

The prevalence of exercise dependence among students

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Abstract:

Background and aim of the study: Exercise has a positive effect on human well-being, which includes the reduced risk of arterial hypertension, lowered cholesterol, reduced effect of diabetes, and positive effects on body mass index. Exercise dependence is a pathological habit in which a person loses control over their behavior. As a result, exercise becomes an addiction and is a priority in a person's daily life. This study aimed to examine the prevalence of exercise dependence among students at the Faculty of Dental Medicine and Health in Osijek, Croatia. *Participants and Methods:* A cross-sectional study included 319 respondents. It was conducted via an online questionnaire from November 2021 to February 2022. The first part of the questionnaire contained general sociodemographic data, and the second part was the Exercise Dependence Scale-21 (EDS-21). *Results:* Of the 319 respondents, 119 exercise regularly. Most students are symptomatic exercisers (79.8%), 6.7% have developed exercise dependence, and 13.4% are asymptomatic exercisers. Moreover, multivariate linear regression analyses showed that some of the demographic characteristics of students were associated with exercise dependence. Younger students ($p = 0.05$) and non-smokers ($p = 0.003$) had higher levels of exercise dependence. Also, the level of exercise dependence was higher in singles ($p = 0.01$) and students with lower body mass index (BMI) ($p = 0.007$) than in married students and those with higher BMI. However, no difference in exercise dependence was observed regarding gender ($p = 0.20$). *Conclusion:* Students with symptoms of exercise dependence lead a healthier lifestyle, have a lower BMI, and are non-smokers. However, the present study has shown that many students have symptoms of exercise dependence, and it is necessary to spot those who need psychological help in time to avoid addiction. Kinesiologists and physiotherapists might play a significant role in this. They could ensure optimal training of students by properly designing training and offering advice to avoid exercise addiction.

Key Words: Croatia, exercise addiction, prevalence, students, symptomatic.

Introduction

Exercise involves physical activity that is structured, planned, and repetitive. It is essential to implement it with a certain intensity, frequency, and duration, depending on a specific goal (Rakovac, 2019). Exercise improves physical and mental health (Talapko et al., 2021). It is crucial in the fight against a sedentary lifestyle (Grajek et al., 2021). When people are motivated and happy during physical activity and exercise, they will most likely persist longer in practicing physical activity (Rakovac, 2019). On the other hand, if someone loses control over the duration, intensity and amount of exercise, they become addicted to exercise (Orhan, Yücel, Sadeq, & Orhan, 2019).

According to the recommendations of the American College of Sports Medicine, moderate-intensity aerobic activity should be performed for at least 150 minutes during the week (Garber et al., 2011). Optimal levels of physical activity recommended for children and adolescents are 60 minutes of moderate or high-intensity physical activity during the day (Jurakić & Heimer, 2012). Physical exercise leads to optimal cardiorespiratory capacity, and thus reduces the risk of cancer, affects weight loss, risky distribution of body fat, reduces the risk of arterial hypertension, lowers cholesterol, reduces the effects of diabetes, and has a positive impact on body mass index (Rakovac, 2019). Furthermore, exercise positively affects the quality of life, reduces emotional distress, and helps us cope with life stressors (Greblo Jurakić & Jurakić, 2019), which are often present in students' daily lives. Numerous studies have shown that physical activity has a positive effect on reducing the symptoms of anxiety and depression, and is, nowadays, often an essential part of the treatment of depression (Greblo Jurakić & Jurakić, 2019; Talapko et al., 2021).

Dependence or addiction is a common mental disorder and a significant public health problem. The main characteristic of addiction is a behavioral disorder and craving for activities and behaviors, where the addict tends to repeat specific actions (Vižintin & Barić, 2013). Exercise dependence is a pathological habit involving excessive exercise in which a person loses control of their behavior. Exercise becomes an obsession and is a priority in the person's daily life (Colledge et al., 2020; Conesa, Plaza, & Palacios, 2017; Juwono & Szabo, 2021). It has not been introduced into the psychiatric classification of DSM-5 and ICD-10 as a distinct

mental dysfunction but is only included in addictive behaviors such as gambling addiction, due to the lack of scientific evidence (Juwono & Szabo, 2021). In the literature, exercise dependence still appears in the context of compulsive, compulsory exercise, abuse, and pathological exercise (Torstveit, Fahrenholtz, Lichtenstein, Stenqvist, & Melin, 2019). When a person is forced to stop exercising or reduce the amount of exercise, exercise dependency develops. Additionally, it appears that this activity is the most crucial aspect of life. As a result of too much exercise, exercise addicts challenge themselves and others, and feel euphoric while exercising or immediately afterwards (De La Vega, Parastatidou, Ruiz-Barquín, & Szabo, 2016).

