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Exploring the Interplay Between Orthorexia Nervosa and Exercise Addiction in the Pursuit of Optimal Well-Being

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Abstract

This study aimed to determine the exercise addiction levels and orthorexia nervosa tendencies of individuals who exercise and to reveal the relationship between them. For this purpose, a correlational screening model, a quantitative research method, was used. "Exercise Addiction Scale (EAS)" developed by Demir, Hazar and Cicioğlu (2018), "ORTO-11 Scale" developed by Donini et al. (2005) and adapted to Turkish by Arusoğlu (2008), and a personal information form prepared by researchers were used in research. As a result, a significant relationship was determined between orthorexia nervosa and exercise addiction. Given the strong association between eating disorders and exercise addiction, future studies might benefit from qualitative research, systematic reviews, or meta-analyses to investigate the relationship between personality types and different types of eating disorders, and to examine the connection between personality traits and the levels of physical exercise.

Keywords: Eating disorders, exercise, exercise addiction, orthorexia nervosa

Optimal Sağlık Arayışı Sürecinde Ortoreksia ve Egzersiz Bağımlılığı Arasındaki İlişkinin İncelenmesi

Öz

Bu araştırmada egzersiz yapan bireylerin egzersiz bağımlılık düzeyleri ve ortoreksiya nervoza eğilimlerini belirlemek ve arasındaki ilişkiyi ortaya koymak amaçlanmıştır. Bu amaçla, nicel bir araştırma yöntemi olan ilişkisel tarama modeli kullanılmıştır. Araştırmaya katılan bireylerin egzersiz bağımlılığı düzeylerini belirlemek için Demir, Hazar ve Cicioğlu (2018) tarafından geliştirilen 17 madde üç faktörden oluşan "Egzersiz Bağımlılığı Ölçeği" (EBÖ), ortoreksiya nervoza eğilimlerini belirlemek için Donini ve ark. (2005) tarafından geliştirilen Arusoğlu (2008) tarafından Türkçeye uyarlanan "ORTO-11" ölçeği ve çeşitli demografik özelliklerini belirlemek için araştırmacılar tarafından oluşturulmuş olan "kişisel bilgi formu" kullanılmıştır. Sonuç olarak ortoreksiya nervoza ve egzersiz bağımlılığı arasında anlamlı bir ilişki saptanmış olup yeme bozuklukları ve egzersiz bağımlılığı gibi durumların bireylerin kişilik özellikleri ile yakından ilişkili olabileceği için, hangi kişilik özelliğinin hangi tür yeme bozukluğu ile ve hangi kişilik özelliğinin ne düzeyde egzersiz bağımlılığı ile ilişkilendirilebileceğine ilişkin gelecekte yapılacak çalışmalarda çeşitli araştırma metotlarından (nitel çalışmalar, sistematik derleme, meta-analiz) faydalanılabilir.

Anahtar Kelimeler: Yeme bozukluğu, egzersiz, egzersiz bağımlılığı, ortoreksiya nervoza

Introduction

Mental health disorders can affect people at different stages of life. Some individuals live with them on an ongoing basis, while others are able to overcome them. Eating disorders have become a serious psychiatric issue among all the psychiatric disorders. Approximately a hundred thousand people have been struggling with eating disorders each year (Van Eeden et al., 2021). Within the disorders recognized as eating disorders, anorexia nervosa, bulimia nervosa, and binge eating have come into prominence (Varga et al., 2013). Although anorexia nervosa was recognized a century ago, bulimia nervosa was first recognized in the year of 1979. There was an increase in bulimia nervosa in 1980s and a decrease was observed in later research related to bulimia nervosa (Varga et al., 2013). Binge eating was first involved in DSM-IV and recognized as a disorder that needed to be studied more. Along with an increasing interest of researchers in eating disorders, experts from other disciplines have begun to put forward several eating disorder "diagnosis" for eating disorders. Among these diagnoses, "orthorexia nervosa" which also has the meaning of "eating healthy food addiction" was defined by Bratman (1997). The concept orthorexia consists of orthos (precise, accurate) which means "healthy food consumption and proper

