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THE PREDICTION OF PHYSICAL AND MENTAL FATIGUE LEVEL IN THE USE OF ERGOGENIC SUPPORT OF ADOLESCENT ATHLETES

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Abstract: Being involved in the developmental period of adolescent athletes may cause more energy and fatigue levels. At this point, the correct and appropriate use of ergogenic supports can contribute to athletes. The study aims to reveal the predictors of fatigue and physical activity levels in adolescent athletes' use of ergogenic support. 171 (female: 98, male: 73) licensed athletes from the Provincial Directorate of Youth and Sports participated in the research voluntarily. Demographic information questionnaire, International Physical Activity Questionnaire-short form (IPAQ-SF), and Chalder Fatigue Scale were used in the research. The data collected in the study were analyzed in the Jamovi (2.0.0) statistical program at a 95% confidence interval and 0.05 significance level. In the analysis of the data, frequency (N), mean (x̄), standard deviation (ss), percentage (%), minimum (Min.), and maximum (Max.) values, Pearson's correlation and binomial logistic regression analysis were used. According to the results of the study, most of athletes do not prefer to use ergogenic support. Those who use ergogenic support mostly use sports drinks, fish oil, and protein powder. Fatigue and total MET levels do not predict the use of ergogenic support by athletes. As a result, it can be said that adolescent athletes do not prefer to use ergogenic support and although their total MET scores are high, their fatigue levels are at a normal level.

Key Words: Physical activity, nutrition, body mass index

ADOLESAN SPORCULARIN ERGOJENİK DESTEK KULLANIMINDA, FİZİKSEL VE MENTAL YORGUNLUK DÜZEYİNİN YORDAYICILIĞI

Öz: Adolesan sporcuların gelişim dönemi içerisinde yer alması, daha fazla enerji ve yorgunluk düzeyine neden olabilmektedir. Bu noktada ergojenik desteklerin doğru ve yerinde kullanımı sporculara katkı sağlayabilmektedir. Araştırmanın amacı adolesan sporcuların ergojenik destek kullanımında, yorgunluk ve fiziksel aktivite düzeylerininin yordayıcılığını ortaya çıkarmaktır. Araştırmaya Gençlik ve Spor İl Müdürlüğü'ndeki 171 lisanslı sporcu (kadın:98, erkek:73) gönüllü olarak katılmıştır. Araştırmada demografik bilgiler anketi, Uluslararası Fiziksel Aktivite Anketi-kısa form (IPAQ-SF) ve Chalder Yorgunluk Ölçeği kullanılmıştır. Araştırmada toplanan veriler Jamovi (2.0.0) istatistik programında %95 güven aralığı ve 0.05 anlamlılık düzeyinde analiz edilmiştir. Verilerin analizinde frekans (N), ortalama (x̄), standart sapma (ss), yüzde (%), minimum (Min.) ve maksimum (Mak.) değerleri ile Pearson's korelasyon ve Binominal lojistik regresyon analizi kullanılmıştır. Araştırmanın bulgularına göre sporcuların çoğunluğu ergojenik destek kullanmayı tercih etmememektedir. Ergojenik destek kullananlar en çok; sporcu içeceği, balık yağı ve protein tozu kullanmaktadır. Sporcuların ergojenik destek kullanımını, yorgunluk ve toplam MET düzeyi yordamamaktadır. Sonuç olarak adolesan sporcular ergojenik destek kullanmayı tercih etmediği ve toplam MET puanları yüksek olsa da yorgunluk düzeylerinin normal seviyede olduğu söylenebilir.

Anahtar Kelimeler: Fiziksel aktivite, beslenme, beden kütle indeksi

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INTRODUCTION

Today, the time required to become an elite-level athlete depends on the athlete's ability, the age of starting sports, training compliance, discipline, nutrition and recovery strategies, etc. It differs from athlete to athlete depending on factors. Elite-level athletes are defined as those who have reached a high-performance level and have mostly completed their physical development, while athletes who have not completed their physical development are defined as adolescent athletes. Since the adolescence period (12-18) is one of the periods in which rapid growth and development are observed, the relationship between training load, nutrition, and rest in this period covers a very important period for athletes (Bilici, 2019). The nutritional needs of adolescent athletes vary according to their physical structures, training loads, age, and gender (Berg, 2019). In a recent study, when the daily energy needs of adolescent athletes and their non-athlete peers were compared, it was determined that the energy needs of adolescent athletes were not met (Bell et al., 2023). In case of energy imbalance, it should not be forgotten that the athletes may experience health problems, as well as a decrease in performance (Desbrow, 2021). A recent study has revealed that there may be eating disorders especially in adolescent athletes and that the nutritional information of the athletes was insufficient (Magee et al., 2023). For example, in a study, it was seen that the dietary guidelines applied for the nutrition of adolescent athletes in Canada had positive effects on athletes (Heidl et al., 2022). Also adolescent athletes need more energy than their non-athlete peers (Desbrow, 2014) and may feel more fatigue than adult athletes (Bergeron et al., 2015).

