T.C.

YEDİTEPE UNIVERSITY INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

INVESTIGATING THE IMPACT OF NUTRITION EDUCATION GIVEN TO PARENTS ON ADOLESCENT SWIMMERS' CONSUMPTION HABITS AND NUTRITION KNOWLEDGE

MASTER THESIS

DİLARA SERARSLAN

İstanbul, 2021

T.C.

YEDİTEPE UNIVERSITY INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

INVESTIGATING THE IMPACT OF NUTRITION EDUCATION GIVEN TO PARENTS ON ADOLESCENT SWIMMERS' CONSUMPTION HABITS AND NUTRITION KNOWLEDGE

MASTER THESIS

DİLARA SERARSLAN

SUPERVISOR

Asst. Prof. Dr. İrem KAYA CEBİOĞLU

İstanbul, 2021

THESIS APPROVAL FORM

Institute : Yeditepe University Institute of Health Sciences

Programme : Nutrition and Dietetics

Title of the Thesis :Investigating The Impact of Nutrition Education Given to Parents on Adolescent Swimmers' Consumption Habits and Nutrition Knowledge

Owner of the Thesis : Dilara Serarslan

Examination Date : 25.06.2021

This study have approved as a Master Thesis in regard to content and quality by the Jury.

	Title, Name-Surname (Institution)
Chair of the Jury:	Asst.Prof.Dr. Binnur OKAN BAKIR (Yeditepe University)
Supervisor:	Asst.Prof.Dr. İrem KAYA CEBİOĞLU (Yeditepe University)
Member/Examiner:	Asst.Prof.Dr. Ayşe Hümeyra İSLAMOĞLU (Marmara University)

APPROVAL

This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation and has been approved by Administrative Board of Institute with decision dated ..... and numbered .....

Prof. Dr. Bayram YILMAZ

Director of Institute of Health Sciences

DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

DİLARA SERARSLAN

ACKNOWLEDGEMENTS

I am thankful to my supervisor Asst. Prof. Dr. İrem Kaya Cebioğlu for her great support on my both master and undergraduate degrees and what I learned about my occupation from her. Also, I am grateful to her for being a role model for me and a guide in my professional life.

I would like to thank my father Prof. Dr. Zahit Serarslan who support me with his academic knowledge and experience in this process and my mother Fitnat Serarslan for being there whenever I need motivation. And I also would like to thank my sisters for their unconditional love and support. I'm grateful to my whole family who has been supporting me throughout my life.

DİLARA SERARSLAN

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

WHO	Word Health Organization
BMI	Body Mass Index
GnRH	Gonadotropin-releasing hormone
LH	Luteinizing hormone
FSH	Follicle-stimulating hormone
PAL	Physical activity level
DNA	Deoxyribonucleic acid
RNA	Ribonucleic acid
ATP	Adenosine triphosphate
TUBER	Türkiye Beslenme Rehberi
SD	Standard deviation
min-max	minimum-maximum
g	gram
kg	kilogram
cm	centimeter
m	meter
kcal	kilocalories
n	sample size
p	probability value
h	hour
%	percent
±	plus-minus sign

ABSTRACT

Serarslan, D. (2021). Investigating the impact of nutrition education given to parents on adolescent swimmers' consumption habits and nutrition knowledge. Yeditepe University Institute Of Health Sciences, Department Of Nutrition And Dietetics, Master Thesis. Istanbul.

Healthy nutrition for adolescent athletes is important for both achieving ideal growth and optimum performance. As nutrition of the adolescence is usually the responsibility of their parents, the healthy nutrition program provided by the parents to their child is important for both growth, performance, and also to gain healthy consumption habits. This can be achieved if the parents have a high level of nutritional knowledge. This study aimed to evaluate the effects of sports nutrition education given to parents on the nutritional knowledge and consumption habits of adolescent athletes. The study was carried out in the swimming department of Galatasaray Sports Club with 60 volunteered athletes. At the beginning of the study, demographic information form, food frequency, and nutritional knowledge questionnaire for athletes were applied to the athletes. Immediately after data collection, nutrition education was given to the athlete's parents. Six weeks after education, questionnaires were applied to the athletes again. After education, there were statistically significant increases in the consumption of some foods such as eggs, pulses, nuts, vegetables, fruits, and bread in the dairy group ($p<0.05$). Also, there was a statistically significant increase in both general and sports nutrition knowledge levels ($p<0.05$). This study showed that parental education has positive effects on adolescent athlete's consumption habits and nutritional knowledge.

Keywords: Adolescent athlete, Parental education, Consumption habits, Nutrition knowledge

ABSTRACT (TURKISH)

Serarslan, D. (2021). Ebeveynlere verilen sporcu beslenmesi eğitiminin adölesan yüzücülerin beslenme bilgi düzeylerine ve tüketim alışkanlıklarına olan etkisinin incelenmesi. Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik Bölümü, Master Tezi. İstanbul.

Adölesan sporcular için sağlıklı beslenme, hem ideal büyümeye ve gelişmeye hem de optimum performansa ulaşmak için önemlidir. Adölesanın beslenmesi genellikle ebeveynlerin sorumluluğunda olduğundan, ebeveynlerin çocuklarına sundukları sağlıklı beslenme planı hem büyüme, hem performans hem de sağlıklı beslenme alışkanlıklarının kazandırılması açısından önemlidir. Bu durum, ebeveynlerin yüksek düzeyde beslenme bilgisine sahip olması ile başarılabilir. Bu çalışmanın amacı ebeveynlere verilen sağlıklı beslenme eğitiminin adölesan sporcuların beslenme bilgi düzeyine ve tüketim alışkanlıklarına olan etkisini değerlendirmektir. Çalışma, Galatasaray Spor Kulübü yüzme şubesinde, 60 gönüllü sporcu ile gerçekleştirilmiştir. Araştırmanın başında sporculara demografik bilgi formu, tüketim sıklığı ve sporculara yönelik beslenme bilgisi ölçme anketi uygulanmıştır. Verilerin toplanmasının hemen ardından sporcunun ebeveynlerine sağlıklı beslenme eğitimi verilmiştir. Eğitimden altı hafta sonra sporculara anketler tekrar uygulanmıştır. Eğitim sonrası süt grubunda, yumurta, bakliyat, yağlı tohum, sebze, meyve ve ekmek gibi bazı besinlerin ve besin gruplarının tüketiminde istatistiksel olarak anlamlı artışlar saptanmıştır ($p<0.05$). Ayrıca sporcuların beslenme bilgi düzeylerinde de istatistiksel olarak anlamlı artışlar saptanmıştır ($p<0.05$). Bu çalışma, ebeveyn eğitiminin adölesan sporcuların tüketim alışkanlıkları ve beslenme bilgileri üzerinde olumlu etkiye sahip olduğunu göstermiştir.

Anahtar Kelimeler: Adölesan sporcu, Ebeveyn eğitimi, Tüketim alışkanlıkları, Beslenme bilgisi

1. INTRODUCTION

The purpose of the adolescent athletes' nutrition is to support their maximum performance in the sport they are interested in by fulfilling all the energy and nutrients needed according to age, sex, and physical activity level, and to achieve the growth and development targeted for them like all other peers (1,2). There are three fundamental rules in sports nutrition. The first of these is ensuring fluid balance. The second rule is maintaining the energy balance. The third fundamental rule is stated as promoting recovery by filling the energy stores discharged after exercise. When these rules are followed in adolescent athlete's nutrition, the risk of illness decreases, weight control, and growth-development goals are achieved, sports performance improves (1).

Swimming represents a sport that requires high training commitment to reach individual performance goals. Most swimmers start practicing high-volume swimming training early in adolescence. Nutritional requirements increase due to both growth and development and intensive training program. Therefore, the importance of an adequate and balanced diet in adolescent swimmers is increasing (3,4).

It is essential to reach parents in interventions to guide adolescents to a healthy diet. Because compared to adult athletes, it is believed that young athletes get support from their parents in matters such as food selection, preparation, and access to food. Hence, parents are seen as the target education group for sports nutrition (5). The importance of nutritional education given to athletes and their parents is also highlighted by international sports organizations such as the International Olympic Committee, Australian Athlete Dietitians (3,6). Studies conducted to evaluate the effectiveness of parental education show that this intervention has a positive effect on the adolescent's food preferences, nutritional knowledge level, nutritional regulation, and anthropometry measurements (7,8,9,10).

Consequently, the parents of adolescent athletes having a high level of knowledge on sports nutrition, encouraging their children to apply the principles of sports nutrition, helping them access food, transferring their knowledge to their children; will contribute to the performance of the athlete, reduce the risk of injury and will be important preparation for the years of adult sportsmanship (11,12).

This study aimed to evaluate the effect of sports nutrition education given to parents on the nutritional knowledge and consumption habits of adolescent athletes. Although studies evaluating the effectiveness of nutritional education given to parents are common, similar to these studies are not common in sports nutrition. Therefore, this study may contribute to filling the literature gap in sports nutrition. Also, this study will help determine whether parental education is an appropriate intervention to improve consumption habits and increase the nutritional knowledge levels of adolescent athletes.

2. LITERATURE REVIEW

2.1. Adolescence

The World Health Organization (WHO) stated the adolescence is the phase of life from ages 10 to 19 between childhood and adulthood (13). Although age restrictions are strived to be determined for the adolescent period, it is quite challenging to include this period in a sharp age group. This is because the process of change in this period is affected by many factors grouped environmentally and individually (11,14). Hence, there are different opinions about the age range and general characteristics (15). For example, it is stated on the website of the Ministry of Health of the Republic of Turkey, the General Directorate of Public Health, and in Turkey Dietary Guidelines that adolescence covers children between the ages of 12-18 (16,17).

Adolescence represents a critical phase of development and a prominent time for laying the foundations of health. During this period, adolescents experience rapid physical, sexual, cognitive, and psychosocial growth. While physical growth and sexual development refer to puberty, psychosocial developments are also experienced in adolescence in addition to puberty. Adolescence development is affected by many factors like as race, sex, environmental factors, familial characteristics, and diet. Hence, it differs individually (15,18).

2.1.1. Physical Changes During Adolescence

In adolescence, physical growth and development gain speed. Anthropometric measurement values in adulthood are reached in a short period of 3-5 years on average. Internal organs and glands grow, serious increases are observed in bone, muscle, and fat tissues. The development of secondary sexual characteristics (pubic hair growth, breast development, testicles, and penile growth) is one of the major changes that occur during adolescence. In this period, in contrast to the general growth and development, the size of the thymus, tonsils, adenoids, and other lymphoid tissues regress (15,19).

The specific acceleration in growth, which starts at any age between the ages of 11-16 and typically lasts for 2-3 years, is called a "pubertal growth spurt". Growth spurt starts on average between the ages of 10-12 in girls and between 11-14 years in boys (15,16). In addition, the height growth rate reaches its maximum during the attack period

and this period is called the peak height velocity. It usually occurs two years earlier in girls than in boys. At puberty, the men grow approximately 26-28 cm, whilst the women grow approximately 23-28 cm, 20-25% of adult height is reached during this period. While the height and weight gains grow together in men, the weight in women grows approximately 6 months after the height. Approximately half of the weight in adulthood is gained in the growth spurt. Subcutaneous fat decreases in both boys and girls at the beginning of adolescence, while an increase in adipose tissue is observed in both sexes, more in girls, in subsequent periods. The rate of increase in muscular tissue reaches its highest value simultaneously with menarche in girls and the peak of growth in height in boys, and the increase in muscle tissue in boys is higher than in girls (19).

The most reliable indicator in evaluating a child's health status is the evaluation of percentile values specific to their country. The child's height, weight, and body mass index values are checked according to their age and sex. Table 2.1, Table 2.2, Table 2.3 show the weight, height, and BMI values percentiles of children aged 10-14, specific to Turkey.

Table 2.1 Bodyweight percentile values (kg)

Men								Women						
3	10	25	50	75	90	97	Age	3	10	25	50	75	90	97
23.6	25.9	28.6	32.2	36.7	41.6	47.8	10 year	23.0	25.6	28.7	32.6	37.3	42.3	48.0
26.6	29.6	33.1	37.8	43.6	50.0	57.8	11 year	26.4	29.6	33.4	38.2	43.7	49.5	55.9
29.9	33.8	38.4	44.3	51.3	58.7	67.1	12 year	32.0	35.8	39.9	45.1	50.9	56.8	63.1
33.4	38.0	43.2	49.8	57.3	64.9	73.3	13 year	37.4	41.1	45.1	50.0	55.5	60.8	66.6
39.1	44.0	49.4	56.2	63.9	71.6	80.1	14 year	41.6	45.0	48.8	53.3	58.3	63.2	68.5

Source: (20)

Table 2.2 Height percentile values (cm)

Men								Women						
3	10	25	50	75	90	97	Age	3	10	25	50	75	90	97
126.4	130.0	133.6	137.6	141.6	145.2	148.7	10 year	125.8	129.6	133.5	137.9	142.2	146.1	150.0
131.7	135.5	139.4	143.8	148.1	152.0	155.9	11 year	132.5	136.6	140.8	145.4	150.1	154.2	158.3
137.0	141.3	145.7	150.6	155.4	159.8	164.1	12 year	141.1	144.9	148.8	153.1	157.4	161.2	165.1
142.8	147.6	152.4	157.7	163.1	167.9	172.6	13 year	146.6	150.2	153.8	157.8	161.8	165.5	169.0
150.3	155.0	159.7	164.9	170.1	174.8	179.5	14 year	149.3	152.8	156.4	160.4	164.3	167.9	171.4

Source: (20)

Table 2.3 Body mass index percentile values (kg/m^2)

Men								Women						
5	15	25	50	75	85	95	Age	5	15	25	50	75	85	95
14.1	15.1	15.7	17.1	18.9	20.1	22.5	10 year	13.9	14.9	15.6	17.1	19.0	20.2	22.6
14.6	15.8	16.5	18.2	20.4	21.7	24.5	11 year	14.5	15.6	16.4	18.0	20.0	21.3	23.8
15.2	16.5	17.4	19.3	21.7	23.1	26.0	12 year	15.3	16.5	17.3	19.0	21.1	22.3	24.8
15.6	17.0	18.0	19.9	22.3	23.7	26.5	13 year	16.3	17.5	18.3	19.9	21.9	23.1	25.4
16.4	17.7	18.6	20.5	22.8	24.2	27.0	14 year	17.1	18.3	19.0	20.6	22.5	23.6	25.8

Source: (20)

Adolescence is also characterized by rapid skeletal growth. Approximately 37% of the total bone mass in adulthood is gained during this period. Bone mineral content and density increase rapidly and peaks in both sexes through puberty. In particular, it is emphasized that there is no increase in bone mineral density after the age of 20. Hence, the only time period in which bone quality can be increased is adolescence (15).

2.1.2. Hormonal Changes During Adolescence

Puberty begins with an increase in the frequency and amount of nighttime oscillations of gonadotropin-releasing hormone (GnRH) in the hypothalamus. GnRH activity enables the release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) from the pituitary, thus initiating the growth and maturation of the gonads. Both hormones increase height growth. Girls begin showing signs of sexual maturation 6 months after FSH and LH reach pubertal levels. FSH stimulates the growth of the ovarian follicle and the release of estrogenic hormones. LH is responsible for the regulation of ovulation, corpus luteum formation, progesterone production, androgen production by theca cells, and estradiol production after ovulation. With ovarian estradiol, breast growth begins, and pubic hair growth begins with adrenal androgens. In boys, LH stimulates testicular maturation and testosterone production by triggering Leydig cells (19,21).

2.2. Nutrition in Adolescence

Nutrition represents the ability of a person to take and use the elements necessary for growth, development, healthy and productive life for a long time. Particularly in infancy, childhood, and adolescence, growth is one of the factors that affect development the most. Adolescence is the period in which growth, development, and nutritional needs

are the highest among these three developmental stages. Physical changes during this period also alter the body's nutritional requirements (22). Adolescents need to be able to fulfill their energy and nutrient needs in an adequate and balanced manner to achieve ideal growth and development. An adequate and balanced diet means the intake of nutrients providing the body with energy, protein, carbohydrate, fat, vitamins, and minerals, and to achieve this, it is necessary to increase the variety of nutrients in the diet. Distinctly fruits, vegetables, and foods containing protein should be consumed every day, and consumption of foods and beverages with low nutritional value and high energy value should be limited (16).

Adolescents developing the habit of healthy eating and lifestyle is essential for them to be healthy individuals in adulthood (16,18). If the nutrition is not sufficient and balanced in childhood and adolescence, it may lead to prominent chronic diseases in adulthood. The risk of developing diseases like osteoporosis, obesity, hyperlipidemia, delayed sexual maturation, cardiovascular diseases, and cancer increases in the future due to inadequate or malnutrition in adolescence (22).

