



# Evaluation of Healthy Eating Attitudes and Sleep Quality in terms of Sports Performance in Fencing Athletes

Övgü DOĞRUYOL<sup>1A</sup>, Gözde OKBURAN<sup>2B</sup>, Sena DOĞRUYOL<sup>3C</sup>

<sup>1</sup> 34. Cad., Cross Zone, Mersin, TÜRKİYE

<sup>2</sup> Doğu Akdeniz Üniversitesi, Sağlık Bilimleri Fakültesi, Beslenme ve Diyetetik Bölümü, Gazimağusa, KIBRIS

<sup>3</sup> Tokat Gaziosmanpaşa Üniversitesi, Fen-Edebiyat Fakültesi, Psikoloji Bölümü, Tokat, TÜRKİYE

Address Correspondence to Övgü Doğruyol: e-mail: [ovgudogruiyol@gmail.com](mailto:ovgudogruiyol@gmail.com)

Conflicts of Interest: The author(s) has no conflict of interest to declare.

Copyright & License: Authors publishing with the journal retain the copyright to their work licensed under the CC BY-NC 4.0.

Ethical Statement: It is declared that scientific and ethical principles have been followed while carrying out and writing this study and that all the sources used have been properly cited.

(Date Of Received): 11.07.2023 (Date of Acceptance): 24.08.2023 (Date of Publication): 31.12.2023

A: Orcid ID: 0009-0009-9832-5076 B: Orcid ID: 0000-0002-6766-1511 C: Orcid ID: 0000-0001-9348-8743

## Abstract

The main purpose of this study is to evaluate the attitudes of adolescent fencing athletes towards healthy eating and their sleep quality in terms of their sports performance. The study was carried out with adolescent fencing athletes who are active in Mersin Province. The study participants included 50 fencing athletes (24 females, 36 males) whose ages ranged from 12 to 18 years. The healthy eating attitudes of the participants were evaluated with the "Attitude Scale for Healthy Nutrition (ASHN)", "Sleep Quality Scale and Sleep Variables Questionnaire (SQS-SVQ)" and sports performance with the "Vertical Jump Test". Obtained results indicated that vertical jump performance was affected by the positive nutrition of the fencing athletes significantly ( $p < 0.05$ ). However, when the vertical jump scores of the athletes were examined, it was determined that the vertical jump performances of the athletes did not differ in terms of their sleep quality ( $p > 0.05$ ). To conclude, it is believed that the present study will contribute to the literature by revealing the relationships between adolescent fencing athletes' attitudes toward healthy eating attitudes, sleep quality, and physical performance.

**Keywords:** Healthy Eating Attitude, Sports Performance, Sleep Quality, Fencing Athletes.

## Eskrim Sporcularında Sağlıklı Beslenme Tutumları ile Uyku Kalitesinin Spor Performansı Açısından Değerlendirilmesi

### Özet

Bu araştırmanın temel amacı; eskrim sporcularının sağlıklı beslenmeye ilişkin tutumları ve uyku kalitelerini spor performansları açısından değerlendirmektir. Araştırma, Mersin İl'inde aktif sporcu olan eskrim sporcuları ile yürütülmüştür. Araştırmaya 12-18 yaş aralığında (24 kız ve 26 erkek) olan toplam 50 eskrim sporcusu dahil edilmiştir. Katılımcıların sağlıklı beslenme tutumları "Sağlıklı Beslenmeye İlişkin Tutum Ölçeği" ile, uyku kaliteleri "Uyku Kalitesi ve Uyku Değişkenleri Ölçeği" ile, spor performansları ise "Dikey Sıçrama Testi" ile değerlendirilmiştir. Elde edilen bulgular, sporcuların dikey sıçrama performanslarının olumlu beslenme alışkanlıklarından anlamlı düzeyde etkilendiğini göstermektedir ( $p<0,05$ ). Ancak, sporcuların dikey sıçrama puanları incelendiğinde, sporcuların dikey sıçrama performanslarının uyku kalitelerine göre farklılaşmadığı tespit edilmiştir ( $p>0,05$ ). Sonuç olarak, mevcut çalışma ile eskrim sporcularının sağlıklı beslenmeye ilişkin tutumları, uyku kaliteleri ve fiziksel performansları arasındaki ilişkilerin birlikte ele alınarak açıklanmasının alan yazına önemli katkılar sağlayacağı düşünülmektedir.

