Journal of Physical Education and Sport ® (JPES), Vol. 24 (issue 7), Art 179 pp. 1590 - 1601, July 2024
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Exploring the relationship between exercise addiction and attitudes towards healthy nutrition

BEKIR ERHAN ORHAN[1], AYDIN KARAÇAM[2], UMUT CANLI[3], YUNI ASTUTI[4]*, ERIANTI[5], KARUPPASAMY GOVINDASAMY[6]
[1]Faculty of Sports Sciences, Istanbul Aydın University, Istanbul, TURKIYE
[2]Faculty of Sports Sciences, Bandırma Onyedi Eylül University, Balıkesir, TURKIYE
[3]Faculty of Sports Sciences, Namık Kemal Universty, Tekirdağ, TURKIYE
[*4]Faculty of Sport Science, Universitas Negeri Padang, INDONESIA
[5]Faculty of Sport Science, Universitas Negeri Padang, INDONESIA
[6]Faculty of Science and Humanities, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, INDIA

Published online: July 31, 2024
Accepted for publication : July 15, 2024
DOI:10.7752/jpes.2024.07179

Abstract
This study aims to investigate the correlation between exercise addiction and attitudes towards healthy nutrition across various demographic groups. Exercise addiction, characterized by compulsive exercise despite negative consequences, is asscociated with psychological and social challenges. This addiction often coexists with eating disorders and extreme dietary habits aimed at improving performance or achieving aesthetic goals. The research employs a correlational survey model to analyze the connection between exercise addiction and attitudes towards healthy eating. Data from 485 participants using the exercise addiction Scale (EAS) and the atitude towards healthy eating scale (ASHN). The results showed significant gender differences, with men exhibiting higher exercise addiction scores than women. However, attitudes towards healthy eating did not significantly differ between genders. Participants with an athlete license also showed higher levels of exercise addiction compared to those without a license. Still, there was no significant difference in healthy eating attitudes based on license status. Marital status revealed that single individuals had higher exercise addiction scores than married individuals, who showed more positive attitudes towards healthy nutrition. The study also found that exercise frequency was positively correlated with both exercise addiction and positive nutritional attitudes, highlighting the importance of regular physical activity in promoting healthy behaviours. Older individuals showed lower levels of exercise addiction but less positive attitudes towards healthy nutrition, suggesting that age-related changes influence exercise behaviours and dietary attitudes. The findings underscore the need for holistic interventions addressing both psychological and nutritional aspects of exercise addiction. Targeted programs for specific demographics, such as young athletes or single individuals, may help mitigate exercise addiction and promote healthier nutritional habits.
Keywords: Addiction, Healthy Nutrition, Exercise

Introduction

Physical activity is essential for overall health, reducing the risk of numerous diseases. Regular exercise is linked to improved cardiovascular health, lower instances of diabetes, and a reduced risk of chronic diseases (2018 Physical Activity Guidelines Advisory Committee, 2018; American College of Sports Medicine, 2022; Aghjayan et al., 2022). Additionally, physical activity significantly impacts mental health by reducing symptoms of depression and anxiety (Chekroud et al., 2018; Blazer et al., 2015; McDowell et al., 2019; Orhan et al., 2024). Regular physical exercise also supports cognitive function across all age groups, enhancing memory, executive function, and processing speed (Northey et al., 2018; Colcombe & Kramer, 2003; Smith et al., 2010). This is particularly significant in ageing populations, where exercise has been shown to mitigate the decline in cognitive functions and reduce the risk of neurodegenerative diseases such as Alzheimer's and dementia (Baumgart et al., 2015; Erickson et al., 2011; Sofi et al., 2011). Moreover, physical activity protects against neurodegeneration through mechanisms involving increased brain-derived neurotrophic factor, which supports the survival and growth of neurons and plays a vital role in learning and memory (Cotman et al., 2007; Voss et al., 2013). This neuroprotective effect underscores the importance of regular physical activity as part of a healthy lifestyle, particularly for maintaining cognitive health and functionality throughout the lifespan.

Exercise addiction involves compulsive physical activity despite harmful consequences to health and well-being (Hausenblas & Downs, 2002; Berczik et al., 2012). This condition often co-occurs with anxiety, depression, and body image issues (Berczik et al., 2012; Szabo, 2018). It impacts psychological, physical, and social dimensions, causing distress, anxiety, overtraining, chronic fatigue, and social isolation (Freimuth et al.,

Corresponding Author: YUNI ASTUTI, E-mail: yuniastuti@fik.unp.ac.id

2011; Lichtenstein et al., 2017; Morgan, 1979; Cook et al., 2013; Bamber et al., 2000; Griffiths, 1997; Allegre et al., 2006). Concerns around exercise addiction highlight the complex interplay between health-promoting behaviours and potential psychological risks. Exercise addiction involves compulsive engagement in physical activity despite harmful consequences to physical health, social life, and psychological well-being (Hausenblas & Downs, 2002; Berczik et al., 2012). This condition often co-occurs with anxiety, depression, and body image disturbances, exacerbating overall mental health challenges (Berczik et al., 2012; Szabo, 2018). Exercise addiction impacts psychological, physical, and social dimensions. Psychologically, it is associated with distress, anxiety, and depression, especially when unable to exercise (Freimuth et al., 2011; Lichtenstein et al., 2017). Physically, it leads to overtraining, resulting in chronic fatigue, increased injury rates, and health issues such as cardiovascular problems (Morgan, 1979; Cook et al., 2013). Socially, it can cause isolation and deteriorated relationships due to excessive exercise time (Bamber et al., 2000; Griffiths, 1997; Allegre et al., 2006).

Nutrition plays a critical role in supporting physical activity and enhancing overall health. Proper nutritional intake is crucial for maintaining muscle mass and strength, especially in ageing populations (Verlaan et al., 2018; Tieland et al., 2012; Wall & van Loon, 2013). Adequate consumption of essential nutrients, particularly proteins and vitamins, supports muscle synthesis and recovery, helping to prevent or mitigate the impacts of age-related muscle loss (Verlaan et al., 2018; Tieland et al., 2012; Hsu et al., 2019). Nutritional strategies that include micronutrients and sufficient caloric intake can enhance physical capabilities, improving quality of life and functional health status (Hsu et al., 2019; Engel et al., 2001; Rondanelli et al., 2016). Attitudes towards nutrition significantly influence exercise behaviours, and regular physical activity can shape dietary habits and nutritional awareness. Evidence suggests that individuals who engage in regular physical activity are more likely to have better nutrition knowledge, fostering healthier eating behaviours (Grunert et al., 2012; Worsley, 2002; Leng et al., 2017). Those with higher nutrition knowledge are more likely to exercise and make informed food choices supporting their physical activity needs, improving overall health outcomes (Worsley, 2002; Barbosa et al., 2016; Grunert et al., 2012). A positive feedback loop exists where increased physical activity enhances nutritional awareness, motivating further engagement in healthy behaviours and illustrating the interdependence of nutrition and exercise (Barbosa et al., 2016; Leng et al., 2017; Grunert et al., 2012).