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nutrition" and orexis (hunger) words (Cena et al., 2019; Varga et al., 2013). People with orthorexia nervosa prioritize all-natural, additive-free foods. If they consume something they perceive as unhealthy, they experience anxiety and may invest heavily in healthy eating apps (Farchakh et al., 2019). Nutrition knowledge that becomes an obsession may cause social, physical, and psychological issues even if individuals think they maintain these behaviors for the purpose of healthy eating. This problem that becomes an obsession pushes individuals to become more picky and may cause poor nutrition. Studies related to orthorexia tendency report that individuals who are physically active have a higher tendency to orthorexia (Demir & Savucu, 2022; Özcan, 2022). Like a higher tendency of physically active individuals to orthorexia, individuals with eating disorders were observed to tend to engage in compelling physical exercises as well (Hallward et al., 2022). Exercise is a stimulant that has physiological effects on the human brain. There can be a euphoria state (runner's high: feeling of ecstasy at the end of running due to endorphin release) at times (Wagemaker & Goldstein, 1980). However, exercise addiction behavior may arise if exercise duration and frequency are increased. According to an extended definition of Russell (1976) related to addiction, addiction is the negative effect experienced in the absence of a substance, object, or activity. Addiction level varies according to the amount of negative effect. About exercise addiction, Glasser (1976) stated that runners were affected negatively when they could not run due to injury, disease, or similar causes. These negative effects are the symptoms that are experienced in minor mood disorders (irritability, overfatigue, anxiety, distractibility, and sleep problems). Thereafter, Thaxton (1982), reported increases in Galvanic Skin Response (GSR) and depression levels according to the Profile of Mood States after exercise deprivation. Despite the fact that exercise has positive health effects, exercise addiction may have negative effects on other psychological disorders like depression and eating disorders (Egorov & Szabo, 2013). Like individuals who have eating disorders do compelling exercises, similarly, exercise addiction seems to accompany with eating disorders most often (Trott et al., 2021). In the literature, there are many research related to the relation between exercise addiction and anorexia nervosa, bulimia nervosa, and binge eating (Godoy et al., 2023). However, there are not many studies about the relationship between exercise addiction and orthorexia nervosa, which has started to be diagnosed recently. The purpose of this study was to examine the relationship between orthorexia nervosa and exercise addiction tendencies of individuals who participate in physical exercise.

Methods

Research Group

The population of the study consisted of students who study at Sports Science Faculties in Türkiye. The sample size was calculated through "simple random sampling" method (Malhotra, 2004). The sample size was calculated as 384 with a 95% confidence interval and a 5% sample margin of error. Four hundred forty-three sports science faculty students were reached by considering possible losses and questions that participants might leave as unanswered. The convenience sampling method, a type of purposeful sampling technique, was used during the determination of the sample. This method can be used to contribute to saving time, cost, and extra effort and also practicality of the research (Patton, 2015).

Ethics Considerations

For current research, ethical approval was obtained from Trakya University Social and Human Sciences Research Ethics Committee (Approval no: E-29563864-050.04.04-380848, Date: 28.12.2022). In addition, the research was carried out in accordance with the principles of the Declaration of Helsinki.

Data Collection

Exercise Addiction Scale (EAS)

Exercise addiction scale developed by Tekkurşun-Demir, Hazar, and Cicioğlu (2018) was used to determine participants' exercise addiction levels. The scale included 17 items and had 5 Likert-type rating. The scale consisted of "Extreme Focusing and Emotional Change," "Postponing individual-social needs and conflict," and "Tolerance developing and passion'' subdimensions, respectively. The scoring of the scale was as Strongly disagree = 1, Partly disagree = 2, Average level agree = 3, Agree = 4, and Strongly agree = 5, and groups were evaluated as normal group (1–17), low-risk group (18–34), risk group (35–51), addicted group (52–69), and high-level addicted group (70–85). Cronbach alpha coefficients of the scale were α = .83 for extreme focusing and emotional change, α = .79 for postponing individual-social needs and conflict, and α = .77 for tolerance developing and passion. In the current research, Cronbach alpha coefficients related to the total and subdimensions of the scale were calculated as α = .80 for extreme focusing and emotional change, α = .74 for postponing individual-social needs and conflict, and α = .73 for tolerance developing and passion.

