

■ Orijinal Makale

The relationship between physical performance and oral and dental health in child athletes

Çocuk sporcularda fiziksel performans ile ağız ve diş sağlığı arasındaki ilişkinin değerlendirilmesi

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ABSTRACT

Aim: Poor oral hygenia status affects nutrition and sleep in children and it is reported to have a negative influence on growth and development. Therefore, similarly it may negatively affect young athletes' performance in sports activities. The aim of this study is to evaluate the relationship between oral hygenia and athletic performance in child athletes from the Sports Academy of Kırıkkale University.

Material and Methods: Decayed Missing Filled Teeth index (DMFT) scores were recorded for each subject and sports performance tests were performed.

Results: The agility (Tdrill, Zigzag, 505, LCDT) and short sprint (10m, 20m, 30m best) tests conducted in this research showed that athletes whose DMFT values were over 3 were more successful than athletes whose DMFT values were equal or more than 3 ($P < 0.01$). Moreover, the results from Bosco test revealed that athletes whose DMFT values less than 3 were significantly more successful ($P < 0.01$). Also a correlation between DMFT values and results of the performance tests were found.

Conclusion: These results highlight the importance of informing young athletes regarding oral health.

Keywords: Oral hygenia, DMFT index, child athletes, agility tests, physical performance

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ÖZ

Amaç: Kötü ağız hijyeninin çocuklarda beslenme ve uykuyu etkilediği ve büyüme-gelişim üzerinde olumsuz etkileri olduğu bildirilmiştir. Bu durum çocuk sporcuların sportif aktiviteler sırasındaki başarısını da olumsuz yönde etkileyebilir. Çalışmamızın amacı Kırıkkale Üniversitesi Spor Akademisindeki çocuk hastaların atletik performansları ile ağız sağlığı arasındaki bir ilişki olup olmadığının değerlendirilmesidir.

Gereç ve Yöntemler: Araştırmaya katılan tüm çocuklara ait "Decayed Missing Filled Teeth index" (DMFT) skorları kaydedilmiş ve spor performans testleri uygulanmıştır.

Bulgular: Uygulanan çeviklik (Tdrill, Zigzag, 505, LCDT) ve "short sprint" (10m, 20m, 30m best) testleri, DMFT değerleri 3'ten düşük olan sporcuların, DMFT değerleri 3 ve daha yüksek olan sporculara göre istatistiksel olarak daha başarılı olduğunu göstermiştir ($P < 0,01$). Bosco testi sonuçlarına göre de DMFT değeri 3'ten daha az olan sporcuların istatistiksel olarak daha başarılı olduğunu göstermiştir ($P < 0,01$). Ayrıca, DMFT skorları ve performans testi sonuçları arasında korelasyon varlığı tespit edilmiştir.

Sonuçlar: Bu sonuçlar çocuk sporcuların ağız sağlığı konusunda bilgilendirilmelerinin önemini ortaya koymaktadır.

Anahtar kelimeler: Ağız sağlığı, DMFT indeksi, çocuk sporcular, çeviklik testleri, fiziksel performans

Introduction

Muscle power and strength are of primary importance for athletes and proper nutrition as the source of energy is crucial, thus optimal dental health is necessary for these individuals [1-3]. In recent years, a negative relationship between nutritional status and oral health in children was reported by several studies [4-6]. It was reported that severe dental caries negatively affects the quality of life in children [7] and children with severely decayed teeth had lower weight and height, indicating malnutrition and growth retardation [5-6]. Pain caused by severe dental caries can affect eating in children and can cause inadequate nutrition while disturbed sleep due to pain may affect secretion of growth hormones [7-9].

Dental caries is a multifactorial chronic disease and it is strongly associated with consumption of fermentable carbohydrates [10-11], which is also recommended as an energy source for exercise [12-13], therefore the risk for dental caries increases in individuals that are engaged in sports activities. Moreover, sports drinks that are frequently consumed during these activities may increase the risk for caries due to their sugar and acid contents [14]. Considering that plaque accumulation and gingival inflammation is significantly higher in adolescents when compared to adults and age is an important factor for oral hygiene [15-16], it can be assumed that child athletes have a higher risk for dental caries.

Since poor oral health status affects growth and development in children, it may also negatively affect young athletes' performance in sports activities. Athletic performance is affected and can be measured by speed, power, strength, flexibility and agility. Performance tests such as Bosco, speed and agility tests are used to evaluate relationship between these factors and athletic performance [17-19].

The aim of this study is to evaluate the relationship between oral health and athletic performance in child athletes from the Sports Academy of Kırıkkale University.