Fatigue is defined as 'the combination of both physiological and psychological mechanisms and a complex phenomenon' (Tornero-Aguilera et al., 2022). Acute physical and mental fatigue is expected immediately after physical activity (Bestwick-Stevenson et al., 2022). Fatigue complaints are common in adolescent athletes. Acute fatigue is expected, especially after high-intensity training to improve performance (Wenger et al., 2019). However, due to factors such as early specialization in sports, the overloading of adolescent athletes in a single sport leads to overuse injuries and mental fatigue (Popkin et al., 2019). In addition, the fatigue complaints here may be caused by the athlete's burnout syndrome (Rowland, 1986). In such a situation, adolescent athletes often turn to the use of ergogenic support without the knowledge of their coaches. The results of a study conducted on adolescent athletes; due to an increase in performance, the desire to reach their goals, and the pressure of peer or social environment, they apply to ergogenic supports (Desbrow, 2021). In fact, it is said that adolescent athletes can achieve 'more increase in performance than ergogenic supplementation will provide with healthy growth, maturation, regular training, and balanced nutrition' (Berg, 2019). However, the prevalence of the use of ergogenic supplements is increasing even in early adolescent athletes (Barrack et al., 2022). In a study conducted with non-athlete adolescents; It was determined that 61.7% of the participants used energy drinks continuously and they had a 21.4% usage level in the last 1 month (Galimov et al., 2019).

In the consensus statement of the International Olympic Committee, nutritional supplements have been defined as 'food, food component, nutrient or non-food compound taken on demand outside of the routine diet' as a dietary supplement that may benefit health or performance (Maughan et al., 2018). Nutritional supplements are generally preferred as health-related dietary supplements (vitamins or minerals), energy requirements in sports (sports drinks, energy bars, or proteins), or ergogenic aids (for example, caffeine, creatine monohydrate, or amino acids) to contribute to sports performance (Tabata et al., 2020). The primary purpose of ergogenic supports is to increase athlete performance and balance body fat ratio, and they are used by athletes to increase endurance, dexterity, speed, and strength in sports (Bayram & Öztürkcan,

2020). In addition to the fact that the use of ergogenic support is an important issue to be emphasized, sports nutrition recommendations must be made with expert support and cooperation (Bilici, 2019). In a study conducted on adolescent rugby athletes, it was concluded that the aim of increasing performance is the first among the purposes of using ergogenic support and that they are aware of ergogenic support with the help of scientific articles and the internet (Harmse and Noorbhai, 2022). The number of studies investigating the short and long-term effects of ergogenic support use in adolescent athletes is limited (Berg, 2019).

As a result of a study conducted in Türkiye, it was determined that only 20.6% of the athletes obtained ergogenic support supplements from the club doctor, and 53.9% of them used them without knowing the side effects of ergogenic support (Çolak et al., 2020). As a result of studies conducted in Türkiye, it has been determined that the number of studies examining the nutritional levels of adolescents is low and that there is a need for individual-specific nutrition programs by evaluating risk factors related to nutrition (Pehlivan, 2019; Selin, 2019; Nalçakan et al., 2020). It has been previously stated that it is important to raise nutritional awareness at an early age since adolescent athletes do not consume enough of important nutritional elements in our country (Güldemir and Bayraktaroğlu, 2020). In addition, when the literature was examined, no study was found that investigated the relationship between the fatigue levels of athletes and MET levels among the reasons for the use of ergogenic support. This research will contribute to the literature in this respect and will be a reference for the studies to be done in this field. In this context, the study aims to reveal the predictors of fatigue and MET levels in adolescent athletes' use of ergogenic support.