Orthorexia Nervosa Scale (ORTO-11)

The scale ORTO-11 developed by Donini et al. (2005) and adapted to the Turkish language by Arusoğlu et al. (2008) was used to determine the orthorexia nervosa levels of participants. The scale originally consists of 15 items; however, in the adaptation study by Arusoğlu et al. (2008), items below 0.50 were excluded and 11 items were selected. In the adaptation study, it was deemed appropriate to evaluate the scale as a single factor. The 11-item scale has 4 Likert ratings and scored as "Always" = 1, "Often" = 2, "Sometimes" = 3, and "Never" = 4. The minimum score that can be obtained from the scale is 11, and the maximum score is 44, with the sixth question being reverse scored. A low score indicates a high orthorexic tendency and a high score indicates a reduced risk of orthorexia nervosa. The cut-off point of the scale was determined to be 27 points (Parra-Fernandez et al., 2017), and scores below 27 were considered to indicate orthorexic tendency. In the Turkish adaptation of the scale, the Cronbach alpha value was determined to be α = .62, and in the current study, the Cronbach alpha value was calculated as α = .60.

Personal Information Form

To determine the demographic characteristics of the participants (sex, age, height, weight, exercise age, etc.), a personal information form created by the researchers was applied.

Data Collection

Research data were collected from students studying at the Faculty of Sports Science using the Exercise Addiction Scale, Orthorexia Nervosa Scale, and personal information form. Some of the data collected were in written form, while the other part was collected through Google Forms on the internet. During the data collection, the participants were informed that the data would only be used for research purposes, their confidentiality would be protected, and they were asked to fill out the form, which took about 6 minutes voluntarily. Data were collected from 454 students who agreed to participate in the study.

Data Analysis

Data obtained from the research were analyzed through the Statistical Package for Social Sciences version 26.0 software (IBM Corp.; Armonk, NY, USA). Frequency analysis was utilized in determining the demographic characteristics of participants. The data set was analyzed in terms of normality for the tests that were going to be used, and skewness and kurtosis values of the scales were calculated as ±1.50. Tabachnick and Fidell (2013) confirm that when skewness and kurtosis values are between ±1.50, the distributions are accepted as normal distributions. As the data distributed as normal, while an independent *t*-test was used in double group comparisons, one-way variance analysis (ANOVA) was used for multiple comparisons. The Pearson correlation test was used to determine the relationship between scales. The significance level was accepted as .05 in all analyses.

Results

In Table 1, the demographical info of the participants was given. According to this, the male and female ratio of participants was close to each other. The vast majority of participants were between 18 and 21 years old and had normal kilo values in terms of body weight index. More than half of the participants had an exercise age of 7 years or above. The weekly exercise (day) and total weekly exercise (minute) ratio were close. Group distributions of participants were as follows: 59.8% were addicted and 28.4% were at risk group.

In Table 2, the average scores obtained from the scales according to the sex variable of the participants were compared. As a result of the independent sample *t*-test, a statistically significant difference was found in favor of male participants in the Exercise Addiction Scale's total and Extreme Focus and Emotional Change sub-dimensions ($p < .05$). No significant difference was found in orthorexia nervosa tendencies and other sub-dimensions of the Exercise Addiction Scale.

Table 1.
Demographic Characteristics of Participants

Variables	Category	*f*	%
Sex	Female	185	41.8
	Male	258	58.2
Age	18–21	307	69.3
	22 and above	136	30.7
BMI	Underweight	33	7.4
	Normal	329	74.3
	Overweight	69	15.6
	Obese	12	2.7
Exercise age	1–2 (years)	47	10.6
	3–4 (years)	73	16.5
	5–6 (years)	68	15.3
	+7 (years)	255	57.6
Weekly exercise	1–2 (days)	165	37.2
	3–4 (days)	190	42.9
	+5 (days)	88	19.9
Weekly totaleexercise	150 min and below	165	37.2
	151–300 min	154	34.8
	301 min and above	124	28.0
Exercise addiction	Normal Group	—	—
	Low-risk Group	10	2.3
	Risk Group	126	28.4
	Addicted Group	265	59.8
	High-level Addicted Group	42	9.5
	Total		
		443	**100**

BMI = Body mass index.

