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Original research

The effects of sports participation on the dental age in adolescents

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Purpose
The present study aims to assess the effect of sports on the dental maturity using two different dental age assessment methods and to determine whether there is a significant correlation between dental maturity and body mass index.

Materials and Methods
One hundred and thirty-eight students from Sports High School (study group) and 126 from Fine Arts High School (control group) with standard panoramic radiographs were included in the study. Dental age was assessed using Nolla's and Haavikko's methods. Demographic information regarding the weekly training hours and sports age of the study group participants was gathered. Body mass index values of all participants were calculated. Factorial analysis of variance and Tukey's test were performed and the Pearson correlation coefficient was calculated.

Results
The mean age of the students was 15.93 ± 1.13 years for the study group and 15.99 ± 1.09 years for the control group. Mean dental age values were lower than the mean chronological age values in both high schools. The difference between the dental and chronological ages was insignificant in Sports High School ($p > 0.05$). Differences in the body mass index between high schools and genders were statistically significant ($p < 0.05$). Significant correlations were detected between the sports and dental ages and between dental age and body mass index values.

Conclusion
Sports participation could have positive effects on the dental maturity as well as on the bone development.

Keywords: *Body mass index, dental age, Haavikko's method, Nolla's method, sports*

Introduction

Numerous studies have been conducted on the influence of sports on human growth and development, with a focus on its effects on bone mineral density, body height and weight. The findings from these studies have mostly indicated the positive impact of sport participation on growth-related parameters, bone development, and overall growth (1-4). However, the relationship between sports and dental maturity is still unclear. When considering the exercise routines and diets of individuals who participate in sports, it can be inferred that sports activities may have a positive effect on dental maturity. Several studies have found that dental maturity is influenced by various factors, including gender, ethnicity, and systemic status (5-7). On the other hand, some studies have reported that environmental factors, such as nutritional status, do not have a significant impact on teeth as they are more isolated compared to other body systems (8,9).

Assessing dental age using tooth maturity and eruption stages is essential in addition to skeletal parameters when evaluating growth and

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developmental periods. There are two primary methods for assessing dental age: visual and radiographical assessment of the physiological maturity stages of teeth, and assessment of age-related changes observed in teeth (10). In determining dental age among children, tooth calcification stages and eruption periods are typically taken into account. Calcification assessment is considered a more reliable method since tooth eruption periods are affected by local and systemic factors and cover a short period, while calcification assessment allows for an assessment without the need for tooth eruption (6,11-13).

Panoramic radiographs obtained from individuals for any reason are a convenient, easy, and reliable means of determining dental age (14). In studies on dental age determination, panoramic radiographs are frequently assessed using Demirjian's, Haavikko's, and Nolla's methods. In previous Turkish studies, mean dental age values determined by Demirjian's method were found to be more advanced than the individual's chronological age, while mean dental age values determined by Haavikko's and Nolla's methods were more consistent with the individual's chronological age. Therefore, Haavikko's and Nolla's methods are regarded as more suitable for the Turkish population (15-18). Nolla's method, which includes a total of 40 maturity stages when intermediate maturity stages are included with the primary maturity stages, is more sensitive (19). It has been found that excluding teeth with a closed apex from evaluation improves the precision of Haavikko's method (20,21).

Body mass index (BMI) is one of the fundamental measurement parameters for evaluating growth and development since it allows for assessing an individual's nutritional status (22). Physical activity is known to have a positive impact on BMI due to energy consumption (23,24).

Our study aims to assess the effect of sports on dental maturity using two different dental age assessment methods and determine if there is a significant correlation between dental maturity and BMI. The null hypotheses of the study are as follows: there is no difference in dental maturity between the sports and control groups, and there is no significant correlation between dental maturity and BMI.

Materials and Methods

Study design

A cross-sectional research design was used for this study.

Ethical approval

The approval was obtained from the Clinical Research Ethics Committee of the Faculty of Medicine, Suleyman Demirel University, Isparta, Turkey (decision no. 103) and the Provincial Directorate of National Education, Governorship of Isparta, Turkey (decision no. 11998629).

