**SPORMETRE**
The Journal of Physical Education and Sport Sciences
Beden Eğitimi ve Spor Bilimleri Dergisi

**DOI: 10.33689/spormetre.1315591**

Geliş Tarihi (Received): 16.06.2023 Kabul Tarihi (Accepted): 04.02.2024 Online Yayın Tarihi (Published): 25.03.2024

# EVALUATION OF BODY COMPOSITION, NUTRITIONAL STATUS, AND EATING ATTITUDES OF MALE INDIVIDUALS BASED ON EXERCISE ADDICTION BEHAVIOR

**Gizem Helvacı[1*], Serap Balaban[2], Aslı Uçar[3]**
[1]Mehmet Akif Ersoy University, Faculty of Health Sciences, BURDUR
[2]Gaziantep University, Faculty of Health Sciences, GAZİANTEP
[3]Ankara University, Faculty of Health Sciences, ANKARA

**Abstract:** In this study, we aimed to examine the body composition, supplement use and nutritional status of young adult males who attend the gym based on their level of exercise addiction. We also intended to determine if there was a link between exercise addiction and eating attitude. The study included 150 volunteers males aged 19 to 30 who had exercised at least three days a week for the last three months. Data were collected through a questionnaire containing questions about the general characteristics of individuals, an eating attitude test, an exercise addiction scale, and a food consumption record. The results of the exercise dependence scale showed that 23.3% of the participants were asymptomatic, 69.3% were non-dependent symptomatic, and 7.3% were addicts. 50% of individuals had an abnormal eating behavior disorder. There was a moderate positive correlation between exercise addiction and eating attitude scale scores ($r=0.50$ and $p<0.05$). The rate of using nutritional supplements is higher in addicted participants ($p<0.05$). While the body fat ratio was statistically higher in non-addicts than in addicts, the body water ratio was statistically lower in non-addicts than in addicts ($p<0.05$). Energy, protein, daily protein intake per body weight, percentage of energy derived from protein, carbohydrate intake, cholesterol, thiamine, riboflavin, vitamin B6, folate, potassium, calcium, magnesium, phosphorus, iron, and zinc intake were statistically significantly higher in addicts than in non-addicts ($p<0.05$). The percentage of energy derived from dietary fat in addicts was statistically significantly lower than in non-addicts ($p<0.05$). As a result, eating disorders were much more common than exercise addiction in regularly exercising young men. In addition to a relationship was established between eating disorders and exercise addiction.

**Key Words:** Eating attitude, exercise addiction, nutritional status

# ERKEK BİREYLERİN VÜCUT KOMPOZİSYONU, BESLENME DURUMU VE YEME TUTUMLARININ EGZERSİZ BAĞIMLILIĞI DAVRANIŞINA GÖRE DEĞERLENDİRİLMESİ

**Öz:** Bu çalışmada spor salonlarına giden genç yetişkin erkeklerin egzersiz bağımlılık düzeylerine göre vücut kompozisyonları, takviye kullanımları ve beslenme durumları incelenmiştir. Ayrıca egzersiz bağımlılığı ile yeme tutumu arasında ilişki olup olmadığını belirlemek amaçlanmıştır. Çalışma, son üç aydır haftada en az üç gün egzersiz yapan 19 ila 30 yaşları arasındaki 150 gönüllü erkekten oluşmaktadır. Veriler, bireylerin genel özelliklerine ilişkin soruları içeren anket formu, yeme tutum testi, egzersiz bağımlılığı ölçeği ve besin tüketim kaydı aracılığıyla toplanmıştır. Egzersiz bağımlılığı ölçeğinin sonuçları, katılımcıların %23,3'ünün asemptomatik, %69,3'ünün bağımlı olmayan semptomatik ve %7,3'ünün bağımlı olduğunu göstermiştir. Bireylerin %50'sinde anormal yeme davranışı bozukluğu bulunmuştur. Egzersiz bağımlılığı ile yeme tutum ölçeği puanları arasında orta düzeyde pozitif korelasyon bulunmuştur ($r=0,50$ ve $p<0,05$). Bağımlı katılımcılarda besin takviyesi kullanma oranı daha yüksektir ($p<0,05$). Vücut yağ oranı bağımlı olmayanlarda bağımlılara göre istatistiksel olarak yüksek bulunurken, vücut su oranı bağımlı olmayanlarda bağımlılara göre istatistiksel olarak daha düşüktür ($p<0,05$). Enerji, protein, vücut ağırlığı başına günlük protein alımı, enerjinin proteinlerden gelen yüzdesi, karbonhidrat alımı, kolesterol, tiamin, riboflavin, B6 vitamini, folat, potasyum, kalsiyum, magnezyum, fosfor, demir ve çinko alımı bağımlı olanlarda bağımlı olmayanlara göre daha yüksek bulunmuştur ($p<0.05$). Bağımlı katılımcıların diyetlerinin yağlardan gelen yüzdesi, bağımlı olmayanlara göre istatistiksel olarak anlamlı derecede daha düşük bulunmuştur ($p<0.05$). Sonuç olarak düzenli egzersiz yapan genç erkeklerde yeme bozuklukları egzersiz bağımlılığından daha yaygındır. Ayrıca yeme bozukluğu ile egzersiz bağımlılığı arasında bir ilişki kurulmuştur.

**Anahtar Kelimeler:** Beslenme durumu, egzersiz bağımlılığı, yeme tutumu

[*] *Corresponding Author: Gizem Helvacı, Arş.Gör.Dr., E-mail: gizemhelvaci_165@* hotmail.com

## INTRODUCTION

A sedentary lifestyle ranks fourth among all causes of death worldwide (Kohl et al., 2012). Lee et al. (2012) reported that 6-10% of non-communicable diseases, including type 2 diabetes, coronary heart disease, and colon and breast cancers worldwide, result from physical inactivity. They also reported that if sedentary individuals are active, life expectancy will increase by 0.68 years worldwide (Lee et al., 2012). Because of the global rise in sedentary lifestyles, increasing regular exercise participation and adherence has become a critical issue that governments and healthcare organizations must tackle (Macfarlane et al., 2016).