In Table 3, average scores obtained from the scales according to the age variable of the participants were compared. As a result of the independent sample *t*-test, no statistically significant difference was found in the total and sub-dimensions of the Exercise Addiction Scale and in orthorexia nervosa tendencies ($p > .05$).

In Table 4, the mean scores obtained from the scales according to body mass index variable of the participants were compared. As a result of the ANOVA analysis, no statistically significant difference was found in the total and sub-dimensions of the Exercise Addiction Scale and in orthorexia nervosa tendencies of the groups ($p > .05$).

In Table 5, the mean scores obtained from the scales according to the exercise age variable of the participants were compared. As a result of the ANOVA analysis, while there was no significant difference in the orthorexia nervosa tendencies of the groups, a statistically significant difference was reached in the Exercise Addiction Scale total score and all sub-dimensions ($p < .05$). This significant difference was found as 1–2 (years) and 3–4 (years) and 7+ (years) in "Extreme Focusing and Emotional Change" sub-dimension, 1–2 (years) and 5–6 (years) and 7+ (years) in "Postponing Individual/Social needs and Conflict" sub-dimension, 1–2 (years) and 7+ (years) in "Tolerance Development and Passion" sub-dimension, and 1–2 (years) and 3–4 (years), 5–6 (years), and 7+ (years) in the "Exercise Addiction Scale total."

In Table 6, the mean scores obtained from the scales according to the variable of the number of weekly exercises of the participants were compared. As a result of the ANOVA analysis, a statistically significant difference was reached in the total and all sub-dimensions of the Orthorexia Nervosa and Exercise Addiction Scale ($P < .05$). The significant difference in Orthorexia Nervosa Scale was found between 1–2 (days) and +5 (days), 5+ (days) and 1–2 (days) in the "Extreme Focusing and Emotional Change" sub-dimension, 5+ (days) and 1–2 (days) and 3–4 (days) in "Postponing Individual/Social needs and Conflict" sub-dimension, 5+ (days) and 1–2 (days) in "Tolerance Development and Passion" sub-dimension, and 3–4 (days) and 1–2 (days), +5 (days) and 1–2 (days) and 3–4 (days) in the total score of the "Exercise Addiction Scale total score."

In Table 7, the average scores obtained from the scales according to the variable of the total weekly exercise duration of the participants were compared. As a result of the ANOVA analysis, there was a statistical difference between the groups in the Exercise Addiction Scale total and all sub-dimensions ($p < .05$). The significant difference was found between groups 301 min and above and 150 min and below in the "Extreme Focusing and Emotional Change" sub-dimension; 301 min and above and 150 min and below in the "Postponing Individual/Social needs and Conflict" sub-dimension, 301 min and above and 150 min and below in the "Tolerance Development and Passion" sub-dimension; and 301 min and above and 150 min and below and between 151–300 min in "Exercise Addiction Scale total score."

The Pearson correlation analysis performed to determine the relationship between Exercise Addiction Scale and the Orthorexia Nervosa Scale was given in Table 8. According to this, there was a negative and low-level statistically significant relationship between the "Postponing Individual/Social Needs and Conflict" and the "Tolerance Development and Passion" sub-dimension and the ORTO-11 scale. On the other hand, there was a moderately statistically significant

Table 2.
Independent Sample t-Test Results of Participants According to the Sex Variable

	Sex	N	Mean	SD	t	p
Orthorexia nervosa	Female	185	26.44	3.60	1.076	.282
	Male	258	26.05	3.85		
Extreme Focusing and Emotional Change	Female	185	26.75	4.34	−2.189	**.029***
	Male	258	27.66	4.25		
Postponing Individual/Social Needs and Conflict	Female	185	16.59	4.48	−.806	.421
	Male	258	16.96	4.88		
Tolerance Development and Passion	Female	185	12.33	3.27	−1.437	.151
	Male	258	12.79	3.35		
Exercise Addiction Total Dimension	Female	185	55.69	9.93	−1.984	**.048***
	Male	258	57.62	10.26		

*$p < .05$.SD = Standard deviation.

negative correlation between the "Extreme Focus and Emotional Change" sub-dimension and the total score of the "Exercise Addiction Scale" and the ORTO-11 scale ($p < .001$).