Study and control groups

During the selection process, the researchers chose students from Isparta Sports High School as the sports group. This high school is the only one in the province with regular sports participation and daily and weekly training periods within the school timetable. For the control group, students from Isparta Fine Arts High School were chosen, which is a high school where art classes such as painting and music are the main focus in the school timetable. These students were not participating in any sports activities, and they approved of this study among other high schools in Isparta, Turkey. The socioeconomic status of the students in both high schools was similar, as they shared the same campus and lived within the same region, which was classified as the low-income class according to the data from the 'Turkey Statistical Institute Income Distribution and Living Conditions Statistics'. The study group consisted of healthy students from Isparta Sports High School and the control group included healthy students from Isparta Fine Arts High School who provided informed consent to participate in the study.

Intraoral and radiographic examination

The study included intraoral and radiographic examinations of participants. Intraoral examinations were performed in a designated hall using sterile equipment. Participants who required radiographic examination and had indications for panoramic radiographs were invited to the clinic. Among the students who visited our clinic, 138 (46 female, 92 male) students from Isparta Sports High School and 126 (79 female, 47 male) students from Isparta Fine Arts High School with non-distorted, high-quality, standard panoramic radiographs (Planmeca Promax 2D, Helsinki, Finland) were included in the study. Dental age was assessed by tooth calcification levels determined from the panoramic radiographs using Nolla's and Haavikko's methods.

The study gathered information on the weekly training hours and sports age of the participants from the study group. Weekly training hours refer to the number of hours spent in sports training each week, while sports age is defined as the duration of sports involvement in years. The data was collected using prepared forms and saved in Microsoft Excel 2013 (Microsoft Corporation, California, USA).

Dental age assessment using Nolla's method

Each tooth was assessed using the ten maturity stages of Nolla's method, in which dental age is determined through the left mandibular teeth, including the third molar (19). When a radiograph image fell between two of the ten stages, intermediate maturity stage scores were utilized by adding 0.2 points if the image was closer to the lesser value's image, 0.5 points if the image fell in the middle of two values, and 0.7 points if the image was closer to the greater value's image. As this method has different scoring tables available depending on the inclusion of mandibular and maxillary third molars for females and males, the dental ages of participants were calculated by determining the sum of the points obtained from each tooth on the table. In the event of a lack of left mandibular teeth, the maturity stage of the symmetric tooth was assessed.

Dental age assessment using Haavikko's method

Haavikko's method is a dental age estimation method that involves assessing all permanent teeth, including third

molars, based on 12 maturity stages consisting of six crown and six root maturation stages (25). Any teeth with complete root maturity were excluded from dental age calculation. The maturity stage of each tooth, including left mandibular third molars, was determined, and corresponding scores for these maturity stages were obtained using tables prepared separately for male and female participants. The mean dental age was established by dividing the sum of scores by the number of examined teeth.

Assessment of BMI

Height and weight measurements for all participants were taken and recorded using a mechanical scale with a stadiometer (MESITAS AS, Mesilife JSA-180, Istanbul, Turkey) to determine BMI. Participants were advised to take off their shoes and wear lightweight clothing during the measurements. BMI for each participant was calculated by dividing weight by the square of height in meters (kg/m^2). Based on the calculated values, each participant's BMI was determined to be within or outside the normal range according to the World Health Organization (WHO) classification (26).