Regular exercise is a set of planned, structured, and repetitive physical activities with sufficient frequency, duration, and intensity to maintain, improve and promote health (Berczik et al., 2012). Regular physical activity has been reported to improve the perceived quality of life and general well-being (Huang & Humphreys, 2012). In addition, it is an essential tool that empowers individuals' motivation to keep their life under control and achieve their life-related goals (Archer & Garcia, 2014). Although regular exercise provides many health benefits, in a small proportion of the population may exercise excessively, leading to adverse health outcomes (Macfarlane et al., 2016). Indeed, there is a lack of consensus on the upper limit of a healthy exercise's duration, frequency, and intensity (Lukacs et al., 2019).

The concept of exercise addiction has recently been introduced in the literature. Exercise addiction is a behavioural disorder in which the individual is overeager to exercise and loses control over exercise habits (Szabo et al., 2015). Excessive exercisers should not be confused with exercise addicts. Excessive exercisers and exercise addicts may both engage in exercise in similar amounts. The difference between these concepts is associated with attitudes and beliefs about training and psychological concerns encountered when exercise is not performed. Exercise addiction entails a compulsive effort, which could involve exercising without considering the detrimental social, occupational, and health consequences. It coexists with other addictions and eating disorders that, if unidentified, might complicate the treatment process (Freimuth et al., 2011).

Exercise addiction occurs especially in athletes with high competition levels (De La Vega et al., 2016). Long-distance runners and bodybuilders have an increased risk. However, it can be seen in many sports (Rossi and Tirapegui, 2016). A passion for and addiction to exercise are more widespread among athletes. In addition, this has been seen in gym members (De La Vega et al., 2016).

Recent studies have shown that males care about body image as much as females, with the desire to lose weight and increase muscle mass by reducing adipose tissue (Edwards et al., 2014). Body dissatisfaction or negative body image affects especially young adult males (19-30 years old) more than middle-aged and older males (Esnaola et al., 2010). Attitudes toward appearance and the desire to have a muscular body may lead to excessive workouts, restrictive diet practices, and improper nutritional supplement use (Tod & Edwards, 2015). In this study, we aimed to examine the body composition, supplement use and nutritional status of young adult males aged 19 to 30 who attend the gym based on their level of exercise addiction. We also intended to determine if there was a link between exercise addiction and eating attitude. There are a limited number of studies evaluating the nutritional status of individuals with exercise addiction. This article aims to expand the existing literature and the nutritional status of exercise-addicted individuals will be analyzed with a cross-sectional design within the scope of gyms in the capital of Turkey. This study will also have the potential to inform practitioners

working with potentially "at-risk" groups, such as doctors, nutritionist, coach and fitness industry workers.

## MATERIALS AND METHODS

### Location, time, and sample of research

This research was conducted on individuals enrolled in two private sports centres in Turkey's capital. The study included males aged 19 to 30 who had exercised at least three days a week for at least 45 minutes a day for the last three months. The gym members were informed about the research. The study was carried out with 150 volunteers who had satisfied the conditions.

### Data collection

Data were collected through a questionnaire containing questions about the general characteristics of individuals, an eating attitude test, an exercise addiction scale, and a food consumption record. In addition, body composition measurements were taken and recorded in the questionnaire.

### Exercise Dependence Scale (EDS)

We adopted a 21-item Likert-type (never-1, always-6) self-rating scale developed by Hausenblas and Downs (2002) to determine exercise addiction. The scale aimed to assess exercise addiction regardless of a single type of exercise. The scale consists of 7 sub-dimensions: tolerance, exercise cessation (withdrawal), intention effect, loss of control, time, decrease in other activities, and continuity. There are three items in each sub-dimension. Each item was scored on a scale ranging from 1 to 6. Cut-off points for sub-dimension scores are considered as <7, between 7 and 14, and ≥ 15 points. Three groups were formed by analyzing more than three sub-dimensions depending on the addiction levels of the subjects. Addicts received greater than or equal to 15 points. Nonaddict symptomatic (risk of exercise addiction) received scores ranging from 7 to14. Asymptomatics received a score of less than 7. The total score ranges from 21 to 126. Higher scores indicate a higher risk of exercise addiction (Hausenblas & Downs, 2002). The reliability and validity of the Turkish version of the scale were carried out by Yeltepe and İkizler (2007).

### Eating Attitude Test (EAT-26)

This scale aimed to identify individuals with anorexic symptoms when it was designed. Its new 26-item version was then created based on the 40-item scale. Items were evaluated in a 6-point Likert type on a scale from 0 to 53. Twenty points are deemed as the cut-off point for the EAT-26. While those greater than and equal to 20 points are defined as abnormal eating behaviour, those below 20 points are described as normal eating behaviour (Garner et al., 1982). The validity and reliability of the scale was evaluated by Devran and Kızıltan (2014) in a pilot application on 50 university students. The internal consistency coefficient (Cronbach's alpha) was found to be 0.70 for EAT-26, and the intraclass correlation coefficient was 0.95.

### Food Consumption Records

The retrospective 24-hour recall method was used to take the participants' food consumption records on days they exercised and days they did not. When keeping track of food consumption, the accuracy of portion size was estimated using a photo catalogue of foods and nutrients (Rakıcıoğlu et al., 2009). The data were analyzed using the Nutrition Information Systems (BeBIS, full version), a food software program compliant with Turkish food. Daily amounts of food consumption and energy intake (protein, fat, carbohydrate, vitamin A, vitamin E, vitamin

B1, vitamin B2, vitamin B6, vitamin B12, vitamin C, calcium, magnesium, iron, phosphorus, and zinc) were calculated.