Discussion and Conclusion and Recommendations

The aim of this study was to compare and evaluate the orthorexia nervosa tendencies and exercise addiction levels of students studying in sports science faculties. The causal comparison method, one of the quantitative research methods, was used in the research. Considering Türkiye in particular, there are not many studies that discuss the relationship between exercise addiction and orthorexia nervosa.

Discussion Related to Orthorexia Nervosa

In the research results, no significant difference was found in the orthorexic tendencies of the participants according to the sex variable. Contrary to the current study's finding, there were significant differences in orthorexic tendencies in favor of men (Gabriel, 2021) and women (Koven & Senbonbatsu, 2013). However, there are also studies supporting the current research's findings, in which no significant difference could be found in terms of sex (Almeida et al., 2018; Clifford & Blyth, 2018; Oberle et al., 2017). When the findings of the current study were evaluated, it can be said that the participants had an orthorexic tendency since the mean score of both female and male participants was determined as the cut-off point (<27). Given the demographic traits of the participants in this study, it seems that the young and single individuals are motivated by a desire for an aesthetically pleasing body, regardless of gender. According to the other findings of the current research, no significant difference was found according to the age category. Several studies (Almeida et al., 2018; Segura-García et al., 2012) suggest that younger people tend to be more susceptible to orthorexia nervosa than older individuals. However, there are also studies (Demir & Savucu, 2022; Turner & Lefevre, 2017) that could not detect a significant difference between orthorexia nervosa and age. Based on these results, there are two-way results in the literature. It can be said that the groups in the current study consisted of university students studying at the faculties of sports sciences, so there was no significant difference due to their close age. Future studies may reveal clearer results if participants' age groups and age ranges were higher. In the current research, orthorexic tendencies were not seen to differ according to the body mass index. This finding shows parallelism with other studies in the literature (Barrada & Roncera, 2018; Cinosi et al., 2015). However, Oberle et al. (2017) found a positive relationship between body mass index and orthorexia nervosa. In a research by Luck-Sikorksi et al. (2018) on 489 female and 518 male, they found a positive relationship between body mass index and orthorexia nervosa. Considering the research findings, it can be argued that there is no

Table 3.
Independent Sample t-Test Results of the Participants According to the Age Variable

	Age	N	Mean	SD	t	p
Orthorexia nervosa	18–21	307	26.30	3.86	.781	.435
	22 and above	136	26.00	3.48		
Extreme Focusing and Emotional Change	18–21	307	27.04	4.49	−1.779	.076
	22 and above	136	27.83	3.82		
Postponing Individual/Social Needs and Conflict	18–21	307	16.86	4.68	.368	.713
	22 and above	136	16.68	4.81		
Tolerance Development and Passion	18–21	307	12.54	3.28	−.528	.598
	22 and above	136	12.72	3.41		
Exercise Addiction Total Dimension	18–21	307	56.56	10.15	−.796	.426
	22 and above	136	57.39	10.18		

SD = Standard deviation.

Table 4.
ANOVA Results of the Participants According to Body Mass Index

	BMI	N	Mean	SD	f	p
Orthorexia nervosa	Underweight	33	26.90	3.87	1.067	.363
	Normal	329	26.24	3.84		
	Overweight	69	25.63	3.22		
	Obese	12	26.91	3.52		
Extreme Focusing and Emotional Change	Underweight	33	26.87	3.87	.112	.953
	Normal	329	27.31	4.44		
	Overweight	69	27.36	3.85		
	Obese	12	27.16	4.83		
Postponing Individual/Social Needs and Conflict	Underweight	33	15.72	4.80	.677	.567
	Normal	329	16.91	4.68		
	Overweight	69	16.72	4.97		
	Obese	12	17.25	4.11		
Tolerance Development and Passion	Underweight	33	12.72	3.44	.150	.930
	Normal	329	12.64	3.26		
	Overweight	69	12.36	3.54		
	Obese	12	12.58	3.55		
Exercise Addiction Total Dimension	Underweight	33	55.42	10.38	.264	.851
	Normal	329	57.00	10.27		
	Overweight	69	56.55	9.42		
	Obese	12	57.25	11.47		