Material and Methods

Eighty-six 12 year-old male child athletes from the School of Physical Education and Sports of Kırıkkale University in November during the 2011-2012 term were included in this study. The study protocol and method were approved by the Ethics Committee of the University of Kırıkkale (2012/08). The athletes and their parents were informed about the study and informed consents were obtained from each participant and parent. Oral examinations were conducted using diagnostic dental equipment and performed in accordance with the criteria of the World Health Organization (WHO). For the assessment of caries prevalence, the DMFT index was used [20-22]. In order to eliminate inter-examiner variability, all clinical examinations and interviews were carried out at the Kırıkkale University (Faculty of Dentistry, Clinics of Operative Dentistry) and were carried out by the same experienced dentist. Determination of the athletes' physical characteristics (age, height, weight, body fat, and years of experience in the sport) and the performance tests (the Bosco test and the speed and agility tests) [23] were performed in the Kırıkkale University gym. The calibration and linearity settings of the instruments used in the measurements were completed before the performance tests. Each test was performed three times with the best result recorded.

To prevent unnecessary fatigue, athletes were instructed to avoid intense exercise for the 24-hour period before the testing session. All athletes were familiarized with the testing procedures through practice in the gymnasium the week before the final tests. Height, weight and body composition measurements



were performed using a Tanita body composition analyzer (Tanita Body Composition Analyzer BC 418 professional model, USA) between morning and noon on the test day.

Statistical Analysis

The obtained data was analysed using version Statistical Package for the Social Sciences version 18.0 (SPSS; SPSS Inc. Chicago, USA). Data obtained from the performance tests presented as mean ± standard deviation. Also Shapiro-Wilk test was used for testing normality of these test results on groups DMFT < 3 and DMFT ≥ 3. Independent samples t-Test (for normal distributed variables) was used for comparison of the test results on groups DMFT<3 and DMFT≥3. Also to determine the relationship between DMFT and different performance tests, Pearson correlation test (r) was used. A p value of <0.05 considered statistically significant.

Results

For all athletes who participated in the survey the age was 12 years, mean body weight was 35.6 kg and the mean height was 147.4 cm. The participants had been active sportsmen for an average of 2.2 years and trained 3–4 times a week (for a total of 6–8 hours a week). Fifteen (17.4%) were regularly seen by dentists. Seventeen (19.7%) brushed their teeth two or more times a day. However, only six (6.9%) used dental floss or mouth rinses. The mean DMFT was 2.1 based on the following component measures: mean active caries (1.0), filled (0.7), and missing (0.3). The mean PI score was 0.9 ± 0.4. According to the results of Shapiro-Wilk tests the variables were normally distributed (P > 0.05).

Findings revealed that there was no significant difference between DMFT ≥ 3 and less than 3 regarding height and weight (P > 0.05), except sport years. Athletes having higher DMFT values had shorter sport years. Therefore, considering that all children were in the same age, it could be said that the groups were similar in terms of given variables except sport years (Table 1).

Table 1. Physical attributions of the sample whose DMFT values are ≥4 and < 4.00

	DMFT	n	Mean ± Std. Deviation	P
Height	< 3,00	49	1.47±0.07	0.61
	≥3,00	37	1.47±0.06	
Weight	< 3,00	49	35.59±5.53	0.98
	≥ 3,00	37	35.62±4.88	
Sport years	< 3,00	49	2.61±0.81	0.00*
	≥ 3,00	37	1.65±0.68	

* Based on t-Test

The agility (Tdrill, Zigzag, 505, LCDT) and short sprint (10m, 20m, 30m best) tests conducted in this research showed that athletes whose DMFT values were over 3 were more successful than athletes whose DMFT values were equal or more than 3

(P < 0.01). Moreover, the results from Bosco test revealed that athletes whose DMFT values less than 3 were significantly more successful (P < 0.01) (Table 2).

Table 2. The comparison of the performance tests results according to DMFT

		n	Mean ± Std. deviation	P
T- Drill test agility	DMFT < 3	49	15.66±1.53	0.001*
	DMFT ≥3	37	19.64±2.4	
Zig zag agility	DMFT < 3	49	6.59±0.52	< 0.001*
	DMFT ≥ 3	37	7.46±0.46	
505 test agility	DMFT < 3	49	3.24±0.18	0.007*
	DMFT ≥3	37	3.62±0.22	
Lateral Change of Direction Test	DMFT < 3	49	6.60±0.64	< 0.001*
	DMFT ≥3	37	7.78±0.59	
10m run best	DMFT < 3	49	2.23±0.20	0.014*
	DMFT ≥ 3	37	2.37±0.18	
20m run best	DMFT < 3	49	3.69±0.33	< 0.001*
	DMFT ≥ 3	37	4.16± 0.31	
30m run best	DMFT < 3	49	5.92±0.38	0.004*
	DMFT ≥3	37	6.53±0.33	
Bosco	DMFT < 3	49	26.42±3.73	< 0.001*
	DMFT ≥ 3	37	21.76±1.66	

*All correlation is significant at the 0.05 level (2-tailed).