**Body composition**

Height was measured using non-stretchable tape barefoot while the back stood against the wall, the legs were together, and the head was in the Frankfort plane (Pekcan, 2008). The Tanita BC 545 N Innerscan body analyzer was used to calculate body weight, body fat percentage (%), lean body mass (kg), total percentage of body water (%), and bone mass (kg). Among the methods of assessing body composition, the use of portable devices is a frequently preferred method in cross-sectional studies due to its features such as being relatively low-cost, non-invasive, and not requiring extensive training. Calibration is done by the device manufacturer. However, there are standard procedures that participants must follow for accurate results. Participants were warned not to engage in consume alcohol or strenuous physical activity before 24 hours. Before the measurements, they were also recommended not to consume caffeine-containing beverages such as tea, coffee, or cola for four hours, fast for at least four hours, and drink large amounts of water (Canpolat, 2018). The measures were taken barefoot in light-weight clothes after the participants' age, gender, height, and training levels were inputted into the measuring device. Tanita, one of the bioelectrical impedance analysis devices, is considered both valid and reliable for the assessment of body composition in the healthy adult population (Vasold et al, 2019). In athletes and individuals with excessive exercise participation, there are changes in body geometry due to training, and this affects bioimpedance measurements (Matias et al, 2016). When adult mode is selected on the device for highly and moderately active individuals, the appropriate mode was selected according to the exercise level, as the results may be erroneous. One study reported that the validity of this method of analysis is not limited to specific body sizes and sports.( Nickerson et al, 2019).

**Statistical analysis**

Statistical Package for Social Sciences (SPSS V.21) software was employed to examine the data and create the tables. Continuous variables were described as arithmetic mean, standard deviation, and minimum and maximum values. Categorical variables were considered numerically and in percentages. Spearman Correlation analysis was used to analyze the relationship between eating attitude and exercise dependence scale scores since the assumptions necessary for parametric tests were unmet. Chi-square analysis was used to evaluate the distribution of participants' supplementation habits according to exercise addiction classification. The One-Way ANOVA Test was utilized to reach body composition and food intake according to exercise dependence levels. P-values less than 0.05 were considered statistically significant.

## RESULTS

Table 1 shows the distribution of general characteristics of male individuals exercising regularly. 88% of the participants were single, 72% were graduates, and 71.3% had a profession. 40% of the participants were smoking cigarettes, while 52.7% were using alcohol. 40.7% of the participants were taking dietary supplements. 38.7% of the participants have been exercising regularly for 4-12 months, 34% for 13-36 months, and 27.3% for more than 36 months. The proportion of participants who mainly do resistance-strength exercise is 75.3% and 59.3% of participants stated that they exercised to increase muscle mass. Their average age was 26.2±3.1.

**Table 1.** *General Characteristics of Participants (n=150)*

| | **Number** | **%** |
|---|---|---|
| **Marital status** | | |
| *Single* | 132 | 88,0 |
| *Married* | 18 | 12,0 |
| **Education** | | |
| *Primary school / Secondary school / High school* | 27 | 18,0 |
| *University* | 108 | 72,0 |
| *Master /PhD* | 15 | 10,0 |
| **Profession** | | |
| *Yes* | 107 | 71,3 |
| *No* | 43 | 28,7 |
| **Smoking** | | |
| *Yes* | 60 | 40,0 |
| *No* | 81 | 54,0 |
| *Used to smoke but quit* | 9 | 6,0 |
| **Use of Alcohol** | | |
| *Yes* | 79 | 52,7 |
| *No* | 71 | 47,3 |
| **Use of Dietary Supplements** | | |
| *Yes* | 61 | 40,7 |
| *No* | 89 | 59,3 |
| **Regular Exercise Time (months)** | | |
| 4-12 | 58 | 38,7 |
| 13-36 | 51 | 34 |
| >36 | 41 | 27,3 |
| **Exercise Type** | | |
| Resistance-strength exercise | 113 | 75,3 |
| Endurance-aerobic exercise | 37 | 24,7 |
| **Purpose of Exercise** | | |
| lose weight | 25 | 16,7 |
| increase muscle mass | 89 | 59,3 |
| relaxation | 23 | 15,3 |
| being healthy | 10 | 6,7 |
| prevent aging | 3 | 2,0 |
| **Disease State** | | |
| Yes | 16 | 10,7 |
| No | 134 | 89,3 |
| **Age**** | 26,2± 3,1 (19-30) | |

** Data are given as mean±standard deviation. Other data are presented numerically and in percentages.

Table 2 demonstrates the exercise addiction, eating disorder status, and scale scores. Participants' mean scores for exercise addiction and eating attitude were 62.6±19.6 and 21.3±9.8, respectively. The results of the exercise dependence scale showed that 23.3% of the participants were asymptomatic, 69.3% were non-dependent symptomatic, and 7.3% were addicts. The mean exercise dependence scale score of addicts was 105.8±8.3. 50% of individuals had an abnormal eating behavior disorder. The mean eating attitude scale score of those with abnormal eating behavior disorder was 28.7±7.7.