**Anahtar Kelimeler:** Sağlıklı Beslenme Tutumu, Spor Performansı, Uyku Kalitesi, Eskrim Sporcuları.

## INTRODUCTION

Nowadays, one of the factors that form the basis of a healthy society is the acquisition of good eating habits and adequate and balanced nutrition by adolescents (1). As in other groups, adolescents who are active in sports are also fed irregularly due to unhealthy eating habits and lack of nutritional information (2,3,4). Moreover, it has been observed that participation in sport and physical activity is gradually increasing with environmental and social changes around the world and in our country. The relationship between exercising and eating well is an important issue, in particular for those who are involved in physical activity (5). Nutrition plays an important role in improving the performance of the athlete, reducing the likelihood of injury, accelerating the recovery process after injury and providing balance in towards weight loss or gain (6). In fact, good nutrition positively affects sports performance by improving physical and psychological well-being (7).

A regular and balanced diet has a positive effect on exercise performance (8). Given that eating is an important part of exercising, much attention needs to be paid to nutrition in regular training (9). The planned dietary programme should provide carbohydrates, vitamins, minerals, adequate fat and the energy and vital activities the athlete needs for training (10). As is the case in other branches of sport, nutrition is also of great importance in fencing. However, there are very few studies on the nutritional attitudes and habits of fencers (11).

### Nutrition in Fencing Athletes

Fencing is a high-intensity type of sport that is based on a professional combination of specific technical skills, the ability to make tactical decisions and physical performance (12). Fencing, which was considered an Olympic branch with the first Modern Olympic Games, is a defence and attack sport based on historical duels (13). In studies of fencing athletes, researchers have highlighted that the energy and nutrient intake of fencers is below the required levels (14,15,16). Inadequate nutrient intake and energy consumption negatively affect the growth and health of fencers (17).

A study by Ghloom and Hajji (11) aimed to determine the nutrient intakes of Kuwaiti national team fencers, compare their nutrient intakes with international norms, and identify the nutritional habits/knowledge necessary to improve their performance. Dietary records were collected from 15 national team fencers. The results showed that the fencers consumed less carbohydrate than their total calorie intake. They also consumed more saturated fat than recommended and more protein than recommended. Similarly,

the results of a study of modern pentathlon athletes, including adolescent fencers, reported that the carbohydrate and calcium intakes of the athletes were inadequate (16). As a result, the researchers concluded that fencing athletes should be informed about healthy and adequate diets in order to properly meet their nutritional needs.

### **Sports Performance and Sleep Quality in Fencing Athletes**

Speed is a very decisive factor for the performance of a fencing athlete. In addition to movements designed to hit an opponent, dynamic movements such as stepping and jumping depend on muscle strength, and power (18), in particular, the neuromuscular function of the lower extremities (19,20). Therefore, leg strength is very important in fencing performance. Jumping is a performance measurement method that depends on the coordination and contraction speed of the leg muscles (21). Although vertical jumping is one of the basic movement skills, it is defined as a multi-joint movement requiring complex motor coordination (22). In the vertical jump, the contact of the feet with the ground is interrupted, the force received from the legs and the explosive force are combined, and the jumping distance of the person rising upwards is formed by pushing off from the ground (23). The primary aim of vertical jumping is to reach the highest possible height (24).

In addition to sensory, psychological, neurological, joint and muscular factors affecting speed, sleep rhythm and routine eating habits are among the factors affecting the speed of the athlete (25). Sleep is one of the key factors in improving the health and performance of athletes (26). It has been shown that sleep directly affects athletic performance as well as healthy nutrition (27,10,28).

Many studies have investigated the physiological and psychological effects of sleep on athletic performance (29,30,31). Sleep quality is very critical in terms of the body's resistance and regeneration, especially in people who exercise (32). Increased sleep quality in athletes has been observed to improve cognitive performance, physical performance, muscle growth, metabolism and psychological health, rapid post-training recovery and reduced risk of injury with increased concentration (33). It has also been reported that athletes need more sleep (9-10 hours) after intense training (34).

Sleep has important effects on performance that cannot be ignored, especially in sports such as fencing, which require high levels of aerobic and anaerobic conditioning (35, 36). Therefore, improving fencers' sleep quality not only improves performance but also prevents injuries (37). However, sleep is often ignored by athletes, despite the fact that it is known to be the most effective way to recover after training (26). Furthermore, there is limited research on the effects of sleep quality on performance in fencing athletes (37).

In conclusion, it is known from the literature and previous studies that unhealthy eating attitudes and irregular sleep are quite common, especially in adolescents. It is also known that the positive effects of healthy eating attitudes and sleep quality on athletic performance are very important. However, there is no study investigating the effect of healthy eating attitudes and sleep quality on fencing performance. This study aims to provide an important contribution to the literature by evaluating the effects of healthy eating attitudes and sleep quality on sport performance in fencing athletes aged 12 to 18 years. In this direction, the hypotheses tested in the current study are as below.