2.2.1. Energy Need in the Adolescence

The energy requirement in adolescence increases considerably compared to childhood. Particularly adolescents with a high level of physical activity and performing in competitive sports have much more energy requirement than their peers with moderate activity levels (See. Table 2.4., Table 2.5.). If energy and nutrients are not sufficiently in the diet, it may cause delays in puberty in adolescents and lower growth-development levels compared to their peers (22).

Table 2.4 Energy requirements and energy reference values according to physical activity levels for boys and adolescents

Age (year)	Resting energy expenditure (kcal/day)	Total energy expenditure (kcal/day)			
		Less active (PAL:1.4)	Moderately active (PAL:1.6)	Active (PAL:1.8)	Very active (PAL:2.0)
10	1150	1621	1851	2081	2311
11	1217	1716	1959	2203	2446
12	1300	1832	2091	2352	2612
13	1402	1976	2257	2537	2818
14	1519	2142	2446	2750	3053
15	1627	2294	2619	2945	3270
16	1711	2412	2755	3097	3439
17	1771	2498	2852	3206	3560
18	1813	2556	2919	3282	3644

Source: (16)

Table 2.5 Energy requirements and energy reference values according to physical activity levels for girls and adolescents

Age (year)	Resting energy expenditure (kcal/day)	Total energy expenditure (kcal/day)			
		Less active (PAL:1.4)	Moderately active (PAL:1,6)	Less active (PAL:1.4)	Very active (PAL:2,0)
10	1105	1559	1780	2001	2222
11	1161	1638	1870	2102	2334
12	1224	1725	1970	2215	2460
13	1282	1808	2064	2320	2577
14	1329	1873	2139	2405	2671
15	1359	1917	2189	2460	2732
16	1379	1944	2220	2495	2771
17	1390	1959	2237	2515	2793
18	1399	1972	2252	2532	2812

Source: (16)

2.2.2. Nutrient Element Need in the Adolescence

Nutrients can be divided into two categories: macronutrients and micronutrients. Macronutrients consist of proteins, carbohydrates, and fats consumed in large amounts in the daily diet and provide energy to the body. Micronutrients contain vitamins and minerals that are necessary and sufficient to be taken into the body, despite their low intake (16). Proteins constitute the fundamental structure of the cell and take part in vital functions such as the functioning of organs, growth and development, and tissue repair. The need increases with body development in adolescents. The average protein requirement of adolescents is 45-60 g/day. When sufficient intake cannot be achieved;

decreases in growth, sexual maturation, and lean body mass are observed. Carbohydrates constitute the primary source of energy in the body. 50-60% of the daily energy in the diet should be provided from carbohydrates. The adequate intake of fats in the diet is essential for providing the body with ideal energy, for the intake of essential fatty acids and fat-soluble vitamins into the body, and for the production of some hormones. 25-30% of daily energy in the diet should come from fat (22). Micronutrients help macronutrients to perform the necessary functions in the body. Vitamins and minerals play prominent roles in energy metabolism in the body, in the production of blood cells, in the immune system, in bone formation, in the prevention of body cells damage, and in reducing the effects of some harmful substances. Thus, a balanced intake of macro and micronutrients into the body is necessary for the protection of general health, growth, and development (16,22). In general in adolescents; sufficient intake of calcium and vitamin D for bone development, iron for oxygen transport to developed muscle cells and energy production, zinc for general growth and sexual development, vitamin A for reproduction, growth, support of the immune system, and vitamin E due to its antioxidant properties. The adequate intake of vitamin C is essential for the synthesis of collagen and other connective tissues, and a sufficient intake of folate is necessary for DNA, RNA, and protein synthesis. Particularly Vitamin D, calcium, iron, and iodine deficiencies are observed in this period in Turkey (16,22).

2.3. Physical Activity in The Adolescence

Due to factors such as technological developments and urbanization in recent years, our daily life has gradually become inactive. Particularly the young population has adapted rapidly to this sedentary life (23-25). Sedentary life is a risk factor for the development of non-communicable metabolic diseases and a prominent global public health problem (23,26). Reducing risk factors is essential for a long and healthy life, and one of the ways to reduce the risk of metabolic diseases is to increase physical activity (23-25).

Physical activity is expressed as the activity in which the individual spends energy by activating the musculoskeletal system. The insufficiency of all this activity is inactivity (27). Regular physical activity is defined as exercise and includes regular, repetitive body

movements. Exercises to increase flexibility, muscular strength and endurance, and cardiorespiratory endurance should be used frequently in adolescence (28).

Many studies have indicated the positive effects of regular physical activity, in other words, exercise, on health (23,29,30). Exercise reduces the risk of chronic diseases in adulthood by preventing the person from feeling good and gaining an active life habit in adulthood, as well as maintaining general health, growth, and development, decreasing the risk of osteoporosis in the future by increasing bone mineral density and protecting from overweight and obesity (28). Although these positive effects are recognized, studies conducted around the world revealed that 80% of adolescents could not reach the minimum physical activity level for 60 minutes a day, which is recommended by the WHO (31-33). In a meta-analysis study conducted in recent years, it has been reported that the high levels of physical activity achieved in adolescence showed significant reductions in cardiometabolic disease risk factors, including waist circumference, blood pressure, triglyceride, and insulin levels, and is associated with a reduced risk of some types of cancer (34). In addition, it has been reported that participation in physical activity decreased symptoms of depression and anxiety in children and adolescents, and it is also associated with mental health functions such as enhanced cognitive functions and increased self-esteem (35). With the participation of adolescents in physical activity, they can achieve positive results such as socialization, getting away from stress and anxiety, as well as being physically healthy. When they make them a part of their lifestyles, they will be able to reduce the risks of the diseases they may encounter in adulthood and enable them to have a better quality of old age. Hence, it is greatly prominent to participate in appropriate physical activity in adolescence when lifelong habits are acquired and to make this behavior a habit (23). Walking, running, swimming, basketball, volleyball can be given as examples of exercises to be performed in adolescence (28).

2.3.1. Swimming

Swimming is an individual or team racing sport that requires the use of one's arms and legs to move through the water. It is an extremely suitable exercise for health promotion and disease prevention and is one of the most popular, most applied, and recommended forms of physical activity today (36). Competitor swimming sport; while it can be performed individually or as a team in the pool, sea, and lake, the competitions take place in two different pool types called long course (50 meter pool) and short course

(25 meter pool). Competitive swimmers compete in five individual styles: butterfly, backstroke, breaststroke, freestyle, and individual medley. In addition to individual styles, there are moreover relay races in which swimmers compete as a team (37).

Swimmers in competitions held in long courses compete in a total of seventeen different branches, including fourteen individual races and three relay races. In the short course; the competitors compete in seventeen styles, and 100 meters of the individual medley (See Table 2.6). This style is typically included in the programs of small-scale competitions held between sports clubs for swimmers under the age of 14. Despite minor changes, competitions have been organized within the framework of these rules for the last 30-40 years (37). The branches in which swimmers will compete are determined according to the body structure and individual ability of the swimmer.

Competitive swimming sport is a cyclical activity based on completing the given distance in the shortest time. Speed is, consequently, an important component and is directly related to muscle strength. Average swimming speed is revealed as a result of the kick and arm pull during swimming (38,39).

Table 2.6 17 styles in swimming

Swimming styles	Distance
Freestyle	50-meter, 100-meter, 200-meter, 400-meter, 800-meter, 1500-meter
Backstroke	50-meter, 100-meter, 200-meter
Butterfly	50-meter, 100-meter, 200-meter
Breaststroke	50-meter, 100-meter, 200-meter
Individual Medley	100-meter (short course only), 200-meter, 400-meter
Relay Races	4 × 50-meter freestyle (only short course), 4 × 100-meter freestyle, 4 × 200-meter freestyle, 4 × 50-meter mixed (only short course), 4 × 100-meter mixed

Source: (37)

2.3.1.1. Energy Systems Used in Swimming

Energy is defined as the ability to do work. Adenosine triphosphate (ATP) is the primary energy source in the body. ATP is used to contract the muscle fibers and to exert force. However, muscle cells can store a limited amount of ATP. Consequently, the muscle cell produces ATP to continue working and performing. In the muscle cell; ATP

is produced by 3 different energy systems called creatine phosphate, anaerobic glycolysis, and aerobic system (40).

The aerobic system is the pathway through which ATP is produced using oxygen. In this energy system, ATP is obtained by the oxidation of free fatty acids or glucose in the cell mitochondria while it is at rest. It is the energy system used predominantly in low-intensity exercises exceeding 10 minutes (40).

Creatine phosphate and anaerobic glycolysis systems are used primarily when the amount of oxygen in the cell is insufficient. The creatine phosphate system provides the fastest production of ATP, which is necessary for the muscles. It is the pathway that takes less than ten seconds, requires explosive force, and rapidly provides energy to the muscle at a very high-intensity activity. In anaerobic glycolysis, energy is obtained from glucose in an oxygen-free environment. This pathway results in a lactic acid deficit. Increased lactic acid density causes muscle fatigue. This system is mainly used in vigorous exercises lasting 2 minutes. While ATP production from these two systems occurs inside the cell but outside the mitochondria, oxygen is not used in either of them (40).

In swimming, the duration of the competition branches ranges from 20 seconds (50 m) to 15.5-16 minutes (1500 m). Hence, all three energy systems are used for energy generation in swimming performance. Their predominant use varies depending on the length of the competition branches. In a 200 meters swimming race the aerobic energy system accounts for 65% of the energy production, while in a 400 meters competition, it accounts for approximately 81% of the energy production. In shorter races (50 and 100 m), the aerobic system contributes only 15.3%, and 33% of the energy production, respectively. Because short distance swimming branches are high-intensity short-term activities, energy recovery from creatine phosphate and anaerobic glycolysis pathways, which provide faster energy recovery, is predominantly used (41,42).

2.3.1.2. Competitor Swimming and Training Programs in Adolescents

Swimming, which is one of the most recommended exercises in adolescence, is practiced by adolescents as a competitive sport both in recreational and professional terms. Competitive adolescent swimmers usually train 11 months of the year. While the swimmers, who are in the early adolescence, swim 3000-4000 meters a day during the season, this distance increases to 5000-6000 meters as they get older. These swimmers

implement high-intensity and long-distance training programs that last 1.5-2 hours in the pool to gain endurance and improve their strength during the season. In addition to pool training, there are resistance and cardio training called land training outside the pool for better performance and development (38,43-45).

Achieving success in competitive swimming depends on many factors. The anthropometric and physiological characteristics and technical skills of the athlete and having a morphological, anatomical, and physiological structure suitable for swimming make it easier to reach potential successes that can be obtained in the future (38,46).

In pre-adolescence, athletes exhibit various physical characteristics and body composition compared to adults. In adolescence, an increase in sports performance is observed due to growth and development (38,47). Having appropriate anthropometric measurements in this period is possible with a balanced and regular diet. Considering the increased energy and nutrient needs particularly due to intense training, an appropriate diet should be provided to the athlete (3).

2.4. Nutrition in Adolescent Athletes

Nutrition means the ability of a person to take and use the elements necessary for growth, development, healthy and productive life for a long time. An adequate and balanced diet is the provision of sufficient energy to the body with ideal nutrients (16). The purpose of the nutrition of adolescent athletes is to support their maximum performance in the sport they are interested in by fulfilling all the energy and nutrients needed according to age, sex, and physical activity, and to achieve the growth and development targeted for them like all other peers (1,2). In athletes who have adequate and balanced nutrition, the risk of illness decreases, weight control is achieved, mental performance remains at the optimum level, growth-development goals are achieved, the maximum level of bone mass can be reached, sports performance improves, and recovery processes after training and competition are accelerated. In case of insufficient and unbalanced nutrition; some problems in the growth-development and normal functioning of the body, decrease in performance, decrease in immunity, focus in the athlete, memory problems are encountered (1,48).

There are three fundamental rules in sports nutrition. The first of these is ensuring fluid balance. The purpose of this application is starting exercise hydrated, compensating dynamically for water and electrolyte losses during and after exercise, and protecting

from dehydration. The second rule is maintaining the energy balance. It includes starting exercise with full energy stores and maintaining energy intake during exercise if necessary, and then refilling energy stores. The third fundamental rule is stated as promoting recovery by filling the energy stores discharged after exercise, repairing muscle damage, and replacing fluid-electrolyte losses (1).

2.4.1. Energy Need in Adolescent Athletes

The key point in sports nutrition is to fulfill the energy to be consumed during the training with a daily diet. Daily energy need varies according to the sex, height, weight, age, daily eating habits, physical activity level, social and cultural habits of the person. Particularly as the activity level increases, the energy need increases, and this need also vary based on the type of activity. For example, in endurance sports (long-distance swimming, marathon, cycling, triathlon, etc.), athletes must perform at medium intensity for a long time, while in strength and weight sports (gymnastics, weightlifting, boxing, wrestling); they should perform at high intensity in a limited time, which can last from a few seconds to three minutes. The energy systems used predominantly in various activities and the nutrients and energy needs used to obtain energy with these systems are different (1,49).

2.4.2. Macronutrient Need in Adolescent Athletes

One of the most prominent purposes in sports nutrition is to fulfill the daily sufficient energy needs of the athlete with his diet (1). As for macronutrients; they consist of proteins, carbohydrates, and fats that fulfill this energy need (1,16). The correct consumption amounts and timings of these items help the athlete to start training with high energy and to recover ideally after training. Hence, an adequate intake is essential for adolescent athletes to present optimum performance. In addition, they are essential for ideal growth and development (3).

2.4.2.1. Carbohydrate Need in Adolescent Athletes

Carbohydrates are the primary source of energy. Proper consumption of carbohydrates and replenishment of stores are essential for brain functions and for providing exercise fuel. The carbohydrate stores in the body (liver and muscle glycogen, blood glucose) are limited and are insufficient to meet the energy needs of many athletes

during training or competitions. Replenishment of store is provided by daily carbohydrate intake and interval. It is recognized that particularly carbohydrates are taken as soon as possible after the performance play a prominent role in starting the renewal of the stores. It is recommended for each athlete to consume enough carbohydrates to meet the energy needs arising from the training load, the general rules are scaled according to body size (See. Table 2.7).

Table 2.7: Carbohydrate consumption according to daily time frames

Need for fast recovery after training	1–1.2 g/kg/h
Daily need	Low-intensity or skill-based activity
	3-5 g/kg/day
	Moderate exercise program (For example: 1 hour/ day)
	5 - 7 g/kg/day
	Endurance program (For example: 1-3 hours/day)
	6 - 10g/kg/day
	Extreme commitment (For example: 4-5 hours/day)
	8 - 12 g/kg/day
	Short time, 0-75 minutes
Need during training	Not required or in very small amounts
	Medium/long time, 75 min-2,5 hours
	30-60 g/h

Source: (3,50)

2.4.2.2. Protein Need in Adolescent Athletes

Adequate protein intake is important for the supply of essential amino acids and growth. In particular, high-quality proteins, taken daily in sufficient amounts, divided into certain intervals, play a role in increasing lean body mass. Intake of adequate energy and carbohydrate is also significant to fulfill adequate protein needs. Because, in insufficient energy intake, proteins are used for energy production. Protein requirement in adolescents is calculated according to the body size of adolescents depending on the protein turnover required for the growth and development of lean body mass. While the daily protein requirement in adolescent boys is between 0.94 g/kg and 0.99 g/kg, it varies between 0.77 g/kg and 0.87 g/kg in girls. This amount is increasing in adolescent athletes. Nevertheless, it is not possible to determine the exact need. Hence, it is disputed that the best approach is to follow the recommended reference intervals for adult athletes, and the daily protein

requirement for adolescent athletes has been reported as 1.3-1.8 g/kg. In some cases, it is debated that the amount of protein taken can be increased to 2.2-2.4 g/kg with a daily diet. In addition, it is recommended that this amount of protein be consumed by dividing the daily meals evenly (1,3)

2.4.2.3. Fat Need in Adolescent Athletes

Ideal fat intake in the daily diet for the adolescent athlete; the adequate intake of fat-soluble vitamins and essential fatty acids is prominent for supporting growth and development and ensuring adequate energy intake. Although fats produce some positive effects on health; since excessive fat consumption in the diet can cause obesity and various long-term health problems, the consumption of fat by adolescent athletes should be in accordance with public health rules. Additionally, the daily fat requirement of athletic adolescents is the same as their non-athletic peers. Hence, the fat consumption of adolescent athletes should be determined by the amounts found in the public health guidelines of the countries. It should constitute 20-35% of the total energy in the daily diet, and the rate of trans fat and saturated fat they consume should be limited to less than 10% of their daily energy, particularly to protect against health problems that may arise in the long term. Plant-based and fish-based unsaturated fats should be predominantly included in the diets of adolescents compared to saturated ones (1,3,16).