Statistical analysis

Statistical analyses were performed using the IBM SPSS (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.) package. A value of $p < 0.05$ was considered statistically significant. Before the study, dental age assessments were performed by one researcher over 25 randomly chosen radiographs at two different times in order to ensure training and calibration. Intraclass correlation coefficient (ICC) was calculated to determine the researcher's internal consistency. Descriptive statistics for quantifiable parameters were obtained by calculating the arithmetic mean and standard error. This was performed in separate calculations for each high school. The Chi-square test of independence was used to determine whether the gender and high school variables were independent of each other. Differences in mean gender values were established by comparing the weekly training duration in hours and sports age data obtained from the Sports High School using the t-test. Variance analysis with the factorial design was utilized to determine the differences between high schools and mean gender values in the continuous variables that met the preconditions of parametric tests, including chronological age and BMI. The Type III sum of squares technique, utilized with imbalance correction, was used in the variance analysis with factorial design. Two levels for the high school factor (Sports High School and Fine Arts High School) and two levels for the gender factor (male and female) were present in the study. Data obtained regarding age were analyzed with repeated measures analysis of variance with factorial design. There were two levels for the gender factor (female and male), five levels for the age group factor (14, 15, 16, 17, and 18), two levels for the high school factor (Sports High School and Fine Arts High School) and three levels for the age type factor (chronological, Nolla's, and Haavikko's). Repeated measures were performed for the levels of the age type factor. Tukey's test, a multiple comparison procedure, was used to detect differences between mean values of the factor levels. A linear relationship between properties was examined by calculating the Pearson correlation coefficient for chronological age, sports age, weekly training duration in hours, BMI, and dental age determined by Nolla's and Haavikko's methods.

Results

The ICC value for the internal consistency of the single researcher who performed all measurements was determined to be 0.95, indicating substantial reliability.

The distribution of mean chronological and dental age values (determined by Nolla's and Haavikko's methods) of students by high school and gender are presented in Table 1. Although no statistically significant difference was observed in mean chronological age values between genders and high schools ($p > 0.05$), a significant difference was found in the gender distribution of high schools ($p < 0.05$). The difference between mean dental age values determined by both methods and chronological age values was statistically significant in Fine Arts High School ($p < 0.05$) and insignificant in Sports High School ($p > 0.05$). Mean dental age values assessed by both methods were significantly lower than the mean chronological age values of female students in both high school groups ($p < 0.05$). The mean dental age values assessed by Nolla's method were greater than the mean chronological age values of male students of Sports High School and lower than the mean chronological age values of male students of Fine Arts High School ($p > 0.05$). The mean dental age values assessed by Haavikko's method were also lower than the mean chronological age values of male students of both high schools. This difference was statistically significant in Fine Arts High School ($p < 0.05$) and insignificant in Sports High School ($p > 0.05$).

Table 2 shows the distribution of mean chronological age values and mean dental age values assessed by Nolla's method by age group and high school. Mean dental age values assessed by Nolla's method were lower than the mean

Table 1: *Mean chronological and dental age (by Nolla's and Haavikko's methods) values distribution of the students by high school and gender.*

High school	Chronological age			Dental age (Nolla)			Dental age (Haavikko)		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
Sports High School (46 female, 92 male)	15.99±1.24$^{\#}$	15.90±1.07	15.93±1.13	14.90±1.85$^{\#}$	15.99±1.85	15.63±1.92	14.75±2.13$^{\#}$	15.47±1.82	15.23±1.95
Fine Arts High School (79 female, 47 male)	15.84±1.07$^{\#}$	16.25±1.09$^{¥}$	15.99±1.09*	14.56±1.83$^{\#}$	15.64±1.36	14.96±1.74*	14.21±2.04$^{\#}$	15.46±1.93$^{¥}$	14.68±2.08*

$^{\#,¥,*}$ $p < 0.05$

chronological age values of all age groups in both high school groups. Although this difference was not statistically significant in the 14 age group in either high school ($p > 0.05$), it was statistically significant for Sports High School in the 18 age group and for Fine Arts High School in the 15, 16, 17, and 18 age groups ($p < 0.05$).

Table 3 displays the distribution of mean chronological age values and mean dental age values assessed by Haavikko's method by age group and high school. Mean dental age values assessed by Haavikko's method were lower than the mean chronological age values of all age groups in both high school groups. This difference was statistically significant in the 14, 15, and 18 age groups in both high schools, and in the 16 and 17 age groups only in Fine Arts High School ($p < 0.05$).

Figure 1 provides the sports age distribution of Sports High School students. The mean sports age values were 4.37 ± 0.25 years for females, 4.14 ± 0.22 years for males, and 4.21 ± 0.23 years in total. Gender and sports age were found to be statistically independent of each other ($p > 0.05$). The weekly training duration distribution of Sports High School students are presented in Figure 2. The mean weekly training duration values were 7.02 ± 0.52 hours for females, 7.45 ± 0.38 hours for males, and 7.31 ± 0.43 hours in total. Weekly training duration and gender were also statistically independent of each other ($p > 0.05$).