- 1) Sport performances of fencing athletes (vertical jump distance) differ according to gender.
- 2) The sport performances of fencing athletes (vertical jump distance) differ according to their attitudes towards healthy nutrition (information on nutrition, emotion for nutrition, positive nutrition and malnutrition).
- 3) Sport performances of fencing athletes (vertical jump distance) differ according to their sleep quality.

## METHOD

### Type of Research and Participants

The type of study conducted is a relational study. The sample of the study consisted of 50 fencing athletes aged between 12 and 18 who were active in Mersin Fencing Sports Club. Within the scope of the research, the participants were selected using the quota sampling method. The descriptive statistics of the participants are shown in Table 1.

<b>Table 1.</b> Descriptive statistics for athletes		
	<b>N</b>	<b>%</b>
<b>Gender</b>		
Girl	24	48,0
Boy	26	52,0
<b>Age</b>		
12-13 age	15	30,0
14-15 age	24	48,0
16-18 age	11	22,0
<b>Education</b>		
Middle school	16	32,0
High school	31	62,0
Other (Graduate)	3	6,0
<b>Doing other sports before fencing</b>		
No	22	44,0
Yes	28	56,0
<b>Duration of Fencing</b>		
4 years and below	16	32,0
5-6 year	23	46,0
7 year and above	11	22,0
<b>Fencing Branch</b>		
Epee	48	96,0
Foil	2	4,0
<b>Training Duration (weekly)</b>		
5 hours and below	12	24,0
6-7 hours	25	50,0
8 hours and above	13	26,0

Table 1 showed that 48% of the athletes included in the study were girls and 30% were boys. It was found that 30% (n=15) of the athletes were 12-13 years old, 48% (n=24) were 14-15 years old and 22.0% (n=11) were 16-18 years old. It was also seen that 32% (n=16) of the athletes had a secondary school education, 62.0% (n=31) had a high school education and 6% (n=3) were university graduates.

It can be seen that 44% (n=22) of the athletes did not interested in any other sport before fencing and 56% of them were interested in another sport. Regarding the duration of fencing, 32% (n=16) of the athletes have been fencing for 4 years or less, 46% (n=23) for 5-6 years and 22% (n=11) for 7 years or more. On the other hand, 96% (n=48) of the fencers were active in Epee branch and 4% (n=2) were active in Foil branch. It was also found that 24% (n=12) of the athletes trained for 5 hours or less, 50% (n=25) for 6-7 hours and 26% (n=13) for 8 hours or more per week.

## Data Collection Tools

### Demographic Information Form

The demographic information form included information on participants' gender, age, education, previous sport, duration of fencing, fencing branch, health status as well as anthropometric measurements (height, weight, percentiles).

### Attitude Scale for Healthy Nutrition (ASHN)

Attitude Scale for Healthy Nutrition (ASHN) was developed by Tekkurşun-Demir and Cicioğlu (38) to assess athletes' attitudes towards nutrition. The scale consists of 21 items and 4 sub-dimensions which are Information on Nutrition (IN), Emotion for Nutrition (EN), Positive Nutrition (PN) and Malnutrition (MP). The scores that can be obtained from the scale range from 21-105. The scale is scored as a 5-point Likert type "strongly disagree", "disagree", "neutral", "agree", "strongly agree". Positive statements on the scale were scored as 1, 2, 3, 4 and 5, and negative statements were scored as 5, 4, 3, 2 and 1 (38). The scores obtained from the scale are presented in Table 1.1.

**Tablo 1.1.** Evaluation of Attitude Scale for Healthy Nutrition (ASHN)

	Very Low	Low	Middle	High	Ideal
ASHN	0-21	22-42	43-63	64-84	85-105

The Cronbach's alpha internal consistency coefficients of the scale are 0.90 for IN, 0.84 for EN, 0.75 for PN and 0.83 for MP. For this study, the Cronbach's alpha internal consistency coefficients are 0.74 for IN, 0.81 for EN, 0.77 for PN and 0.85 for MP.