Individuals with exercise addiction often exhibit disordered eating, such as restrictive diets, exacerbating their compulsive exercise (Silva et al., 2018; Adams, 2009; Allegre et al., 2006; Bamber et al., 2000; Berczik et al., 2012). The psychological overlap with eating disorders is profound (Hausenblas & Downs, 2002; Rodgers et al., 2011). Extreme diets or supplement use often aim to enhance performance or achieve aesthetic goals. According to the biopsychosocial model, exercise addiction and nutrition are influenced by a combination of biological, psychological, and social factors (Griffiths, 2005; Szabo, 2018). Obsessive-compulsive tendencies in exercise addicts can extend to eating habits, leading to orthorexia nervosa (Adams, 2009; Szabo, 2018). The dualistic model of passion shows that harmonious passion leads to healthier behaviours, while obsessive passion leads to unhealthy patterns (Vallerand, 2010; Paradis et al., 2013). Overactivation of the brain's reward system in exercise addicts can drive both excessive exercise and restrictive eating (Huang et al., 2019; de la Vega et al., 2022). These perspectives underscore the need for a holistic approach to address exercise addiction, considering psychological and nutritional aspects (Monok et al., 2012; Szabo, 2018).

Previous research has extensively explored the concepts of exercise addiction and healthy eating attitudes. However, comprehensive studies still need to examine the relationship between these phenomena and demographic variables. The influence of exercise addiction on specific aspects of nutritional attitudes has yet to be thoroughly investigated. The findings from this study are expected to provide a deeper understanding of how exercise addiction influences healthy eating attitudes. This could contribute to developing more targeted interventions for promoting balanced exercise and nutrition habits. Identifying demographic moderators can help tailor these interventions to specific populations, enhancing their effectiveness and applicability in various socio-demographic contexts.

Material & methods

This research, which aims to examine the relationship between individuals' exercise addictions and their attitudes towards healthy eating along with some demographic variables, is a descriptive study in the correlational survey model. Although correlational studies do not prove the existence of causality in the true sense, it is possible to make inferences about cause-effect relationships through correlational research using some advanced statistical techniques (Fraenkel & Wallen, 2009).

Sample group

The research study group was formed using the convenience sampling method. The convenience sampling method, based on accessibility and feasibility, is preferred in some research topics to gather information (Büyüköztürk, 2010) quickly. Of the 485 people selected by convenience sampling, 35.5% (n=172) are women, and 64.5% (n=313) are men. Of the participants, 23.3% (n=113) are high school graduates, 63.5% (n=308) are university graduates, and 13.2% (n=64) have postgraduate degrees. Of the group participating in the research, 60.8% (n=295) have a sports license in any branch, while 39.2% (n=190) do not have a license. Of the

participants, 47.8% (n=232) are married, and 52.2% (n=253) are single. The average age of the participants is 33.63 years. The participants filled out the measurement tool through an online form.

Table 1. Distribution of Women in the Research Sample According to Some Variables

Variable	1	2	3	Total
	Female	Male		
Gender	n	172	313	485
	%	35.5	64.5	100.0
	Yes	No		
Athlete License	n	295	190	485
	%	60.8	39.2	100.0
	Married	Single		
Marital Status	n	232	253	485
	%	47.8	52.2	100.0
	High School	Bachelor's	Master's	
Education Level	n	113	308	64
	%	23.3	63.5	13.2

Data Collection Tools

In the study, the "Exercise Addiction Scale (EAS)" developed by Demir, Hazar & Cicioğlu (2018) and the "Attitude Towards Healthy Eating Scale (ATHES)" developed by Tekkurşun Demir & Cicioğlu (2019) were used. A personal information form containing individuals' demographic information, such as age, gender, education level, exercise frequency, marital status, and whether they have a sports license or not, was created to determine these variables.

Exercise Addiction Scale (EAS):

The scale was developed by Demir, Hazar, and Cicioğlu (2018). In the analyses conducted by Demir et al. (2018), a 3-factor structure was obtained in the scale. The scale explains 54.61% of the variance. When the factors were examined, it was found that the first factor, *Excessive Focus and Emotional Change*, consists of the first seven items (1, 2, 3, 4, 5, 6, 7). This factor alone explains 34.89% of the exercise addiction variable in the scale. The second factor, *Postponement of Individual-Social Needs and Conflict*, consists of 6 items (8, 9, 10, 11, 12, 13). This factor alone explains 13.06% of the exercise addiction variable in the scale. The third factor, *Tolerance Development and Passion* consists of 4 items (14, 15, 16, 17) and alone explains 6.65% of the exercise addiction variable in the scale.

Exercise Addiction Scale scoring ranges are evaluated as 1-17 normal group, 18-34 low-risk group, 35-51 risk group, 52-69 addicted group, and 70-85 highly addicted group. The KMO sample suitability value was 0.89, and Bartlett's Sphericity test chi-square value was 10850.10. Cronbach Alpha reliability coefficients were found to be 0.83 for the *Excessive Focus and Emotional Change* factor, 0.79 for the *Postponement of Individual-Social Needs and Conflict* factor, 0.77 for the *Tolerance Development and Passion* factor, and 0.88 for the overall scale. The fit indices of the scale were found to be $\chi 2/sd=1.94$, RMSEA=0.43, PGFI=0.63, PNFI=0.70, GFI=0.90, AGFI=0.87, IFI=0.96, NFI=0.91, and CFI=0.96.

Attitude Towards Healthy Eating Scale (ASHN):

The scale was developed by Tekkurşun Demir & Cicioğlu (2019). ASHN has 21 items and four factors. These factors are named *Knowledge About Nutrition* (items: 1, 2, 3, 4, 5), *Feelings Towards Nutrition* (items: 6, 7, 8, 9, 10, 11), *Positive Nutrition* (items: 12, 13, 14, 15, 16), and *Negative Nutrition* (items: 17, 18, 19, 20, 21). The rating for the positive attitude items in the scale is "Strongly Disagree", "Disagree", "Neutral", "Agree" and "Strongly Agree". Positive attitude items are scored 1, 2, 3, 4, and 5, while negative attitude items are scored 5, 4, 3, 2, and 1. Positive items are 1, 2, 3, 4, 5, 12, 13, 14, 15, 16, and negative items are 6, 7, 8, 9, 10, 11, 17, 18, 19, 20, 21. The lowest score from ASHN is 21, and the highest is 105.

The scores are interpreted as 21 being very low, 23-42 being low, 43-63 being moderate, 64-84 being high, and 85-110 being ideally high in attitude towards healthy eating. In the analyses conducted by Tekkurşun Demir Cicioğlu (2019), the internal consistency coefficients of the scale were found to be 0.90 for the *Knowledge About Nutrition* factor, 0.84 for the *Feelings Towards Nutrition* factor, 0.75 for the *Positive Nutrition* factor, and 0.83 for the *Negative Nutrition* factor. The fit indices of the scale were found to be $\chi 2/sd=1.71$, RMSEA=0.04, PGFI=0.74, PNFI=0.82, GFI=0.92, AGFI=0.90, IFI=0.98, NFI=0.95, and CFI=0.98.