**Table 2.** Participant Exercise Addiction and Eating Disorder and Scale Scores (n=150)

| | **Min** | **Max** | **Mean±SD** |
|---|---|---|---|
| **Exercise Addiction Scale Sub-Dimensions** | | | |
| *Effects of exercise cessation (withdrawal)* | 3 | 18 | 8,8±3,8 |
| *Continuity* | 3 | 18 | 7,6±4,3 |
| *Tolerance* | 3 | 18 | 10,3±3,8 |
| *Loss of control* | 3 | 18 | 8,9±3,7 |
| *Reducing other activities* | 3 | 18 | 8,3±3,8 |
| *Time* | 3 | 18 | 9,2±3,6 |
| *Intention effect* | 3 | 18 | 9,4±4,1 |
| ***Total score*** | 24 | 121 | 62,6±19,6 |
| **EAT-26 Sub-Dimensions** | | | |
| Diet | 3 | 31 | 13,2±6,4 |
| Bulimia | 0 | 15 | 2,8±2,9 |
| Oral Control | 0 | 18 | 5,2±3,6 |
| **Total score** | 3 | 53 | 21,3±9,8 |
| | **n** | **%** | **Mean±SD** |
| **Exercise addiction** | | | |
| *Asymptomatic* | 35 | 23,3 | 39,4±7,3 |
| *Nonaddict symptomatic* | 104 | 69,3 | 65,8±11,7 |
| *Addict* | 11 | 7,3 | 105,8±8,3 |
| **Eating Attitude** | | | |
| *Normal Eating Behavior (EAT<20)* | 75 | 50,0 | 13,8±4,5 |
| *Abnormal Eating Behavior (EAT≥20)* | 75 | 50,0 | 28,7±7,7 |

The correlation coefficients of the participant exercise addiction and eating attitude scale scores are shown in Table 3. There was a moderate positive correlation between exercise addiction and eating attitude scale scores ($r=0.50$ and $p<0.05$).

**Table 3.** Correlation between Participant Exercise Addiction and Eating Attitudes (n=150)

| | Diet | Bulimia | Oral Control | **EAT-26 Total score** |
|---|---|---|---|---|
| *Effects of exercise cessation* | 0,22* | 0,18* | 0,21* | 0,28* |
| *Continuity* | 0,28* | 0,35* | 0,28* | 0,38* |
| *Tolerance* | 0,18* | 0,09 | 0,13 | 0,20* |
| *Loss of control* | 0,29* | 0,24* | 0,18* | 0,33* |
| *Reducing other activities* | 0,43* | 0,39* | 0,20* | 0,47* |
| *Time* | 0,37* | 0,28* | 0,11 | 0,37* |
| *Intention effect* | 0,43* | 0,32* | 0,21* | 0,45* |
| **Total Score of Exercise Addiction** | 0,46* | 0,35* | 0,25* | 0,50* |

Spearman Correlation Analysis, *p<0.05

Table 4 depicts the distribution of participant body composition measurements based on the exercise addiction classification. There was no statistically significant relationship between the level of exercise addiction and body weight, height, BMI, muscle weight, or bone mass

(p>0.05). While the body fat ratio was statistically higher in non-addicts than in addicts, the body water ratio was statistically lower in non-addicts than in addicts (p<0.05).

**Table 4.** Distribution of Participants' Body Composition Measurements Based on Their Exercise Addiction Classification (n=150)

| | **Exercise Addiction** | | | | |
|---|---|---|---|---|---|
| | **Non-addict-Asymptomatic** | **Non-addict-Symptomatic** | **Addict** | **Total** | **p** |
| | **Mean±SD** | **Mean±SD** | **Mean±SD** | | |
| **Body weight (kg)** | 81,5±20 | 81,4±12,6 | 81,3±7,3 | 81,4 ± 14,3 | 0,99 |
| **Height (cm)** | 178,9±6,4 | 179,3±6,2 | 182,1±5,6 | 179,4± 6,2 | 0,32 |
| **BMI (kg/m$^2$)** | 25,4±5,6 | 25,3±3,4 | 24,5±1,5 | 25,2±3,9 | 0,79 |
| **Body fat percentage (%)** | 18±7,7 | 16,6±5,3 | 12,3±3,7 | 16,6 ± 5,9 | **0,02** |
| **Body muscle weight (kg)** | 62,3±9,5 | 64,3±7,8 | 68,3±4,9 | 64,1 ± 8,1 | 0,09 |
| **Bone mass (kg)** | 3,03±0,6 | 3,2±0,5 | 3,3±0,3 | 3,1 ± 0,5 | 0,29 |
| **Body water percentage (%)** | 60,1±5 | 60,8±3,8 | 63,9±3 | 60,9± 4,2 | **0,03** |
| One Way Anova Analysis | | | | | |

Table 5 depicts the distribution of dietary supplement habits of participants according to exercise addiction classification. While the ratio of nutritional supplements are higher in those who are dependent, the ratio of those who do not use nutritional supplements in non -dependent and symptomatic ones are higher (p <0.05). The rate of using nutritional supplements that increase endurance is higher among addicted participants (p <0.05).

**Table 5.** Distribution of Dietary Supplement Habits of Participants According to Exercise Addiction Classification

| | **Exercise Addiction** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Non-addict-Asymptomatic** | | **Non-addict-Symptomatic** | | **Addict** | | **X$^2$** | **sd** | **p** |
| | **n** | **%** | **n** | **%** | **n** | **%** | | | |
| **Dietary Supplement Usage Status** | | | | | | | | | |
| No | 28 | 18,7 | 60 | 40,0 | 1 | 0,7 | 17,819 | 2 | **0,000**[b] |
| Yes | 7 | 4,7 | 44 | 29,3 | 10 | 6,7 | | | |
| **Dietary Supplement Type** | | | | | | | | | |
| Increasing endurance | | | | | | | | | |
| No | 7 | 11,5 | 32 | 52,5 | 2 | 3,3 | 15,613 | 2 | **0,000**[a] |
| Yes | - | - | 12 | 19,7 | 8 | 13,1 | | | |
| Increasing strength | | | | | | | | | |
| No | 3 | 4,9 | 9 | 14,8 | 5 | 8,2 | 4,181 | 2 | 0,124[a] |
| Yes | 4 | 6,6 | 35 | 57,4 | 5 | 8,2 | | | |
| Health enhancing | | | | | | | | | |
| No | 4 | 6,6 | 35 | 57,4 | 6 | 9,8 | 2,599 | 2 | 0,273[a] |
| Yes | 3 | 4,9 | 9 | 14,8 | 4 | 6,6 | | | |