Further, after a more extended period of reduced activity or abstention, the person resumes their excessive exercise patterns and raises their exercise volume to obtain the previous euphoric feeling (Starzak, Sas-Nowosielski, & Pajerska, 2019). Exercise addiction is a complex disorder that can co-occur with other comorbidities, among which eating disorders are the most common. Additionally, certain personality traits are associated with a high risk of developing exercise addiction, such as perfectionism, low self-esteem, neuroticism, and extraversion (Szabo, Demetrovics, et al., 2018). People addicted to exercise constantly push their limits and are never satisfied with their training. A healthy lifestyle and diet are also important to them. They often use supplements, indicating an addiction disorder (Vižintin & Barić, 2013). Such individuals continue to exercise after injury and are not bothered by the poor consequences for their health, social relationships, and professional life due to their exercise regime (Simón-Grima, Marcén, & Marín, 2019; Starzak et al., 2019). Also, they often lack self-confidence and are ashamed of their body even though they are working on it (Greblo Jurakić & Jurakić, 2019). In other words, a person feels guilty until they exercise and relief when they exercise excessively (Çakın, Juwono, Potenza, & Szabo, 2021). It is essential to distinguish the commitment of professional athletes with a large volume of training from exercise addiction (Lichtenstein, Melin, Szabo, & Holm, 2021). For top athletes, success depends on regular training, so they are constantly on the verge of overtraining (Lichtenstein et al., 2021). Exercise becomes pathological when problems and harmful consequences occur both mentally and physically (Szabo, Demetrovics, et al., 2018). Locomotor system injuries, hormonal disorders, dehydration, fatigue, weight loss, overtraining and cardiovascular problems are frequent consequences of exercise addiction (Müssigbrodt et al., 2017).

Exercise dependence is classified as primary and secondary (Nogueira, Molinero, Salguero, & Márquez, 2018). In primary dependence, a person exercises frequently and with great intensity because they falsely expect to solve a significant problem or escape from stress (Szabo, Demetrovics, et al., 2018). In this case, exercise brings psychological satisfaction (Cook et al., 2013). In secondary dependence, compensatory behavior occurs. A person exercises uncontrollably to achieve their desired physical appearance, control, and weight loss (Nogueira et al., 2018). Exercising is just a means for a person to reach a goal. Secondary dependence often occurs with eating disorders (Cook et al., 2013).

There are no definite diagnostic criteria for this maladaptive exercise behavior, although it has been the focus of years of scientific study. Therefore, it is still unknown how many students suffer from exercise dependence (Dinardi, Egorov, & Szabo, 2021). Short screening tools have been designed to assess the risk of exercise dependence. They are based on behavioral addiction symptoms, where the intensity and frequency of symptoms are calculated on a specific scale. A particular value is obtained that associates a person with exercise addiction (Szabo, Demetrovics, et al., 2018). The best known are the Exercise Dependence Scale-21 (EDS-21) and the Exercise Addiction Inventory (EAI) (Dumitru, Dumitru, & Maher, 2018). In preventing exercise addiction, it is essential to recognize potential risk factors such as anxiety, body image disturbances, and obsessive-compulsive behavior, as these are most closely associated with excessive exercise (Back, Josefsson, Ivarsson, & Gustafsson, 2019). Cognitive behavioral therapy is used as a treatment for exercise addiction to uncover and correct thoughts associated with the false belief that exercise is good in any situation (Manea, Milea, & Câmpăan, 2018). Health-promoting organizations should pay close attention to students' risk of exercise dependence in the light of the growing fitness trends that may encourage more students to exercise excessively. Most research on exercise addiction has been done in relation to university students, among whom the prevalence of exercise addiction risk has been reported to range from 3.4% to 13.4% (Szabo, Demetrovics, & Griffiths, 2018). However, the prevalence of exercise dependence in the general population is not high and amounts to about 0.3 to 0.5% (Garilović & Macuka, 2018). However, due to the wide range of exercise dependence risks in students, more studies are still needed to evaluate this issue's occurrence, severity, and characteristics (Marques et al., 2019).