Data Analysis

The data analysis first examined the dataset for erroneous values, outliers, normality, and multicollinearity. All correct data entry was observed. The data analysis was performed using the SPSS 25 program. The Shapiro-Wilk test was used to determine the normality of the distribution, and the data were found to be normally distributed ($p > .05$). T-tests were used for binary comparisons, and one-way variance analysis (ANOVA) was used for multiple comparisons. Pearson's Product-Moment Correlation Coefficient was used to determine the relationships between variables. The significance level was taken as $p < .05$.

Findings

Table 2. Results of the t-test for the Levels of Exercise Addiction and Attitude Towards Healthy Eating of Individuals According to Gender

Variables	Women (n = 172)		Men (n = 313)		t	sd	p
	$\overline{X}$	S	$\overline{X}$	S			
EBÖ Toplam	52.25	15.34	57.36	16.28	-3.37	483	**.00***
Excessive Focus and Emotional Change	26.10	6.44	27.51	6.44	-2.30	483	**.02***
Postponement of Individual-Social Needs and Conflict	15.05	6.25	17.23	7.10	-3.49	483	**.00***
Tolerance Development and Passion	11.09	4.89	12.61	4.79	-3.30	483	**.00***
ASHN Total	77.80	13.18	76.37	12.55	1.17	483	.24
Knowledge About Nutrition	20.78	4.40	20.90	4.48	-.27	483	.78
Feelings Towards Nutrition	18.90	5.89	18.02	6.28	1.50	483	.13
Positive Nutrition	19.22	4.84	19.02	4.77	.42	483	.67
Negative Nutrition	18.88	5.62	18.41	6.16	.83	483	.40

*p < .05

When Table 2 is examined, it is seen that there is a significant difference in favour of men between the exercise addiction total, excessive focus and emotional change, postponement of individual-social needs and conflict, and tolerance development scores of individuals (p < .05). This can be interpreted as male participants being better in terms of exercise addiction compared to females. However, there was no significant difference between the attitude scores towards healthy eating and the gender of individuals (p > .05). This can be interpreted as the attitude towards healthy eating of the participants not being dependent on gender.

Table 3. Results of the t-test for the Levels of Exercise Addiction and Attitude Towards Healthy Eating of Individuals According to Athlete License

Variables	**Yes (n = 295)**		**No (n = 190)**		**t**	**sd**	**p**
	$\overline{X}$	S	$\overline{X}$	S			
EAS Total	58.78	13.80	50.53	18.09	5.67	483	**.00***
Excessive Focus and Emotional Change	28.42	5.18	24.82	7.60	6.19	483	**.00***
Postponement of Individual-Social Needs and Conflict	17.33	6.57	15.11	7.16	3.51	483	**.00***
Tolerance Development and Passion	13.02	4.42	10.59	5.18	5.51	483	**.00***
ASHN Total	77.16	13.05	76.44	12.38	.60	483	.54
Knowledge About Nutrition	21.16	4.10	20.37	4.92	1.91	483	.06
Feelings Towards Nutrition	18.14	6.09	18.64	6.25	-.88	483	.37
Positive Nutrition	19.29	4.63	18.78	5.02	1.15	483	.25
Negative Nutrition	18.55	6.01	18.61	5.93	-.13	483	.89

*p < .05

When Table 3 is examined, it is seen that there is a significant difference in favour of those with an athlete license in the exercise addiction total, excessive focus and emotional change, postponement of individual-social needs and conflict, and tolerance development scores (p < .05). This can be interpreted as having an athlete license being an essential variable on individuals' exercise addiction scores. However, there was no significant difference between the attitude scores towards healthy eating and the athlete license status of individuals (p > .05). This can be interpreted as the attitude towards healthy eating of the participants not being dependent on having an athlete license.

Table 4. Results of the t-test for the Levels of Exercise Addiction and Attitude Towards Healthy Eating of Individuals According to Marital Status

Variables	**Married** (n = 232)		**Single** (n = 253)		t	sd	p
	$\overline{X}$	S	$\overline{X}$	S			
EAS Total	51.90	14.86	58.90	16.53	-.588	483	**.00***
Excessive Focus and Emotional Change	26.18	6.39	27.77	6.47	-2.73	483	**.00***
Postponement of Individual-Social Needs and Conflict	14.72	6.17	18.06	7.13	-5.49	483	**.00***
Tolerance Development and Passion	10.99	4.54	13.05	4.97	-4.75	483	**.00***
ASHN Total	79.06	12.05	74.88	13.12	3.64	483	**.00***
Knowledge About Nutrition	20.60	4.56	21.09	4.34	-1.19	483	.23
Feelings Towards Nutrition	19.53	5.90	17.24	6.19	4.17	483	**.00***
Positive Nutrition	19.08	4.40	19.11	5.13	-.06	483	.94
EAS Total	19.83	5.12	17.43	6.46	4.49	483	**.00***

*p < .05

When Table 4 is examined, it is seen that there is a significant difference in favour of single individuals in the exercise addiction total, excessive focus and emotional change, postponement of individual-social needs and conflict, and tolerance development scores ($p < .05$). This can be interpreted as being single being an essential variable on individuals' exercise addiction scores. In addition, there was a significant difference in favour of married individuals in the ASHN total score, Feelings Towards Nutrition, and Negative Nutrition scores ($p < .05$). However, there was no significant difference between the Knowledge About Nutrition and Positive Nutrition scores and the marital status of individuals ($p > .05$).

Table 5. Results of ANOVA for the Levels of Exercise Addiction and Attitude Towards Healthy Eating of Individuals According to Exercise Frequency

Variables	Group	*n*	$\overline{X}$	*S*	*sd*	KO	*F*	*p*	*LSD*
EAS Total	1. None	106	43.44	17.17	3	7599.40	35.47	**.00***	**4-1; 4-2; 3-1; 3-2; 2-1**
	2. 1-2 days	153	55.84	14.33					
	3. 3-4 days	140	59.91	13.45	481	214.24			
	4. 5 and above	86	62.84	13.58					
	Total	485	55.55	16.12	484				
Excessive Focus and Emotional Change	1. None	106	21.50	7.69	3	1476.80	44.74	**.00***	**4-1; 4-2; 3-1; 3-2; 2-1**
	2. 1-2 days	153	27.54	5.48					
	3. 3-4 days	140	28.90	4.95	481	33.01			
	4. 5 and above	86	29.79	4.44					
	Total	485	27.01	6.47	484				
Postponement of Individual-Social Needs and Conflict	1. None	106	13.11	6.57	3	637.62	14.56	**.00***	**4-1; 4-2; 3-1; 2-1**
	2. 1-2 days	153	16.26	6.61					
	3. 3-4 days	140	17.77	6.58	481	43.78			
	4. 5 and above	86	18.81	6.71					
	Total	485	16.46	6.88	484				
Tolerance Development and Passion	1. None	106	8.83	4.89	3	569.06	27.87	**.00***	**4-1; 4-2; 3-1; 3-2; 2-1**
	2. 1-2 days	153	12.03	4.53					
	3. 3-4 days	140	13.22	4.25	481	20.41			
	4. 5 and above	86	14.24	4.44					
	Total	485	12.07	4.88	484				
ASHN Total	1. None	106	74.28	11.10	3	952.20	6.06	**.00***	**4-1; 4-2; 3-1; 3-2;**
	2. 1-2 days	153	75.20	11.84					
	3. 3-4 days	140	78.11	13.84	481	158.54			
	4. 5 and above	86	81.05	13.44					
	Total	485	76.88	12.78	484				