Aim of the Research

The aim of this study is to determine the effect of fatigue and physical activity levels on adolescent athletes' use of ergogenic support. Other aims of the research are presented below:
[1]. What is the prevalence of dietitian use among adolescent athletes and the type of dietitian they receive support from?
[2]. What is the prevalence of adolescent athletes' use of ergogenic support, the ergogenic supports they use, and the attitudes of their trainers towards the use of ergogenic support?
[3]. Is there a relationship between the physical activity levels of adolescent athletes and their fatigue levels?
[4]. Does the use of ergogenic support by adolescent athletes predict fatigue and MET levels?

METHOD

Research Model

The model of this research, which investigated the role of fatigue and physical activity level in the use of ergogenic support by adolescent athletes, is a descriptive study based on the relational screening model. The relational screening model is defined as a method that aims to 'determine the existence or degree of change between two or more variables' (Karasar, 2018).

Research Group

First of all, correlation analysis was used to calculate sample size and true power size with G*power (3.1) software (α=0.05, power=0.95, effect size=0.70). According to the results of the analysis, a sample of 115 participants revealed that the real power was 95% (Faul et al., 2007). 171 (female:98, male:73) licensed athletes from the Karaman Provincial Directorate of Youth and Sports participated in the research voluntarily. Among the participants, there are athletes with European (n:1), Türkiye (n:19), Region (n:11) and Provincial (n:77) degrees. The mean age of the participants (14.28±2.09 years), mean height (1.63±12.8 cm), mean weight

(55.9±14.2 kg), mean BMI (20.8±3.5 kg/m^2), and total MET-min mean scores (2674.7±2744.9). 50.3% (n:86) of the participants are individual athletes and 49.7% (n:85) are team athletes. The average training year of the participants was (3.0±2.4) and the average daily training time (2.0±0.8) hours. In addition, since the participants were adolescents, the average daily water consumption (2.2±1.0 liters) and sleep duration (8.0±1.3 hours) were determined.

Demographic Information Questionnaire: The demographic information of the participants was determined by the researcher. In the questionnaire, there are questions about gender, age, height, weight, sports branch, athlete supplement usage status, dietitian support, daily water consumption, and sleep times.

International Physical Activity Questionnaire-Short Form (IPAQ-SF): The international physical activity questionnaire was designed by Doctor Michael Booth in 1996. The International Physical Activity Assessment Group developed the IPAQ based on this questionnaire. The questionnaire is used in two forms, short and long, to determine the sedentary lifestyles and physical activity levels of adults. In this study, a short form consisting of 7 questions was used. The questions are aimed at determining the duration of walking, moderate and vigorous activities, and sitting times (minutes and days) for at least 10 minutes in the last week. Metabolic Equivalent (MET-minutes) scores of individuals in minutes are calculated with the questions obtained from the questionnaire. Heavy physical activity is calculated as 8.0 MET, moderate physical activity as 4.0 MET, and walking as 3.3 MET (Sağlam et al., 2010). The Turkish validity and reliability study of the questionnaire was conducted in 2005 (Öztürk, 2005).

Chalder Fatigue Scale: The scale was developed by Trundie Chalder in 1993 (Chalder, 1993). In the scale, the fatigue felt by individuals in the last 1 month is evaluated through self-report. While there were 14 questions in the first version of the scale, 3 questions were removed from the scale afterward. The final version of the scale with 11 questions consists of 7 items on physical fatigue and 4 items for the mental fatigue subsection (Cella & Chalder, 2010). The scale has two different (Likert and bi-model) scoring systems. Likert scoring is used in clinical research, while bi-model scoring is used in epidemiological screening studies. Bi-model scoring (0-0-1-1) system was also used in this study. According to this scoring system, it varies between the points that can be taken from the physical fatigue subsection (0-7), the mental fatigue subsection (0-4), and the total (0-11). Higher scores mean higher levels of fatigue. The Turkish validity and reliability study of the scale was conducted in 2019 (Adın, 2019). According to the validity and reliability study, Cronbach's alpha coefficients of the scale were found to be in the scale total (0.90), physical sub-dimension (0.79) and mental sub-dimension (0.79). In this study, the high Cronbach's alpha coefficient for the total scale (0.83), physical sub-dimension (0.81) and mental sub-dimension (0.67) mean that the items in the scale are reliable for this study.

Data Analyses

First of all, analyses were made to determine whether the data obtained in the study had a normal distribution.