2.4.3. Need for Micronutrients in Adolescent Athletes

Micronutrients perform identical functions in athletes and non-athletes. In current sources, it is mentioned that the need for vitamins does not increase with exercise in young athletes. In studies conducted with adult athletes, it has been reported that exercise does not cause an increase in mineral (sodium, potassium, magnesium) requirements, except for those lost with sweat. It is included in the suggestions that children and adolescent athletes have a lower sodium content of sweat than adults, but sodium loss may be different for the individuals and should not be ignored completely (1,51).

Hence adolescent athletes often require multivitamin and mineral supplements. Nevertheless, studies have shown that vitamin supplements do not have a positive effect on growth, lean body mass, and physical performance in healthy and well-nourished youth. Adolescents having an adequate and a balanced diet do not need the supplements as they receive sufficient vitamins and minerals from dietary sources (1,51). Nevertheless,

deficiencies of iron, calcium, and vitamin D are known to have negative effects on performance. Iron deficiency anemia is the most common nutrient deficiency in the world. The prevalence of iron deficiency anemia in athletes has been reported to be similar to that of non-athletes at approximately 3%. In studies with adolescent athletes, decreased iron stores are often observed without clinical symptoms. This is particularly true for women athletes doing endurance sports. Results from food consumption studies in adolescent athletes reveal that men athletes, in general, exceed the recommended amount of iron in the daily diet. Daily recommended amounts of iron intake is prominent for athletes to keep their health and performance at an optimum level (See Table 2.8) (1,3).

Calcium and vitamin D play a significant role in skeletal development and maintenance. Adolescence is a critical time for bone building. In this period; in the presence of appropriate and sufficient minerals, bone mineral density can reach the highest levels. The ideal bone mineral density helps to reduce the risk of osteoporosis in later years. During this period, the need for calcium increases due to significant bone growth in both boys. It is estimated that the rate of skeletal calcium accretion in adolescence is approximately 300 mg per day (3,52). Considering urinary losses and net calcium absorption from food being approximately 25-35%, the recommended calcium intake for adolescents is 1150-1300 mg per day. Although vitamin D is taken into the body with some foods in the daily diet; most people get most of their vitamin D through exposure to sunlight. Hence, dietary recommendations for vitamin D change due to differences in sun exposure. When evaluated in general, the daily vitamin D requirement of adolescents is 100 mcg/day (3,16). Particularly adolescent athletes with little sun exposure, training in indoor sports areas, and taking protective measures against the sun when they are outside carrying the risk of vitamin D deficiency. It is very significant for these athletes to regularly monitor their vitamin D levels and use supplements if there is a deficiency in the maintenance of bone health and optimum performance (3).

2.4.4. Hydration Requirement in Adolescent Athletes

Although extensive research has not been conducted on the fluid need in children and adolescents, it has been reported that the daily fluid needs between the ages of 6-11 are 1.6 liters. (53). Children and young people are more sensitive to heat than adults. They

show less tolerance than adults during exercise in hot and dry weather. Because the ratio of surface areas to body mass is higher and they absorb more heat from the environment than adults. In addition, it is recognized that sweating capacity is more limited in children and that agonist and antagonist muscles spend higher energy for the same task than adults and generate more metabolic heat per body mass due to incompatible contractions in this age group during physical activity (1,3,53). Consequently, cold and suitable fluids (water, milk, etc.) should be provided in sufficient quantities before, during, and after training to maintain optimum hydration, heat, and performance levels, adolescent athletes (3). Although it has been reported that the amount of sweating in a moderate exercise in a hot environment in girls and boys is between 500-600 ml/hour, athletes should be informed to be aware of their own fluid loss, as individual sweating rates may differ (3,53). This loss should be determined with weight control before and after training, and the loss should be replaced during and after training (3). In addition, the observation of urine color and individual monitoring of fluid balance should be taught to adolescent athletes (1). Pale yellow, abundant and odorless urine is an indicator of sufficient fluid consumption (1,53). Before starting exercise, they should be fully hydrated and should be ensured to drink 15-20 ml of fluid every 150-200 minutes during exercise. If exercise takes longer than 90 minutes, chilled fluids with balanced electrolyte content and carbohydrate content (4-8%) should be consumed (1).

2.4.5. Factors Affecting the Nutritional Habits of Adolescents and Athletes

Adolescence is the period in which physiological, psychological, and social development is rapid, life-long behaviors occur to a large extent, and the individual is most suitable for acquiring knowledge and habits (13). The nutritional habits gained in this period are largely determining the nutritional habits and health status to be followed for the rest of life. Many factors affect the food preferences and eating behaviors of adolescents, grouped environmentally and individually (See Figure 2.1).

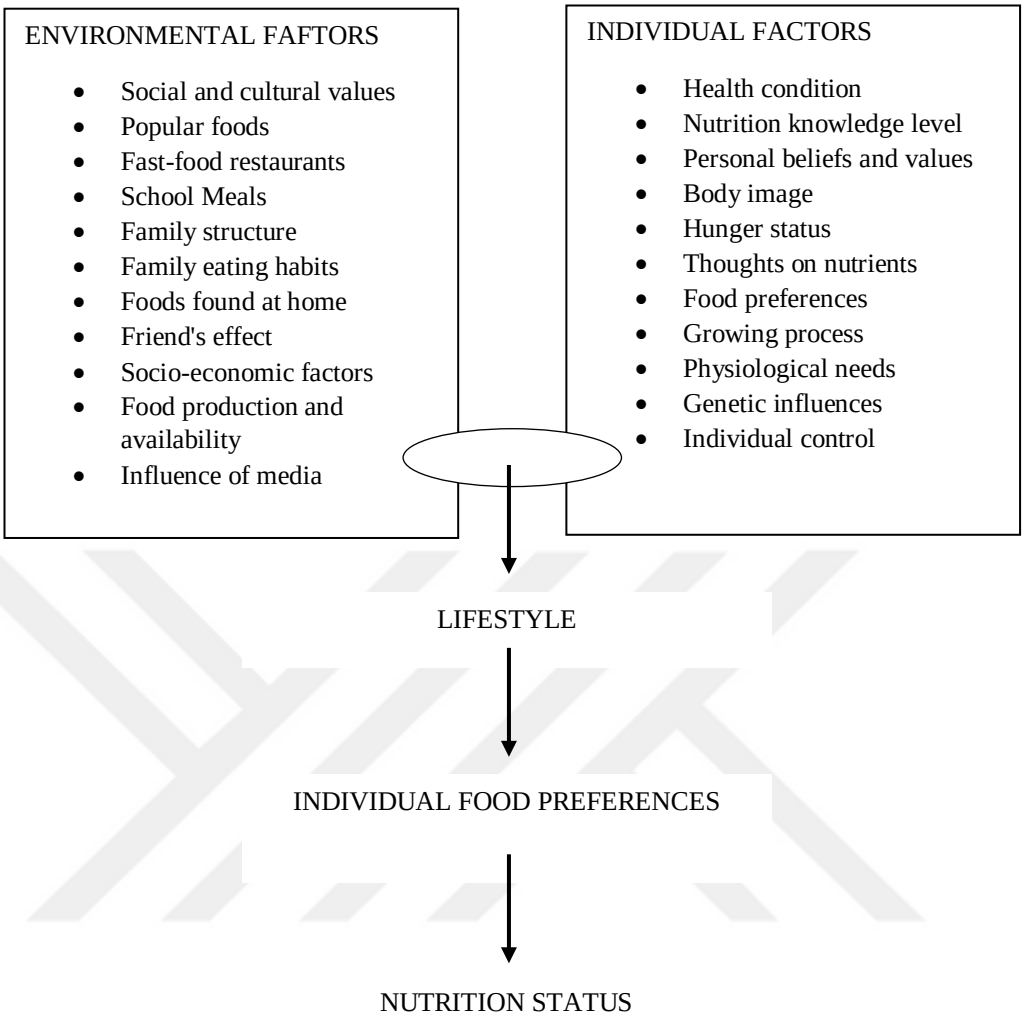

Figure 2.1: Environmental and individual factors affecting food preferences and eating behaviors in adolescents

Source: (11,14)

Adolescence is critical for an individual to establish a lifelong relationship with food. It is particularly important in terms of the connection between diet, exercise, and body perception. The adoption of vegetarian nutrition, the implementation of popular diets, and the use of food supplements are also predominantly shaped during this period (3,13).

Adolescent athletes follow a diet plan created with the selection of appropriate foods and fluids, helping to maximize their training adaptation. Hence, athletes should make food choices that will positively affect both their performance and their health.

Various factors affect these preferences. Physiological and biological factors such as hunger, appetite, basal metabolic rate, amount of lean mass in the body, presence of gastrointestinal disorders; social-environmental factors such as lifestyle, beliefs, nutritional knowledge level, body perception, weight control, nutritional habits of the family, nutritional knowledge and transfer of trainers, peers' preferences, access to food, economic factors such as cost and income affect the nutritional habits and food preferences of the adolescent athlete (54). Nevertheless, although there are many factors affecting food preferences, it is known that the nutritional knowledge, culture, and habits of parents or family members have a fundamental effect on the formation of the food preferences and eating behaviors of the adolescent, considering adolescent athletes receive care from either their parents or an adult family member in daily life (11,55).

2.5. Effects of Parents on The Nutrition of Adolescent and Athlete

It is usually the responsibility of their parents to feed individuals at the beginning of childhood and adolescence. Parents and family members have a fundamental effect on the individual's eating habits, eating behaviors, and food choices (11,55). During this period, the family plays a major role in gaining lifelong nutritional habits. Particularly the family's eating together as a family is one of the most prominent factors determining the nutritional status of the adolescent. In addition, the contents of the meals consumed, the type of food available at home, the availability of fresh food at home, the frequency of the family eating outside, the attitudes and behaviors of parents towards eating with food consumption habits also affect the nutritional habits of adolescents. Families forcing children to eat certain foods, restrictions against certain foods, and being an example and model also amend children's eating habits and body weights (56,57). In a study conducted with 10-14 age group adolescents and their parents; it has been ascertained that the foods preferred and kept at home by the parents, the food preparation techniques applied at home, the parents' state of being at home, their feeding behavior and their anxiety about their economic and health conditions affect the food choices of the children (58). As the age of adolescents increases, they begin to become independent of the family in terms of nutrition and they decide for themselves where, when, how much and what food they will consume. For example, young adolescents between the ages of 12-14 eat more meals at home compared to adolescents between the ages of 15-17 and positive or negative eating

habits gained in the family environment during this period predominantly affect the independent food preferences of individuals. In conclusion, particularly at the beginning of adolescence, before the individual begins to make independent decisions about nutrition, it is significant for the growth and development of the adolescent individual to have a high level of nutritional knowledge, to be able to pass this information on to the child, to encourage the child to perform good nutritional behaviors, and for the health status in adulthood (11,12). In a study in which various questions were asked to trainers, athletes, and dieticians to identify the obstacles to good nutrition of athletes; all three groups of participants stated that the effects of the lifestyle and culture of the household on nutrition, their beliefs about nutrition, kitchen shopping at home, cooking techniques applied during food preparation are effective in the nutrition of the athlete. In the study, it was also stated that adult athletes are independent in food preparation and choices, but younger athletes receive support from their parents in food selection and preparation. Dietitians and trainers participating in the study emphasized this factor and stated that parents were the appropriate target group for nutrition education (5).

Consequently, the parents of adolescent athletes having a high level of knowledge on sports nutrition, encouraging their children to apply the principles of sports nutrition, helping them access food, transferring their knowledge to their children; will contribute to the performance of the athlete, reduce the risk of injury in sports at an early age and will be important preparation for the years of adult sportsmanship (11,12).

2.5.1. Effects of Parents' Nutritional Knowledge Levels on Adolescent and Athlete's Nutrition

It is essential to reach parents in interventions to guide children to a healthy diet. Because children require parental support to make permanent changes in eating behaviors. In ideal conditions; parents play a role in the formation of their children's nutritional behavior by purchasing food, preparing meals, transferring these skills to their children, talking to their children about nutrition, and as a model and example for them (59,60). Parents' nutritional knowledge level is a prominent determinant of the final outcome of this process (61).

In studies on child nutrition, it has been shown that parental participation in nutrition education is the most effective method in improving nutritional habits (7,9). In

a systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5-12, multi-component programs that motivate children and families to change eating behaviors and single-component programs that provide free fruit and vegetable distribution were compared. As a result of the review, it was shown that multi-component programs in which the family and the child are included in the healthy eating process together provide greater improvements in children's fruit and vegetable consumption (9). In the Special Turku Coronary Risk Factor Intervention Project for Children-STRIP, it has been examined how the child-targeted nutritional counseling for 6 years affects the nutritional knowledge, attitude, and habits of the responsible parent who mainly purchases and prepares food. In this project, the intervention group consists of 98 families and the control group consists of 89 families. While detailed nutrition education was given to the parents of the intervention group at regular intervals for 6 years, detailed education was not given to the control group. During this process, a questionnaire measuring nutritional information was applied to the participants, food consumption records for 24 hours were taken for the whole family and certain blood parameters were controlled for the whole family. In the study, it was ascertained that the parents of the intervention group had more information about the causal relationship between food choices and coronary heart disease and the nutrient content of foods compared to the control group. Children in the intervention group were shown to have lower intakes of total fat, saturated fat, and cholesterol in their diets, and serum cholesterol concentrations throughout the study 3-10% lower than children in the control group. In addition, although child-targeted nutritional counseling was given, the total and saturated fat intake of the parents also decreased. It was discovered that mothers in the intervention group had lower mean serum cholesterol concentrations than those in the control group. Consequently, at the end of 6 years; it has been shown that child-targeted nutritional counseling given to parents increases the nutritional knowledge of parents and improves the diet quality of both the child and the parents (10). The parent who is predominantly responsible for the nutrition of the child is considered to be the mother. In a study conducted to determine the relationship between mothers' nutritional knowledge and children's food consumption; it has been discovered that the availability of healthy foods at home, the children's consumption of sufficient fruits and vegetables are directly proportional to the healthy nutrition knowledge of the mother (62).

Compared to adult athletes, it is believed that young athletes get support from their parents in matters such as food selection, preparation, and access to food. Hence, parents are seen as the target education group for sports nutrition (5). The importance of nutritional education given to athletes and their parents is also highlighted by international sports organizations such as the International Olympic Committee, Australian Athlete Dietitians (3,6). In a study conducted with thirty-four competitive swimmers to determine the impact of parents 'participation in nutrition education, swimmers' adherence to the Mediterranean diet and their nutritional knowledge was tested just before and six weeks after the half-day nutrition education. Parents of twenty-two of the thirty-four swimmers also participated in the study. At the end of the study, adherence to the Mediterranean diet and the nutritional knowledge levels of all swimmers increased. But, athletes whose parents also received nutritional education have higher levels of nutritional knowledge compared to athletes whose parents did not receive nutrition education. Consequently, it has been revealed that nutrition education contributes to both nutritional (7).

Finally, as the nutritional knowledge level of parents increases, the current and future nutritional habits and health conditions of children and adolescents are positively affected. Hence, families should possess a high level of nutritional knowledge in order for adolescent athletes to acquire healthy eating habits, to ensure sufficient growth and development, to be healthy adults, to have knowledge about sports nutrition, and to implement this information (10,61).

2.6. Nutrition in Adolescent Swimmers

Swimming represents a sport that requires high training commitment to reach individual performance goals. Regular training and competitions start at a very early age in swimming. Most swimmers start practicing high-volume swimming training early in adolescence. Thus, nutritional requirements increase due to both growth and development and intensive training program (3,4). The energy need of swimmers varies depending on the training-competition cycles and the content of each training (3,63). Adolescent swimmers should provide the body with sufficient energy intake and various nutrients to maintain their health, support swimming performance, and keep their growth and development at optimum level in the long term (3). Principally, it is recommended to arrange the carbohydrate need in adult swimmers as 3-10 g/kg/day depending on the

training intensity. To encourage tissue adaptation and recovery, they should consume 0.3 g/kg of highly bioavailable protein per body mass after training and at regular intervals throughout the day (4,41). When adolescent swimmers and adult swimmers are compared, since the adolescents have a lower training history and metabolic adaptation, it is believed that they consume more carbohydrates while the protein needs are higher than the values given above due to increased growth-development requirements. Nevertheless, it is not known whether the micronutrient needs are above normal levels. It is believed that if adolescents are encouraged to follow adequate nutrition plans with various foods, they can fulfill their energy and micronutrient needs (4,63). It is necessary to ensure adequate intake of micronutrients such as calcium, vitamin D, and iron, particularly with a rich diet. To maintain optimal hydration, it is necessary to ensure that adolescent swimmers have access to clean and cold water before, during, and after training (63).

The parents and coaches of adolescent athletes should be aware of the nutritional needs of this group. Parents can support adolescent swimmers by providing healthy eating opportunities at home, strengthening education about nutrition in the domestic environment, and helping them access to necessary nutrients before and after training. Identically, coaches should encourage adolescents to have a healthy diet by helping them access both correct nutritional information and necessary nutrients before, during, and after training (4,63).