### Sleep Quality Scale and Sleep Variables Questionnaire (SQS-SVQ)

Sleep Quality Scale and Sleep Variables Questionnaire (SQS-SVQ) was developed by Meijer and Van den Wittenboer (39) and the validity and reliability studies were carried out by Önder, Masal, Demirhan, Horzum and Beşoluk (40). The scale consists of 7 items to assess sleep quality and 8 items determine parental control, total sleep time, midpoint of sleep and sleep efficiency. In the scale, the TIB value should be calculated for the calculation of total sleep time (TST). TIB is calculated using the following formula [TIB= (24:00- item13) + item9]. The formula used to calculate TST is [TST= TIB-item14-item15]. Scale items are scored on a range of 1-3 points. Scores that can be obtained from the scale vary between 7-21. A high score on the scale indicates poor sleep quality, while a low score indicates good sleep quality. In the present study, only the first 7 items were used to assess sleep quality. The Cronbach's alpha internal consistency coefficient of the scale is 0.72, and the Cronbach's alpha internal consistency coefficient for this study was 0.76.

### Physical Performance Measurement (Vertical Jump Test)

The physical performance of young fencers was measured using the My Jump2 application. In the My Jump2 application, the athlete's vertical jump performance is recorded using the video recording function of the iPhone under the observation of the researcher. Thus, distance of vertical jump and duration can be calculated by recording athletes' videos (41).

Before starting the jump test, each athlete warmed up with 5 minutes of running and 10 minutes of branch-specific warm-up to prepare for the vertical jump test. The athletes were then taken individually to the vertical jump test. When the athletes felt ready, they jumped to the highest point they could jump and then the distance of the jump was measured. When a vertical jump was performed, a person's legs and body were positioned parallel to ground level, and power was used from legs, arms and body to make a vertical jump. After the jump, the athlete landed on the mat and the jump distance was measured using the My Jump2 programme. The vertical jump distance was recorded in centimetres (cm). Each athlete repeated the jump twice and the best distance was recorded as the jump distance.

## Data Analysis

The data of the study were analysed using SPSS26.0 (Statistical Package for Social Sciences) program. Means and standard deviations were calculated for all variables in the study. The relationships between variables were analysed using Spearman correlation analysis. The effect of athletes' attitudes towards healthy nutrition and sleep quality scores on vertical jump distance was assessed by multivariate regression analysis.

## Procedure

Firstly, the necessary permissions were obtained from the researchers who developed/adapted the scales to be used in the study. Then, the ethical permissions were obtained to conduct the research, following the approval of the Ethics Committee of the Scientific Research and Publication Ethics Committee of the Eastern Mediterranean University, dated 31.12.2021 and numbered 2021/05.

Secondly, parents of athletes aged under 18 were asked for permission to participate in the study using the 'Family Consent Form' and coaches using the 'Club Consent Form'. Athletes who agreed to participate in the study were informed in detail about the purpose of the study and the procedure. All participants were then asked to agree to participate voluntarily in the research using the Informed Voluntary Consent Form. Participants were also informed that their answers would remain confidential and would only be used for scientific research.

Participants took an average of 10 minutes to complete the scales. After completing the scales, the height of the athletes was measured in centimetres (cm) using an ultrasonic height meter (Langen Messtab 5003) without shoes and socks. Leg lengths were also measured without shoes and socks by the researcher using a tape measure, referencing the length between the wrist bone and pelvis.

Athletes' body weight was measured using a scale on an empty stomach before training. A vertical jump test was then performed on each athlete to measure physical performance. The vertical jump distances of the athletes were measured using the "My Jump2" programme. Each athlete repeated the jump twice and the best distance was recorded by the researcher as a vertical jump distance score.

## FINDINGS

The research tested the hypothesis "*Sport performances of fencing athletes (vertical jump distance) differ according to gender*" by using independent samples t-test analysis. The obtained results showed the significant differences in the vertical jump distances in terms of gender ( $p < .05$ ). Accordingly, the vertical jump distances of male athletes were significantly higher than those of female athletes (Table 2).

**Table 2.** Comparison of vertical jump distances in terms of gender of athletes

	Gender	n	X	StD	p
Vertical Jump Distance (cm)	Girl	24	27,77	5,35	0,024*
	Boy	26	33,58	10,05	

\* $p < 0,05$

Furthermore, the hypotheses "*The sport performances of fencing athletes (vertical jump distance) differ according to their attitudes towards healthy nutrition (information on nutrition, emotion for nutrition, positive nutrition and malnutrition)*" and "*Sport performances of fencing athletes (vertical jump distance) differ according to their sleep quality*" were tested by multiple regression analysis. The results showed that the total variance explained was 60.9% and the positive nutrition sub-dimension predicted vertical jump distance ( $\beta = 0.53$ ;  $p < .05$ ).