BMI = Body mass index; SD = Standard deviation.

significant difference according to the body mass index values of the participants; on the other hand, participants had a lower score than the intersection point (<27) in all body mass index categories, and they generally had orthorexic tendencies. The reason why there is no significant difference between orthorexic tendency and body mass index may be due to the fact that the majority of the participants were in the normal weight category. In the current research, there was no significant difference in orthorexic tendencies according to exercise age and weekly exercise duration (min) variables. However, when the results were examined in terms of the number of exercises per week (days), orthorexic tendency increased as the number of days increased, and a significant difference was observed between those who exercised 1–2 days a week and those who exercised 5 days or more in favor of those who exercised 5 days or more. Various studies have observed that various forms of participation in exercise are associated with an increased tendency for orthorexia nervosa. There are studies emphasizing that the level of participation in sports is associated with orthorexia nervosa in Italian athletes, Hungarian university students, and Polish students (Hyrnik et al., 2016; Segura-García et al., 2012). On the other hand, in a study on Portuguese fitness individuals, it was stated that participants with an orthorexic disposition participated in three or more exercises per week compared to participants without an orthorexic disposition (Almeida et al., 2018). According to another study, which provides evidence that exercise frequency is associated with a high level of orthorexic tendency, it has been stated that university students exercising in the UK exhibit orthorexic tendencies related to exercise, but this may vary depending on the type of exercise they do, that is, participants who do weight training and are interested in branches that require technical-tactical skills do not show orthorexic tendencies (Clifford & Blyth, 2019). According to these results, it is known that as the number of exercises per week increases, orthorexic tendency increases, and diet is important in both performance sports and recreational sports. Individuals who participate in exercise follow a diet program (calorie calculation, protein, carbohydrate, and fat intake) along with a high exercise frequency to have an aesthetic look or enhance their performances. At this point, it can be thought that the participants pay too much attention to their nutrition, so they become obsessed and their orthorexic tendencies increase. Therefore, the increase in orthorexic tendencies with the number of exercises may be a result of the reasons mentioned.

Discussion Related to Exercise Addiction

Considering the sex differences of the participants in the current study, it was determined that the mean scores of male participants in the sub-dimensions of the Exercise Addiction Scale, Extreme Focusing and Emotional Change were significantly higher. When the literature is examined, there are studies that support the current studies' results. Dumitru et al. (2018) examined exercise addiction according to sex differences in their systematic review. Except for two of the 27 studies that they examined in accordance with the criteria, exercise dependence levels were higher in men than in women in their results. Tekkurşun-Demir and Türkeli (2018) found a significant difference in favor of men in the sub-dimensions of "Postponing Individual-Social need and conflict" and "Developing tolerance and passion." In another study, Costa et al. (2013) found that in individuals between the ages of 18–64, men had higher scores than women in exercise addiction levels. However, contrary to the current study's results, there are also studies in which women had higher scores and in which there was no significant difference (Demirel & Cicioğlu,

Table 5.
ANOVA Results of the Participants According to the Exercise Age

	Exercise Age (years)	N	Mean	SD	F	p	Tukey
Orthorexia nervosa	a1–2	47	27.08	3.79	1.105	.347	—
	b3–4	73	25.86	3.64			
	c5–6	68	26.04	3.70			
	d7 and above	255	26.20	3.78			
Extreme Focusing and Emotional Change	a1–2	47	25.06	4.40	5.343	**.001****	*b** > *a*
	b3–4	73	27.53	3.84			*d** > *a*
	c5–6	68	26.95	4.53			
	d7 and above	255	27.70	4.25			
Postponing Individual/Social Needs and Conflict	a1–2	47	14.44	4.46	6.038	**.000****	*c** > *a*
	b3–4	73	16.19	4.58			d* > a
	c5–6	68	16.75	4.61			
	d7 and above	255	17.43	4.69			
Tolerance Development and Passion	a1–2	47	11.23	3.48	3.678	**.012***	*d** > *a*
	b3–4	73	12.28	2.99			
	c5–6	68	12.77	3.13			
	d7 and above	255	12.89	3.37			
Exercise Addiction Total Dimension	a1–2	47	50.53	10.65	8.239	**.000****	*b** > *a*
	b3–4	73	56.05	9.38			*c** > *a*
	c5–6	68	56.58	9.57			*d** > *a*
	d7 and above	255	58.25	10.02			