[a] Likelihood Ratio analysis [b] Pearson chi square analysis

Table 6 shows the participants' energy and nutrient intake based on their level of exercise addiction. Energy, protein, daily protein intake per body weight, percentage of energy derived from protein, carbohydrate intake, cholesterol, thiamine, riboflavin, vitamin B6, folate, potassium, calcium, magnesium, phosphorus, iron, and zinc intake were statistically

significantly higher in addicts than in non-addicts ($p<0.05$). The percentage of energy derived from dietary fat in addicts was statistically significantly lower than in non-addicts ($p<0.05$).

**Table 6.** Energy and Nutrient Intake of Participants by Exercise Addiction Levels (n=150)

| Energy and Nutrient | Asymptomatic (Mean±SD) | Symptomatic (Mean±SD) | Addict (Mean±SD) | F | p |
|---|---|---|---|---|---|
| **Energy (kcal)** | 1964±186 | 2187±228 | 2440± 201 | 24,1 | **0,000** |
| **Protein(g)** | 91,4±20 | 119,8±34 | 133,4±27 | 13,2 | **0,000** |
| **Protein (g/kg)** | 1,2±0,3 | 1,5± 0,5 | 1,6± 0,3 | 9,7 | **0,000** |
| **Protein(%)** | 19 ± 4 | 22± 5 | 22±3 | 6,2 | **0,003** |
| **Fat (g)** | 66±15 | 71±10 | 69±11 | 2,3 | 0,106 |
| **Fat (%)** | 30±7 | 29±5 | 26±4 | 3,4 | **0,037** |
| **Carbohydrate (g)** | 245±46 | 260±40 | 308±24 | 10 | **0,000** |
| **Carbohydrate (%)** | 50±8 | 48±5 | 51±4 | 2,8 | 0,062 |
| **Fibre (g)** | 21±6 | 24±7 | 25±6 | 1,9 | 0,140 |
| **Polyunsaturated fat (g)** | 13±5 | 12±4 | 13±3 | 0,5 | 0,601 |
| **Cholesterol (mg)** | 427±160 | 577±238 | 532±211 | 6,1 | **0,003** |
| **Vitamin A (µg)** | 1103±788 | 1530±1676 | 1437±796 | 1,1 | 0,333 |
| **Vitamin E (mg)** | 13±5 | 13±5 | 17±7 | 3 | 0,681 |
| **Vitamin $B_1$ (mg)** | 1,1±0,5 | 1,3±0,5 | 1,8±0,8 | 8,2 | **0,000** |
| **Vitamin $B_2$ (mg)** | 1,4±0,4 | 1,9±0,6 | 2±0,5 | 12 | **0,000** |
| **Vitamin $B_6$ (mg)** | 1,6±0,7 | 2,2±1,1 | 2,7±1,1 | 6 | **0,003** |
| **Folate (µg)** | 329±110 | 409±139 | 493±172 | 7,6 | **0,001** |
| **Vitamin C (mg)** | 111±61 | 107±51 | 147±55 | 2,7 | 0,072 |
| **Sodium(mg)** | 4149±1264 | 4429±1320 | 4743±1162 | 1,1 | 0,349 |
| **Potassium(mg)** | 2546±511 | 3096±693 | 3445±654 | 12 | **0,000** |
| **Calcium(mg)** | 794±240 | 956±255 | 1095±339 | 7,6 | **0,001** |
| **Magnesium (mg)** | 288±67 | 345±77 | 394±80 | 11,2 | **0,000** |
| **Phosphorus (mg)** | 1270±269 | 1641±401 | 1829±407 | 15,7 | **0,000** |
| **Iron (mg)** | 11,3±2,8 | 13,5±3,3 | 14,1±3,4 | 6,5 | **0,002** |
| **Zinc (mg)** | 11,6±2,4 | 14,1±3,7 | 16,2±4,5 | 9,6 | **0,000** |
| One-Way ANOVA Analysis | | | | | |

## DISCUSSION AND CONCLUSION

In this study, 73.3% of the participants stated that they mainly did resistance exercise. Resistance training is the primary way individuals can achieve muscle hypertrophy (Schoenfeld et al, 2016). This suggests that the majority of individuals come to the gym to increase muscle mass. As a matter of fact, increasing muscle mass (59.3%) took the first place in the aim of exercising. This was followed by weight loss (16.7%) and relaxation (15.3%) goals. In the study conducted by Yi and Seo (2018), 55% of those who participated in exercise stated that their goal was a healthy life, and 21.4% stated that their goal was to lose weight. Kilpatrick et al. (2005) identified many reasons that motivate participation in exercise. These reasons include stress management, weight management, socialization, improving health, and improving strength and endurance. The purpose of participating in exercise varies between genders. It has been reported that women participate in exercise mostly for weight management, while men participate in exercise to increase strength and endurance and to socialize (Kilpatrick et al., 2005).