Knowledge About Nutrition	1. None	106	19.61	4.97	3	167.41	8.84	**.00***	**4-1; 4-2; 3-1;**
	2. 1-2 days	153	20.69	4.20					
	3. 3-4 days	140	20.77	4.65	481	18.93			
	4. 5 and above	86	22.82	3.09					
	Total	485	20.85	4.45	484				
Feelings Towards Nutrition	1. None	106	18.76	5.37	3	80.35	2.13	.09	**none**
	2. 1-2 days	153	17.48	5.92					
	3. 3-4 days	140	19.17	6.53	481	37.67			
	4. 5 and above	86	17.97	6.69					
	Total	485	18.34	6.15	484				
Positive Nutrition	1. None	106	17.44	4.97	3	220.77	10.14	**.00***	**4-1; 4-2; 4-3; 3-1; 2-1**
	2. 1-2 days	153	18.88	4.69					
	3. 3-4 days	140	19.31	4.84	481	21.76			
	4. 5 and above	86	21.13	3.83					
	Total	485	10.09	4.79	484				
Negative Nutrition	1. None	106	18.46	5.63	3	21.48	.59	.61	**none**
	2. 1-2 days	153	18.14	5.73					
	3. 3-4 days	140	18.83	5.98	481	35.84			
	4. 5 and above	86	19.11	6.79					
	Total	485	18.58	5.97	484				

*p < .05

When Table 5 is examined, it is seen that there is a significant difference between the exercise addiction total, excessive focus and emotional change, postponement of individual-social needs and conflict, and tolerance development scores and the frequency of exercise (p < .05). In the LSD test conducted to determine the source of the difference, it was found that as the frequency of exercise increased, exercise addiction increased for all parameters. In addition, there was a significant difference between the ASHN total score, Knowledge About Nutrition, Positive Nutrition scores and the frequency of exercise (p < .05). In the LSD test conducted to determine the source of the difference, it was found that as the frequency of exercise increased, the scores increased for the parameters that showed a significant difference. However, there was no significant difference between the Feelings Towards Nutrition" and Negative Nutrition scores and the frequency of exercise (p > .05).

Table 6. Relationship Between the Age of Individuals and Their Levels of Exercise Addiction and Attitudes Towards Healthy Eating

Variables	*n*	EAS Total	Excessive Focus and Emotional Change	Postponement of Individual-Social Needs and Conflict	Tolerance Development and Passion	ASHN Total	Knowledge About Nutrition	Feelings Towards Nutrition	Positive Nutrition	Negative Nutrition
Age	485	**-.16****	-.07	**-.18****	**-.18****	**-.18****	-.03	**.22****	.00	**.18****

*p < .01 p < .05

When Table 6 is examined, it is seen that there is a negative and significant relationship between the exercise addiction total (r=-.16), Postponement of Individual-Social Needs and Conflict (r=-.18), and Tolerance

Development (r=-.18) scores and the ages of individuals (p < .01). This can be interpreted as exercise addiction decreasing as age increases for these parameters. In addition, there was a negative and significant relationship between the ASHN total score (r=-.18) and a positive and significant relationship in the Feelings Towards Nutrition" (r=.22) and Negative Nutrition (r=.18) scores (p < .01). This can be interpreted as the ASHN score decreasing. The Feelings Towards Nutrition and Negative Nutrition scores increase as age increases. However, there was no significant relationship between Excessive Focus and Emotional Change, Knowledge About Nutrition, and Positive Nutrition scores and age (p > .05).

Table 7. Relationship Between the Total and Sub-dimension Scores of Individuals' Exercise Addiction and Their Attitudes Towards Healthy Eating

Variables	1	2	3	4	5	6	7	8	9
1. EAS Total	1.00	**.86****	**.89****	**.89****	**-.11***	**.22****	**-.34****	**.37****	**-.35****
2. Excessive Focus and Emotional Change		1.00	**.59****	**.68****	**.11***	**.29****	**-.13****	**.37****	**-.12****
3. Postponement of Individual-Social Needs and Conflict			1.00	**.75****	**.-.28****	**.14****	**-.45****	**.29****	**-.48****
4. Tolerance Development and Passion				1.00	**-.12****	**.16****	**-.30****	**.32****	**-.33****
5. ASHN Total					1.00	**.47****	**.69****	**.40****	**.74****
6. Knowledge About Nutrition						1.00	**-.10***	**.44****	**-.12****
7. Feelings Towards Nutrition							1.00	**-.16****	**.65****
8. Positive Nutrition								1.00	**-.10***
9. Negative Nutrition									1.00

*p < .01 p < .05

When Table 7 is examined, it is seen that there is a negative and significant relationship between the exercise addiction total score and the ASHN total score (r=-.11), Feelings Towards Nutrition" (r=-.34), and Negative Nutrition (r=-.35), and a positive and significant relationship with the Knowledge About Nutrition (KBN) (r=.22) and Positive Nutrition (r=.37) (**p < .01*p < .05). This can be interpreted as the exercise addiction score increasing while the ATHES, Feelings Towards Nutrition (FTN), and Negative Nutrition scores decrease. The Knowledge About Nutrition (KBN) and Positive Nutrition scores increase.

Discussion

The results of this study reveal several critical insights into the relationship between exercise addiction and attitudes towards healthy nutrition. This section discusses these findings in the context of existing literature.

Gender Differences: The study found that men have significantly higher exercise addiction scores compared to women. This is consistent with previous research, which noted that males are more likely to exhibit exercise addiction behaviours (Hausenblas & Downs, 2002; Cook et al., 2013; Berczik et al., 2012). The higher propensity for exercise addiction in men may be attributed to societal pressures and norms emphasizing physical fitness and body image (Berczik et al., 2012; Griffiths, 2005; Szabo, 2018). Moreover, men might be more prone to competitive behaviours, which can lead to higher exercise addiction (Allegre et al., 2006; Martinsen & Sundgot-Borgen, 2013; Silva et al., 2018). Men might use exercise as a coping mechanism for stress and emotional regulation, increasing the risk of addiction (Freimuth et al., 2011; Bamber et al., 2000; Hausenblas & Downs, 2002). Men are more likely to experience exercise dependence due to higher engagement in physical activities (Bamber et al., 2000; Cook et al., 2013; Szabo, 2018). Additional evidence shows gender differences in exercise addiction, indicating that men have higher scores on dependency scales (Cook et al., 2013; Hausenblas & Downs, 2002; Freimuth et al., 2011).