Although there is some research on exercise dependence in the Croatian population, there is no research on university students. Furthermore, the definitions of exercise dependence are not complete. Therefore, additional research is needed to add to our knowledge and focus on the prevalence of these factors among students. The aim of this study was to examine the prevalence of exercise dependence among health-related university students at the Faculty of Dental Medicine and Health, Osijek.

Participants & methods

Participants

The study was conducted as a cross-sectional study from November 2021 to February 2022 via an online questionnaire. In the study, 319 students at the Faculty of Dental Medicine and Health Osijek, Croatia,

participated, of which 119 (37.3%) students exercised regularly. Only those students who exercised regularly were involved in the further data processing. The research was conducted in accordance with the guidelines for the safety of persons participating in such a study, including the Declaration of Helsinki.

Instruments

The questionnaire consisted of two parts. In the first part of the questionnaire, students were asked for general sociodemographic data such as age, gender, body mass index (BMI), whether they exercise regularly, average daily sleep duration, smoking, and marital status.

The second part of the questionnaire included the Exercise Dependence Scale-21 (EDS-21), which aimed to assess the presence of exercise addiction symptoms. The scale has 21 items that are appropriately distributed into seven subscales. Specific subscales, such as tolerance, withdrawal, the effects of intention, lack of control, time, reduced involvement in other activities, and continuance, are criteria or symptoms of exercise dependence. Tolerance represents the need to increase the amount of exercise to achieve the effect a person wants. The withdrawal effect includes anxiety and exhaustion if exercise is absent or is done to avoid such symptoms. The effects of intention represent more intense and more prolonged exercise than the person planned. Lack of control refers to the impossible reduction and management of exercise and the constant desire to exercise. Time is associated with planning exercise or a great deal of free time spent exercising. Reduced involvement in other activities means often thinking about exercising and putting exercise ahead of other activities. Continuance refers to a person exercising even though they have an injury resulting from constant exercise. Students marked the frequency of situations related to feelings and behaviors during exercise on a scale from 1 (never) to 6 (always). EDS-21 can categorize individuals into three groups (Slišković et al., 2018). The total EDS-21 score is calculated by the sum of the responses of individual items and is between 26 and 126. A score ranging from 0 to 42 is classified as asymptomatic (no symptoms of exercise dependence), while scores ranging from 43 to 84 are classified as symptomatic (mild exercise dependence), and scores ranging from 85 to 126 are classified as exercise dependence (Orhan et al., 2019). The study used the validated EDS-21 scale translated into Croatian (Slišković et al., 2018).

Statistical analyses

Descriptive statistics present the students' general characteristics and the exercise dependence scale results as mean values and standard deviation, or as absolute and relative values. Chi-square, Mann-Whitney, and Kruskal-Wallis tests were used to determine the differences between demographic variables and exercise dependence groups. In addition, multivariate regression analyses were performed to determine the independent effects of age, gender, BMI, sleep duration, marital status and smoking, as independent variables, on the overall EDS-21 scale score as dependent variables. The analyses were performed using the SPSS statistical program (22.0, SPSS Inc., Chicago, IL, USA) with a significance level of 0.05.

Results

General data on the students who exercise regularly are shown in Table 1. Most students were female (77.3%) and single (61.3%), with an average age of 24 years. Students most often engage in exercise in the gym (n = 35), aerobics (n = 32) and running (n = 25).

Table 1. Demographic characteristics of students (N = 119)

Variable	Mean	Standard deviation	Variable	N	%
Age (years)	24	6	Marital status		
BMI (kg/m²)	22.69	5.12	Married	9	7.6
Sleeping (hours)	7.39	1.18	Partnership	37	31.1
EDS-21	60.35	17.56	Single	73	61.3
	N	%	Smoking		
Gender			Smoker	27	22.7
Male	27	22.7	Ex-smoker	10	8.4
Female	92	77.3	Non-smoker	82	68.9

BMI – body mass index

Table 2. Comparison of the average overall score of exercise dependence scale symptoms

EDS-21	N	%	Mean	SD	χ^2	p*
Asymptomatic	16	13.4	35.50	4.75	57.683	<0.001
Symptomatic	95	79.8	61.16	11.27		
Dependent	8	6.7	100.50	13.49		

*Kruskal-Wallis test

The average level of exercise dependence of students who exercise regularly (N = 119) was 60.35 ± 17.56. The most significant number of students (79.83%) belonged to the group of symptomatic exercisers with some symptoms of exercise dependence, while 6.72% were dependent exercisers (Table 2).