This study reveals that the rates of exercise addiction and eating disorders were 7.3% and 50% in regularly exercising males. There was a moderate positive correlation between the two behavioural disorders ($r=0.50$ $p<0.05$). In a study of 79 male gym members in Germany, the rate of exercise addiction was reported to be 8.9% in those exercising at least one hour a week. The rate of eating disorders was lower than in our study (7.6%). They reported a positive correlation between both disorders ($r=0.28$ $p<0.05$) (Müller et al., 2015), which is consistent with our findings. In a study of 375 gym members in Afyonkarahisar, Turkey, the researchers found a weak but positive connection ($r=0.14$ $p<0.05$) between exercise addiction and eating behaviour (Yıldırım et al., 2017). Besides gymnasiums, studies in universities and hospitals have reported a relationship between exercise addiction and eating disorders. Research on patients with eating disorders at a psychiatry clinic in Norway found a strong correlation between the exercise addiction and eating disorder total scores ($r=0.62$ $p<0.05$) (Bratland-Sanda et al., 2011). A moderate correlation ($r=0.488$ p0.05) was observed between scale scores of eating disorders and exercise addiction in another study of 237 university students (Zmijewski and Howard, 2003). Cultural variations and sample characteristics may lead to disparities in reported rates and correlation coefficients. It is widely accepted that exercise addiction and eating disorders are related to personality traits. Individuals who are excessively concerned about body weight, appearance and body image, who are stressed and have perfectionist personality traits are at higher risk. These disorders may also occur as a result of the psychological effects of social media. When individuals compare their own bodies with the ideal body image presented by the media, this leads to body dissatisfaction. Additionally, individuals may be exposed to incorrect health advice on these platforms (Rodgers et al., 2016). Therefore, unconscious social media use; It is one of the risk factors for exercise addiction, eating disorders, and body dissatisfaction (Quesnel et al, 2018). High social media literacy of individuals is protective against negative consequences resulting from social media use (Tamplin et al, 2018).

Our examination of body composition according to levels of exercise addiction revealed that exercise addicts had a lower body fat ratio than non-addicts, with a similar muscle mass. Unlike the present study, Jee and Eun (2017) found that university males with exercise addiction had higher muscle mass than non-addicts, with a similar fat ratio. We found a mean body fat ratio of 12.3% in exercise addicts. The body fat ratio of a healthy male is recommended to be between 10 and 22% (Turocy et al., 2011). Although the body fat ratio is lower in exercise addicts, it remains within a recommended range at all levels of exercise addiction. According to this study, the rate of nutritional supplement use is statistically significantly higher in individuals addicted to exercise. It was determined that 10 out of 11 participants with exercise addiction used nutritional supplements. Rossi and Trapegui (2016) reported in their study that 42.3% of individuals with exercise addiction used nutritional supplements. In their study, Segura-Garcia et al. (2010) reported that the rate of using nutritional supplements in male individuals who exercise excessively to gain muscle was higher than in male individuals who exercise excessively to lose weight. It can be said that the high prevalence of exercise addict participants in this study in using nutritional supplements is due to individuals aiming for muscle gain. In this study, the frequency of using nutritional supplements that increase endurance (caffeine, carbohydrate drinks, etc.) was found to be significantly higher in individuals addicted to exercise. Endurance-increasing supplements are used to increase muscle strength and muscular endurance in resistance exercises (Grgic et al, 2019). The majority of exercise addicted participants prefer resistance exercise and may have turned to these supplements to increase muscular endurance.

There has been limited research on the dietary habits of exercise addicts. Torstveit et al. (2019) investigated the energy, fibre, and macronutrient intakes of 53 healthy male participants consisting of long-distance runners, triathletes, and cyclists based on their exercise addiction scale scores. They divided the participants into groups based on the average exercise addiction scale score: those with high and low exercise addiction scores. Their findings revealed no statistically significant difference between the two groups regarding one-day average energy, fibre, protein, carbohydrate, and fat intakes (Torstveit et al., 2019). Our study did not find any difference between fibre and fat intake according to exercise addiction, supporting Torstveit et al. (2019). However, we found that participants with exercise addiction received more energy, protein, and carbohydrates. People with exercise addiction are expected to have high energy needs and intakes due to their high degree of physical activity. It is recommended that 45-60% of daily dietary energy is derived from carbohydrates, 20-35% from fats and 10-20% from proteins (Tüber, 2015). The ratio of dietary energy derived from fat and carbohydrates for exercise addicts is within the recommended range. However, the percentage of daily dietary energy derived from protein was higher (22%) than recommended in exercise addicts. In our study, daily protein intake per body weight was 1.6 g in exercise addicts. Torstveit et al. (2019) found that daily protein intake per body weight was 1.7 g in the high exercise addiction group (mean 65.5) and 1.6 g in the low exercise addiction group (mean 45.9).

Exercise addiction can be accompanied by bigorexia (muscle dysmorphia). Exercise addiction scores have been shown to correlate positively with the severity of bigorexia (Soler et al., 2013). Therefore, the food intake of people suffering from bigorexia may mirror the food intake of exercise addicts. Segura et al. (2015) compared the food intake records of 18-45-year-old males with bigorexia (45) and non-bigorexia (45) (96). They observed that the daily protein intake per body weight in persons without bigorexia was 1.5-2 g while the daily protein intake per body weight in individuals with bigorexia was greater than 2 g. They also reported that individuals suffering from bigorexia consumed less fibre and more cholesterol. Although the iodine intake and the percentage of energy derived from fat were somewhat lower in people with bigorexia, all participants received the recommended amount of micronutrients other than iodine (Segura et al., 2015). We noticed no difference between fibre intake and exercise addiction. Lower cholesterol intake in people not addicted to exercise could be ascribed to less animal-derived foods and eggs consumption. Intakes of vitamins B1, B2, B6 and E, folate, potassium, calcium, magnesium, phosphorus, iron, and zinc were high in exercise addicts. We can assert that the higher food and energy intake of exercise addicts caused them to consume higher micronutrient intakes.