On the other hand, another result from the multiple regression analysis did not support the hypothesis "*Sport performances of fencing athletes (vertical jump distance) differ according to their sleep quality*". It was found that the athletes' sleep quality scores were not a significant predictor of their vertical jump distances. In other words, the athletes' sleep quality has no significant effect on their athletic performance (Table 3).

**Table 3.** Evaluation of the sub-dimensions of the attitude scale for healthy nutrition and sleep quality in terms of vertical jump distance

	Std. $\beta$	t	R <sup>2</sup> Cor. R <sup>2</sup>	p
(Constant)		-3,897		0,000**
Information on Nutrition	0,13	0,859		0,395
Emotion for Nutrition	0,19	1,281		0,208
Positive Nutrition	0,53	2,052		0,047*
Malnutrition	-0,61	-1,651	0,680	0,106
Sleep Quality	0,12	0,866	0,609	0,392

\*\*p< 0,001; \*p< 0,05

## DISCUSSION AND CONCLUSION

The meeting of nutritional needs during adolescence is very important in terms of growth and development. Athletes whose nutritional needs are adequate, balanced and met according to individual requirements have healthy bodies and performance. Adequate nutritional intake is very important in adolescent athletes to improve sports performance and minimise sports injuries, as well as health, growth and development (39,40).

### Evaluation of Athletes' Vertical Jump Performances by Gender

In the current study, the vertical jump distance was found to be statistically different ( $p<0.05$ ) in vertical jump distance in terms of gender. In other words, it was found that the vertical jump distance of male athletes was higher than that of female athletes. Accordingly, the average vertical jump distance of adolescent female athletes was  $27.77\pm 5.35$ , while the average vertical jump distance of adolescent male athletes was  $33.58\pm 10.05$ . Similar results were found in a study by Kurihara et al (42) on adolescents between the ages of 12 and 17. The researcher reported a mean jump distance of  $36.6\pm 5.6$  for females and  $44.7\pm 8.9$  for males. On the other hand,

Supporting the findings of the present study, a study investigating the effect of gender and exercise habits on speed and anaerobic power in adolescent athletes reported that male athletes had higher vertical jump values compared to female athletes (43). However, a study by Çetinkaya (44) investigating the differences between the vertical jump test and gender in adolescent basketball players aged 11-18 years found that there was no significant difference between male and female adolescent athletes in the vertical jump test. A study by Laurson et al (45) of 529 adolescents aged 10-18 years demonstrated that male adolescents had higher vertical jump values than female adolescents. High muscle mass is effective in the force produced during the vertical jump (46). Therefore, the better performance of males in vertical jump tests may be explained by the developmental process and muscle mass in adolescence.

### Evaluation of Athletes' Vertical Jump Performances According to Their Attitudes Towards Healthy Nutrition

The hypothesis "*The sport performances of fencing athletes (vertical jump distance) differ according to their attitudes towards healthy nutrition (information on nutrition, emotion for nutrition, positive nutrition and malnutrition)*" was tested by multivariate regression analysis. The results indicated that the adolescent fencers' positive nutrition attitudes scores significantly predicted their vertical jump distances ( $p<0.05$ ).

Inadequate energy intake during periods of intense training in adolescent athletes can lead to muscle wasting, impair growth and development, and increase the risk of injury. In addition, the recovery time of athletes who suffer from injuries during training or competition may be prolonged if their nutritional intake is inadequate and irregular (47). A study investigating the relationship between healthy eating attitudes and athletic performance in active adolescents explored healthy eating attitudes and anthropometric measures (running test, grip strength and vertical jump). The results indicated that a healthy diet had a positive effect

on performance tests and that good eating attitudes and physical activity contributed to physical health, especially in male participants (48). This finding also supported the results of the present study.

### **Evaluation of Vertical Jump Performance in Athletes in terms of Sleep Quality**

The third hypothesis “*Sport performances of fencing athletes (vertical jump distance) differ according to their sleep quality*” tested by multiple regression analysis demonstrated that fencers' sport performance did not differ by sleep quality.

It has been emphasised that one of the most important factors that has a positive effect on the performance of athletes is sleep duration and quality of sleep (29). Adolescent athlete who trains 4-6 hours a day needs 10-12 hours of sleep (31). A meta-analysis study has shown that poor sleep, frequency of sleep disruption, sleeping late and waking up early are common habits among adolescents and have serious implications for learning, school performance and neurobehavioural functioning (49).