The mean BMI value of Sports High School students was 20.66 ± 0.20 kg/m^2 (19.90 ± 0.33 kg/m^2 for females and 21.04 ± 0.25 kg/m^2 for males) and the mean BMI value of Fine Arts High School students was 21.23 ± 0.33 kg/m^2 (20.92 ± 0.43 kg/m^2 for females and 21.75 ± 0.50 kg/m^2 for males); all values were within the normal range according to the WHO classification. Differences in BMI between high

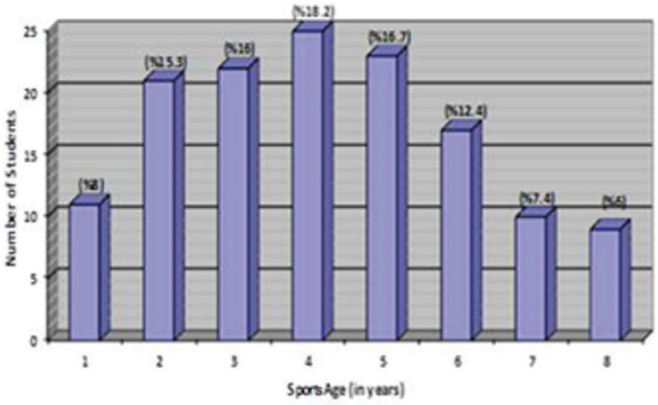

Figure 1. *The sports age distribution of Sports High School students.*

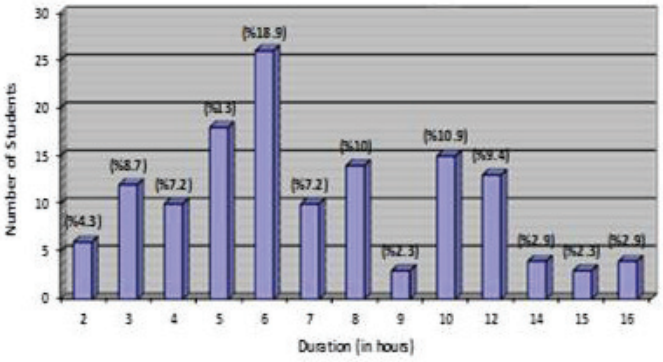

Figure 2. *The weekly training duration distribution of Sports High School students.*

Table 2: *The distribution of mean chronological age values and mean dental age values assessed by Nolla's method by age group and high school.*

Age group	Chronological age		Dental age (Nolla)	
	Sports High School	Fine Arts High School	Sports High School	Fine Arts High School
14	14.24 ± 0.12	14.24 ± 0.32	13.70 ± 0.89	13.86 ± 1.27
15	14.93 ± 0.22	15.07 ± 0.24*	14.52 ± 1.39	14.41 ± 1.66*
16	15.90 ± 0.30	15.87 ± 0.27*	15.84 ± 1.51	14.61 ± 1.59*
17	16.93 ± 0.28	16.86 ± 0.29*	16.84 ± 1.59	15.69 ± 1.26*
18	17.76 ± 0.14*	17.88 ± 0.32*	16.93 ± 2.28*	16.36 ± 2.15*

*$p < 0.05$

Table 3: *The distribution of mean chronological age values and mean dental age values assessed by Haavikko's method by age group and high school.*

Age group	Chronological age		Dental age (Haavikko)	
	Sports High School	Fine Arts High School	Sports High School	Fine Arts High School
14	14.24 ± 0.12*	14.24 ± 0.32*	12.96 ± 1.01*	13.00 ± 1.65*
15	14.93 ± 0.22*	15.07 ± 0.24*	13.85 ± 1.45*	14.07 ± 2.08*
16	15.90 ± 0.30	15.87 ± 0.27*	15.70 ± 1.55	14.16 ± 2.03*
17	16.93 ± 0.28	16.86 ± 0.29*	16.67 ± 1.03	15.62 ± 1.37*
18	17.76 ± 0.14*	17.88 ± 0.32*	16.50 ± 2.05*	16.51 ± 1.80*

*$p < 0.05$

schools and genders were statistically significant ($p < 0.05$). BMI distribution of both high school students was determined based on the WHO classification. Accordingly, 60 (43%) of the Sports High School students were found to be underweight, 71 (52%) of them were normal weight, and 7 (5%) of them were overweight, while 56 (45%) of the Fine Arts High School students were found to be underweight, 53 (42%) of them were normal weight, 14 (11%) of them were overweight, and 3 (2%) of them were obese.