2.6.1. Energy Need of Adolescent Swimmers

For adolescents, it is challenging to determine a clear energy requirement as they show metabolic variation both individually and in comparison to each other. In addition, it should be kept in mind that individual physical activity levels, training, and competition programs of adolescent swimmers will vary and their energy needs will also be influenced (3). Energy need in adolescents is found by multiplying the basal metabolic rate calculated by Schofield's equation and the physical activity factor. The Schofiel Equation is based on weight and height in the 10-17 age category (See. Table 2.8) (3,64). Nevertheless, due to the variety of activity factors that affect energy needs and their individuality, it is recommended that estimation-based equations are used only as a guide. Growth and development indicators should be followed regularly to determine whether energy intake is sufficient (3).

Table 2.8: Schofield Equation for ages 10-18

Age Group	Men	Women
10-18 years old	17.7×weight + 659 (kcal)	13.3- 4×weight + 693 (kcal)

Source: (64)

Although it is not possible to determine the energy needs of adolescents precisely, according to some studies on this subject; it is determined that the daily energy requirement for boys in the 11-18 age group is 2250-2755 kcal., 1845-2110 kcal for girls in the same age group. For a young athlete who trains regularly, the physical activity level (PAL) coefficient has been determined by the studies to be 1.6, for medium intensity training, 1.8 for medium and intensive training, and 2.0 for high-intensity training every day. In studies on swimming, it has been concluded that as the training intensity increases, the energy spent in training increases. An adolescent swimmer can spend up to 700 kcal in one hour of training. In another study, it was discovered that the daily energy need of adolescent girls who swim 4.3 km a day is 2300 kcal and that the need can be up to 3000 kcal in heavier training programs (63,65).

Low energy availability means not being able to fulfill with daily dietary the energy required for maintaining vital activities in the body, and the energy needed for growth and development. This may reveal negative consequences such as suboptimal growth and development and bone density, increased risk of injury and disease (3). In addition, low energy availability can cause drowsiness and fatigue during the performance of young athletes (3,63).

Hence, the focus in swimmers' nutrition plans should be the manipulation of energy intake depending on the daily changing training needs. This should be achieved by adjusting the amount and timing of daily macronutrients according to the intensity, frequency, and volume of training (4,63).

2.6.2. Need for Macro Nutrients in Adolescent Swimmers

Adequate intake of macronutrients, namely carbohydrates, proteins, and fats that provide energy to the body, is critically important for swimmers, as in all athletes, to achieve optimum performance and maintain health (16). The correct consumption amounts and timings of these items help the athlete to start training with high energy and to recover ideally after training (3). The amount and timing of the intake of macro

nutrients vary depending on the swimmer's branch, training, competition duration, and intensity (41,63).

2.6.2.1. Carbohydrate Need in Adolescent Swimmers

Carbohydrates are one of the main energy sources for cells and stored in the human body for possible starvation. As the level of physical activity increases, its use for energy production increases (63). The daily carbohydrate requirement of adolescent athletes is the same as the recommended reference values for adult athletes (3,63). The carbohydrate need is determined according to the athlete's body size, branch, training, competition time, and intensity. Considering these reference intervals in swimming, it is determined depending on the athlete's body mass and main style, namely, the athlete's performance in long-distance (1500 meters) or short distance (50-100 meters) competitions, training intensity, and duration (See Table 2.9) (41,63).

Table 2.9: Daily carbohydrate need according to training intensity and duration

Low-intensity or skill-based activity	3-5 g/kg/day
Moderate exercise program (For example: 1 hour/day)	5 - 7 g/kg/day
Endurance program (For example: 1-3 hrs/day)	6 - 10 g/kg/day
Extreme commitment (For example: 4-5 hours/day)	8 - 12 g/kg/day

Source: (3,50)

In a study conducted with a group of swimmers who were about 19 years old; as the training intensity increases; in swimmers who cannot increase their energy (48.2 to 62.8 kcal/kg/day) and carbohydrate (5.3 to 8.2 g/kg/day) intake, the feeling of fatigue and muscle pain is higher than those who can increase it, and the inability to complete the training has been observed. It was ascertained that the muscle glycogen stores of the group with insufficient energy and carbohydrate intake were found to be statistically significantly reduced compared to the other group. In another study, the blood glucose levels of swimmers given 8 g/kg/day carbohydrate and 5 g/kg/day carbohydrate during training were compared. It was observed that the blood glucose level of the group given 8 g/kg/ day carbohydrate was statistically significantly lower at the 60^{th} minute of the training compared to the pre-training levels, and the same situation was experienced 20 minutes after the start of the training in the other group. In addition, it was discovered that the swimmers in the group with higher carbohydrate intake had higher blood glucose

levels during and at the end of training compared to the other group. Nevertheless, hypoglycemia was not experienced in either group (66). In another study conducted on swimmers exercising at moderate intensity, it was observed that 6 g/kg/ day carbohydrate intake was sufficient to replenish glycogen stores, and higher amounts (12 g/kg/day) did not contribute to performance. When the effects of carbohydrate intake on health are evaluated; it is revealed that inadequate carbohydrate intake in adolescent swimmers may cause upper respiratory tract symptoms such as nasal congestion, sneezing, bronchitis, sinusitis, or rhinitis (63).

Considering the studies conducted, carbohydrate intake should be periodized depending on the intensity of the daily training programs of adolescent swimmers in order to protect both swimming performance and health. While it is recommended that adolescent swimmers, who follow intensive training programs and train more than once a day, take 8-12 g/kg carbohydrate daily, it is emphasized that these amounts should be reduced as the number and intensity of training decreases. In order to replenish carbohydrate stores, it is recommended (3,4,63)

2.6.2.2. Protein Need in Adolescent Swimmers

Adequate protein intake is essential for the supply of essential amino acids, training adaptation, and growth. Protein needs cannot be determined precisely in adolescent athletes. Hence, it is argued that the best approach is to follow the recommended reference ranges for adult athletes, and daily protein needs are reported to be at least 1.1-1.2 g/kg protein per day for growth, development, and physical activity, and 1.3-1.8 g/kg on average. In some cases, it is claimed that the amount of protein taken with a daily diet of 2.2-2.4 g/kg can be increased (3). In addition; it is recommended that this amount of protein is divided evenly into meals during the day (0.2-0.3 g/kg/meal or 20-25 g/meal) and consumed in various ways from protein sources with high bioavailability (1,3).

There are not enough studies to determine the protein needs of adolescent swimmers specific to their sport. Consequently, when giving consumption advice to these swimmers, the reference ranges generally used for adolescent athletes should be taken into consideration and the individual protein requirement of the swimmer should be calculated (63).

2.6.2.3. Fat Need in Adolescent Swimmers

Ideal fat intake in the daily diet for the adolescent athlete; adequate intake of fat-soluble vitamins and essential fatty acids is prominent for supporting growth and development and ensuring adequate energy intake. Fat consumption should constitute 20-35% of the total energy in the daily diet of the adolescent athletes, and the rate of trans fat and saturated fat they consume should be limited to less than 10% of their daily energy, particularly to protect against health problems that may arise in the long term. Plant-based and fish-based unsaturated fats should be predominantly included in the diets of adolescents compared to saturated ones (1,3,16).

Fat consumption is a good source for adolescent girl swimmers, who perform particularly in long-distance branches, to get enough energy with a daily diet. These athletes are at risk of impaired menstrual function and low bone mineral density in the absence of sufficient energy (3,63).

In some studies, 2 g of fat per lean mass for athletes engaged in strength sports such as swimming is recommended. Nevertheless, these values are valid for adult athletes. More studies are required to precisely determine the daily fat needs of adolescent swimmers. Therefore, it is recommended to consider country-specific public health guidelines to determine the daily fat needs of adolescent swimmers (63).

2.6.3. Hydration Requirement in Adolescent Swimmers

Although detailed research has not been conducted on the fluid need in children and adolescents, it has been reported that the daily fluid needs between the ages of 6-11 are 1.6 liters (53). On the other hand, athletes need an increased fluid need due to fluid loss during training. Hence, adolescent athletes should take adequate and appropriate fluids before, during, and after training (See Table 2.10). In 1 hour of exercise, adolescents lose an average of 350-700 ml of fluid (63). By ascertaining the difference in body mass before and after training, fluid loss during training should be determined and the fluid lost during and after training should be replaced (3).

Table 2.10 Fluid requirement before, during, and after training

Time	Time / frequency of fluid consumption	Amount of liquid
Before training	4 hours before	5-7ml/kg
	2 hours before	3-5 ml/kg
During training	Within 1 hour during training	0.4-1.8 liters
After training	After performance	Every 1 kg after training. 1.5 liters of fluid for body mass loss

Source: (2,67)

A loss equal to or greater than 2% of body weight should be avoided (3). Dehydration can increase the sensation of exercise intensity and cause an excessive increase in heart rhythm. Symptoms such as muscle cramps, headache, nausea, fatigue that occur faster during the performance, loss of strength, and decreased concentration may occur in adolescent athletes. Consequently, while dehydration threatens the health, it causes a decrease in sports performance (3,63). The in-mouth of the swimmers is constantly moist, especially as they perform in the water. Thus, they may have difficulty noticing that they are thirsty and remembering to drink water. At this point, it is very essential that both trainers and parents encourage athletes to consume fluids and support access to suitable and cold drinks (63).

2.6.4. Planning Food Consumption Before, During, and After Swimming Training

In swimming, the intake of sufficient energy and macronutrients is as significant as maintaining health, supporting growth and development, and keeping the performance at the optimum level. Depending on the intensity of the daily training program, both energy and macronutrient intake amounts should be periodized, while their intake intervals should also be planned. Since the three energy systems available in swimming can vary according to the style and can be used predominantly, the intensity, density, and distance of the training significantly affect the food intake and intervals (See Table 2.11) (4,41). For example, while the need for carbohydrates is not high in low-intensity training, the need increases in high-intensity training. In addition, as the duration of the training increases, carbohydrate intake is needed during training, while the need decreases or even is not needed as the duration becomes shorter (41).

Table 2.11 Nutrient needs before, during, and after swimming training

Macronutrients	Training type	Daily and before, during, and after exercise intake amounts
Carbohydrate	Long-distance / low-intensity training	Daily Intake: 6 g/kg/day 2 hours before training: no need During exercise: no need After exercise: 1 g/kg/day
	High-intensity training	Daily Intake: 10-12 g/kg/day 3-4 hours before training: 1-2 g/kg/day During exercise (for workouts exceeding 75 minutes): 60-90 g/hour After exercise: 1 g/kg/day
Protein	Daily need	Daily Intake: 2 g/kg/day After exercice: 0.3g/kg With + 1g/kg carbohydrate
Fat	Long-distance / low-intensity training	Daily Intake: 30-35% of energy intake
	High-intensity training	Daily Intake: 20-25% of energy intake

Source: (4,41)

Pre-training carbohydrate intake is responsible for filling muscle glycogen stores and preparing for training, protecting from the feeling of hunger during training, and preventing hypoglycemia that may occur during training. The intake during training ensures that blood glucose levels are kept constant, protection from the feeling of hunger, protection from dehydration, particularly if taken in liquid form, and keeping performance at an optimum level. Carbohydrate taken after training, on the other hand, helps to replenish the decreased muscle glycogen stores during training, to prevent recovery and muscle loss (3,50).

Adequate intake of proteins before swimming training is essential to prevent hunger and ensure a sufficient daily protein intake. While there is no need for protein intake during training, taking it with carbohydrates after training increases acute muscle protein synthesis and supports muscle development. Hence, adequate intake should be ensured after training since it contributes to growth and development, particularly in adolescence (2,3).

Fat intake before and after swimming training is essential for the daily intake of sufficient energy, fat-soluble vitamins, and essential fatty acids. Nevertheless, it is not

needed during training. While taking it before training, excessive consumption should be avoided to avoid digestive problems (2,3).

2.6.5. Nutrition in Swimming Competitions

The purpose of nutrition for the competition is based on two bases. It means to create a nutrition plan that will fulfill the energy and nutrient needs of the swimmers, which will change depending on the intensity of the competition program, and to evaluate the conditions of the environment where the competition will take place and to manage the situation accordingly (4).

Before swimming competitions usually swimmers enter a rest phase called "taper". Therefore, energy and nutrient needs are reduced. Hence, the nutrition of the swimmer should be planned in accordance with this period to avoid unwanted weight gain. During the competition, the need for energy and nutrients changes depending on the intensity of the competitions in which the swimmer will perform. Some swimmers may only perform in one branch, while others may compete in more than one branch. Hence, the energy needs of swimmers competing in multiple competitions will be higher than others (4,68).

On a competition day, it is essential for swimmers to have full muscle glycogen storages, to be well hydrated, and to be protected from the feeling of hunger. To ensure this; a menu rich in easily digestible carbohydrates should be provided to the swimmer 1-3 hours before warming up. During and after the warm-up or if the swimmer will perform in more than one branch, the consumption of carbohydrate-rich foods such as sports drinks, fruits, fruit juices, athletes and cereal bars should be ensured. Carbohydrate and protein-rich foods such as flavored milk, meat sandwiches, chicken pasta increase repair, recovery, and adaptation. Hence, it is critical to consume them at the end of the competition. If there are less than 60 minutes between competitions, swimmers should focus on easily digestible carbohydrate sources that will not cause gastrointestinal distress. As the time between competitions increases, more extensive meals, including protein and other nutrients, should be consumed to aid recovery and improve the overall food quality on the day of the competition (2,4).

3. MATERIALS AND METHOD

This study was carried out in the swimming department of Galatasaray Sports Club, between the 5th of October – 1st of December 2020. This study aimed to evaluate the effect of sports nutrition education given to the parents of swimmers in the 10-11-12-13-14 age group on the nutritional knowledge and consumption habits of swimmers. 89 swimmers aged 10-11-12-13-14 who train in this club were aimed to participate in the study. 60 swimmers made up the sample of the study. Ethical approval was given by Yeditepe University Clinical Researches Ethical Committee with the number 37068608-6100-151849 on the 9th of April in 2020 and written approval was obtained from Galatasaray Sports Club for the study.

Informed consent forms were given to the parents of the athletes. Also, written consent forms specific to children were distributed to the athletes. The study was based on willingness. Therefore, the participants only who wanted to take part in the study were included. Participants who had an injury that prevent exercise and had been exercising regularly for less than 6 months were excluded.

At the beginning of the study, demographic information form, food frequency questionnaire, and nutritional knowledge questionnaire for athletes were applied to the athletes for data collection.

3.1. Demographic Information Form

Various questions were asked to determine the general condition of the athletes in the form. These questions include the duration of the athletes' participation in sports, whether they have an injury that prevents their regular participation in training, whether they have diseases, intolerance, or allergies that affect their diet, whether they apply a special diet plan depending on the preference. Anthropometry measurements were taken by the researcher. A digital weighing machine is used for weight measurement and a stadiometer is used for height measurement. The weight measurement was made 3-4 hours after eating, while athletes wearing thin clothes. In measuring height with the stadiometer, the athletes were asked to be bare feet and to stand by touching the vertical board of the stadiometer with the head, shoulder blades, hips, and heels. Afterward, they were asked to focus forward with the eyes in the upright position. When the positioning

was adjusted, the horizontal part of the stadiometer was placed in a way to compress the hair and the height measurements of the athletes were taken. BMI was calculated by dividing the body mass of athletes in kilograms by the square of their height in meters (69).

3.2. Food Frequency Questionnaire

The food frequency questionnaire that was customized following the sports nutrition literature by the researcher was filled out by the athletes (69). In the questionnaire, the consumption status and amounts of six food groups categorized in the TUBER (Turkish Nutrition Guide) are questioned. These six food groups were the milk-yogurt-cheese group, meat-chicken-fish-egg-legume-oilseed-nuts group, bread-cereal group, vegetable group, fruit group, and optional foods group (16).

3.3. The Nutritional Knowledge Questionnaire for Athletes

To measure the sports nutrition knowledge of athletes, the nutritional knowledge questionnaire for athletes, consisting of two parts and 20 questions prepared by taking samples from the literature, was applied. The first 10-question section included questions about energy needs and macro-micro nutrients. In this section, general nutrition knowledge was questioned. The second section was about sports nutrition. Athlete's macro-micronutrient needs, fluid needs, nutrition, and nutrition timing specific to the training-competition period were questioned. Test results were calculated separately for the first and second parts of the questionnaire. Each question was worth 1 point. Athletes received a maximum of 10 points from each section. 0 - 3 points were considered as low level, 4 - 7 points as average level, 8 - 10 points as a good level (69,70)

3.4. Nutrition Education

After the first data collection, a one-hour online education on healthy nutrition in adolescent athletes that prepared with the Microsoft PowerPoint program was given to the parents via the Zoom program. Energy, macro-micro nutrients, fluid requirements in adolescent athletes, recommended daily portions of foods and food groups according to the adolescents in TUBER, nutritional needs of before, during, after performance topics were covered in the education program.