*$p < .05$ **$p < .01$.SD = Standard deviation. a, b, c, d represent exercise age of the participants.

2020; Batu & Aydın, 2020). Considering the research findings, the reason why the male and female participants did not have any significant differences in terms of exercise addiction scores may be due to the demographic characteristics and population structure of the research group. Considering another result of the current study, no difference was found in the exercise addiction levels of the participants according to the body mass index. In a study, Gün and Ağırbaş (2019) conducted research on physical education students. They examined the relationship between physical activity level, body mass index, and exercise addiction. As a result of the research, no difference

Table 6.
ANOVA Results of the Participants According to Weekly Exercise Variable

	Weekly Exercise (day)	N	Mean	SD	f	p	Tukey
ORTO-11	a1–2	165	26.76	3.73	3.325	**.037***	*a** > *c*
	b3–4	190	26.03	3.61			
	c+5	88	25.57	3.97			
Extreme Focusing and Emotional Change	a1–2	165	26.41	4.47	7.824	**.000****	*c** > *a*
	b3–4	190	27.43	3.95			
	c+5	88	28.60	4.41			
Postponing Individual/Social Needs and Conflict	a1–2	165	15.86	4.63	9.319	**.000****	*c** > *a*
	b3–4	190	16.84	4.60			*c** > *b*
	c+5	88	18.50	4.69			
Tolerance Development and Passion	a1–2	165	12.18	3.44	4.086	**.017***	*c** > *a*
	b3–4	190	12.57	3.25			
	c+5	88	13.43	3.09			
EAS total	a1–2	165	54.46	10.36	11.768	**.000****	*b** > *a*
	b3–4	190	57.02	9.60			*c** > *a*
	c+5	88	60.79	9.74			*c** > *b*

*$p < .05$ **$p < .01$. SD = Standard deviation. a, b, c represent weekly exercise (day) of the participants.

Table 7.
ANOVA Results of the Participants According to Weekly Total Exercise Duration Variable

	Weekly Total Exercise	N	Mean	SD	f	p	Tukey
ORTO-11	[a]150 min and below	165	26.53	3.80	2.034	.132	
	[b]151–300 min	154	26.31	3.44			
	[c]301 min and above	124	25.66	4.01			
Extreme Focusing and Emotional Change	[a]150 min and below	165	26.53	4.28	7.828	**.000**	*c* > a*
	[b]151–300 min	154	27.09	4.30			*c* > b*
	[c]301 min and above	124	28.50	4.12			
Postponing Individual/Social Needs and Conflict	[a]150 min and below	165	15.87	4.71	7.471	**.001**	*c* > a*
	[b]151–300 min	154	16.83	4.63			
	[c]301 min and above	124	18.01	4.59			
Tolerance Development and Passion	[a]150 min and below	165	12.19	3.53	4.613	**.010**	*c* > a*
	[b]151–300 min	154	12.44	3.05			
	[c]301 min and above	124	13.34	3.25			
EAS total	[a]150 min and below	165	54.66	10.37	10.345	**.000**	*c* > a*
	[b]151–300 dk	154	56.54	9.65			*c* > b*
	[c]301 min and above	124	60.02	9.73			

SD = Standard deviation.