Table 1. Results of normality analysis of the data

	Physical Fatigue	Mental Fatigue	Total Fatigue	Total MET
Skewness	1.2511	1.7983	1.3589	0.86348
Kurtosis	0.58767	2.6397	1.4088	-0.44517

Table 1 was observed that the skewness and kurtosis values of the data were not between (-3.0 and +3.0) and it was decided that the data were normally distributed (Kalaycı, 2010). Frequency (n), mean ($\bar{x}$), standard deviation (ss), percent (%), minimum (Min.), and maximum (Max.) values were used in the descriptive statistics of the data. The relationship between dependent and independent variables was determined by Pearson correlation analysis and Binomial logistic regression analysis. Logistic Regression analysis is preferred in cases where the dependent variable has 2 categories (Beydemir, 2014). Normal distribution of independent variables, linearity and equality of variance-covariance matrices do not need to be met in logistic regression analysis (Tabachnick & Fidell, 1996). All analyzes were performed at the 95% confidence interval and ($p<0.05$) significance level in the Jamovi (2.3.21.0) statistical program.

Research Ethics: Before the research, ethical permission was obtained from the Scientific Research Publication and Ethics Committee of Karamanoğlu Mehmetbey University (Date: 29.12.2022, Number: E-75732670-020-107320). Afterwards, research permission was obtained from the Ministry of Youth and Sports, General Directorate of Education, Research and Coordination, for the research to be conducted with the athletes in the Karaman Provincial Directorate of Youth and Sports (Date: 27.03.2023, Number: E-36592570-600-4512984).

RESULTS

In this part of the study, first, the training loads of the participants and the values of fatigue and total MET scores are presented below (Table 2).

Table 2. Descriptive statistics of the chalder fatigue scale

Variables	N	Item Average	sd.	Min.	Max.
Physical Fatigue Sub Dimession	171	1.5	2.0	0	7
Mental Fatigue Sub Dimession	171	0.6	1.0	0	4
Total Fatigue	171	2.1	2.6	0	11

When Table 2 is examined, the participants above 4 points are considered tired in the evaluation of the total fatigue scores of the participants. According to this, 25.1% (n:43) of the participants are tired and 74.9% (n:128) are not tired. It is seen that the physical, mental and total fatigue score averages of the participants are at a normal level (below 4). The dietitian support and ergogenic support use by the participants are presented below (Table 3).

Table 3. Dietitian support and ergogenic support usage rates of the participants

		N	%
Dietitian support	Yes	42	24.6
	No	129	75.4
Dietitian type	Athlete Training Center	17	40.5
	Private hospital	14	33.3
	Government hospital	11	26.2
Use ergogenic support	Yes	40	23.4
	No	131	76.6
Coach attitude	She/he doesn't want me to use	41	23.9
	She/he does not interfere with my use	81	47.4
	She/he wants me to use it within his knowledge	49	28.7

When Table 3 is examined, it is seen that the majority of the participants (75.4%) did not apply for dietitian support, and the majority of those who received dietitian support preferred the Athlete Training Center (40.5%). It was seen that the majority of the participants (76.6%) did not use ergogenic support and the majority of the participant trainers (47.4%) stated that they were not involved in the use of ergogenic support by their athletes. The ergogenic supports used by the participants are presented below (Table 4).

Table 4. The proportion of ergogenic supplements that participants prefer to use

Nutritional supplements	N	%	Nutritional supplements	N	%
1. Sport drinks	18	20.2	6. Vitamin B12	9	1.1
2. Fish oil	17	19.1	7. Caffeine	6	6.7
3. Protein powder	12	13.5	8. Creatine	4	4.4
4. Vitamin C	12	13.5	9. Beta Alanine	1	1.2
5. Vitamin E	9	10.1	10. L-Karnitine	1	1.2

When Table 4 is examined, it is seen that the participants mostly use sports drinks (n:18). It is seen that they use fish oil (n:17) in the second place, protein powder (n:12) in the third place, vitamin C (n:12) in the fourth place and vitamin E (n:9) in the fifth place. The relationship between total MET and fatigue scores is presented below (Table 5).