Six weeks after the education, the food frequency questionnaire and the nutritional knowledge questionnaire for athletes have been applied to the athletes again in order to evaluate the educational effectiveness.

3.5. Statistical Analysis

The statistical evaluation of the data were conducted via SPSS 18.0 statistical package program in Windows. The suitability of the variables to normal distribution was examined with using the Kolmogorov-Smirnov test. Descriptive analyzes were displayed using mean ± standard deviation for quantitative variables, and nominal variables were given using frequency and percentages. Wilcoxon test and Chi-square test were used to reveal the significance of the difference between two measures conducted pre and post-education. Statistical significance was accepted $p<0.05$.

4. RESULTS

The universe of the study was 89 athletes, but 60 of them volunteered to participate in the study. None of the athletes withdrew from the study and did not have any of the exclusion factors.

Figure 4.1 is showing the distribution of all athletes in terms of their sex. 55% (n=33) of the athletes who participate in the study were men and 45% (n=27) of them were women.

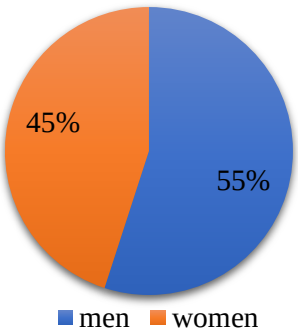

Figure 4.1 Distribution of all athletes in terms of their sex

Figure 4.2 is showing the distribution of all athletes in terms of their ages. 11% (n = 7) of the athletes in the study were 10 years old. %35 (n=21) of them 11 years old. 20% (n=12) of them were 12 years old. 21% (n=13) of them were 13 years old. 11% (n = 7) of them were 14 years old.

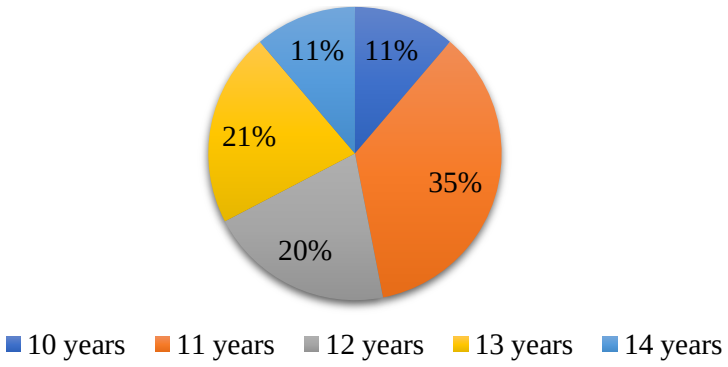

Figure 4.2 Distribution of all athletes in terms of their ages

Information about age, height, weight, BMI, and years of participation in the sport of athletes in the study was given in Table 4.1. The ages of the athletes in the study were

between the ages of 10-14, and the mean age of the group was 11.86±1.2 years. The height of the group varied between 133-186 cm and the mean height was determined as 158.4±12.2 cm. The weight of the group varied between 31.1-77.0 kg. and the mean weight was determined as 50.68±10.92 kg. BMI values obtained by the height and weight measurements of the group varied between 14.98-28.04 and the mean value of the BMI was 19.9±2.53. The years of participation in the sport of athletes varied between 2-10 years, the mean value was 6.46±2.11.

Table 4.1 General Characteristics of Athletes (n=60)

	mean±SD
Athletes' age (years)	11.86±1.2
Athletes' height (cm)	158.4±12.2
Athletes' weight (kg)	50.68±10.92
BMI	19.9±2.53
Years of participation in the sport	6.46±2.11

The height measurements of the athletes were evaluated according to height percentiles specific to Turkish children. The distribution of percentile values for height of all athletes is showing in figure 4.3. In the group, 3% (n=2) of the athletes were short, 51% (n=31) had the ideal height, 21% (n=13) were tall, and 23% (n=14) were too tall.

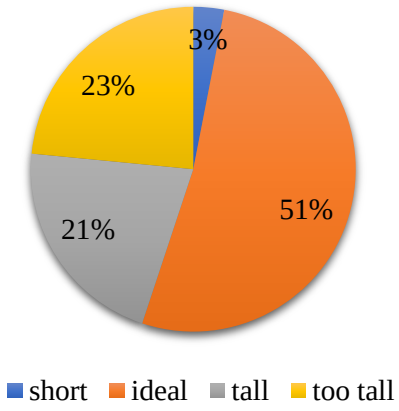

Figure 4.3 The distribution of percentile values for height of all athletes

The weight measurements of the athletes were evaluated according to weight percentiles specific to Turkish children. The distribution of percentile values for the weight of all athletes is showing in Figure 4.4. In the group, 83% (n=50) of the athletes had the ideal weight, 8% (n=5) were overweight, and 8% (n=5) were obese.

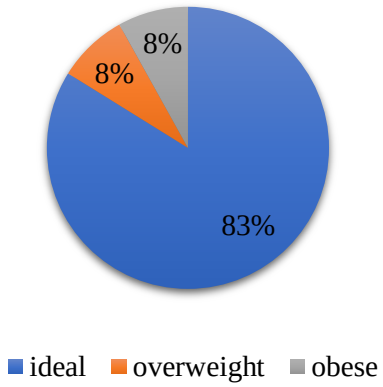

Figure 4.4 The distribution of percentile values for weight of all athletes

The BMI measurements of the athletes were evaluated according to BMI percentiles specific to Turkish children. The distribution of percentile values for the BMI of all athletes is showing in figure 4.5. In the group, 2% (n=1) of the athletes were skinny, 85% (n=51) were ideal, 8% (n=5) were overweight. and 5% (n=3) were obese.

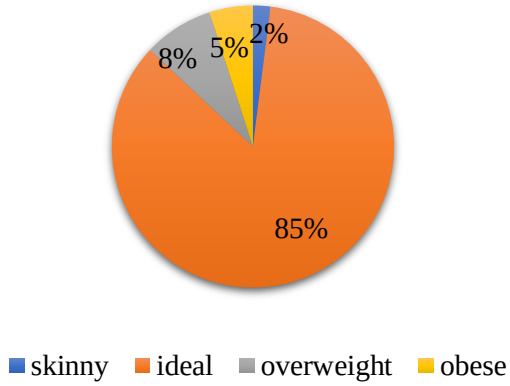

Figure 4.5 Distribution of percentile values for BMI of all athletes

Table 4.2 is showing the distribution of questions and answers regarding general characteristics. 95% (n=57) of the athletes did not have any diseases, 5% (n=3) of them had diseases. 95% (n=57) of the athletes were not using medications, 5% (n=3) of them were using medications. 95% (n=57) of the athletes had food allergies, 5% (n=3) of them had no food allergies. 48.3% (n=29) of the athletes were changing their diet according to their training and competition cycle, 51.7% (n=31) of them were not. 20% (n=12) of the athletes were using nutritional supplements, 80% (n=48) of them were not. 65% (n=39) of the athletes stated that they had information about sports nutrition, 35% (n=21) stated that they did not have any information about sports nutrition.

Table 4.2 Distribution of questions and answers regarding general characteristics

		n	%
Do you have any diseases?	yes	3	5
	no	57	95
Do you have any medication that you are using?	yes	3	5
	no	57	95
Do you have any food allergies?	yes	3	5
	no	57	95
Do you change your diet according to your training and competition cycle?	yes	29	48,3
	no	31	51,7
Do you use nutritional supplements?	yes	12	20
	no	48	80
Do you have any information about sports nutrition?	yes	39	65
	no	21	35

Table 4.3 is showing the athletes' daily food consumption portions. When the daily food consumption was evaluated, after the education, buttermilk, egg, legumes, nuts, vegetables, fruits, and bread consumption increased statistically significant ($p<0.05$). There was no statistically significant change in the amount of consumption of other foods ($p>0.05$). Also, there was a statistically significant change in the amount of water consumption ($p<0.05$).

Table 4.3 Athletes' daily food consumption portions

	Before Education		After Education		Significance
	mean±SD	min-max	mean±SD	min-max	p
Milk	0.93±0.57	0-2	0,94±0.62	0-2	0.771
Yogurt	0.58±0.65	0-4	0,50±0.51	0-1.57	0.441
Buttermilk	0.16±0.36	0-1	0,33±0.56	0-2	0.001*
Kefir	0.036±0.25	0-2	0,12±0.45	0-3	0.168
Cheese	0.52±0.36	0-1	0,54±040	0-2	0.608
Redmeat	0.81±0.55	0.07-3	0,85±0.53	0.07-3	0.312
Chicken	0.4±0.48	0-3	0,42±0.47	0-3	0.726
Fish	0.25±0.24	0-1	0,24±0.23	0-1.57	0.697
Egg	0.53±0.31	0-1.5	0,60±0.32	0.07-1.5	0.004*
Legume	0.36±0.25	0-1	0,42±0.23	0-1	0.032*
Nut	0.81±0.78	0-5	1,04±0.79	0-4	0.002*
Vegetable	0.9±0.56	0.7-2.36	1,29±0.80	0.07-3	0.000*
Fruits	1.57±0.72	0.14-3	1,82±0.79	0.14-4	0.017*
Bread	1.22±0.86	0-4	1,45±0.91	0-4.5	0.001*
Pasta	0.71±0.32	0-1	0.70±0.49	0-2	0.729
Rice	0.49±0.38	0-1	0.45±0.46	0-2	0.365
Bulgur	0.22±0.35	0-1	0,21±0.41	0-2	0.700
Oatmeal	0.01±0.07	0-0.5	0,003±0.02	0-0.21	0.357
Cornflakes	0.08±0.25	0-1	0,07±0.24	0-1	0.888
Olive oil	3.83±2.23	0-10	4,23±3	0-20	0.373
Sunflower oil	0.64±1.70	0-10	0.81±1.57	0-6	0.384
Butter	0.48±0.70	0-3	0.66±1.19	0-6	0.524
Pastry	0.57±0.59	0-3.4	0.54±0.60	0-3.14	0.500
Cake	0.28±0.58	0-3	0.36±0.63	0-2.5	0.410
Pudding	0.53±0.66	0-2.3	0.43±0.56	0-2.36	0.162
Baklava	0.04±0.16	0-1	0.04±0.18	0-1	0.537
Biscuit	0.27±0.80	0-4	0.22±0.67	0-3.14	0.602
Chocolate	0.60±0.64	0-2	0.59±0.60	0-2	0.731
Chips	0.45±1.14	0-5	0.26±0.81	0-3.93	0.169
Protein bar	0.05±0.17	0-1	0.07±0.21	0-1	0.534
Carbohydrate gel	0	0	0.0008±0.005	0-0.05	0.317
Sports Drink	0.003±0.011	0-0.07	0.025±0.131	0-1	0.068
Water (lt)	1.8±0.75	0.4-3.5	2±0.99	1-7	0.012*

* $p < 0.05$

Table 4.4 is showing the athletes' daily food groups' consumption portions. The dairy group included milk, yoğurt, buttermilk, kefir, and cheese. The Red meat-Chicken group included red meat, and chicken. The Bread-grains group included bread, pita, flatbread, pasta, rice, bulgur, oatmeal, and cornflakes. The vegetable oil group included olive oil and sunflower oil. The fat group included butter and margarine. The dessert group included cake, pudding, and baklava. The packed food group included biscuits, chocolate, and chips. The sports food-drink group included a protein bar, carbohydrate gel, and sports drink. The optional foods included fat group, pastry, dessert group, packed food group, sports food-drink group. When the daily consumption of food groups was evaluated, after the education, the dairy group consumption increased statistically significant ($p<0.05$). There was no statistically significant change in the consumption amounts of the other food groups ($p>0.05$).

Table 4.4 Athletes' daily food groups' consumption portions

	Before Education		**After Education**		**Significance**
	mean±SD	**min-max**	**mean±SD**	**min-max**	**p**
Dairy group	2.25±1.09	0.43-7	2.46±0.96	0-5	0.016*
Redmeat-Chicken group	1.01±0.68	0.09-4.5	1.06±0.67	0.09-4.5	0.174
Bread-grains group	2.7±1.3	0.21-6	2.9±1.3	0.57-6	0.508
Vegetable oil group	4.47±2.94	0-20	5.05±3.13	0-20	0.085
Fat group	0.48±0.70	0-3	0.66±1.19	0-6	0.524
Dessert group	0.85±0.73	0-3	0.84±0.70	0-2.75	0.793
Packed food group	1.3±1.5	0-7	1.08±1.27	0-7.07	0.073
Sports food-drink group	0.06±0.17	0-1	0.10±0.30	0-2	0.305
Optional foods	3.3±2.2	0.41-11.8	3.23±2.17	0.23-9.11	0.202

* $p<0.05$

Table 4.5 is showing the nutritional knowledge questionnaire answers' distribution both before education and after education. When each question in the test is evaluated one by one, statistically significant increases were found in the answers to the questions numbered 1, 2, 8, 18, 19, and 20 ($p<0.05$). There was no statistically significant change in the answers to the other questions ($p>0.05$).

Table 4.5 The percentage distribution of the answers to the Nutritional Knowledge Questionnaire

		Correct answer		False answer		Significance
		n	%	n	%	p
Q1	BE	25	41.7	35	58.3	0.004*
	AE	65	65	21	35	
Q2	BE	45	75	15	25	0.039*
	AE	53	88.3	7	11.7	
Q3	BE	46	76.7	14	23.3	1
	AE	45	75	15	25	
Q4	BE	52	86.7	8	13.3	0.754
	AE	54	90	6	10	
Q5	BE	57	95	3	5	0.687
	AE	55	91.7	5	8.3	
Q6	BE	58	96.7	2	3.3	1
	AE	59	98.3	1	1.7	
Q7	BE	56	93.3	4	6.7	1
	AE	57	95	3	5	
Q8	BE	39	65	21	35	0.003*
	AE	53	88.3	7	11.7	
Q9	BE	42	70	18	30	0.289
	AE	46	76.7	14	23.3	
Q10	BE	38	63.3	22	36.7	0.549
	AE	41	68.3	19	31.7	
Q11	BE	56	93.3	4	6.7	0.375
	AE	59	98.3	1	1.7	
Q12	BE	7	11.7	53	88.3	0.146
	AE	13	21.7	47	78.3	
Q13	BE	51	85	9	15	0.180
	AE	56	93.3	4	6.7	
Q14	BE	58	96.7	2	3.3	1
	AE	59	98.3	1	1.7	
Q15	BE	54	90	6	10	0.375
	AE	57	95	3	5	
Q16	BE	49	81.7	11	18.3	0.727
	AE	51	85	9	15	
Q17	BE	57	95	3	5	.
	AE	60	100	0	0	
Q18	BE	18	30	42	70	0*
	AE	34	56.7	26	43.3	
Q19	BE	20	33.3	40	66.7	0.021*
	AE	28	46.7	32	53.3	
Q20	BE	34	56.7	26	43.3	0.008*
	AE	46	76.7	14	23.3	

* $p < 0.05$, BE: Before education, AE: After education

The Nutritional Knowledge Questionnaire consisted of the general nutrition part and the sports nutrition part and these two-part were evaluated differently from each other. Table 4.6 is showing the general nutrition scores and the sports nutrition scores before education and after education. Before education, the general nutrition scores varied between 3-10 points and the mean score was 7.6±1.5 points. After Education, the general nutrition scores varied between 4-10 points and the mean score was 8.4±1.6 points. There was a statistically significant increase in the general nutrition scores before and after the education ($p<0.05$). Before education, the sports nutrition scores varied between 3-9 points and the mean score was 6.7±1.3 points. After Education, the general nutrition scores varied between 3-10 points and the mean score was 7.7±1.1 points. There was a statistically significant increase in the sports nutrition scores before and after the education ($p<0.001$).

Table 4.6 The Nutritional Knowledge Questionnaire's score

	Before Education		**After Education**		**Significance**	
	mean±SD	**min-max**	**mean±SD**	**min-max**	**Z**	**p**
General Nutrition Score	7.6±1.5	3-10	8.4±1.6	4-10	-3.720	0.000*
Sports Nutrition Score	6.7±1.3	3-9	7.7±1.1	3-10	-5.043	0.000*

* $p < 0.001$

Table 4.7 is showing the distribution of the nutritional knowledge questionnaire scores level before education and after education. In the questionnaire, 0-3 points were considered low level, 4-7 points were considered average level, 8-10 points were considered to have a good level of general or sports nutrition knowledge. The general nutrition part of the questionnaire was evaluated. In this part, before the education, 1.7% (n=1) of the athletes achieved a low-level score, 43.3% (n=26) an average-level score, and 55% (n=33) a high-level score. After education, none of the athletes had a low-level score. 25% (n=15) of the athletes achieved an average-level score, and 75% (n=45) a high-level score. The sports nutrition part of the questionnaire was evaluated. In this part, before the education, 1.7% (n=1) of the athletes achieved a low-level score, 63.8% (n=41) an average-level score, and 30% (n=18) a high-level score. After education, 1.7% (n=1) of the athletes achieved a low-level score, 31.7% (n=19) an average-level score, and 66.7% (n=40) a high-level score.