Statistically significant correlations observed among the assessed parameters are shown for each high school in Table 4.

Discussion

The importance of sports activities in the growth and development of young adults is well-established (4,27). A study has shown that individuals who participate in sports exhibit greater gains in height, muscle mass, and bone mineralization rates compared to their non-sporting peers (28). Various age estimation methods are utilized to assess the level of physical growth and development in these individuals (29). Teeth contain building blocks such as calcium, phosphate, and magnesium, which are similar to bone structure and can also be utilized in these methods (30,31).

In a previous study, the importance of dental age assessment to support skeletal age assessment for fair competition in sports was emphasized, and it was suggested that third molars could be examined for this purpose (32). Several studies have reported positive correlations between dental and skeletal maturity, and it has been suggested that dental maturity could be a parameter reflecting skeletal maturity (33-36). Dental age assessment methods typically involve histological, biochemical, and radiological techniques, with the radiographic technique considered a quick, easy, and reliable method (19,37).

In a study conducted in Turkey among 425 children aged between 7 and 13 years, it was reported that mean dental age values using Nolla's method were significantly lower than mean chronological age values for both genders (17). In another study carried out in Turkey, dental ages of 719 children aged between 6 and 18 years were assessed using Nolla's method, and the mean dental age values were lower than the mean chronological age values for both genders. However, the difference was only statistically significant in females. The study reported that dental age estimation using Nolla's method is reliable for males in the Turkish population (18). In another study conducted in Turkey among 673 children aged between 5 and 16 years, the mean dental age value assessed using Demirjian's method was found to be greater than the mean chronological age value by 0.86 years. Conversely, the mean dental age value assessed using Nolla's method was lower than the mean chronological age value by 0.54 years. Based on these results, it has been concluded that Nolla's method yields more reliable results for dental age assessment in the Turkish population (16). Haavikko's method was initially used in 1970 among 885 Finnish children between the ages of 2 and 13 years, and it was found to be consistent with chronological age (38). Due to its development based on individuals from northern European countries, Haavikko's method is considered more credible in assessing dental maturity in these countries. In a study conducted in Turkey, three different methods (Nolla's, Demirjian's, and Haavikko's) were used to assess dental ages of 425 children between the ages of 7 and 13 years. According to the results, Haavikko's method was found to be more reliable than the other methods and yielded results closer to chronological age (17). Therefore, Nolla's and Haavikko's methods, which were considered the most suitable for the Turkish population compared to other methods, were used in the current study to assess dental age using tooth calcification levels (16-18). For this purpose, panoramic radiographs were used as they were found to provide more accurate results than periapical radiographs (39).

In studies conducted among children in various countries, some researchers have reported that dental age assessed by Nolla's and Haavikko's methods tend to be lower than chronological age, while other researchers have found dental age evaluated by these methods to be comparable to chronological age (40,41). In a previous study, it was reported that the mean dental age value set by Nolla's method

Table 4: *Statistically significant correlations observed among the assessed parameters for Sports High School and Fine Arts High School.*

Parameters	Pearson correlation coefficient		p value	
	Sports High School	Fine Arts High School	Sports High School	Fine Arts High School
Sports age-Chronological age	0.245		0.004*	
Sports age-Age group	0.255		0.003*	
Sports age-Haavikko's dental age	0.188		0.027*	
Sports age-Nolla's dental age	0.198		0.020*	
Chronological age-BMI	0.262		0.002*	
Age group-Haavikko's dental age	0.650	0.464	0.001*	0.001*
Age group-Nolla's dental age	0.577	0.421	0.001*	0.001*
Age group-BMI	0.287		0.001*	
Haavikko's dental age-Nolla's dental age	0.822	0.898	0.001*	0.001*
Haavikko's dental age-BMI	0.293	0.294	0.001*	0.001*
Nolla's dental age-BMI	0.345	0.284	0.001*	0.001*