Table 5. The relationship between participants' total MET and fatigue scores

		1.Total MET	2.Physical fatigue	3.Mental fatigue	4.Total fatigue
1.Total MET	r	1	0.09	0.09	0.10
	p		0.23	0.26	0.18
2.Physical fatigue	r		1	0.46	0.94
	p			<0.000***	<0.000***
3.Mental fatigue	r			1	0.74
	p				<0.000***

***p<0.001

When Table 5 is examined, a moderate positive correlation was found between mental fatigue and physical fatigue (r=.46, p<0.001). There is a high level of positive correlation between physical fatigue and total fatigue (r=0.94, p<0.001). There is a high level of positive correlation between mental fatigue and total fatigue (r=0.74, p<0.001). No correlation was found between total MET and physical fatigue, mental fatigue and total fatigue (p>0.05). The current status of the participants' mean fatigue and MET levels related to the use of ergogenic support is presented below (Figure 1).

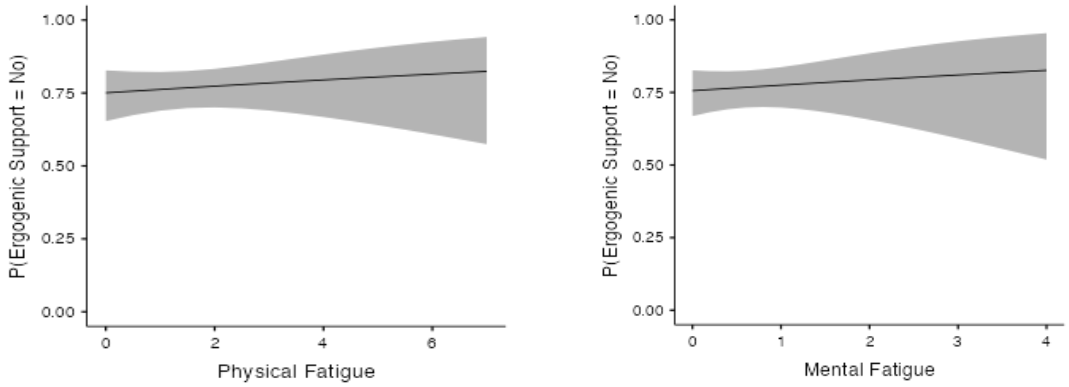

Figure 1. Estimated mean fatigue and MET classification by use of ergogenic support

When Figure 2 is examined, it is seen that the averages of ergogenic support use and fatigue groups (tired-not tired) are close. In the MET classification, it is seen that the average of the active and very active groups is close, and the average of the inactive group is lower. The cause-effect relationship between fatigue and MET levels in the use of ergogenic support by the participants is presented below (Table 6).

Table 6. Results of binomial regression analysis of fatigue and MET levels in participants' use of ergogenic support

Model	Predictor	Estimate	Confidence Interval	Standart Error	Z	p
Use Ergogenic Support	İntercept	1.192600	0.64-1.75	0.28	4.22	<0.000***
	Fatigue Level (*VIF:1.02, Tolerance: 0.98):*					
	Not Tired---Tired	2.254173	-0,63-1.14	0.45	0.56	0.57
	MET Classification *(VIF:1.01, Tolerance: 0.99):*					
	İnactive--Very Active	-1.038449	-2.26-0.18	0.62	-1.66	0.08
	Active---Very Active	0.084990	-0.69-0.86	0.39	0.22	0.10

****p<0.001, VIF: Variance Inflation Factor, N:171, R^2=0.34 (Negelkerkes), Model=x^2(3)=3.88, p=0.27*

When Table 6 is examined, the ergogenic support use model is statistically significant according to the fatigue status and MET classification groups in the model ($p<0.001$). The fact that the VIF values of the independent variables (fatigue status and MET class) are below 10, the tolerance value is above 0.2, and the standard error scores are below 2 in the model means that there is no multicollinearity problem (Myers, 1990, Field, 2005). Although there is no multicollinearity problem, the fatigue status (tired-not tired) of the participants and the MET class (inactive-active-very active) groups do not predict the use of ergogenic support ($p>0.05$).