The prevalence of exercise dependence symptoms, based on the subscales and categories of EDS-21 student questionnaires, is shown in Table 3. Students belonging to the group of exercise addicts have more pronounced symptoms of exercise dependence compared to the other two groups of students belonging to the asymptomatic and symptomatic exerciser groups.

Table 3. The average score of the seven components of the exercise dependence scale (N = 119)

Subscale	Asymptomatic	Symptomatic	Dependent	χ^2	p*
	Mean \pm SD	Mean \pm SD	Mean \pm SD		
Withdrawal	7.43 \pm 2.53	11.31 \pm 3.53	17.13 \pm 0.84	32.65	<0.001
Continuance	4.00 \pm 1.63	7.34 \pm 3.26	12.88 \pm 4.26	28.29	<0.001
Tolerance	6.50 \pm 2.45	11.33 \pm 2.99	16.50 \pm 1.93	40.97	<0.001
Lack of control	4.93 \pm 1.57	8.65 \pm 2.41	14.63 \pm 3.20	40.53	<0.001
Reduction in other activities	3.69 \pm 1.25	6.45 \pm 2.56	11.13 \pm 3.39	33.17	<0.001
Time	4.94 \pm 1.53	8.35 \pm 2.36	13.88 \pm 2.03	41.74	<0.001
Intention effect	4.56 \pm 1.63	8.41 \pm 2.68	14.63 \pm 3.20	40.51	<0.001

SD – standard deviation; *Kruskal-Wallis test

On the basis of the category to which the students belonged, depending on the presence of exercise addiction symptoms, it may be seen that there are associations with some demographic variables (Table 4). For example, marital status significantly affects exercise dependence, and single students belonged either to the group of symptomatic exercisers or dependent exercisers. Likewise, non-smokers are more addicted to exercise than smokers, just like younger students.

Table 4. The association of the exercise dependence scale with students' demographic variables

Variable	Asymptomatic	Symptomatic	Dependent	χ^2	p
	16 (13.4 %)	95 (79.8 %)	8 (6.7 %)		
	Mean \pm SD	Mean \pm SD	Mean \pm SD		
Age (years)	28 \pm 8	23 \pm 6	20 \pm 1	12.040	0.002
BMI (kg/m²)	22.27 \pm 1.64	23.53 \pm 3.86	13.53 \pm 11.45	5.586	0.061
Sleeping (hours)	7.31 \pm 0.70	7.46 \pm 1.24	6.63 \pm 1.09	3.654	0.161
Gender	N (%)	N (%)	N (%)	U	p*
Male	2 (12.5)	23 (24.2)	2 (25.0)	1147	0.547
Female	14 (87.5)	72 (75.8)	6 (75.0)		
Marital status				χ^2	p**
Married	5 (31.3)	4 (4.2)	0	8.714	0.013
Partnership	6 (37.5)	25 (26.3)	6 (75.0)		
Single	5 (31.3)	66 (69.5)	2 (25.0)		
Smoking				χ^2	p**
Smoker	4 (25.0)	21 (22.1)	2 (25.0)	10.311	0.006
Ex-smoker	0	9 (9.5)	1 (12.5)		
Non-smoker	12 (75.0)	65 (68.4)	5 (62.5)		

BMI – body mass index, SD – standard deviation, Chi-square test; *Mann-Whitney U test; **Kruskal-Wallis test

The results of the multivariate regression analysis used to determine the effects of age, gender, BMI, marital status, and smoking on the EDS-21 scale are shown in Table 5. In addition, individual regression analyses were performed to determine the effects of these factors on individual EDS-21 subscales. Minor effects of withdrawal were associated with older age (t = -2.13, 95% CI from -0.35 to -0.01; p = 0.036) and higher BMI (t = -2.69, 95% CI from -0.37 to -0.06; p = 0.008). Lower exercise continuity was observed in non-smokers (t = -2.71, 95% CI from -2.11 to -0.33; p = 0.008).

Women (t = -2.58, 95% CI from -3.88 to -0.50; p = 0.0116), older students (t = -2.21, 95% CI from -0.34 to -0.02; p = 0.029) and students with higher BMI (t = -2.33, 95% CI from -0.32 to -0.03; p = 0.022) had lower tolerance and constantly increased the amount of exercise. Also, it was observed that a minor lack of control was associated with female gender (t = -2.55, 95% CI from -3.20 to -0.40; p = 0.012), older age (t = -2.04, 95% CI from -0.27 to -0.003; p = 0.046), higher BMI (t = -3.08, 95% CI from -0.31 to -0.07; p = 0.003), and non-smoking (t = -2.85, 95% CI from -1.69 to -0.30; p = 0.005). Non-smokers (t = -2.46, 95% CI from -1.56 to -0.17; p = 0.015) were less involved in other activities. More minor effects of intention, i.e., less intense exercised, were observed in students with a higher BMI (t = -2.56, 95% CI from -0.33 to -0.04; p = 0.012) and smokers (t = -2.79, 95% CI from -1.93 to -0.33; p = 0.006).