was found between the BMI variable according to exercise addiction. Özkan et al. (2023) reported that there was no significant relationship between exercise addiction and body mass index in their study on 252 exercise participants. On the other hand, Demir (2021), and İskender (2021) did not find a significant difference between body mass index and exercise addiction in their studies. These results are in line with the current research findings. On the other hand, there are also studies that found a relationship between body mass index and exercise addiction (Allegre et al., 2007; Klein et al., 2004). It is thought that the reason why there is no difference between body mass index and exercise addiction levels is due to the fact that the current studies' sample group is students studying at faculties of sports science; most of these students are assumed to be interested in exercise, and 3/4 of them are of normal weight when BMI values are considered. In light of the other findings from the current study, it was observed that the levels of exercise addiction among participants significantly escalated with increasing exercise experience, frequency of weekly workouts (in days), and total weekly exercise duration (in minutes). Studies in parallel with the current research are available in the literature. Costa et al. (2013) conducted their research on a total of 409 Italians between the ages of 18 and 64 who had been exercising regularly for the last 3 months. In their research, they compared the status of exercise addiction to age, sex, mood, and exercise frequency and stated that there was a moderately positive relationship between exercise addiction and exercise frequency. In another study on 384 university students, Sicilia et al. (2017) stated that both exercise frequency and exercise intensity significantly predicted exercise addiction. In another study, Başoğlu (2018) reported that there was a significant difference between the exercise frequency and exercise addiction levels of 120 members who had been exercising regularly for the last year and registered to the gym. They reported that the dependent group had a higher level of exercise frequency compared to the other groups. In another study, Bruno et al. (2018) reported that the frequency of exercise was significantly higher in the high-risk addicted group than in the low-risk addicted group. In a study (Costa et al., 2012) on 519 Italian participants who exercised regularly for over a year, it was determined that there was a relationship between exercise frequency and exercise addiction level, and individuals at risk at the exercise addiction level exercised more frequently than independent individuals. In a study conducted on elite athletes and students of a sports science faculty (Cicioğlu et al., 2019), they found that there was a moderately positive relationship between exercise age and exercise addiction level and that the level of exercise addiction increases as the exercise age increases. Bavli et al. (2015) concluded in their study on 99 dancers that the symptomatic group had higher exercise age compared to the asymptomatic group according to the level of exercise addiction. Considering the studies, there are limited studies (Arslanoğlu et al., 2021; Batu & Aydın, 2020;) that could not detect a relationship between exercise age and exercise addiction, while many studies (Demirel & Cicioğlu, 2020; Koçyiğit et al., 2022) revealed that the level of exercise addiction increases as the exercise age increases. Looking at the research findings; the increase in exercise addiction levels may arise from physiological (such as the desire of the person to exercise more with the increase of endorphin hormone, the continuation of exercise for certain purposes etc.) or psychological factors (such as stress and anxiety).

Table 8.
Correation Test Results between Exercise Addiction Scale (EAS) and Orthorexia Nervosa Scale

	Extreme Focusing and Emotional Change	Postponing Individual/ Social Needs and Conflict	Tolerance Development and Passion	EAS Total
ORTO-11	–.237**	–.124**	–.142**	–.214**

**$p < .001$.

Pearson correlation test of orthorexia nervosa and Exercise Addiction Scale revealed a low negative correlation. This can be interpreted as when the level of exercise addiction increases, orthorexia nervosa scores decrease (a decrease in orthorexia nervosa scores indicates an increase in orthorexic tendency). There are studies that support the results of the current research (Mavrandrea & Gonidakis, 2022; Strahler et al., 2021). It can be stated that the main reason for this relationship is that participants who exercise for certain purposes (recreational, performance, health, fitness, etc.) exercise very often to achieve their goals and pay attention to their diet accordingly.

The data obtained from the current study and the literature were examined together, and it was concluded that there is a significant relationship between orthorexia nervosa and exercise addiction. In addition, while there was no significant difference in the orthorexic tendencies of the participants in terms of sex, age, BMI, exercise age, and weekly exercise duration, there was a difference between the number of weekly exercises. It was reported that the exercise dependence levels of the participants differed in all other variables (sex, exercise age, weekly exercise duration, and number) except age and BMI.

The future studies can be carried out in societies with different food cultures and cuisines among wide age groups and on individuals with different BMI values. On the other hand, the participants can be compared according to the type of participation in exercise (recreational and performance).

Availability of Data and Materials: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Trakya University (Approval no: E-295 63864 -050. 04.04 -3808 48, Date: 28.12.2022).

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