DISCUSSION AND CONCLUSION

In this study, the relationship between fatigue and MET levels in adolescent athletes' use of ergogenic support was investigated. According to the research results, the majority of the athletes do not receive dietitian support and the majority of the athletes who receive dietitian support prefer the Athlete Training Center (ATC). It is known that adolescent athletes in developed countries apply to dietitians for ergogenic support, while in underdeveloped countries there is a lack of continuous training programs for the nutrition of athletes (Jovanov et al., 2019). Although Türkiye is in a developing country class, Athlete Training Centers have been operating since 28 January 2010 (ATC Regulation, 2010). Athlete Training Centers cover the regulations regarding the “shelter, nutrition, health, dress and discipline principles and procedures” of the athletes. In the Athlete Training Centers, personnel such as doctors (preferably sports physicians), nutritionists, psychologists, physiotherapists, health officers, and nurses work in the trainer classes. It can be said that the majority of the athletes in this study are not aware of the nutritionists in ATC, and those who have knowledge prefer ATC.

It was observed that the majority of the athletes did not prefer to use ergogenic support, and the rate of those who preferred was 24.6%. It is known that 'popularity, functionality, price, taste, convenience, antidoping and familiarity' are among the reasons for adolescent athletes prefer ergogenic supplements (Kakutani et al., 2019). In a study conducted in Türkiye, including adolescent martial athletes, it was determined that 22.6% of the athletes used ergogenic support, and they used ergogenic supports to 'improve performance, lose weight, increase muscle mass, increase energy level, health and satiety' (Çamaşırcı, 2020). Although there is a similar

percentage of use in this study, there is no clear inference because the reasons for use have not been investigated. It was determined that the most preferred nutritional supplements of the athletes in this study, and the athletes using ergogenic supplements were sports drinks, fish oil, protein powder, vitamins C and E. After the International Sports Nutrition Association first published a status statement on energy drinks in 2013, it is known that the content of energy drinks has changed as well as the number of studies on sports drinks has increased (Jagim et al., 2023). Energy drinks were introduced to the market by the United States in the late 1990s (Wire, 2022). Energy drinks are mostly marketed for individuals and adolescents in the age range (20-39) (Vercammen et al., 2019). In a study that also included adolescent athletes, it was determined that 10% of the athletes preferred sports drinks (Çamaşırcı, 2020). The result of this research supports that sports drinks are ranked first by adolescent athletes. In addition, it can be said that sports drinks are more preferred because they are more accessible than other ergogenic supports.

The protein powder used by athletes in this study is widely used by the athletes because it increases muscle hypertrophy and lean body mass by eliminating muscle damage (Vanderberghe et al., 1997). In a study conducted on athletes, it was determined that approximately one out of every 2 adolescent athletes uses protein powder (Yager and McLean, 2020). According to a study conducted on elite adolescent athletes, it was determined that males use protein powder more than females (Mettler et al., 2022). The results of this research show that the majority of the athletes using protein powder in this study are males and that the athletes are athletes in sports that require strength and power. Fish oil, another nutritional supplement used by adolescent athletes, is known to be used by elite athletes (Rosimus, 2018). The American College of Sports Medicine (ACSM) status statement does not include fish oil, and the International Olympic Committee (IOC) consensus statement includes the phrase 'limited support' for fish oil (Thomas et al., 2016). Vitamin C, another nutritional supplement, is an antioxidant vitamin, as well as a water-soluble vitamin involved in the synthesis of collagen, L-carnitine, and some neurotransmitters (Higgins et al., 2020). Vitamin E is widely used by athletes as it 'removes free radicals produced by mitochondria from the body' (Braakhuis and Hopkins, 2015). When the literature is examined, it is seen that vitamins C and E are mostly taken to protect and develop the immune system (Shakoor et al., 2021), and fish oil is preferred because it accelerates recovery during the rehabilitation period with its antioxidant effect (Lewis et al., 2020). Because the athletes in this study live in Karaman and the climate of Karaman is harsh, it can be thought that the athletes preferred fish oil, vitamins C and E to protect or strengthen their immunity.

In a study conducted in Türkiye, it is seen that the nutritional knowledge level of adolescent athletes is low (Çimen, 2021), the majority of athletes do not use ergogenic supplements, and those who use ergogenic supplements mostly prefer protein powder (Çamaşırcı, 2020). The lack of studies on the nutrition of adolescent athletes in the Turkish athlete population draws attention. An interesting result of this research is that the majority of athletes report that their coaches are not involved in the use of ergogenic support. In a study conducted on adolescent athletes, it was found that the athletes prefer to use ergogenic supports even though they know the harms, they know the effect of ergogenic supports thanks to their trainers, and the athletes do not know enough about the purpose of using ergogenic supports (Jovanov et al., 2019). The results of a meta-analysis show that athletes tend to use ergogenic support according to the behaviors of their trainers (Boardley et al., 2019).