Table 4.7 Distribution of The Nutritional Knowledge Questionnaire scores level

		Before education		After education	
		n	**%**	**n**	**%**
General Nutrition Score	Low level	1	1.7	0	0
	Average level	26	43.3	15	25
	Good level	33	55	45	75
Sports Nutrition Score	Low level	1	1.7	1	1.7
	Average level	41	68.3	19	31.7
	Good level	18	30	40	66.7

5. DISCUSSION

It is important to achieve ideal growth and development during adolescence and this is possible with a sufficient, balanced, and healthy diet. Additionally, adolescents developing the habit of healthy eating and lifestyle is essential for them to be healthy individuals in adulthood (16,18).

Adolescent athletes need both more energy and nutrients due to increased physical activity compared to their peers who are not physically active. As well as, important for increasing sports performance and protecting from injuries (1,3).

Having high nutritional knowledge is necessary for the athlete to apply a healthy diet. Parents' nutritional knowledge is also important, as the nutrition of children and adolescents is usually the responsibility of their parents (5,11,12).

This study aimed to evaluate the effect of sports nutrition education given to parents on the nutritional knowledge and consumption habits of adolescent athletes.

In this study, it was determined that the nutrition education given to the parents affected the consumption habits of the athletes. After the education, there were statistically significant changes in the consumption amount of some foods such as dairy group, egg, legume, nut, vegetable, fruit, and bread. Since dairy group, egg, legume, nut, vegetable, and fruit are frequently used nutrients in the diet plans of athletes, their statistical increase in this study was important. Because dairy products are important sources of many nutrients, including high-quality protein, calcium, phosphorus, zinc, B1 (thiamine), B2 (riboflavin), B6, B12, and niacin. Individuals of all age groups, especially children and adolescents, should consume dairy products every day. They have an important effect on the growth and development of children and adolescents due to their ingredients (16). Additionally, the branched-chain amino acid found in dairy products triggers muscle recovery after performance. For this reason, consuming ideal amounts in the diets of athletes will promote performance and recovery (71). In a study evaluating the effect of milk consumption on recovery, milk was given to men athletes after a workout and a week later, the same athlete group take a sports drink containing only carbohydrates after a workout. Their muscle recovery is evaluated after exercise. The effects of consumption of milk after endurance exercise on signaling molecules of skeletal

muscle protein turnover, leucine kinetics, and performance measures were higher compared with a sports drink (72). The main components of legumes are carbohydrates and protein. In addition, it is a source of various micronutrients, fiber, and unsaturated fatty acids that are important for health. It is recommended to be consumed at least 3 times a week. Nuts are rich in various micronutrients, fat, and protein. Despite their high-fat content, they do not contain cholesterol as they are of vegetable origin. Consuming appropriate portions every day is important for a balanced diet (16). Ideal amounts of the consumption of nuts and legumes will contribute to athletes' muscle development due to their protein contents. As well, they are ideal alternatives to animal-based protein (73). Vegetables and fruits, which are sources of vitamins, minerals, antioxidants, and fiber, are effective in growth and development, cell renewal, tissue repair, skin and eye health, tooth and gum health, blood formation, and resistance to diseases. In addition, due to the feeling of satiety and low energy, they have an important role in preserving and maintaining a healthy weight in children and adolescents and in preventing excess body weight gain (16). Ideal consumption of vegetables and fruits enables the athlete to get enough of most of the micronutrients, maintain their general health and protect them from injuries. In addition, athletes need to get enough of these nutritious foods, as micronutrient deficiencies can cause severe decreases in performance (73).

Recommended daily portions of foods and food groups according to the ages are stated in TUBER. There are also recommendations specific to the age group of the athletes participating in this study, but these recommendations are for the average adolescent. Considering that the athletes participating in this study need more energy than the average adolescent, it should be aimed to accept the reference values recommended in TUBER as the lower limit. When the food and food groups consumed by the athletes before the education were compared with the recommended daily portion in TUBER, there were some inadequate, adequate and excessive consumption values. After education, the consumption of some foods reached adequate amounts. The daily consumption of the dairy group recommended in the guideline was 3 portions (16). Before the education, the dairy group consumption of the athletes was inadequate according to the guideline. Although there was a significant increase in consumption after education, the dairy group consumption was still below the adequate portion. Daily consumption of the red meat-chicken group recommended in the guideline was 0.75 portion, and the

recommended portion for the egg was 0.5 (16). Red meat-chicken and egg consumption were excessive according to the guideline in both before and after education. Daily consumption of fish recommended in the guideline was between 0.21-0.28 portion (16). The fish consumption was adequate according to guideline both before and after education. Daily consumption of the bread-grains group recommended in the guideline was 3-5 portions (16). Although there was a statistically significant increase in bread consumption after education, there was no statistically significant increase in the bread-grains group which is important for athlete's nutrition. Daily consumption of legumes recommended in the guideline was 0.42 portion and the recommended portion for the nuts was 1 (16). While the consumption of legumes and nuts was insufficient before education, it reached an adequate level after education. Daily consumption of vegetables recommended in the guideline was between 2-3.5 and the recommended portion for the fruit was between 2-2.5 (16). Before the education, vegetable and fruit consumption of the athletes was inadequate. Although there was a significant increase in consumption after education, vegetable and fruit consumption was still below the adequate consumption portion. In the guideline, the upper limit for the consumption of optional foods is determined as 4 portions (16). The amount of optional food consumption of athletes did not exceed the safe amount recommended in guidelines both before and after education. The daily water requirement recommended in the guideline was 2000-2400 ml. (16). While the daily water consumption was insufficient before education, it reached an adequate level after education. As a result, before the education, most of the food and food groups questioned in the food frequency test were consumed at insufficient levels. Although there were statistically significant increases in the consumption of some foods after the education, the ideal reference value was reached only in the legumes and nuts group. In similar studies in which the consumption amounts of the adolescent athletes were evaluated, inadequate nutrient intakes were also determined (74-76). For example, in a study conducted with adolescent swimmers, it was determined that the daily diet of swimmers was deficient in carbohydrates, vitamins, and minerals (74). In another study evaluating the nutritional habits of adolescent swimmers, the distribution of calories between carbohydrates, proteins, and fats was not ideal for athletes trying to optimize performance. These young swimmers consumed too excessive fat and inadequate carbohydrate and women swimmers did not meet the recommended dietary allowances

for calcium and iron (75). In a study aimed at comparing nutrient intake in adolescent swimmers and non-athletes in the United States, it was determined that both swimmers and non-athletes generally had similar intakes of macro and micronutrients and inadequate amounts of calcium, vitamin D, and daily servings of fruits, vegetables, grains, and dairy products (76). The reason why consumption amounts are insufficient in this study and similar studies may be the errors inherent in the methodology for assessing food intake. One of the main errors associated with diet records is under-reporting of food intake (74,76-78). The under-reporting may be unconscious or may be related to perceived body image (79).

As in this study, many studies have shown that parental education has a positive effect on their children's consumption habits (8,80-83). In particular, parental involvement is essential to achieve the long-term benefits of adolescent nutrition programs (84). Also, the importance of parental education is highlighted by international sports organizations such as the International Olympic Committee, Australian Athlete Dietitians (37,60). In 2016 a systematic review was conducted to evaluate the impact of multi-strategy nutrition education programs on the health and nutrition of adolescents. In this review, the multi-strategies that school staff, teachers, and parental involvement, and using theoretical models to guide made statistically significant changes in anthropometric and dietary intake (8). In another study conducted in 2016 was showed that parental nutrition literacy and parental education have increased child diet quality (80). In a study conducted to improve the nutritional quality of school children's lunchboxes, 2 schools were randomly selected, while students in one school were in the control group, the other school's students were the experimental group. Infographics were hung on the experimental group's school and brochures explaining the ideal lunch box contents were distributed to their families. 6 months after the intervention, the lunch boxes of the students were checked. The food quality of the lunch boxes of the experimental group was significantly higher than the control group (81). In a systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5-12, multi-component programs that motivate children and families to change eating behaviors and single-component programs that provide free fruit and vegetable distribution were compared. As a result of the review, it was shown that multi-component programs in which the family and the child are included in the healthy eating

process together provide greater improvements in children's fruit and vegetable consumption (57). According to the result of a study conducted in China in 2019, parental nutrition knowledge education has a positive effect on childrens' hemoglobin level, through the channel of knowledge improvement and dietary change (82). In a study conducted to evaluate the effect of nutrition education in the school curriculum on adolescents, general nutrition information was added to students' sciences curriculum. The incorporation of nutrition education in the sciences curriculum resulted in a significant increase in students' knowledge regarding nutrition-related diseases, in caring for the nutritive value of foods, and in fresh vegetable preference. Although adolescents' attitudes towards nutrition issues were found to be positive, their daily eating habits did not necessarily match their attitudes and eating habits. . At the end of the study, it was emphasized that nutrition education for adolescents should include not only the education given to them but also teachers and family members who support them in their nutrition, to change their nutritional habits (83).

In this study, the nutritional knowledge questionnaire was applied before and after the education that given to parents to evaluate the general and sports nutrition knowledge of the athletes. At the end of this study, there was a statistically significant increase in both general and sports nutrition knowledge levels. Similar studies have shown that parental education may have a positive effect on adolescents' nutritional knowledge (7,85,86). For example, in a study, the effectiveness of nutrition education given only to children and given to both parents and children was compared. Before and after education, children's nutritional knowledge, preferences, and dietary diversity were evaluated. When the group in which the parents and children received education together was compared with the other group, their nutritional knowledge and preferences increased significantly (85). When looking at another study conducted with adolescent swimmers, this study aimed to determine the impact of parents 'participation in nutrition education, swimmers' adherence to the Mediterranean diet, and their nutritional knowledge was tested just before and six weeks after the half-day nutrition education and conducted with thirty-four competitive swimmers. Parents of twenty-two of the thirty-four swimmers also participated in the study. Apart from the athletes, they were also given a half-day nutritional education, and tests were carried out for their children's adherence to the Mediterranean diet. At the end of the study, it was ascertained that both the adherence to

the Mediterranean diet and the nutritional knowledge levels of all swimmers increased. In addition, the study discovered that athletes whose parents also received nutritional education have higher levels of nutritional knowledge compared to athletes whose parents did not receive nutrition education. Consequently, it has been revealed that nutrition education contributes to both nutritional knowledge and healthy eating habits, as well as increasing efficiency with the participation of parents in the education process (7). In a study, the effectiveness of a child-only and a child-plus-parent nutrition education program was evaluated. 176 children attending second and third grade were divided into control and experimental groups. While nutrition education was given to only children in the control group, nutrition education was given to both children and their parents in the experimental group. Findings indicated that nutrition knowledge and self-reported dietary habits significantly improved in both control and experimental groups. But parental education improved participant self-efficacy, where a child's willingness to ask their primary caregivers to buy fruits and vegetables increased significantly. The study shows that for the nutritional behaviors and knowledge of children and adolescents who are still cared for by their parents to develop, their families' nutritional knowledge should increase (86).

This study also had some limitations. Firstly, the education content was a healthy diet for adolescent athletes. In a single seminar, energy, macro-micronutrient needs, training, and competition-specific nutrition types topics were discussed. It might be more beneficial if the topics had been divided and explained in separate seminars. Secondly, to maximize accurate reporting when administering the food frequency questionnaire, the athletes were given detailed instructions on portion sizes and completed the questionnaires under the supervision of the researcher. Despite this, athletes had some difficulties filling the food frequency questionnaire. Lastly, The Nutritional Knowledge Questionnaire for Athletes used in the study has been used before in the literature. However, it was not a validated measurement tool. It would be better to measure internal consistency if it is used in future studies.

Adolescent swimmers should provide the body with sufficient energy intake and various nutrients to maintain their health, support swimming performance, and keep their growth and development at optimum level in the long term (3). But in this study and similar studies, the dietary intake of the adolescent swimmers was inadequate (74-76).

And at the end of one of these studies, researchers mentioned that the poor dietary habits of adolescents who swim competitively may threaten the optimum athletic performance and place them at risk for future chronic diseases, including osteoporosis (76). For this reason, the nutrition of adolescent swimmers should be developed for their growth, performance, and healthy adulthood. Parents have a great responsibility to help adolescents gain healthy nutritional habits. Adolescents can gain healthy nutritional habits if their parents have sufficient knowledge about nutrition. As well, they can reach optimum performance. The fact that the family provides the athlete with adequate meals at the right times increases the performance of the athlete in both training and competition time and protects the athlete from injuries (5,11,12). Especially in swimming, having the chance to participate in important sports competitions such as the Olympic Games and World Championship at a very young age requires swimmers to follow a good nutrition plan from a very young age to reach their optimum performance (46). For this reason, it is known that awareness of athletes' parents is important (41,46).

This study aimed to evaluate the effect of sports nutrition education given to parents on the nutritional knowledge and consumption habits of adolescent athletes. Although studies evaluating the effectiveness of nutritional education given to parents are common, similar to these studies are not common in sports nutrition. Therefore, this study will contribute to filling the literature gap in sports nutrition. In this study, there was a statistically significant increase in both general and sports nutrition knowledge levels. In addition, it was determined that nutrition education given to parents had a positive effect on consumption habits. This education method can be applied in different sports teams and more adolescent athletes may become aware of sports nutrition and their nutritional habits may change positively. Awareness of healthy nutrition in adolescent athletes will also be an important factor for them to be successful adult athletes.

6. REFERENCES

1. Aydoğan AU, Yılmaz E. Spor Yapan Çocukta Beslenme. Klinik Tıp Pediatri Dergisi. 2018; 10(5): p. 19-27.

2. Purcell LK, Society CP, Section PSaEM. Sport nutrition for young athletes. Paediatrics & Child Health. 2013; 18(4): p. 200-202.

3. Desbrow B, McCormack J, Burke LM, Cox GR, Fallon K, Hislop M, et al. Sports Dietitians Australia Position Statement: Sports Nutrition for the Adolescent Athlete. International Journal of Sport Nutrition and Exercise Metabolism. 2014; 24(5): p. 570-584.

4. Shaw G, Boyd KT, Burke LM, Koivisto A. Nutrition for Swimming. International Journal of Sport Nutrition and Exercise Metabolism. 2014; 24(4): p. 360-372.

5. Heaney S, O'Connor H, Naughton G, Gifford J. Towards an Understanding of the Barriers to Good Nutrition for Elite Athletes. International Journal of Sports Science & Coaching. 2008; 3(3): p. 391-401.

6. Mountjoy M, Bizzini NAL, Blimkie C, Evans J, Gerrard D, Hangen J, et al. IOC consensus statement: ''training the elite child athlete''. British Journal of Sports Medicine. 2008; 43(2): p. 163-164.

7. Philippou E, Middleton N, Pistos C, Andreou E, Petrou M. The impact of nutrition education on nutrition knowledge and adherence to the Mediterranean Diet in adolescent competitive swimmers. Journal of Science and Medicine in Sport. 2017; 20(4): p. 328-332.

8. Meiklejohn S, Ryan L, Palermo C. A Systematic Review of the Impact of Multi-Strategy Nutrition Education Programs on Health and Nutrition of Adolescents. Journal of Nutrition Education and Behavior. 2016; 48(9): p. 631-646.

9. Evans CE, Christian MS, Cleghorn CL, Greenwood DC, Cade JE. Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 y. The American Journal of Clinical Nutrition. 2012; 96(4): p. 889-901.

10. Rasanen M, Niinikoski H, Keskinen S, Helenius H, Talvia S, Rönnemaa T, et al. Parental nutrition knowledge and nutrient intake in an atherosclerosis prevention project: the impact of child-targeted nutrition counselling. Appetite. 2003; 41(1): p. 69-77.

11. Kabaran S, Mercanlıgil SM. Adolesan Dönem Besin Seçimlerini Hangi Faktörler Etkiliyor? Güncel Pediatri Dergisi. 2013; 11(3): p. 121-127.

12. Story M, Stang J. Understanding adolescent eating behaviors. In Guidelines for Adolescent Nutrition.; 2005. p. 9-19.

13. World Health Organization. Nutrition in adolescence: issues and challenges for the health sector: issues in adolescent health and development. 1st ed. Organization WH, editor. Geneva: World Health Organization; 2005.

14. Neumark-Sztainer D, Story M, Perry C, Casey MA. Factors influencing food choices of adolescents: findings from focus-group discussions with adolescents. Journal of the American Dietetic Association. 1999; 99(8): p. 929-937.