Studies that have investigated the relationship between sleep quality and athletic performance in adolescents have reported different findings. For instance, studies in the literature have reported a decrease in the jump height of participants in vertical jump tests performed during the period of poor sleep quality (50,51). Similarly, another study investigating the relationship between sleep quality and vertical jump reported a significant 2.8 cm decrease in vertical jump height in adolescent athletes with poor sleep quality. Thus, it can be explained that the decrease in athletic performance in many sports (basketball, football, volleyball, etc.) that require regular jumping movements, due to a decrease in lower extremity strength (52). Another study evaluating sleep duration and athletic performance in athletes reported that the teams that finished the competition faster had longer sleep durations than the teams that finished the competition slower. The researchers found that athletes who spent more time in bed and slept longer finished the competition in a higher place and had better athletic performance (53). Therefore, it can be seen that the results of adolescent sleep studies in the literature vary, although it is known that improving sleep quality before and after training in adolescents improves athletic performance (54). These differences may be due to variables such as the age of the participants, the method of measuring sleep quality (single measurement) or the characteristics of the exercise performed by the athlete.

The research has some limitations. The first limitation is the research sample. The present research only included fencers between the ages of 12 and 18. In future studies, it is important to study with groups of different ages and fencing branches in terms of generalisability of the research. The lack of determination of the athletes' knowledge on nutrition, dietary status and eating attitudes before the study is another limitation of the study. Therefore, the determination of the athletes' previous level of nutritional knowledge and their food consumption status may allow a more detailed evaluation of their healthy eating attitudes. Finally, the lack of classification of the anthropometric measurements (waist/hip ratio) of the athletes in terms of risk groups and their body composition (fat mass, fat-free mass, bone mass) are other limitations of the study. In future studies, the measurement of body composition may provide more detailed information about the effects on athletic performance.

In conclusion, the present study shows that healthy eating habits and the avoidance of malnutrition are highly effective in improving sports performance in athletes. In addition, the results of the study emphasise that increasing healthy eating attitudes in adolescent athletes will positively contribute to sleep quality. There is no previous study in the literature that shows the effect of attitudes towards healthy eating and sleep quality on the sport performance of adolescent fencing athletes. Thus, identifying the variables affecting sport performance in fencing athletes would be considered a contribution to the literature. However, further studies are needed to identify other possible dynamics that may affect the athletic performance of fencing athletes.