Our study has several limitations. Due to the study's cross-sectional nature, it is impossible to establish a causality relationship. Because data collection is based on self-report, respondent-induced reporting errors may occur. Because the study only included participants from two gymnasiums in one city, generalizing the findings to the entire population would be misleading seriously. However, our strengths include using validated measuring instruments (EDS and EAT-26) and expanding the limited literature on the nutritional status of exercise addicts.

Eating disorders were much more common than exercise addiction in regularly exercising young men. A relationship was established between eating disorders and exercise addiction. It is recommended that a study be conducted in different age groups and locations to determine the extent of the relationship, risk factors, and protective factors between these two disorders, which should be addressed most importantly. Future research should encourage coaches, dietitians, psychologists, and physicians to collaborate to identify at-risk individuals early and develop treatment strategies.

Exercise addiction is a disorder that tends to remain hidden and has diagnostic problems. Coaches, dieticians, psychologists and doctors should cooperate for diagnosis and appropriate treatment. For this reason, it is recommended to employ health professionals in gyms. Individuals with primary or secondary exercise addiction in gyms should be identified by experts as soon as possible and treatment should be started if necessary.Increasing exercise frequency and duration is a risk factor for exercise addiction. For this reason, exercise duration and frequency should be planned well. A healthy training program should be prepared by coaches and individuals should be monitored to ensure that they adhere to this program.Trainers should be informed about exercise addiction, eating disorders and appropriate nutrition.Trainers should be encouraged to refer gym members to a dietitian for accurate information and guidance regarding nutrition and supplements.Dietitians working in gyms should follow the current literature on sports nutrition and provide accurate information to gym members. Dietitians should provide seminars and training to gym members to increase social awareness in combating exercise addiction, eating disorders, inappropriate use of nutritional supplements and excessive protein intake.

**Ethics Committee Approval:** The study was performed by the Declaration of Helsinki, and ethics committee approval was received from Üsküdar University (No: 09/28.09.2021).

**Informed Consent:** Documented reported approval was received from all participants in this study.
**Peer-review:** Externally peer-reviewed.

**Acknowledgments:** We would like to express our special thanks to all the participants for participating in our study and for their sincere answers.

**Declaration of Interest:** The authors have no conflicts of interest to declare.

## REFERENCES

Archer, T., & Garcıa, D. (2014). Physical exercise influences academic performance and well-being in children and adolescents. *Int J Sch Cogn Psychol, 1,* e102.

Berczık, K., Szabó, A., Griffiths, M.D., Kurimay, T., Kun, B., Urbán, R., & Demetrovics, Z. (2012). Exercise addiction: symptoms, diagnosis, epidemiology, and etiology. Subst Use Misuse, *47*, 403–417.

Bratland-Sanda, S., Martinsen, E.W., Rosenvinge, J.H., Rø, Ø., Hoffart, A., & Sundgot-Borgen, J. (2011). Exercise dependence score in patients with longstanding eating disorders and controls: The importance of affect regulation and physical activity intensity. *Eur Eat Disord Rev, 19*(3), 249–255.

Canpolat, E. (2018). Possible role of phase angle from bioelectric impedance analysis parameters as diagnostic criteria. *Ann Health Sci Res, 7*(1), 58-65.

De La Vega, R., Parastatidou, İ.S., Ruiz-Barquin, R., & Szabo, A. (2016). Exercise addiction in athletes and leisure exercisers: The moderating role of passion. *J Behav Addict, 5*(2), 325–331.

Devran, B. (2014). *An investigation of dietary habits, eating attitudes and behaviours in adolescents and adults from eastern anatolia region in Turkey*. Başkent University, Institute of Health Science, Nutrition and Dietetic Master Degree Thesis, Ankara.

Edwards, C., Tod, D., & Molnar, G. (2014). A systematic review of the drive for muscularity research area. *Int Rev Sport Exerc Psychol, 7,* 18–41.

Esnaola, İ., Rodriguez, A., & Goni, A. (2010) Body dissatisfaction and perceived sociocultural pressures: gender and age differences. *Salud Ment, 33,* 21-29.

Freimuth, M., Moniz, S., & Kim, S.R. (2011). Clarifying Exercise addiction: differential diagnosis, co-occurring disorders, and phases of addiction. *Int J Environ Res Public Health, 8*, 4069-4081.

Garner, D.M., Olmsted, M.P., Bohr, Y., & Garfinkel, P.E. (1982). The eating attitudes test: psychometric features and clinical correlates. Psychol Med, *12*(4), 871-878.

Grgic J, Mikulic P, Schoenfeld BJ, Bishop DJ, & Pedisic Z (2019) The influence of caffeine supplementation on resistance exercise: a review. *Sports Med*, *49*, 17.

Hausenblas, H.A., & Downs, D.S. (2002). How much is too much? The development and validation of the Exercise Addiction scale. *Psychol Health, 17*, 387-404.

Huang, H., & Humphreys, B.R. (2012). Sports participation and happiness: Evidence from US microdata. *J Econ Psychol, 33,* 776–793.

Jee, Y.S., & Eun, D. (2017). Exercise Addiction and Psychophysiological Health in Korean Collegiate Students. *Int J Ment Health Addict, 16*(2), 451–465.

Kılpatrick M, Hebert E, & Bartholomew J (2005). College students' motivation for physical activity: differentiating men's and women's motives for sport participation and exercise. *Journal of American College Health, 54*(2), 87–94.

Kohl, H.W., Craig, C.L., Lambert, E.V., Inoue, S., Alkandari, J.R., Leetongin, G., & Kahlmeier, S. (2012) The pandemic of physical inactivity: global action for public health. *Lancet, 380*, 294-305.

Lee, I.M., Shiroma, E.J., Lobelo, F., Puska, P., Blair, S.N., Katzmarzyk, P.T., Anderson, L.B. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet, 380*, 219-29.