Table 5. Multivariate regression analyses of overall exercise dependence scale scores (N = 119)

Variable	B	SE	Beta	t	95% CI	p
Age	-0.76	0.38	-0.27	-1.99	-1.52–(-0.001)	0.050
BMI	-0.98	0.36	-0.28	-2.74	-1.68–(-0.27)	0.007
Sleeping	-1.52	1.38	-0.10	-1.11	-4.26–1.21	0.271
Gender	-5.21	4.07	-0.13	-1.28	-13.62–2.74	0.204
Marital status	2.79	2.81	0.10	0.99	-2.79–8.37	0.323
Smoking	-6.112	2.02	-0.29	-3.03	-10.11–(-2.12)	0.003

B—unstandardized beta coefficient; SE—standard error; CI—confidence interval; Gender: 1 = male, 2 = female; Marital status: 1 = married, 2 = partnership, 3 = single; Smoking: 1 = smoker, 2 = ex-smoker, 3 = non-smoker.

Discussion

The research was conducted on 319 students of the Faculty of Dental Medicine and Health in Osijek, Croatia, of whom 119 (37.3%) exercise regularly. The present study examined the prevalence of student exercise dependence, and 6.72% of students were categorized as dependent exercisers, 79.83% as independent exercisers with some symptoms of exercise dependence, and 13.45% as the group of asymptomatic exercisers. Exercise is considered a valuable aspect of human life. However, if a person is obsessed with exercise, it becomes addictive (Dinardi et al., 2021). In a Spanish study of 240 students, Reche-García et al. found that 6% of students showed a risk of exercise dependence. Similar to this study, 65% of students had symptoms of exercise dependence but were not addicted, and 29% were asymptomatic (Reche-García, Montero, & Martínez-Rodríguez, 2018). The disorder is difficult to characterize, so different rates of prevalence of exercise dependence are found in the literature (Dinardi et al., 2021). In a systematic review of the literature, Marques et al. found that the prevalence of exercise dependence risk is between 3% and 7% in regular exercisers and the university student population, and 6% and 9% in the athlete population (Marques et al., 2019).

Students' most common activities in this research were gym exercise, aerobics, and running. Other less-represented activities included ball sports, Pilates, dancing, boxing, walking, and archery. In their systematic analysis, Di Lodovico et al. concluded that the largest share of people at risk of developing exercise addiction is in endurance sports (14.2%), followed by ball sports (10.4%), and gym exercise (8.2%), and sports with a strength category (6.4%). Exercise addiction can potentially develop in all sports, but some are characterized by a higher risk. The most strenuous activities have the highest risk of exercise dependence, which explains why endurance sports, such as long-distance running, have the highest prevalence of exercise dependence (Di Lodovico, Poulmais, & Gorwood, 2019). The fact is that approximately half the people who start some physical activity give up in the first six months, while people who choose to participate in a marathon rarely give up because the characteristics of that training favor the development of tolerance (Di Lodovico et al., 2019; Nogueira et al., 2018).

Concerning the scoring of individual subscales in this study, the average level of exercise dependence of students who exercise regularly was 60.35 ± 17.56 . On the basis of the average scores, some students were categorized into a group of exercisers with some symptoms of exercise addiction. It was observed that students scored the most on the withdrawal effects and tolerance subscales, which means that they exercise to not feel anxious and exhausted, and need to exercise more to achieve the desired result. Numerous studies have been reported in the literature showing that levels of student exercise dependence are lower compared to professional athletes (Juwono, Tolnai, & Szabo, 2021; Orhan et al., 2019). The study conducted by Orhan et al. on 141 professional athletes found that the average level of exercise dependence was 71.41 (Orhan et al., 2019). Comparing the results of the present study with Orhan et al., it was noticed that students are less exposed to the risk of exercise addiction than professional athletes. Turkish research by Cicioğlu et al. conducted on 97 students and 74 professional athletes also observed significantly lower levels of student exercise dependence (Cicioğlu, Demir, Bulğay, & Çetin, 2019).