* $p<0.05$

underestimated the chronological age value by 0.87 years in females and 1.18 years in males (37). Some studies utilizing Haavikko's method have reported that dental age results were consistent with chronological age, suggesting Haavikko's method to be a useful method (20,42). Other studies have found Haavikko's method to underestimate chronological age (43,44). In our study, mean dental age values found by Nolla's and Haavikko's methods were lower than mean chronological age values in both high school groups. Smaller differences between mean dental age values by Nolla's and Haavikko's methods and mean chronological age values in Sports High School students compared to Fine Arts High School students suggest that sports activities may have a positive impact on dental maturity. Mean dental age values assessed by both methods were found to be lower than mean chronological age values in female students of both high school groups. In male students of Sports High School, the difference between mean dental age values assessed by both methods and mean chronological age values was smaller than in male students of Fine Arts High School. Dental maturity was greater in males involved in sports activities compared to females, which may be associated with males taking part in more physically challenging activities.

Moreover, higher BMI values among males compared to females may indicate an acceleration in dental maturity due to increased BMI. A research has pointed out a potential relationship between skeletal and dental development and a positive effect of bone development on dental maturity (45). It may be considered that sports activities, which affect the piezoelectric effect influencing the stimulation of osteoblasts, may also have a positive effect on the stimulation of odontoblasts (46). On the other hand, while showing a tendency to underestimate mean chronological age values, mean dental age values assessed by Nolla's and Haavikko's methods were found to be consistent with each other and based on the guidance of previous studies, it was confirmed in our study that both methods are suitable for dental age estimation in children among the Turkish population (16-18).

Although the compatibility between mean dental age assessed by each method and mean chronological age differs by age group, it must be taken into consideration that consistency between dental age and chronological age may decrease as the number of teeth assessable for these methods decreases as individuals get older. In the dental age values estimated by Haavikko's method in Fine Arts High School, the tendency of dental age to be lower than chronological age among all age groups was noted. It was also observed that Nolla's method provided results closer to chronological age only in the 14 age group. Therefore, it can be inferred that Nolla's method may be suitable for use in 14-year-olds who do not participate in sports. The significantly lower dental age assessed by Haavikko's method compared to chronological age in the 14 and 15 age groups of Sports High School students may be explained by lower sports ages and BMI values seen in students among these age groups. On the other hand, because there was not a statistically significant difference between mean dental age values assessed by Nolla's method and mean chronologic age values in all age groups except the 18 age group in this high school, Nolla's method may be suitable for the dental age assessment of individuals who participate in sports. It was observed that for the 16 and 17 age groups in Sports High School, as sports age increases, dental maturity and BMI are positively influenced, and dental age values assessed by both methods tend to be closer to chronological age values. This finding in our study was compatible with a study conducted in the United States, which reported that long-term and regular sports activities had positive effects on BMI (47). In the 18 age group, the statistically significant underestimation of mean dental age values assessed by both methods compared with the mean chronological age values in both high schools may be associated with the decline in methodological sensitivity in this age group.