15. Baltacı G, Ersoy G, Karaağaoğlu N, Derman O, Kanbur N. Ergenlerde Sağlıklı Beslenme ve Hareketli Yaşam. Ankara: T.C. Sağlık Bakanlığı Temel Sağlık Hizmetleri GenelMüdürlüğü Beslenme ve Fiziksel Aktiviteler Daire Başkanlığı; 2008 [cited 2021 Ocak 3. Available from: https://sbu.saglik.gov.tr/Ekutuphane/kitaplar/t41.pdf.

16. Türkiye Cumhuriyeti Sağlık Bakanlığı. Türkiye Beslenme Rehberi TÜBER 2015. Ankara:; 2015. Report No.: 978-975-590-608-9.

17. Türkiye Cumhuriyeti Sağlık Bakanlığı. Türkiye Cumhuriyeti Sağlık Bakanlığı Halk Sağlığı Genel Müdürlüğü. [Online].; 2017 [cited 2021 Nisan 1. Available from: https://hsgm.saglik.gov.tr/tr/beslenme/ergenlik-doneminde-beslenme.html.

18. World Health Organization. World Health Organization. [Online]. [cited 2020 Aralık 12. Available from: https://www.who.int/health-topics/adolescent-health/#tab=tab_1.

19. Parlaz EA, Tekgül N, Karademirci E, Öngel K. Ergenlik Dönemi: Fiziksel Büyüme, Psikolojik ve Sosyal Gelişim Süreci. The Journal of Turkish Family Physician. 2012; 3(2): p. 10-16.

20. Neyzi O, Günöz H, Furman A, Bundak R, Gökçay G, Darendeliler F, et al. Türk çocuklarında vücut ağırlığı, boy uzunluğu, baş çevresive vücut kitle indeksi referans değerleri. Çocuk Sağlığı ve Hastalıkları Dergisi. 2008; 51(1): p. 1-14.

21. Forbes EE, Dahl RE. Pubertal development and behavior: hormonal activation of social and motivational tendencies. Brain and Cognition. 2010; 72(1): p. 66-72.

22. Erkan T. Adolescent nutrition/Ergenlerde beslenme. İstanbul: Turkish Pediatrics Archive; 2011 [cited 2021 Ocak 5. Available from: https://go.gale.com/ps/anonymous?id=GALE%7CA255839691&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=13060015&p=AONE&sw=w.

23. Pancar S. Orta Ergenlerin Fiziksel Aktivite Düzeylerinin Değerlendirilmesi. Spor Eğitim Dergisi. 2020; 4(3): p. 104-11.

24. Birinci YZ, Şahin Ş, Vatansever Ş, Pancar S. Yaşlılarda Fiziksel Egzersizin Beyin Kaynaklı Nörotrofik Faktör (BDNF) Üzerine Etkisi: Deneysel Çalışmaların Sistematik Derlemesi. Spor Hekimliği Dergisi. 2019; 54(4): p. 276-287.

25. Marques A, Santos DA, Hillman CH, Sardinha LB. How does academic achievement relate to cardiorespiratory fitness, self-reported physical activity and objectively reported physical activity: a systematic review in children and adolescents aged 6–18 years. British Journal of Sports Medicine. 2018; 52(16): p. 1-11.

26. Laird Y, Fawkner S, Niven A. A grounded theory of how social support influences physical activity in adolescent girls. 2018; 13(1).

27. Korkusuz F. Fiziksel aktivite ve kemik sağlığı. In ; 2009; Ankara : Başkent Üniversitesi Fiziksel Aktivite, Beslenme ve Sağlık Kongresi.

28. Baltacı G, Düzgün İ. Adolesan ve Egzersiz. Ankara: T.C. Sağlık Bakanlığı; 2008 [cited 2021 Şubat 8. Available from: https://sbu.saglik.gov.tr/Ekutuphane/kitaplar/t40.pdf.

29. Poitras VJ, Gray CE, Borghese MM, Carson V, Chaput JP, Janssen I, et al. Systematic review of the relationships between objectively measured physical activity and health. Applied Physiology, Nutrition, and Metabolism. 2016; 41(6): p. 197-239.

30. McMahon EM, Corcoran ·P, O'Regan G, Keeley H, Cannon M, Carli V, et al. Physical activity in European adolescents and associations with anxiety, depression and well-being. European child & adolescent psychiatry. 2017; 26(1): p. 111-122.

31. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U. Global physical activity levels: surveillance progress, pitfalls, and prospects. 2012; 380(9838): p. 247-257.

32. Rhodes RE, Janssen I, Bredin SSD, Warburton DER, Bauman A. Physical activity: Health impact, prevalence, correlates and interventions. Psychology & Health. 2017; 38(2): p. 942-975.

33. World Health Organization. World Health Organization Web Site. [Online].; 2020 [cited 2021 Ocak 22. Available from: https://www.who.int/news-room/fact-sheets/detail/physical-activity.

34. Biddle S, Ciaccioni S, Thomas G, Vergeer I. Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality. Psychology of Sport and Exercise. 2019; 42: p. 146-155.

35. Biddle SJH, Asare M. Physical activity and mental health in children and adolescents: a review of reviews. British Journal of Sports Medicine. 2011; 45(11): p. 886-895.

36. Tanaka H. Swimming Exercise Impact of Aquatic Exercise on Cardiovascular Health. Sports Medicine. 2012; 39(5): p. 377-387.

37. FINA Swimming Rules. Federation internationale de natation web site. [Online]. [cited 2021 Ocak 20. Available from: https://resources.fina.org/fina/document/2021/01/12/b3885f9b-630a-4390-861d-4e7f6031f4a4/2017_2021_swimming_16032018.pdf.

38. Alaydın A, Kamuk YU. Türkiye Yüzme Şampiyonası Seçmelerine Katılan 11-12 Yaş Yüzücülerin Barajı Geçme Durumlarına Göre Fiziksel ve Fizyolojik Özelliklerinin İncelenmesi. Eurasian Research in Sport Science. 2020; 5(1): p. 26-43.

39. Barbosa TM, Fernandes RJ, Keskinen KL, Vilas-Boas JP. The influence of stroke mechanics into energy cost of elite swimmers. European Journal of Applied Physiology. 2008; 103(2): p. 139-149.

40. Kenney WL, Wilmore JH, Costill DL. Spor ve Egzersiz Fizyolojisi Ankara: Spor Yayınevi; 2021.

41. Domínguez R, Jesús-Sánchez-Oliver A, EduardoCuenca , Jodra P, Silva SFd, Mata-Ordóñez F. Nutritional needs in the professional practice of swimming: a review. Journal of Exercise Nutrition and Biochemistry. 2017; 21(4): p. 1-10.

42. Capelli C, Pendergast DR, Termin B. Energetics of swimming at maximal speeds in humans. European Journal of Applied Physiology. 1998; 78(5): p. 385-393.

43. Hibberd EE, Myers JB. Practice habits and attitudes and behaviors concerning shoulder pain in high school competitive club swimmers. Clinical Journal of Sport Medicine 2013; 23(6).

44. Salo D, Riewald SA. Tailoring Traning for Specific Stroke and Events, in Complete Conditioning for Swimming: Human Kinetics; 2008. p. 33-76

45. Leonard J. USA Swimming. [Online]. [cited 2021 Ocak 5. Available from: https://www.usaswimming.org/docs/default-source/clinics/online-clinic-series/training-and-technique/12-1-10-developing-aerobic-improvements.pdf?sfvrsn=b98b5c32_4.

46. Hannula D, Thornton N. Developmental Stages of Competitive Swimmers, in Swim Coaching Bible Volume 2. Human Kinetics; 2012.

47. Santos MA, Junior MLB, Melo W, Costa A, Costa C. Estimate of propulsive force in front crawl swimming in young athletes. Journal of Sports Medicine. 2012; 3: p. 115-120.

48. International Olympic Committee. International Olympic Committee consensus statement on youth athletic development. British Journal of Sports Medicine. 2015; 49(13): p. 843-851.

49. Petrie HJ, Stover EA, Horswil CA. Nutritional Concerns for the Child and Adolescent Competitor. Nutrition. 2004; 20(7-8): p. 620-631.

50. Burke LM, Hawley JA, Wong SHS, Jeukendrup AE. Carbohydrates for training and competition. Journal of Sports Sciences. 2011; 29(1): p. 17-27.

51. Petrie HJ, Stover EA, Horswill CA. Nutritional concerns for the child and adolescent competitor. Nutrition. 2004; 20(7-8): p. 620-631.

52. Matkovic V. Calcium metabolism and calcium requirements during skeletal modeling and consolidation of bone mass. American Journal of Clinical Nutrition. 1991; 54(1): p. 245-260.

53. Ersoy G, Hasbay A. Sporcu Beslenmesi. Ankara: T.C. Sağlık Bakanlığı Temel Sağlık Hizmetleri GenelMüdürlüğü Beslenme ve Fiziksel Aktiviteler Daire Başkanlığı; 2008 [cited 2021 Ocak 3. Available from: https://sbu.saglik.gov.tr/Ekutuphane/kitaplar/A%203.pdf

54. Birkenhead KL, Slater G. A Review of Factors Influencing Athletes' Food Choices. Sports Medicine. 2015; 45(11): p. 1511-1522.

55. Favaro A, Santonastaso P. Effects of parents' psychological characteristics and eating behaviour on childhood obesity and dietary compliance. Journal of Psychosomatic Research. 1995; 39(2): p. 145-151.

56. Shrewsbury VA, King LA, Hattersley LA, Howlett SA, Hardy LL, Baur LA. Adolescent-parent interactions and communication preferences regarding body weight and weight management: a qualitative study. International Journal of Behavioral Nutrition and Physical Activity. 2010; 7(1): p. 1-7.

57. Matheson DM, N.Robinson T, Varady A, Killen JD. Do Mexican-American Mothers' Food-Related Parenting Practices Influence Their Children's Weight and Dietary Intake? Journal of the American Dietetic Association. 2006; 106(11): p. 1861-1865.

58. Holsten JE, Deatrick JA, Kumanyika S, Pinto-Martin J, Compher CW. Children's food choice process in the home environment. A qualitative descriptive study. Appetite. 2012; 58(1): p. 64-73.

59. Contento I, Balch G, Bronner Y, Lytle L, Maloney S, Olson C, et al. The effectiveness of nutrition education and implications for nutrition education policy, programs, and research: a review of research. In.: Journal of Nutrition Education (USA); 1995. p. 284-418.

60. Koivisto UK, Fellenius J, Sjödén PO. Relations between parental mealtime practices and children's food intake. Appetite. 1994; 22(3): p. 245-285.

61. Crockett SJ, Mullis RM, Perry CL. Parent nutrition education: a conceptual model. Journal of School Health. 1988; 58(2): p. 53-57.

62. Campbell KJ, Abbott G, Spence AC, Crawford DA, McNaughton SA, Ball K. Home food availability mediates associations between mothers' nutrition knowledge and child diet. Appetite. 2013; 71: p. 1-6.

63. Ferens K, Przeliorz-Pyszczek A. Nutritional Principles of Adolescent Swimmers. Central European Journal of Sport Sciences and Medicine. 2019; 25(1): p. 51-61.

64. Yıldız E, Merdol TK, Baysal A, Aksoy M, Pekcan AG, Besler HT, et al. Diyet El Kitabı Ankara : Hatipoğlu Yayınları; 2014.

65. Barbosa TM, Fernandes R, Keskinen KL, Colaço P, Cardoso C, Silva J, et al. Evaluation of the energy expenditure in competitive swimming strokes. International Journal of Sports Medicine. 2006; 27(11): p. 894-899.

66. Costill DL, Flynn MG, Kirwan JP, Houmard JA, Mitchell JB, Thomas R, et al. Effects of repeated days of intensified training on muscle glycogen and swimming performance. Medicine and Science in Sports and Exercise. 1988; 20(3): p. 249-254.

67. Sawka MN, Burke LM, Eichner ER, Maughan RJ, Montain SJ, Stachenfeld NS. American College of Sports Medicine position stand. Exercise and fluid replacement. Medicine & Science in Sports & Exercise. 2007; 39(2): p. 377-390.

68. Stellingwerff T, Pyne DB, Burke LM. Nutrition considerations in special environments for aquatic sports. International Journal of Sport Nutrition and Exercise Metabolism. 2014; 24(4): p. 470-479.

69. Pekcan G. Beslenme durumunun saptanması. In Diyet El Kitabı.; 2008. p. 67-141.

70. Duman EU. 10-18 yaş grubu yüzücülerin beslenme bilgi düzeyleri ile bazı parametrelerin ilişkisinin saptanması. Haliç Üniversitesi. 2011. MScThesis.

71. James LJ, Stevenson EJ, Rumbold PLS, Hulston CJ. Cow's milk as a post-exercise recovery drink: implications for performance and health. European Journal of Sport Science. 2018;(40-48).

72. Lunn WR, Pasiakos SM, Colletto MR, Karfonta K, Carbone J, Anderson JM, et al. Chocolate Milk and Endurance Exercise Recovery: Protein Balance, Glycogen, and Performance. American College of Sports Medicine. 2012; 44(4): p. 682-691.

73. Larson-Mayer E, Ruscigno M. Gaining the Plant-Based Advantage, in Plant-based Sports Nutrition : Human Kinetics; 2020.

74. Hassapidou MN, Valasiadou V, Tzioumakis L, Vrantza P. Nutrient intake and anthropometric characteristics of adolescent Greek swimmers. Nutrition & Dietetics. ; 59(1): p. 38-42.

75. Berning JR, Troup JP, VanHandel PJ, Daniels J, Daniels N. The Nutritional Habits of Young Adolescent Swimmers. International Journal of Sport Nutrition and Exercise Metabolism. 1991; 3(1): p. 240–248.

76. Collins AC, Ward KD, Mirza B, Slawson DL, McClanahan BS, Vukadinovich C. Comparison of nutritional intake in US adolescent swimmers and non-athletes. Health. 2012; 4(10): p. 873-888.

77. Mertz W. Food intake measurements: is there a gold standard? Journal of the American Dietetic Association. 1992; 92(12): p. 1463-1465.

78. Burrows TL, Martin RJ, Collins CE. A Systematic Review of the Validity of Dietary Assessment Methods in Children when Compared with the Method of Doubly Labeled Water. Journal of the American Dietetic Association. 2010; 110(10): p. 1501-1510.

79. Edwards J, Lindeman A, Mikesky A, Stager J. Energy balance in highly trained female endurance runners. Medicine and Science in Sports and Exercise. 1993; 25(12): p. 1398-1404.

80. Gibbs HD, Kennett AR, Kerling EH, Yu Q, Gajewski B, Ptomey LT, et al. Assessing the Nutrition Literacy of Parents and Its Relationship With Child Diet Quality. 2016; 48(7): p. 505-509.

81. Díaz-Ramírez G, Jiménez-Cruz A, Bacardí-Gascón M. Nutritional Intervention to Improve the Quality of Lunchboxes Among Mexican School Children. Journal of Community Health. 2016; 41: p. 1217–1222.

82. Zhao Q, Yu X. Parental Nutrition Knowledge, Iron Deficiency, and Child Anaemia in Rural China. The Journal of Development Studies. 2020; 56(3): p. 578-595.

83. Amahmid O, Guamri YE, Guamri YE, Yazidi M, Razoki B, KKR, et al. Nutrition education in school curriculum: impact on adolescents' attitudes and dietary behaviours. International Journal of Health Promotion and Education. 2019; 58(5): p. 242-258.

84. Vardanjani AE, Reisi M, Javadzade H, Pour ZG, Tavassoli E. The Effect of nutrition education on knowledge, attitude, and performance about junk food consumption among students of female primary schools. Journal of Education and Health Promotion. 2015; 53(4).

85. Sirasa F, Mitchell L, Azhar A, Chandrasekara A, Harris N. A six-week healthy eating intervention with family engagement improves food knowledge and preferences but not dietary diversity among urban preschool children in Sri Lanka. Public Health Nutrition. 2021; p. 1-22.

86. Baghurst T. Nutritional education program to reduce obesity. International Journal of Children Adolescent Health. 2014; 7(3).

87. Hibberd EE, Laudner KG, Kucera KL, Berkoff DJ, Yu B, Myers JB. Effect of Swim Training on the Physical Characteristics of Competitive Adolescent Swimmers. The American Journal of Sports Medicine. 2016; 44(11): p. 2813-2819.

88. Eyinacar M. Sağlıklı Beslenme Alışkanlığı Kazandırılması Projesi Kapsamında İlkokul Öğrencilerinin Ebeveynlerine Verilen Beslenme Eğitiminin, Çocukların Beslenme Alışkanlıkları Üzerine Etkileri. Hacettepe Üniversitesi. 2019. MScThesis.

7. APPENDICES

7.1.Ethical Approval

T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 37068608-6100-15- 1849 **09/04/2020**
Konu: Klinik Araştırmalar
Etik kurul Başvurusu hk.