Regression analysis of the EDS-21 scale with the general student data indicated that exercise dependence was negatively correlated with age. The same was found by Costa et al. in a study conducted on 409 respondents who exercised regularly in gyms for at least three months. Exercise dependence decreases with age because, in the general population, the level of physical activity gradually decreases (Costa, Hausenblas, Oliva, Cuzzocrea, & Larcán, 2013). Also, in this study, a negative correlation was observed between exercise dependence and BMI, which is identical to the result of a study by Vieira et al. The higher the BMI, the less likely it is to develop exercise dependence (Vieira, Da Rocha, & Ferrarezzi, 2010).

The present study observed that slightly more male students were exercise dependent than female students, but the difference was not statistically significant. Some studies have observed a greater exercise dependence in men than women (Costa et al., 2013; MacIntyre, Heron, Howard, & Symons Downs, 2021). In some of them, most of the respondents were students of the Faculty of Kinesiology, which could have led to such results (Vižintin & Barić, 2013). On the other hand, Vieira et al. showed no significant gender differences in exercise dependence in gymnasts (Vieira et al., 2010). One of the reasons for not noticing the difference in exercise dependence between women and men in this study may be the much larger number of female students in the overall sample. The reason why in most studies men make up a higher percentage of people addicted to exercise may lie in the fact that muscular body appearance is essential to men, and they are motivated to compete, while women achieve their ideal body appearance through exercise and diet or aesthetic procedures (Vižintin & Barić, 2013).

Various general population studies have shown that singles exercise much more than married people, and singles are more likely to develop an exercise addiction (Cavazzotto et al., 2022; Puciato & Rozpara, 2021). Such observations were made using the EDS-21 scale, where less exercise dependence was observed in married persons compared to singles (Numanović, Mladenović, Janjić, & Radmanović, 2018). Thus, this study observed that most students who show signs of exercise dependence, or who are dependent, are single. However, by regression analysis, this difference was not significant. A possible reason for this is that the students included in this study are younger (with an average age of 24), and few are married (7.6%). Therefore, no significant association between marital status and exercise dependence was observed.

This study showed that non-smokers are more exercise addicted than smokers, which is consistent with other studies that found that smokers have lower levels of physical activity than non-smokers (Efendi, Özalevli, Naz, & Kiliç, 2018; Szabo, Griffiths, Aarhus Høglid, & Demetrovics, 2018). Also, exercise dependence is associated with a lower prevalence of nicotine use (Szabo, Griffiths, et al., 2018). A healthier lifestyle is associated with regular exercise. However, excessive exercise can lead to dependence.

This study has some limitations. First, the research was conducted using questionnaires whose answers may be affected by student bias. In addition, the sample may be biased because most respondents were women (77.3%). However, the gender distribution in the research sample corresponds to the total gender distribution of all students in the Faculty of Dental Medicine and Health. Also, as the study was conducted in the student population, most of them are single, which could also affect the results. Future research should address these potentially confusing variables.

Conclusions

Early detection of exercise dependence symptoms is of great importance in recognizing exercise dependence in time. This research showed that students of the Faculty of Dental Medicine and Health, Osijek are slightly dependent on exercise and are classified as symptomatic exercisers. The present study results showed that 6.72% of students are at risk of exercise dependence, which is in accordance with the results of other studies on the prevalence of exercise dependence risk in university students, ranging from 3.4 to 13.4% (Szabo, Demetrovics, et al., 2018). At the same time, the majority of students (79.83%) have symptoms of exercise dependence. Furthermore, this study observed that some of the demographic characteristics of students are associated with a higher risk of exercise dependence, such as younger age, non-smoking, being single, and lower BMIs. In addition, students with symptoms of exercise dependence lead a healthier lifestyle, have a lower BMI, and are non-smokers. However, students at risk of exercise dependence need psychological help to find the causes that lead to addiction. Kinesiologists and physiotherapists might play a significant role in this. In addition, they could ensure optimal training of students by designing their training properly and offering advice to avoid exercise addiction. However, for an accurate diagnosis of exercise dependence and the establishment of suitable treatment, attention should be paid to the intrinsic factors of each student that may cause exercise dependence. Therefore, although the risk of university students developing exercise dependence is low, further research could help identify risk factors for developing exercise dependence and extend our understanding of this maladaptive behavior.

Conflicts of interest

The authors declare no conflict of interest.

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