrestlers to be better than the other two groups.

In the light of the literature above, exercise can be said to have a positive effect on BMD, especially when exercise is straining and combined with a carbohydrate, protein and vitamin (calcium and vitamin D) intake. Our findings are supported by the literature.

The correlation tests in this study revealed that a protein, carbohydrate and vitamin intake significantly affected BMD ($p<0,01$). The degree to which the groups' protein, carbohydrate and vitamin intake affected their BMD is at the 0,05 significance level.

As is known, bone mineral density is affected by different factors such as diet type, medicine use, calcium intake and gender. In this study, the survey revealed that the athletes did not use medicine, did not take calcium and followed a similar non-specific diet.

As a result; in the current study, it has been seen that static loads increase bone mineral density more than dynamic loads. Moreover, increasing daily training time and the number of weekly training sessions provides a positive contribution towards the development of bone mineral density.

These findings may have implications for the development of new approaches and training methods for trainers and athletes, as well as for doctors and medical scientists involved in the treatment of decrease or insufficient development of bone mineral density.

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**Conflict of interest**

The authors have declared that no competing interest exists.

**Ethical approval**

Moreover, prior to the measurements, the approval of the Afyon Kocatepe University Medicine Faculty Ethics Committee was obtained for the study.

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