## REFERENCES

1. Meşe-Yavuz C, Koca-Özer B. adölesan dönem okul çocuklarında beslenme alışkanlıkları ve beslenme durumunun değerlendirilmesi. *Journal of Tourism and Gastronomy Studies*, 2019; 7(1), 225-243.
2. Savige G, MacFarlane A, Ball K, Worsley A, Crawford D. Snacking behaviours of adolescents and their association with skipping meals. *International Journal of Behavioral Nutrition and Physical Activity*, 2007; 4(1).
3. Süel E, Karakaya I, Savucu Y. Elit seviyedeki basketbolcuların beslenme bilgi ve alışkanlıkları. *Fırat Üniversitesi Sağlık Bilimleri Tıp Dergisi*, 2006; 20(4), 271-275.
4. Ersoy G. Okul Çağı ve Spor Yapan Çocukların Beslenmesi, 2001.
5. Jenner SL, Buckley GL, Belski R, Devlin BL, Forsyth AK. Dietary intakes of professional and semi-professional team sport athletes do not meet sport nutrition recommendations-A systematic literature review. *Nutrients*, 2019; 11(5), 1160.
6. Ersoy G, Hasbay A. Sporcu beslenmesi. 2008: Ankara.
7. Güneş Z. Spor ve beslenme. Nobel Yayın Dağıtım, 2005: 4.Baskı, Ankara.
8. Ulutaş Z, Özgül F. Beslenmenin Futbol Performansı Üzerine Etkisi. 2020: Lambert Academy Publishing.
9. Gilmore O. Leaving competitive sport: Scottish female athletes' experiences of sport career transitions. *Thesis Dissertation, University of Stirling*, 2008.
10. Önler E, Yılmaz A. Cerrahi birimlerde yatan hastalarda uyku kalitesi. 2008: İstanbul.
11. Ghouloum K, Hajji S. Comparison of diet consumption, body composition and lipoprotein lipid values of Kuwaiti fencing players with international norms. *Journal of the International Society of Sports Nutrition*, 2011; 8(1).
12. Wazir MR, Mostaert WN, Pion MJ, Lenoir M. Anthropometry, Physical Performance, and Motor Coordination of Medallist and Non-Medallist Young Fencers. *Archive of Budo*, 2018; 14, 33-40.
13. Roi GS, Bianchedi D. The science of fencing. *Sports Medicine*, 2008; 38(6), 465-481.
14. Volpe SL. Micronutrient requirements for athletes. *Clinics in sports medicine*, 2007; 26(1), 119-130.
15. Loureiro LL, Fonseca S, Castro NG, Dos Passos RB, Porto CP, Pierucci AP. Basal metabolic rate of adolescent modern pentathlon athletes: Agreement between indirect calorimetry and predictive equations and the correlation with body parameters. *PloS one*, 2015; 10(11), e0142859.
16. Coutinho LA, Porto CP, Pierucci AP. Critical evaluation of food intake and energy balance in young modern pentathlon athletes: A cross-sectional study. *Journal of the International Society of Sports Nutrition*, 2016;13(1).
17. Le Meur Y, Dorel S, Baup Y, Guyomarch JP, Roudaut C, Hausswirth C. Physiological demand and pacing strategy during the new combined event in elite pentathletes. *European Journal of Applied Physiology*, 2012; 112(7), 2583-2593.
18. Barth B, Beck E. The complete guide to fencing. 2007: Meyer & Meyer Verlag.
19. Poulis I, Chatzis S, Christopoulou K, Tsolakis C. Isokinetic strength during knee flexion and extension in elite fencers. Perceptual and motor skills, 2009; 108(3), 949-961.
20. Tsolakis C, Tsiganos G. The influence of training on neuromuscular factors in elite and non elite fencers. *Serbian Journal of Sports Sciences*, 2008; 2(15), 59-65.
21. Cizauskas G, Kliziene I, Klizas S, Sipaviciene S. Vertical jump performance: testing leg muscles strength, muscular performance and body balance. *Journal of Vibroengineering*, 2014;16(8), 3841-3849.
22. Petrigna L, Karsten B, Marcolin G, Paoli A, D'Antona G, Palma A, Bianco A. A review of Countermovement and squat Jump testing methods in the context of public health examination in adolescence: Reliability and feasibility of current testing procedures. *Frontiers in Physiology*, 2019; 10.
23. Markovic G, Dizdar D, Jukic I, Cardinale M. Reliability and factorial validity of squat and Countermovement Jump tests. *The Journal of Strength and Conditioning Research*, 2004; 18(3), 551.
24. Karatrantou K, Gerodimos V, Voutselas V, Manouras N, Famisis K, Ioakimidis P. Can sport-specific training affect vertical jumping ability during puberty? *Biology of Sport*, 2019; 36(3), 217-224.
25. Magyar P, Oravitan M. Effective training interventions for the development of speed in fencing: A systematic review. *Discobolul – Physical Education, Sport and Kinetotherapy Journal*, 2021; 465-474.
26. Halson SL. Nutrition, sleep and recovery. *European Journal of Sport Science*, 2008; 8(2), 119-126.
27. Engin E, Özgür G. Yoğun bakım hemşirelerinin uyku düzen özelliklerinin iş doyumu ile ilişkisi. *Ege Üniversitesi Hemşirelik Yüksekokulu Dergisi*, 2004;20(2), 45-55.
28. Potter PA, Perry AG. Fundamentals of nursing. *Mosby Year Book, StLouis, Missouri*, 2009; 6, 1198-1227.
29. Ulusoy Y. Uykunun egzersiz performansı üzerine etkisi: Uyku, beslenme ve toparlanma ilişkisi. *Çanakkale Onsekiz Mart Üniversitesi Spor Bilimleri Dergisi*, 2020; 3(3), 1-22.
30. Arnal PJ, Lapole T, Erblang M, Guillard M, Bourrilhon C, Léger D, Chennaoui M, Millet GY. Sleep extension before sleep loss. *Medicine & Science in Sports & Exercise*, 2016;48(8), 1595-1603.
31. Scott WA. Maximizing performance and the prevention of injuries in competitive athletes. *Current Sports Medicine Reports*, 2002; 1(3), 184-190.
32. Driver HS, Taylor SR. Exercise and sleep. *Sleep medicine reviews*, 4(4), 2000; 387-402.
33. Haack M, Mullington JM. Sustained sleep restriction reduces emotional and physical well-being. *Pain*, 2005; 119(1-3), 56-64.
34. Walsh NP, Halson SL, Sargent C, Roach GD, Nédélec M, Gupta L, Leeder J, Fullagar HH, Coutts AJ, Edwards BJ, Pullinger SA, Robertson CM, Burniston JG, Lastella M, Le Meur Y, Hausswirth C, Bender AM, Grandner MA, Samuels CH. Sleep and the athlete: Narrative review and 2021 expert consensus recommendations. *British Journal of Sports Medicine*, 2020; 55(7), 356-368.
35. Bottoms LM, Sinclair J, Gabrusz T, Price MJ. Physiological responses and energy expenditure to simulated epee fencing in elite female fencers. *Serbian Journal of Sports Sciences*, 2010; 5(1), 17-20.
36. Bird SP. Sleep, recovery, and athletic performance. *Strength & Conditioning Journal*, 2013; 35(5), 43-47.
37. Ma T, Zhang H, Ghigiarelli J. An evaluation of knee overuse injuries and sleep disturbance among men and women fencers,