Lukacs, A., Sasvari, P., Varga, B., Mayer, K. (2019). Exercise addiction and its related factors in amateur runners. *J Behav Addict, 8*, 343–349.

Macfarlane, L., Owens, G., & Del Pozo Cruz, B. (2016) Identifying the features of an exercise addiction: A Delphi study. J Behav Addict, *5*, 474–484.

Matias, C. N., Santos, D. A., Júdice, P. B., Magalhães, J. P., Minderico, C. S., Fields, D. A., Lukaski, H., Sardinha, L.B., & Silva, A. M. (2016). Estimation of total body water and extracellular water with bioimpedance in athletes: A need for athlete-specific prediction models. *Clinical nutrition*, *35*(2), 468-474.

Muller, A., Loeber, S., Sochtig, J., Wildt, B.T., & Zwaan, M. (2015) Risk for exercise dependence, eating disorder pathology, alcohol use disorder and addictive behaviors among clients of fitness centers. *J Behav Addict*, *4*, 273-280.

Nickerson, B. S., Snarr, R. L., & Ryan, G. A. (2019). Validity of foot-to-foot bioelectrical impedance for estimating body composition in NCAA Division I male athletes: A 3-compartment model comparison. *The Journal of Strength & Conditioning Research*, *33*(12), 3361-3366.

Pekcan, G. (2008). *Detection of nutritional status*. Turkish Ministry of Health. Publication No: 726 Ankara.

Rakıcıoğlu, N., Tek, N.A., Ayaz, A., & Pekcan, G. (2009). *Food photo catalog*. Ata Ofset printing.

Rodgers, R. F, Lowy, A. S, Halperin, D. M, & Franko, D. L. (2016). A meta-analysis examining the influence of pro-eating disorder websites on body image and eating pathology. *European Eating Disorders Review, 24*(1), 3–8

Rossi, L., & Tirapegui, J. (2016). Exercise dependence and its relationship with supplementation at gyms in Brazil. Nutr Hosp, *33*, 431-436.

Schaenfeld, B. J., Ogborn, D., & Krieger, J. W. (2016). Effects of resistance training frequency on measures of muscle hypertrophy: a systematic review and meta-analysis. *Sports Medicine, 46*(11), 1689-1697.

Segura, A. M., Castell, E. C., Baeza, M. M. R., & Guillen, V. F. G. (2015) Valoración de la dieta de usuarios de sala de musculación con dismorfia muscular (vigorexia). *Nutr Hosp*, *32*(1), 324-329.

Segura-Garcia C, Ammendolia A, Procopia L, Papaianni MC, Sinopoli F, Bianco C, De Fazio P, & Capranica L (2010). Body uneasiness, eating disorders, and muscle dysmorphia in individuals who overexercise. *Journal of Strength and Conditioning Research, 24,* 3098-3104.

Soler, P.T., Fernandes, H.M., Damasceno, V.O., & Silva Novaes, J. (2013). Vigorexia and levels of exercise dependence in gym goers and bodybuilders. *Rev Bras Med Esporte*, *19*(5), 343-346.

Szabo, A., Griffiths, M.D., De La Vega Marcos, R., Mervo, B., Demetrovics, Z. (2015). Methodological and conceptual limitations in exercise addiction research. *Yale J Biol Med*, *88*(3), 303–308.

Tamplin, N. C., McLean, S. A., Paxton, S. J. (2018). Social media literacy protects against the negative impact of exposure to appearance ideal social media images in young adult women but not men. *Body Image, 26,* 29-37.

Tod, D., & Edwards, C. (2015). A meta-analysis of the drive for muscularity's relationships with exercise behaviour, disordered eating, supplement consumption, and exercise dependence. *Int Rev Sport Exerc Psychol, 8*(1), 185–203.

Torstveit, M.K., Fahrenholtz, I.L., Lichtenstein, M.B., Stenqvist, T.B., Melin, A.K. (2019). Exercise dependence, eating disorder symptoms and biomarkers of relative energy deficiency in sports (RED-S) among male endurance athletes. *BMJ Open Sport Exerc Med*, *5*, e000439.

Turkey Nutritional Guide (Türkiye Beslenme Rehberi, TÜBER) 2015. Turkey Ministry of Health, Ankara.

Turocy, P. S., Depalma, B. F., Horswill, C. A., Laquale, K. M., Martin, T. J., Perry, A. C., Somova, M. J., & Utter, A. C. (2011). National athletic trainers' association position statement: safe weight loss and maintenance practices in sport and exercise. *J Athl Train, 46*(3), 322-336.

Vasold, K. L., Parks, A. C., Phelan, D. M., Pontifex, M. B., & Pivarnik, J. M. (2019). Reliability and validity of commercially available low-cost bioelectrical impedance analysis. *Int J Sport Nutr Exerc Metab*., *29*(4), 406-410.

Yeltepe, H., & İkizler, C. (2007). Validation and reliability study of exercise dependence scale-21 in Turkish. *J Depend, 8*(1), 29-35.

Yıldırım, İ., Yıldırım, Y., Ersöz, Y., Işık, Ö., Saraçlı, S., Karagöz, Ş., & Yağmur, R., (2017). Correlation Between Exercise Dependence and Eating Attitudes and Behaviors. *Celal Bayar University J Physical Educ Sport Sci*, *12*, 43-54.

Yı Y, & Seo J (2018). The relationship between communication competence and exercise participation type: focusing on joining clubs and using fitness applications. *J Exerc Rehabil.14*(6),934-938.

Zmıjewskı, C.F., & Howard, M.O. (2003). Exercise dependence and attitudes toward eating among young adults. *Eat Behav, 4*(2), 181–195.