Approximately half of the body weight of an adult is gained during adolescence. It has been reported that having a BMI within normal ranges during this period is predictive of having healthy body measurements in adulthood (48,49). In a study conducted in Turkey among 664 adolescent participants with an average age of 14.48 years, it was reported that participants who exercise regularly had mean BMI values within normal values and these mean values were significantly lower than those who were not involved in sports and that sports activities contribute to maintaining a BMI value within normal ranges (49). In another study carried out in Turkey, BMI values of 204 adults who participated in sports and 208 adults who were not active were assessed, and it was found that BMI scores of individuals who were involved in sports were significantly lower, thus demonstrating the positive effect of sports on BMI (50). In a study performed on two Southern Californian high schools with 37 participants who were involved in sports and 37 participants who were not involved in sports between the ages of 14 and 17 years, it was found that the mean BMI value of the participants who were involved in sports was significantly lower. It was inferred that their general body health was in better condition when compared with the participants who were not involved in sports (48). In contrast, in a Canadian study in which 2278 children aged between 9 and 10 years were included, no statistically significant relationship was found between sports activities and BMI (23). In a study conducted on the Turkish population in which BMI values of 160 adults involved in sports were assessed, there was no statistically significant association between sports age and BMI (51). Despite some different findings, our study was consistent with the body of evidence indicating a positive influence of sports participation on BMI. The mean BMI value of Sports High School students in our study, who were designated as the sports group, was observed to be lower than the mean BMI value of Fine Arts High School students. The significant correlations detected between sports age and dental age and between dental age and BMI values suggest that sports participation positively affects dental maturity and bone development.

This study has several limitations that need to be considered. Firstly, there was no sports club with enough professional athletes in the province where the study was conducted, and hence, professional athletes could not be included in the study to assess the impact of sports on dental maturity. Secondly, there was only one Sports High School in the province, and the only high school that was willing to participate in the study among other high schools was Isparta Fine Arts High School. As a result, it was impossible to achieve an

equal distribution of gender among high schools. Additionally, only students who had indications for panoramic radiographs were included in the study, and their skeletal maturity was not evaluated to prevent further radiation exposure.

Conclusion

The results of this study suggest that there may be positive effects of sports on dental maturity and bone development, although these findings are subject to some limitations. Further studies are needed to confirm these results and provide more conclusive evidence on this topic.

Türkçe öz: *Adolesanlarda sporun diş yaşı üzerine etkisinin incelenmesi. Amaç: Bu çalışma, sporun diş olgunluğu üzerindeki etkisini iki farklı diş yaşı değerlendirme yöntemi kullanarak değerlendirmeyi ve diş olgunluğu ile vücut kitle indeksi arasında anlamlı bir ilişki olup olmadığını belirlemeyi amaçlamaktadır. Gereç ve Yöntem: Standart panoramik radyografileri olan Spor Lisesi'nden (çalışma grubu) 138 ve Güzel Sanatlar Lisesi'nden (kontrol grubu) 126 öğrenci çalışmaya dahil edildi. Diş yaşı, Nolla ve Haavikko yöntemleri kullanılarak değerlendirildi. Çalışma grubu katılımcılarının haftalık antrenman saatleri ve spor yaşları ile ilgili bilgiler edinildi. Tüm katılımcıların vücut kitle indeks değerleri hesaplandı. Faktöriyel varyans analizi ve Tukey testi yapıldı ve Pearson korelasyon katsayısı belirlendi. Bulgular: Öğrencilerin yaş ortalamaları; çalışma grubu için 15.93 ± 1.13 yıl, kontrol grubu için 15.99 ± 1.09 yıl idi. Her iki lisede de ortalama diş yaşı değerleri, ortalama kronolojik yaş değerlerinden daha düşüktü. Spor Lisesi'nde, diş yaşı ve kronolojik yaş arasındaki fark önemsizdi ($p > 0.05$). Liseler ve cinsiyetler arasındaki vücut kitle indeks farklılıkları, istatistiksel olarak anlamlıydı ($p < 0.05$). Spor yaşı ile diş yaşı arasında ve diş yaşı ile vücut kitle indeksi değerleri arasında anlamlı korelasyonlar tespit edildi. Sonuç: Spor, kemik gelişiminin yanı sıra diş olgunluğunu da olumlu yönde etkileyebilir. Anahtar Kelimeler: Diş yaşı, Haavikko metodu, Nolla metodu, spor, vücut kitle indeksi*

Ethics Committee Approval: The research protocol has been approved by the Clinical Research Ethics Committee of the Faculty of Medicine, Suleyman Demirel University, Isparta, Turkey (decision no. 103) and the Provincial Directorate of National Education, Governorship of Isparta, Turkey (decision no. 11998629).

Informed Consent: Informed consents were obtained from the participants and the parents or the legal guardians of the participants.

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