Table 3 shows Pearson correlations between DMFT and eight performance tests. The biggest correlation observed at Zig Zag Agility Test (r = 0.741, P < 0.01). Moreover The Pearson correlations analyses (r) yielded a significant negative correlation between the DMFT and Bosco Test (R = -0.449, P < 0.01) (Table 3).

Table 3. The relationship between DMFT and performance tests

DMFT	r	P
T- Drill Test Agility	0.648"	<0.001*
Zig Zag Test Agility	0.741"	<0.001*
505 Test Agility	0.718"	0.005*
Lateral Change of Direction Test Agility	0.697'	<0.001*
10m run best	0.695"	0.006*
20m run best	0.626"	0.002*
30m run best	0.695"	0.001*
Bosco	-0.656"	<0.001*

All correlation is significant at the 0.05 level (2-tailed).

Discussion

Proper nutrition is very important for child and adolescent athletes to maintain proper growth and show optimal performance in sports [24]. On the other hand, several studies have reported that children with high number of caries tend to show growth retardation and usually underweight. [4-6-25]. Since poor nutritional status may affect performance negatively, the present study evaluated the effect of oral health on the performance of child athletes.

According to the results of the present study, children with higher DMFT scores showed poorer performance in all of performance tests when compared to athletes that had lower DMFT scores. Also there was correlation between the DMFT scores and performance tests. These results indicate that not only growth is affected by oral health; but also performance of child athletes is negatively affected by severe caries status. A possible reason for this negative effect can be malnutrition that can be a result of poor oral hygiene. Van Gemert-Schriks et al [4] evaluated influence of dental caries on body growth in prepubertal children and reported that untreated caries and caries experience in children negatively effects body growth. Similarly, Ngoenwivatkul et al [26] observed a relationship between dental health status and body weight in children. They stated that dental caries is an important risk factor for malnutrition in children. Thus, poor performance in child athletes that had higher DMFT scores in our study may be a result of malnutrition. Another possible cause of poor performance in children with poor oral hygiene is the lack of adequate sleep. Dujister et al reported that one of the most important factors that influenced weight gain and growth in children was the impact of oral health on sleeping [27]. It was suggested that since chronic pain negatively affects sleeping, disturbance in production of growth hormones can lead to retardation of growth [9-27]. Therefore poor sleeping due to pain may have also affected performance of the athletes in the present study. A third reason may be the systemic effect of severe caries since it was theorized that growth can be suppressed by pulpally involved teeth by depressing erythrocyte production and reducing hemoglobin levels [28]. The literature regarding oral health status of child athletes is very limited and since there are no studies evaluating the relationship between oral health and performance for children, making a comparison of our results is impossible. The studies regarding oral health status of child athletes mainly focus on children with intellectual disabilities [29-32]. Thriandini et al [29] screened child athletes with a mean age of 13.4 and observed that almost 70% of the athletes had visible untreated caries. Oredugba et al [30] conducted a similar study in Nigeria and reported that 22.4% of the child athletes had untreated caries lesions. Bissar et al [31] evaluated child athletes between 12-17 years in the Special Olympics in Germany and observed a caries prevalence of 58% and a mean DMFT of 2.3. In a study where Puerto Rican athletes were included [32], it was reported that almost 45% of the athletes had untreated dental caries. Although these results are from a special group of children they are concordant with our results showing high DMFT scores. Published studies regarding nutritional habits of

child athletes show that, there is a tendency of consumption of soft drinks and refined sugars [33, 34] that can result with poorer oral health condition in these individuals.

There are a few studies investigating the effect of oral health on performance that were carried out in adults. In a study evaluating the relationship between dental condition and hand strength and maximum bite force, it was reported that carries and missing teeth negatively affected bite force [35]. This result is in line with our study since it can be assumed that muscle strength can be lower by severe decay conditions where nutrition is adversely affected. Also, inadequate bite force can result with difficulty in chewing function and influence nutrition.

The present study hypothesized that the oral health status of child athletes affects performance. Our results showed that athletes with DMFT < 3 performed significantly better than those with DMFT ≥ 3 and there was a correlation between DMFT scores and results of the performance tests. Further clinical research on the subject may confirm and reveal possible reasons behind this difference. Also these results highlight the importance of informing young athletes regarding oral health.

Declaration of conflicting interests

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