In the relational analysis, a positive relationship was found between mental fatigue and physical fatigue, between physical fatigue and total fatigue, and between mental fatigue and total fatigue.

Movements involving whole body movements cause not only physical but also mental fatigue (Weavil and Amman, 2019). In a study conducted on elite adolescent athletes, they concluded that there is a relationship between physical and mental fatigue, but the resulting mental fatigue emerges as a structure that is largely separate from mental fatigue (Russell et al., 2020). There is a positive relationship between the physical and mental fatigue levels of the athletes in this study, which may be due to the fact that the athletes are not yet at the elite level. Another research result is that there is no relationship between athletes' total MET and physical, mental and total fatigue. Although the acute effect of physical activity creates fatigue in the person, it may actually contribute to the reduction of physical and mental fatigue by increasing the vitality of the person in the long run. In a study conducted on adults in 2019, it was observed that as the total MET levels of individuals increased, their general fatigue scores decreased (Yıldız, 2019). Although acute fatigue occurs after exercise, chronic fatigue is not expected in athletes when adaptation to training is ensured by paying attention to the relationship between loading, resting and nutrition. It can be said that the fact that the athletes in this study had a training history of at least 1 year may have positively affected this result.

The last result of the study is that the use of ergogenic support is not affected by the fact that the athletes are tired, not tired, and are in the inactive, active and very active groups. The energy requirements of adolescent athletes are different from those of adult athletes; It is known that they need nutrition suitable for sports (Bakırcan, 2021). Although the athletes in the research group in this study were active athletes in different sports branches, individual and team, physical and mental fatigue levels were found to be at normal levels. It is known that high perceived fatigue means that the next physical activity will be perceived negatively (Greenhouse-Tucknott et al., 2022). However, the fact that the relationship between the total MET scores and fatigue scores of the athletes in this study was not determined, it can be said that the trainers of the athletes paid attention to the relationship between loading and resting. In addition, the fact that the majority of the athletes in this study do not prefer to use ergogenic support may mean that the athletes do not need or are not aware of ergogenic support. It is difficult to make a clear conclusion about this, because no measurement has been made whether the athletes need physiological ergogenic support or not, and the scale for this has not been used. Whether the athletes used only ergogenic support, total MET scores and self-reported fatigue levels were determined with the help of the scale. In this respect, it can only be recommended that adolescent athletes need a different nutrition program due to the period they are in, and that the nutritional needs of athletes should be met with food rather than ergogenic supplements (Desbrow, 2021).

Conclusion

In conclusion, this study is the first to examine together the amount of ergogenic support use and total MET, physical and mental fatigue level, and other related factors that may affect the use of ergogenic support in adolescent athletes. It can be said that adolescent athletes do not prefer to use ergogenic supports. It can be thought that the reason for this was that the intensity and volume of strength training was not high enough to require the use of ergogenic support due to the age period of adolescent athletes. Although the physical and mental fatigue levels of adolescent athletes were high, it can be said that they pay attention to the relationship between loading and resting. In addition, the fact that adolescent athletes do not prefer to use ergogenic support even if their total MET levels were high may mean that trainers and athletes were conscious about this issue.

Suggestions

- Adolescent athletes can be informed so that athletes can benefit more from Athlete Training Centers.
- Trainers can be informed about ergogenic supports during in-service training, and athletes can be guided to use the right nutritional supplement.
- Adolescent athletes, especially in sports branches that require low body weight, can be provided with regular health screenings without showing signs of low energy deficiency.
- In order not to adversely affect the development of adolescent athletes in developmental age, the relationship between nutrition and rest can be followed by both the coach and family members after training.
- In order to prevent the use of wrong ergogenic support, a nutrition guide called the use of ergogenic support in athletes can be created and given to athletes through athlete training centers.
- This study can be expanded and made into a report by researching it on a whole Türkiye basis.

Limitations

- First of all, the first limitation of this study was that it was conducted on adolescent athletes in a particular province, so the results may differ when different regions and age groups change.
- Another limitation of the study was the lack of training content that would require adolescent athletes to use too much ergogenic support developmentally.
- Finally, the scales applied to adolescent athletes were based on the athletes' self-reports. The fatigue levels and daily energy expenditure amounts of athletes in any clinical setting have not been directly determined.

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