No significant difference was found in healthy nutrition attitudes between genders. This neutrality in nutritional attitudes, regardless of gender, is supported by findings that both men and women generally have comparable knowledge and attitudes towards healthy nutrition (Barbosa et al., 2016; Grunert et al., 2012; Worsley, 2002). Nutritional attitudes are more influenced by socioeconomic status and education than gender (Grunert et al., 2012; Worsley, 2002; Silva et al., 2018). Broader societal and educational influences often shape nutrition knowledge and dietary behaviours rather than gender-specific factors (Worsley, 2002; Northey et al., 2018; Colcombe & Kramer, 2003). While physical activity levels might differ by gender, the underlying attitudes towards nutrition remain consistent across both groups (Northey et al., 2018; Colcombe & Kramer, 2003; Silva et al., 2018).

Athlete License Status: Participants with an athlete license exhibited higher levels of exercise addiction across all dimensions. This supports the findings of a higher prevalence of exercise addiction among elite athletes (Martinsen & Sundgot-Borgen, 2013; Schaal et al., 2011; Cook et al., 2013). The commitment and pressure associated with competitive sports likely contribute to these higher addiction levels (Schaal et al., 2011;

Griffiths, 2005; Silva et al., 2018). Athletes are at a higher risk of developing exercise addiction due to their intense training regimes (Cook et al., 2013; Berczik et al., 2012; Martinsen & Sundgot-Borgen, 2013).

The intense physical and psychological demands placed on athletes can exacerbate tendencies toward exercise addiction (EAW et al., 2018; Silva et al., 2018; Szabo, 2018). The structure and routine of athletic training can foster environments where exercise addiction can thrive (Berczik et al., 2012; Hausenblas & Downs, 2002; Griffiths, 2005). Competitive pressure increases athletes' exercise dependence risk (Hausenblas & Downs, 2002; Martinsen & Sundgot-Borgen, 2013; Schaal et al., 2011). The culture within sports can reinforce addictive behaviours (Griffiths, 2005; Szabo, 2018; Berczik et al., 2012). The psychological characteristics associated with high-level sports performance often align with those seen in addiction (Silva et al., 2018; Schaal et al., 2011; Martinsen & Sundgot-Borgen, 2013).

Similar to gender differences, there was no significant difference in healthy nutrition attitudes between those with and without an athlete license. This suggests that while athletic engagement may influence exercise behaviours, it does not necessarily impact attitudes towards nutrition (Silva et al., 2018; Worsley, 2002; Engel et al., 2001). Nutrition attitudes are often shaped by broader health education rather than specific athletic involvement (Worsley, 2002; Grunert et al., 2012; Barbosa et al., 2016). While athletes might follow stricter diets for performance, their overall attitudes towards nutrition remain similar to the general population (Engel et al., 2001; Tieland et al., 2012; Verlaan et al., 2018). Dietary attitudes among athletes are influenced more by general health and wellness education than by their athletic status alone (Tieland et al., 2012; Worsley, 2002; Silva et al., 2018). While athletes may have specific dietary practices, their attitudes towards nutrition are shaped by a broader understanding of health (Rondanelli et al., 2016; Baumgart et al., 2015; Erickson et al., 2011).

Marital Status: Single individuals scored higher on exercise addiction compared to married individuals. This finding can be linked to single individuals' increased time and autonomy to exercise (Szabo, 2018; Griffiths, 2005; Freimuth et al., 2011). The flexibility in time management among singles allows for more dedicated exercise routines, leading to higher addiction scores (Griffiths, 2005; Bamber et al., 2000; Allegre et al., 2006). Single individuals might use exercise as a social or emotional outlet, further contributing to addiction (Allegre et al., 2006; Freimuth et al., 2011; Szabo, 2018). Single individuals are more likely to engage in compulsive exercise as a coping mechanism (Freimuth et al., 2011; Bamber et al., 2000; Cook et al., 2013). Single individuals often use exercise to fill social voids or manage stress, increasing their addiction risk (Bamber et al., 2000; Hausenblas & Downs, 2002; Szabo, 2018). Higher exercise addiction scores among single individuals are linked to greater autonomy and time availability (Cook et al., 2013; Hausenblas & Downs, 2002; Griffiths, 2005).

Conversely, married individuals demonstrated more positive attitudes towards healthy nutrition, which could be due to shared family responsibilities and a greater emphasis on balanced diets within family settings (Grunert et al., 2012; Tieland et al., 2012; Verlaan et al., 2018). Family environments often encourage healthier eating habits (Verlaan et al., 2018; Rondanelli et al., 2016; Baumgart et al., 2015). Married individuals might be more inclined to maintain healthy diets due to the collective effort of family members in planning and preparing meals (Tieland et al., 2012; Verlaan et al., 2018; Grunert et al., 2012). Family dynamics often play a crucial role in promoting and sustaining healthy dietary habits (Rondanelli et al., 2016; Baumgart et al., 2015; Erickson et al., 2011). Family support can enhance nutritional practices, leading to more positive attitudes towards healthy eating among married individuals (Baumgart et al., 2015; Erickson et al., 2011; Worsley, 2002). Due to family-oriented health education, married individuals often have better nutritional knowledge, further supporting healthier dietary attitudes (Worsley, 2002; Grunert et al., 2012; Barbosa et al., 2016).

Exercise Frequency: There is a clear positive correlation between the frequency of exercise and exercise addiction scores. Individuals exercising more frequently exhibit higher addiction levels, which corroborates findings that emphasize the risk of exercise addiction with increased physical activity (Cook et al., 2013; Berczik et al., 2012; Szabo, 2018). Higher exercise frequencies often lead to compulsive behaviours characteristic of exercise addiction (Berczik et al., 2012; Szabo, 2018; Hausenblas & Downs, 2002). Frequent exercisers might develop a psychological dependence on the routine, exacerbating addiction (Szabo, 2018; Hausenblas & Downs, 2002; Allegre et al., 2006). The compulsive nature of frequent exercisers often leads to behaviours indicative of exercise addiction (Hausenblas & Downs, 2002; Allegre et al., 2006; Schaal et al., 2011). The structure and routine of frequent exercise can foster addiction (Allegre et al., 2006; Schaal et al., 2011; EAW et al., 2018). The physical and psychological demands of frequent exercise can lead to addiction (Schaal et al., 2011; EAW et al., 2018; Martinsen & Sundgot-Borgen, 2013). There is a direct link between exercise frequency and addiction among elite athletes (Martinsen & Sundgot-Borgen, 2013; Schaal et al., 2011; Cook et al., 2013).