İlgili Makama (Dilara Serarslan)

Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Bölümü Dr. Öğr. Üyesi İrem Kaya Cebioğlu'nun sorumlu araştırmacı olduğu **"Ebeveynlere Verilen Sporcu Beslenmesi Eğitiminin Adölsan Yüzücülerin Beslenme Bilgi Düzeylerine ve Tüketim Alışkanlıklarına Olan Etkisinin İncelenmesi"** isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası **(1832)** kayıt Numaralı KAEK Başvuru Dosyası, Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından **08.04.2020** tarihli toplantıda incelenmiştir.

Sağlık Bakanlığı'nın Covid-19 pandemisi nedeniyle uygulamakta olduğu ''toplumsal izolasyon veya karantina'' uygulamalarının bitiminde başlanması şartıyla;

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isimi belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (**KAEK Karar No: 1190**).

Prof. Dr. Turgay ÇELİK
Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurulu Başkanı

Yeditepe Üniversitesi 26 Ağustos Yerleşimi, İnönü Mahallesi Kayışdağı Caddesi 34755 Ataşehir / İstanbul
T. 0216 578 00 00 www.yeditepe.edu.tr F. 0216 578 02 99

7.2.Galatasaray Sports Club Approval

GALATASARAY SPOR KULÜBÜ

Sayı: 2019-2/183

Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurul Başkanlığı

Konu: Klinik araştırma izni hk.

27 Şubat 2020

Yeditepe Üniversitesi Beslenme ve Diyetetik Anabilim Dalı yüksek lisans öğrencisi Dilara Serarslan tarafından akademik amaçlı olarak yapılması planlanan "Ebeveynlere verilen sporcu beslenmesi eğitiminin adölesan yüzücülerin beslenme bilgi düzeylerine ve tüketim alışkanlıklarına olan etkisinin incelenmesi" isimli klinik araştırmanın Kulübümüzde uygulanmasında herhangi bir sakınca yoktur.

Saygılarımızla,

Gamze Doğuş	Selçuk Rıza İren
Operasyon Müdürü	Kulüp Genel Sekreteri

Ali Sami Yen Spor Kompleksi Türk Telekom Stadyumu
Huzur Mahallesi 34415 Seyrantepe - İstanbul
Tel: (0212) 305 19 05 Fax: (0212) 305 19 48

7.3. Informed Consent Form

T.C. YEDİTEPE ÜNİVERSİTESİ	KLİNİK ARAŞTIRMALAR ETİK KURULU BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU	TARİH: VERSİYON

Sorumlu Araştırmacı Dr. Öğr. Üyesi İrem Kaya Cebioğlu

Katılımınızı talep ettiğimiz **"Ebeveynlere verilen sporcu beslenmesi eğitiminin adölesan yüzücülerin beslenme bilgi düzeylerine ve tüketim alışkanlıklarına olan etkisinin incelenmesi"** adlı bu çalışma İstanbul Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik bölümü Dr. Öğr. Üyesi İrem KAYA CEBİOĞLU ve yüksek lisans öğrencisi Dyt. Dilara SERARSLAN tarafından yürütülen bir araştırmadır.

Çalışma Galatasaray Spor Kulübü Ergün Gürsoy Olimpik Yüzme Havuzu Tesislerinde gerçekleştirilecektir. Çalışma başlangıç tarihi Eylül.2020, sonlanım tarihi ise Aralık.2020' dir. 10-12 yaş grubu 89 gönüllü sporcunun çalışmaya katılması hedeflenmektedir. Araştırma işleyişi ile ilgili ayrıntılı bilgiler aşağıda belirtilmiştir.

1. Katılımcıların tümünün antropometri ölçümleri (boy ve kilo ölçümleri) alınacaktır.
2. Araştırmacı tarafından özelleştirilerek hazırlanan besin tüketim sıklığı formu, literatürden örnek alınarak düzenlenen veri toplama formu (demografik bilgiler) ve sporcu beslenmesi bilgi düzeyi saptama formu sporculara uygulanacaktır.
3. Form ve anketler tamamlandıktan sonra gönüllü katılımcıların tümünün ebeveynlerine "Sporcularda Sağlıklı Beslenme" konusu ile ilgili araştırmacı tarafından eğitim verilecektir.
4. Eğitimden 6 hafta ve 3 ay sonra sporculara aynı testler tekrar uygulanacaktır.

Araştırmanın amacı ebeveynlere verilen beslenme eğitiminin gönüllü sporcu katılımcıların beslenme bilgi düzeylerine ve tüketim alışkanlıklarına olan etkisini incelemektir.

Çalışmada kesinlikle yaşadıklarınız (özeliniz) sorulmayacaktır. Genel olarak katılımcıların tüketim alışkanlıkları ve sporcu beslenmesi bilgileri incelenecektir. Araştırmada alınacak tüm bilgiler araştırma kapsamı dışında hiçbir kişiyle kesinlikle paylaşılmayacaktır. Elde edilecek bilgiler, Etik Kurul, kurum ve diğer sağlık otoritelerinin orijinal tıbbi kayıtlarına doğrudan erişimleri olacaktır. Fakat bu gönüllü onam formunun imzalanmasıyla bu bilgiler gizli tutulacaktır. Bu çalışmaya katılmayı reddedebilirsiniz. Çalışmanın herhangi aşamasında gerekçe belirtmeksizin katılım onayınızdan vazgeçebilirsiniz.

Araştırmaya katılımınız için sizden herhangi bir ücret istenmeyecek ve katılımınız karşılığında size herhangi bir ücret ödenmeyecektir. Ayrıca çocuğunuza bu araştırma hakkında anlayacağı şekilde bilgilendirme yapılacak ve araştırmaya katılımı için rızası alınacaktır. Sizden beklenen, bilgilendirilmiş onam formunu imzalayıp, bu araştırmaya katkı sağlamayı kabul ettikten sonra, çalışma başlangıcında veri toplama formunun, besin tüketim sıklığı anketinin ve sporcu beslenmesi bilgisi saptama formunun eksiksiz doldurulması, katılımcıların ebeveynlerin sözlü eğitime katılması ve eğitimden 6 hafta ve 3 ay sonra aynı veri toplama formlarının doldurulmasıdır.

Sorumlu Araştırmacı: Dr. Öğr. Üyesi İrem KAYA CEBİOĞLU
Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü Öğretim Üyesi
Araştırmacı: Dyt. Dilara SERARSLAN
Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü Yüksek Lisans Öğrencisi

Bilgilendirilmiş Gönüllü Olur Formundaki tüm açıklamaları okudum. Bana, yukarıda konusu ve amacı belirtilen araştırma ile ilgili açıklamalar, yukarıda adı belirtilen araştırmacı diyetisyen tarafından yapıldı. Araştırmaya gönüllü olarak katıldığımı, istediğim zaman gerekçeli veya gerekçesiz olarak araştırmadan ayrılabileceğimi biliyorum. Söz konusu araştırmaya, hiçbir baskı ve zorlama olmaksızın kendi rızamla katılmayı kabul ediyorum.

Ad, Soyadı:
Tarih:
İmza:

Sorumlu Araştırmacı:

7.4.Informed Consent Forms Specific to Children

Yazılı Rıza Formu

Merhaba,

Benim adım Dilara Serarslan, beslenme uzmanıyım. Senin yaşındaki yüzücülerle bir araştırma yapıyoruz. Bu araştırmada amacımız ailendeki büyük insanlara (annen, baban gibi) yüzücü beslenmesi ile ilgili eğitim verdikten sonra ailene verilen bu eğitimin senin beslenme alışkanlıklarında ve bilgi düzeyinde olan etkilerini değerlendirmek. Araştırma ile yeni bilgiler öğreneceğiz. Bu yeni bilgiler, senin ve senin yaşındaki yüzücülerin beslenme alışkanlıklarında ve sporcu beslenmesi bilgi düzeylerinde iyileşmeler sağlayabilir. Bu nedenle araştırmaya katılmanı öneriyoruz.

Araştırmayı ben ve üniversiteden hocam olan İrem Kaya Cebioğlu ile birlikte yapıyoruz. Bu araştırmaya katılacak olursan; eylül ayında seni daha iyi tanıyabilmek için veri toplama, beslenme alışkanlıklarını anlayabilmek için besin tüketim sıklığı ve sporcu beslenmesi bilgi düzeyini saptayabilmek için sporcu beslenmesi bilgi düzeyi saptama formu olmak üzere toplam 3 adet formu bizim için doldurmanı isteyeceğiz ve eğer aile büyüklerin sporcu beslenmesi eğitimine katılırlarsa bu formları belli aralıklarla 2 defa daha doldurmanı isteyeceğiz.

Bu araştırmanın sonuçları, senin gibi yüzücü olan çocuklar için yararlı bilgiler sağlayacaktır. Bu sonuçları, başka beslenme uzmanları ve doktorlarla da paylaşacağız; ama senin adını söylemeyeceğiz.

Bu araştırmada aramızda olmak için, karar vermeden önce; anne ve babanla da konuşmalı, onlara danışmalısın. Biz zaten anne ve babana bu araştırmadan bahsedeceğiz; onların izinlerini alacağız. Anne ve baban "tamam" deseler bile; önemli olan, senin kararın. Sen, araştırmaya katılmayı kabul etmeyebilirsin. Bu araştırmaya katılmak senin isteğine bağlı ve istemezsen katılmazsın. Önce katılmayı kabul etsen bile, sonradan vazgeçebilirsin; bu tamamen sana bağlı. Kabul etmediğin durumda da, bana, antrenörüne ve ailene bunu belirtebilirsin.

Aklına şimdi gelen veya daha sonra gelecek olan soruları, istediğin zaman bana cep telefonumdan arayıp ulaşarak sorabilirsin. Telefon numaram bu kağıtta yazıyor. Bu araştırmaya katılmayı kabul ediyorsan aşağıya lütfen adını ve soyadını yaz ve imzanı at. İmzaladıktan sonra sana ve ailene bu formun bir kopyası verilecektir.

Çocuğun Adı, Soyadı:
Çocuğun imzası ve tarih:

Velisinin Adı, Soyadı:
Velisinin imzası ve tarih:

Beslenme Uzmanı/ Diyetisyen Dilara SERARSLAN
Cep Tel: 0539 344 0888

7.5.Demographic Information Form

VERİ TOPLAMA FORMU

Katılımcı Ad-Soyadı:
Katılımcı Doğum Yılı:
Cinsiyet : ☐Kız ☐Erkek
Boy: Kilo:

1. Ne kadar zamandır spor yapıyorsunuz?

   ……..

2. Antrenmanlara katılımızı engelleyecek herhangi bir sakatlığınız var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

3. Tanısı konulmuş herhangi bir hastalık/sağlık probleminiz var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

4. Günlük diyetinizde besin kısıtlaması gerektiren bir hastalığınız var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

5. Kullanmakta olduğunuz ilaç/ilaçlar var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

6. Besin alerjiniz var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

7. Besin intoleransınız var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

8. Tercihen hiç tüketmediğiniz bir besin var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

9. Günlük beslenmenizde uyguladığınız bir beslenme modeli (vejeteryan-vegan-ketojenik-alkali-aralıklı açlık vb..) var mı? Evet ise belirtiniz.

   ☐ Evet ☐ Hayır ……

10. Antrenman – müsabaka döngünüze göre beslenme modelinizi değiştirir misiniz? Evet ise, ne gibi farklılıklar olur?

    ☐ Evet ☐ Hayır ……

11. Besin destekleri (multivitamin, protein tozu vb.) kullanıyor musunuz? Evet ise belirtiniz.

    ☐ Evet ☐ Hayır ……

12. Sporcu beslenmesi konusunda bilginiz var mı?

    ☐ Evet ☐ Hayır ……

7.6. Food Frequency Questionnaire

	TÜKETİM SIKLIĞI (DEFA)							MİKTAR	
BESİNLER	Her gün tüketirim.	Haftada 5-6 defa tüketirim.	Haftada 3-4 defa tüketirim.	Haftada 1-2 defa tüketirim.	15 günde bir defa tüketirim.	Ayda 1 defa tüketirim.	Hiç tüketmem	Ev ölçüsü (tabak, bardak, el büyüklüğü, kaşık vb.)	Net miktar (gram)
Süt, yoğurt, ayran, kefir vb.									
Peynir									
Kırmızı et (bonfile et, köfte vb.)									
Tavuk eti									
Balık									
Yumurta									
Kuru baklagil (nohut, kuru fasulye, mercimek vb.)									
Yağlı tohumlar (fındık, badem, ceviz, fıstık, fıstık ezmesi vb.)									
Sebzeler									
Meyveler									
Ekmek, pide, bazlama vb.									
Tahıl ürünleri (makarna, pilav, bulgur, yulaf ezmesi, mısır gevreği vb.)									
Sıvı yağ (zeytinyağ, ay çiçek yağ vb.)									
Katı yağ (tereyağ, margarin vb.)									
Hamur işi (börek, poğaça, açma)									
Tatlı (kek, muhallebi, baklava vb.)									
Paketli atıştırmalıklar (bisküvi, çikolata, cips vb.)									
Paketli sporcu yiyecekleri (protein bar, protein krakeri, karbonhidrat jeli vb.)									
Sporcu içeceği (powerade vb.)									

Günlük su tüketiminizi litre veya su bardağı ölçüsü ile belirtiniz: ....

7.7. Nutritional Knowledge Questionnaire for Athletes

SPORCU BESLENME BİLGİSİ SAPTAMA FORMU

1. BÖLÜM /GENEL BESLENME BİLGİSİ

1. Aşağıdakilerden hangisi enerji kaynağı değildir?

☐Yağlar ☐Karbonhidratlar ☐Proteinler ☐Vitaminler

2. Aşağıdakilerden hangisi en hızlı kullanılan enerji kaynağıdır?

☐Yağlar ☐Karbonhidratlar ☐Proteinler ☐Vitaminler

3. Aşağıdakilerden hangisi yağların en zengin kaynağıdır?

☐Pirinç-Bulgur ☐Bal-Reçel ☐Muz-Ananas ☐Ceviz-Fındık

4. Aşağıdakilerden hangisi kalsiyumun en zengin kaynağıdır?

☐Sebze-meyveler ☐Süt-yoğurt ☐Pirinç-bulgur ☐Et-tavuk-balık

5. Aşağıdakilerden hangisi en iyi protein kaynağıdır?

☐Yumurta ☐Kuru Baklagiller ☐Sebzeler ☐Meyveler

6. Aşağıdakilerden hangisi en iyi karbonhidrat kaynağıdır?

☐Süt – Yoğurt ☐Etler ☐Sebzeler ☐Pirinç- Makarna

7. Aşağıdakilerden hangisi vitaminlerin en iyi kaynağıdır?

☐Süt – Yoğurt ☐Etler ☐Sebzeler ve Meyveler ☐Pirinç- Makarna

8. Aşağıdakilerden hangisi demirin en iyi kaynağıdır?

☐Süt – Yoğurt ☐Etler ☐Sebzeler ve Meyveler ☐Pirinç- Makarna

9. Aşırı protein tüketimi vücutta sıvı ve elektrolit kaybına sebep olur.

☐Doğru ☐Yanlış

10. Kuru baklagiller demir ve posadan zengindir.

☐Doğru ☐Yanlış

2. BÖLÜM / SPORCU BESLENMESİ BİLGİSİ

11. Antrenman ve müsabaka sırasında su içilmelidir.

☐Doğru ☐Yanlış

12. Vitamin ve mineral destekleri performansı arttırır.

☐Doğru ☐Yanlış

13. Demir eksikliğine bağlı anemi performansı düşürür.

☐Doğru ☐Yanlış

14. Dehidratasyon (vücudun susuz kalması) performansı düşürür.

☐Doğru ☐Yanlış

15. Antrenman-müsabaka öncesi yüksek yağlı besin tüketimi performansı düşürür.

☐Doğru ☐Yanlış

16. Sıvı ihtiyacının karşılanmasında sadece susama hissine güvenmek yeterlidir.

☐Doğru ☐Yanlış

17. Aç karna antrenman yapmak erken yorgunluk ve konsantrasyon güçlüğü yaratır.

☐Doğru ☐Yanlış

18. Antrenmandan veya müsabakadan en az kaç saat önce ana yemek yenilmelidir?

☐1-2 Saat ☐3-4 Saat ☐5-6 Saat ☐Süre Önemli Değil

19. Antrenman veya müsabaka sonrası ne zaman yemek yenilmelidir?

☐ 10-15 dakika içinde ☐ 1-2 saat içinde ☐ 3-4 saat içinde ☐Süre Önemli Değil

20. Antrenman veya müsabaka sonrası besin tercihinde neye dikkat edilmelidir?

☐Yağlardan zengin olmalıdır ☐Proteinden zengin olmalıdır.

☐ Karbonhidrattan zengin olmalıdır. ☐ Protein ve karbonhidrattan zengin olmalıdır.

Sabırla anketi tamamladığınız için teşekkür ederim…