38. Tekkurşun-Demir G, Cicioğlu Hİ. Sağlıklı beslenmeye ilişkin tutum ölçeği (SBİTÖ): Geçerlik ve güvenirlik çalışması. *Gaziantep Üniversitesi Spor Bilimleri Dergisi*, 2019; 4(2), 256-274.
39. Meijer AM, Van den Wittenboer GL. The joint contribution of sleep, intelligence, and motivation to school performance. *Personality and Individual Differences*, 2004; 37(1), 95-106.
40. Önder İ, Masal E, Demirhan E, Horzum MB, Beşoluk Ş. Psychometric properties of sleep quality scale and sleep variables questionnaire in Turkish student sample. *International Journal of Psychology and Educational Studies*, 2016; 3(3), 9-21.
41. Stanton R, Kean CO, Scanlan AT. *My Jump* for vertical Jump assessment. *British Journal of Sports Medicine*, 2015; 49(17), 1157-1158.
42. Kurihara T, Terada M, Numasawa S, Kusagawa Y, Maeo S, Kanehisa H, Isaka T. Effects of age and sex on association between toe muscular strength and vertical jump performance in adolescent populations. *Plos one*, 2021; 16(12).
43. Ziyagil MA, Zorba E, Bozatlı S, İmamoğlu O. 6-14 yaş grubu çocuklarda yaş, cinsiyet ve spor yapma alışkanlığının sürat ve anaerobik güce etkisi. *CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi*, 1999; 3(3).
44. Çetinkaya C. Farklı altyapı kategorilerinde yer alan basketbolcuların bazı motorik özellikleri ile şut isabetlerinin yaş ve cinsiyete göre karşılaştırılması. *Yayınlanmamış Yüksek Lisans Tezi*, 2019; İstanbul Gelişim Üniversitesi.
45. Laurson KR, Baptista F, Mahar MT, Welk GJ, Janz KF. Long jump, vertical jump, and vertical jump power reference curves for 10-18 year olds. *Measurement in Physical Education and Exercise Science*, 2022; 26(4), 306-314.
46. Eler N. The correlation between right hand finger ratio (2D: 4D) and the parameters of anthropometric and physical fitness in children. *Journal of Human Sciences*, 15(1), 2018; 656-664.
47. Rodriguez NR, Di Marco NM, Langley S. Nutrition and athletic performance. *Medicine & Science in Sports & Exercise*, 2009; 41(3), 709-731.
48. Manzano-Carrasco, S, Felipe JL, Sanchez-Sanchez J, Hernandez-Martin A, Clavel I, Gallardo L, Garcia-Unanue J. Relationship between adherence to the Mediterranean diet and body composition with physical fitness parameters in a young active population. *International Journal of Environmental Research and Public Health*, 2020; 17(9), 3337.
49. Dewald JF, Meijer AM, Oort FJ, Kerkhof GA, Bögels SM. The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review. *Sleep Medicine Reviews*, 2010;14(3), 179-189.
50. Daanen HA, Van Ling S, Tan TK. Subjective ratings and performance in the heat and after sleep deprivation. *Aviation, Space, and Environmental Medicine*, 2013;84(7), 701-707.
51. Takeuchi L, Davis GM, Plyley M, Goode R, Shephard RJ. Sleep deprivation, chronic exercise and muscular performance. *Ergonomics*, 1985; 28(3), 591-601.
52. Halson SL. Sleep in elite athletes and nutritional interventions to enhance sleep. *Sports Medicine*, 2014; 44(S1), 13-23.
53. Master L, Nye RT, Lee S, Nahmod NG, Mariani S, Hale L, Buxton OM. Bidirectional, daily temporal associations between sleep and physical activity in adolescents. *Scientific Reports*, 2019; 9(1).
54. Cheikh M, Hammouda O, Gaamouri N, Driss T, Chamari K, Cheikh R B, Dogui M, Souissi N. Melatonin ingestion after exhaustive late-evening exercise improves sleep quality and quantity, and short-term performances in teenage athletes. *Chronobiology International*, 2018; 35(9), 1281-1293.