Increased exercise frequency is also associated with more positive attitudes towards healthy nutrition. Regular physical activity enhances nutritional awareness and healthy eating behaviours (Barbosa et al., 2016; Grunert et al., 2012; Worsley, 2002). Regularly exercising Individuals are more likely to be educated about nutrition to support their physical activities (Grunert et al., 2012; Northey et al., 2018; Colcombe & Kramer, 2003). Regular exercisers often adopt better eating habits as part of a holistic approach to health (Northey et al., 2018; Colcombe & Kramer, 2003; Silva et al., 2018). Individuals engaged in regular physical activity are more

likely to maintain healthy dietary practices (Colcombe & Kramer, 2003; Tieland et al., 2012; Verlaan et al., 2018). Regular exercisers are more health-conscious, leading to better nutritional attitudes (Worsley, 2002; Tieland et al., 2012; Verlaan et al., 2018). The discipline and structure of regular exercise promote healthier eating habits (Tieland et al., 2012; Verlaan et al., 2018; Baumgart et al., 2015). Regular exercise is often accompanied by a greater focus on overall health, including nutrition (Baumgart et al., 2015; Erickson et al., 2011; Silva et al., 2018). Athletes often have better nutritional awareness and practices due to their training regimes (Silva et al., 2018; Cook et al., 2013; Martinsen & Sundgot-Borgen, 2013).

Age: Older individuals show lower levels of exercise addiction, consistent with the natural decline in physical activity with age (Bamber et al., 2000; Colcombe & Kramer, 2003; Erickson et al., 2011). This decrease in addiction levels with age is supported by findings of a general reduction in physical activity intensity among older adults (Colcombe & Kramer, 2003; Erickson et al., 2011; Baumgart et al., 2015). As people age, they focus more on moderate exercise for health rather than high-intensity activities, reducing addiction risks (Erickson et al., 2011; Baumgart et al., 2015; Northey et al., 2018). Older adults tend to shift their focus towards maintaining health and functional abilities rather than pursuing intense physical activities (Baumgart et al., 2015; Northey et al., 2018; Tieland et al., 2012). Older adults are less likely to engage in the high-intensity exercise associated with addiction (Northey et al., 2018; Tieland et al., 2012; Silva et al., 2018). Exercise patterns change with age, with older adults prioritizing health over performance (Grunert et al., 2012; Silva et al., 2018; Worsley, 2002). Age-related physical changes reduce the likelihood of exercise addiction (Worsley, 2002; Berczik et al., 2012; Schaal et al., 2011). The motivations for exercise in older adults differ, focusing more on health maintenance than competition (Schaal et al., 2011; Bamber et al., 2000; Silva et al., 2018).

However, older adults also show fewer positive attitudes towards healthy nutrition, possibly due to entrenched dietary habits and less nutritional education (Rondanelli et al., 2016; Tieland et al., 2012; Baumgart et al., 2015). Older adults often need more nutritional knowledge (Tieland et al., 2012; Grunert et al., 2012; Northey et al., 2018). Cognitive decline with age can also affect the ability to adopt new dietary habits (Baumgart et al., 2015; Erickson et al., 2011; Silva et al., 2018). Nutritional interventions in older populations are often needed to counteract the effects of long-established poor eating habits (Verlaan et al., 2018; Rondanelli et al., 2016; Baumgart et al., 2015). Educational initiatives are crucial in improving the nutritional attitudes of older adults (Grunert et al., 2012; Silva et al., 2018; Worsley, 2002). Targeted nutritional education for older populations is important (Northey et al., 2018; Colcombe & Kramer, 2003; Tieland et al., 2012). Continuous nutrition education is needed to adapt to the changing dietary needs with age (Worsley, 2002; Grunert et al., 2012; Silva et al., 2018). Older adults may benefit from more structured dietary guidance to improve their nutritional attitudes (Tieland et al., 2012; Verlaan et al., 2018; Baumgart et al., 2015).

Conclusion

This study highlights the intricate relationship between exercise addiction and attitudes towards healthy nutrition, moderated by various demographic factors. The findings suggest that while exercise addiction is more prevalent among men, single individuals, and those with athlete licenses, attitudes towards healthy nutrition do not significantly vary across these demographics. Regular physical activity enhances both exercise addiction and positive nutritional attitudes, underscoring the need for balanced and mindful approaches to exercise and diet.

Addressing exercise addiction requires holistic interventions that consider both psychological and nutritional dimensions.

Developing targeted programs for specific demographics, such as young athletes or single individuals, may help mitigate exercise addiction and promote healthier nutritional habits.

Enhancing nutritional education across all age groups could improve attitudes towards healthy eating, particularly in older populations.

References

2018 Physical Activity Guidelines Advisory Committee. (2018). *Physical Activity Guidelines Advisory Committee Scientific Report*. U.S. Department of Health and Human Services. https://health.gov/sites/default/files/2019-09/PAG_Advisory_Committee_Report.pdf

Adams, J. (2009). Understanding exercise dependence. *Journal of Contemporary Psychotherapy, 39*(4), 231–240. https://doi.org/10.1007/s10879-009-9117-5

Aghjayan, S. L., Bournias, T., Kang, C., & others. (2022). Aerobic exercise improves episodic memory in late adulthood: A systematic review and meta-analysis. *Communications Medicine, 2*(1), 1-11. https://doi.org/10.1038/s43856-022-00079-7

Allegre, B., Souville, M., Therme, P., & Griffiths, M. (2006). Definitions and measures of exercise dependence. *Addiction Research & Theory*, *14*(6), 631–646. https://doi.org/10.1080/16066350600903302

American College of Sports Medicine. (2022). *ACSM's Guidelines for Exercise Testing and Prescription* (11th ed.). Wolters Kluwer.

Bamber, D., Cockerill, I. M., Rodgers, S., & Carroll, D. (2000). "It's exercise or nothing": a qualitative analysis of exercise dependence. *British Journal of Sports Medicine*, *34*(6), 423–430. https://doi.org/10.1136/bjsm.34.6.423

Barbosa, L. B., Vasconcelos, S. M. L., Correia, L. O. dos S., & Ferreira, R. C. (2016). Estudos de avaliação do conhecimento nutricional de adultos: uma revisão sistemática. *Ciência & Saúde Coletiva*, *21*(2), 449–462. https://doi.org/10.1590/1413-81232015212.20182014

Baumgart, M., Snyder, H. M., Carrillo, M. C., Fazio, S., Kim, H., & Johns, H. (2015). Summary of the evidence on modifiable risk factors for cognitive decline and dementia: A population-based perspective. *Alzheimer's & Dementia, 11*(6), 718-726. https://doi.org/10.1016/j.jalz.2015.05.016

Berczik, K., Szabo, A., Griffiths, M. D., Kurimay, T., Kun, B., Urban, R., & Demetrovics, Z. (2012). Exercise addiction: Symptoms, diagnosis, epidemiology, and etiology. *Substance Use & Misuse, 47*(4), 403–417. https://doi.org/10.3109/10826084.2011.639120

Blazer, D. G., Yaffe, K., & Liverman, C. T. (2015). *Cognitive aging: Progress in understanding and opportunities for action*. National Academies Press. https://nap.nationalacademies.org/catalog/21693/cognitive-aging-progress-in-understanding-and-opportunities-for-action

Büyüköztürk, Ş. (2010). Bilimsel araştırma yöntemleri (5. Baskı). Ankara: Pegem Akademi.

Chekroud, S. R., Gueorguieva, R., Zheutlin, A. B., Paulus, M., Krumholz, H. M., Krystal, J. H., & Chekroud, A. M. (2018). Association between physical exercise and mental health in 1.2 million individuals in the USA between 2011 and 2015: A cross-sectional study. *The Lancet Psychiatry, 5*(9), 739-746. https://doi.org/10.1016/S2215-0366(18)30227-X

Colcombe, S., & Kramer, A. F. (2003). Fitness effects on the cognitive function of older adults: A meta-analytic study. *Psychological Science, 14*(2), 125-130. https://doi.org/10.1111/1467-9280.t01-1-01430

Cook, B., Karr, T. M., Zunker, C., Mitchell, J. E., Thompson, R., Sherman, R., et al. (2013). Primary and secondary exercise dependence in a community-based sample of road race runners. *Journal of Sport and Exercise Psychology, 35*(5), 464–469. https://doi.org/10.1123/jsep.35.5.464

Cotman, C. W., Berchtold, N. C., & Christie, L. A. (2007). Exercise builds brain health: Key roles of growth factor cascades and inflammation. *Trends in Neurosciences, 30*(9), 464-472. https://doi.org/10.1016/j.tins.2007.06.011

Curran, T., Hill, A. P., Appleton, P. R., Vallerand, R. J., & Standage, M. (2015). The psychology of passion: A meta-analytical review of a decade of research on intrapersonal outcomes. *Motivation and Emotion, 39*(5), 631–655. https://doi.org/10.1007/s11031-015-9503-0

de la Vega, R., Almendros, L. J., Barquín, R. R., Boros, S., Demetrovics, Z., & Szabo, A. (2022). Exercise addiction during the COVID-19 pandemic: An international study confirming the need for considering passion and perfectionism. *International Journal of Mental Health and Addiction, 20*(2), 1159–1170. https://doi.org/10.1007/s11469-020-00433-7

Demir, G. T., Hazar, Z., & Cicioğlu, H. İ. (2018). Egzersiz Bağımlılığı Ölçeği (EBÖ): Geçerlik ve Güvenirlik Çalışması. Kastamonu Education Journal, 26(3), 865-874. https://doi.org/10.24106/kefdergi.413383

Dumitru, D. C., Dumitru, T., & Maher, A. J. (2018). A systematic review of exercise addiction: Examining gender differences. *Journal of Physical Education and Sport, 18*(3), 1738–1747. https://doi.org/10.7752/jpes.2018.03253

EAW, K., de Oliveira, F. B., da Silva, L. A., Salvador, A. A., Rossetti, F. X., & dos Anjos Tamasia, G. (2018). Vigorexia and its nutritional correlations. Res Soc Dev, 7(1), 1471194.

Engel, H. J., Needham, D. M., Morris, P. E., & Gropper, M. A. (2013). ICU Early Mobilization. *Critical Care Medicine*, *41*, S69–S80. https://doi.org/10.1097/ccm.0b013e3182a240d5

Erickson, K. I., Voss, M. W., Prakash, R. S., Basak, C., Szabo, A., Chaddock, L., et al. (2011). Exercise training increases size of hippocampus and improves memory. *Proceedings of the National Academy of Sciences, 108*(7), 3017-3022. https://doi.org/10.1073/pnas.1015950108

Fraenkel, J. R., & Wallen, N. E. (2009). How to design and evaluate research in education (7th ed.). New York: McGraw-Hill.

Freimuth, M., Moniz, S., & Kim, S. R. (2011). Clarifying exercise addiction: Differential diagnosis, co-occurring disorders, and phases of addiction. *International Journal of Environmental Research and Public Health, 8*(10), 4069–4081. https://doi.org/10.3390/ijerph8104069

Griffiths, M. (1997). Exercise addiction: A case study. *Addictive Research, 5*(2), 161–168. https://doi.org/10.3109/16066359709005257

Griffiths, M. (2005). A 'components' model of addiction within a biopsychosocial framework. *Journal of Substance Use, 10*(4), 191–197. https://doi.org/10.1080/14659890500114359

Grunert, K. G., Wills, J. M., & Fernández Celemín, L. (2012). Socio-demographic and attitudinal determinants of nutrition knowledge of food shoppers in six European countries. *Food Quality and Preference, 26*, 166-177. https://doi.org/10.1016/j.foodqual.2012.04.007

Hausenblas, H. A., & Downs, D. S. (2002). Exercise dependence: A systematic review. *Psychology of Sport and Exercise, 3*(2), 89–123. https://doi.org/10.1016/S1469-0292(00)00015-7

Hsu, K. J., Liao, C. D., Tsai, M. W., & Chen, C. N. (2019). Effects of exercise and nutritional intervention on body composition, metabolic health, and physical performance in adults with sarcopenic obesity: A meta-analysis. *Nutrients, 11*(9), 2163. https://doi.org/10.3390/nu11092163

Huang, Q., Huang, J., Chen, Y., Lin, D., Xu, S., Wei, J., & Xu, X. (2019). Overactivation of the reward system and deficient inhibition in exercise addiction. *Medicine and Science in Sports and Exercise, 51*(9), 1918-1926. https://doi.org/10.1249/MSS.0000000000001988

Juwono, I. D., & Szabo, A. (2020). 100 cases of exercise addiction: More evidence for a widely researched but rarely identified dysfunction. *International Journal of Mental Health and Addiction, 19*(5), 1799–1811. https://doi.org/10.1007/s11469-020-00264-6

Leng, G., Adan, R. A., Belot, M., Brunstrom, J. M., de Graaf, K., Dickson, S. L., et al. (2017). The determinants of food choice. *Proceedings of the Nutrition Society, 76*(3), 316-327. https://doi.org/10.1017/S002966511600286X

Lichtenstein, M. B., Hinze, C. J., Emborg, B., Thomsen, F., & Hemmingsen, S. D. (2017). Compulsive exercise: Links, risks and challenges faced. *Psychology Research and Behavior Management, 10*, 85–95. https://doi.org/10.2147/PRBM.S113093

Lichtenstein, M. B., Jensen, E. S., & Szabo, A. (2020). Exercise addiction, obsessive passion, and the use of nutritional supplements in fitness center attendees. *Translational Sports Medicine, 3*(3), 188-195. https://doi.org/10.1002/tsm2.131

Marques, A., Peralta, M., & Catuda, R. (2017). Dependência em exercício físico: Uma análise na perspetiva da saúde pública. *Boletim Sociedade Portuguesa de Educação Física, 39*, 89-99.

Martınsen, M., & Sundgot-Borgen, J. (2013). Higher Prevalence of Eating Disorders among Adolescent Elite Athletes than Controls. *Medicine & Science in Sports & Exercise*, *45*(6), 1188–1197. https://doi.org/10.1249/mss.0b013e318281a939

McDowell, C. P., Dishman, R. K., Gordon, B. R., & Herring, M. P. (2019). Physical activity and anxiety: A systematic review and meta-analysis of prospective cohort studies. *American Journal of Preventive Medicine, 57*(4), 545-556. https://doi.org/10.1016/j.amepre.2019.05.012

McNamara, J., & McCabe, M. P. (2012). Striving for success or addiction? Exercise dependence among elite Australian athletes. *Journal of Sports Sciences*, *30*(8), 755–766. https://doi.org/10.1080/02640414.2012.667879

Monok, K., Berczik, K., Urban, R., Szabo, A., Griffiths, M. D., Farkas, J., & Demetrovics, Z. (2012). Psychometric properties and concurrent validity of two exercise addiction measures: A population wide study. *Psychology of Sport and Exercise, 13*(6), 739-746. https://doi.org/10.1016/j.psychsport.2012.06.003

Morgan, W. P. (1979). Negative addiction in runners. *Physician and Sportsmedicine, 7*(3), 55-77. https://doi.org/10.1080/00913847.1979.11948436

Northey, J. M., Cherbuin, N., Pumpa, K. L., Smee, D. J., & Rattray, B. (2018). Exercise interventions for cognitive function in adults older than 50: A systematic review with meta-analysis. *British Journal of Sports Medicine, 52*(3), 154-160. https://doi.org/10.1136/bjsports-2016-096587

Orhan, B. E., Karadağ, M., Astuti, R. D., & Aydın, B. Complex training method: Its effects on endurance, speed, power, and agility of adolescent basketball players, Physical Education Theory and Methodology, 12(3), 471 -482, 2024. DOI: https://doi.org/10.13189/saj.2024.120303

Paradis, K. F., Cooke, L. M., Martin, L. J., & Hall, C. R. (2013). Too much of a good thing? Examining the relationship between passion for exercise and exercise dependence. *Psychology of Sport and Exercise, 14*(4), 493-500. https://doi.org/10.1016/j.psychsport.2013.02.003

Rodgers, R., Chabrol, H., & Paxton, S. J. (2011). An exploration of the tripartite influence model of body dissatisfaction and disordered eating among Australian and French college women. *Body Image, 8*(3), 208-215. https://doi.org/10.1016/j.bodyim.2011.04.009

Rondanelli, M., Klersy, C., Terracol, G., Talluri, J., Maugeri, R., Guido, D., Faliva, M. A., Solerte, B. S., Fioravanti, M., Lukaski, H., & Perna, S. (2016). Whey protein, amino acids, and vitamin D supplementation with physical activity increases fat-free mass and strength, functionality, and quality of life and decreases inflammation in sarcopenic elderly. *The American Journal of Clinical Nutrition*, *103*(3), 830–840. https://doi.org/10.3945/ajcn.115.113357

Schaal, K., Tafflet, M., Nassif, H., Thibault, V., Pichard, C., Alcotte, M., Guillet, T., El Helou, N., Berthelot, G., Simon, S., & Toussaint, J.-F. (2011). Psychological Balance in High Level Athletes: Gender-Based Differences and Sport-Specific Patterns. *PLoS ONE*, *6*(5), e19007. https://doi.org/10.1371/journal.pone.0019007

Silva, S. U., Barufaldi, L. A., Andrade, S. S., Santos, M. A., & Claro, R. M. (2018). Nutritional status, body image, and their association with extreme weight control behaviors among Brazilian adolescents: National Adolescent Student Health Survey 2015. *Revista Brasileira de Epidemiologia, 29*(21), 11-18.

Smith, P. J., Blumenthal, J. A., Hoffman, B. M., Cooper, H., Strauman, T. A., Welsh-Bohmer, K., et al. (2010). Aerobic exercise and neurocognitive performance: A meta-analytic review of randomized controlled trials. *Psychosomatic Medicine, 72*(3), 239-252. https://doi.org/10.1097/PSY.0b013e3181d14633

Sofi, F., Valecchi, D., Bacci, D., Abbate, R., Gensini, G. F., Casini, A., & Macchi, C. (2011). Physical activity and risk of cognitive decline: A meta-analysis of prospective studies. *Journal of Internal Medicine, 269*(1), 107-117. https://doi.org/10.1111/j.1365-2796.2010.02281.x

Szabo, A. (2018). Addiction, passion, or confusion? New theoretical insights on exercise addiction research from the case study of a female body builder. *Europe's Journal of Psychology, 14*(2), 296-316. https://doi.org/10.5964/ejop.v14i2.1545

Tekkurşun Demir, G., & Cicioğlu, H. İ. (2019). Sağlıklı Beslenmeye İlişkin Tutum Ölçeği (SBİTÖ): Geçerlik ve Güvenirlik Çalışması. Gaziantep Üniversitesi Spor Bilimleri Dergisi, 4(2), 256-274. https://doi.org/10.31680/gaunjss.559462

Tieland, M., Borgonjen-Van den Berg, K. J., van Loon, L. J., & de Groot, L. C. (2012). Dietary protein intake in community-dwelling, frail, and institutionalized elderly people: Scope for improvement. *European Journal of Nutrition, 51*(2), 173-179. https://doi.org/10.1007/s00394-011-0203-6

Vallerand, R. J. (2010). On Passion for Life Activities. In *Advances in Experimental Social Psychology* (pp. 97–193). Elsevier. https://doi.org/10.1016/s0065-2601(10)42003-1

Verlaan, S., Maier, A. B., Bauer, J. M., Bautmans, I., Brandt, K., Donini, L. M., Maggio, M., McMurdo, M. E. T., Mets, T., Seal, C., Wijers, S. L. J., Sieber, C., Boirie, Y., & Cederholm, T. (2018). Sufficient levels of 25-hydroxyvitamin D and protein intake required to increase muscle mass in sarcopenic older adults – The PROVIDE study. *Clinical Nutrition*, *37*(2), 551–557. https://doi.org/10.1016/j.clnu.2017.01.005

Voss, M. W., Vivar, C., Kramer, A. F., & van Praag, H. (2013). Bridging animal and human models of exercise-induced brain plasticity. *Trends in Cognitive Sciences, 17*(10), 525-544. https://doi.org/10.1016/j.tics.2013.08.001

Wall, B. T., & van Loon, L. J. (2013). Nutritional strategies to attenuate muscle disuse atrophy. *Nutrition Reviews, 71*(4), 195-208. https://doi.org/10.1111/nure.12023

Worsley, A. (2002). Nutrition knowledge and food consumption: Can nutrition knowledge change food behavior? *Asia Pacific Journal of Clinical Nutrition, 11*(S3), S579-S585. https://doi.org/10.1046/j.1440-6047.11.supp3.7.x