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Aging and exercise: Addiction risks unveiled

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Abstract

This study aims to investigate exercise addiction among middle-aged and older adults and examine the psychological, social, and biological factors influencing this addiction. Among the participants, 41 middleaged and 26 older adults were identified as exercise addicts. Exercise addiction levels were assessed using the Exercise Addiction Inventory. Health-promoting behaviors were evaluated with the Health-Promoting Behavior Scale, health anxiety with the Health Anxiety Inventory, and death anxiety with the Death Anxiety Scale. Scores on the Exercise Addiction Inventory, Health-Promoting Behavior Scale, Health Anxiety Inventory, and Death Anxiety Scale were significantly higher in the older group compared to the middleaged group ($p = .001$, $p = .041$, $p = .002$, and $p = .047$, respectively). In the middle-aged group, no significant associations were found between exercise addiction and health-promoting behaviors, health anxiety, or death anxiety ($p > .05$). In the older group, however, moderate and significant correlations were observed between exercise addiction and health-promoting behaviors ($r = 0.454$, $p = .020$) as well as death anxiety ($r = 0.425$, $p = .030$). A strong and significant relationship was also identified between exercise addiction and health anxiety in the older group ($r = 0.717$, $p < .001$). The findings suggest that exercise addiction in older adults is associated with psychological and behavioral factors, including health anxiety, health-promoting behaviors, and death anxiety.

Keywords: addictive, aged, anxiety, death, exercise

Main points

- Exercise addiction in older adults is significantly associated with psychological factors such as health anxiety, health-protective behaviors, and death anxiety.
- In middle-aged adults, exercise addiction is less influenced by psychological factors, with exercise primarily serving as a means of psychological relaxation and stress management.
- Exercise addiction in older adults may be driven by psychological factors such as health anxiety and death anxiety, highlighting the importance of psychological support in the development of treatment and prevention strategies.

Introduction

The middle-aged and older adult populations represent a rapidly growing demographic across various regions worldwide (Qiu et al., 2023). Aging is a multifaceted period influenced by the interaction of biological, social, and psychological factors, often leading to various negative consequences (Asejeje & Ogunro, 2024). Many intervention strategies have been created to reduce the harmful effects of aging, with exercise recognized as a cornerstone of these methods. Regular physical activity is vital in preserving health, independence, and enhancing the overall quality of life for elderly individuals. Specifically, exercise enhances cardiovascular health, strengthens muscles and bones, improves balance, coordination, and flexibility, supports cognitive function, aids in managing chronic illnesses, decreases the risk of falls, and boosts mental well-being (Galloza et al., 2017; Sabat et al., 2024).

Despite the well-documented benefits of exercise, its frequent recommendation by families and healthcare providers necessitates a nuanced perspective. Aging often brings increased health challenges and mental vulnerability, predisposing individuals to various forms of dependency. Common dependencies observed among older adults include substance use, medication reliance, gambling, shopping,

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and internet use (Billieux et al., 2015; Koechl et al., 2012). Additionally, excessive emotional attachment in personal relationships is also prevalent in this demographic (Çavuşoğlu & Demirkol, 2018).

While exercise is widely regarded as integral to healthy aging, an overemphasis on its role in maintaining health combined with anxiety related to illness and mortality may lead some older adults to develop a compulsive focus on physical activity. Such compulsive engagement with exercise can overshadow other important aspects of life and, paradoxically, detract from overall well-being (Hausenblas & Giacobbi, 2004). These circumstances raise concerns about the potential for exercise to evolve into an addiction in some individuals. Exercise addiction was initially identified by Baekeland (1970) during participant screening for a study investigating the effects of exercise deprivation on sleep patterns (Baekeland, 1970).

Exercise addiction is marked by a compelling, uncontrollable need to participate in physical activities, even when it leads to adverse effects. In contrast to substance-related disorders, exercise addiction is frequently overlooked, as the emphasis on regular exercise as part of a healthy lifestyle often obscures its recognition (Hądzlik et al., 2024). Exercise addiction, like other addictions, involves six core components: salience, tolerance, mood modification, withdrawal, conflict, and relapse (Hądzlik et al., 2024).

Salience makes exercise the central focus of life, while tolerance drives individuals to increase workout intensity or duration. Mood modification leads to reliance on exercise for emotional relief, but withdrawal symptoms like anxiety emerge without it. Conflict strains relationships and health, and relapse often follows attempts to reduce excessive exercise. This condition is often characterized by compulsive tendencies and a psychological dependency that are absent in those merely dedicated to regular exercise (Zmijewski & Howard, 2003). People with exercise addiction frequently view physical activity as the central focus of their lives, experiencing withdrawal-like symptoms when unable to exercise (Zmijewski & Howard, 2003).

While existing research on exercise addiction has largely focused on younger adults—primarily linked to concerns about physical appearance and performance—the phenomenon in older populations remains understudied.

The main goal of this study is to explore exercise addiction in middle-aged and older adults and examine the biological, social, and psychological factors that contribute to this addiction. A review of the literature reveals a notable gap in research addressing exercise addiction in older populations. This study seeks to fill this gap by investigating the causes or consequences of exercise addiction later in life. The findings aim to inform the development of prevention and treatment programs tailored to older adults while contributing to a more balanced understanding of the benefits and risks of exercise in this demographic.

Material and Methods

Ethical approval for the study was obtained from the Ethics Committee for Non-Interventional Health Sciences Research at Istanbul Okan University (approval date: September 11, 2024, reference no.: 11.09.2024-180). The study was conducted in accordance with the Helsinki Declaration. Before the assessments, all participants were informed about the objectives of the study and provided written informed consent. Following consent, participants' exercise addiction was determined using the Exercise Addiction Inventory (EAI). A recent study highlights an EAI assessment tool that effectively frames exercise addiction as a recognized condition while clearly outlining its distinct components (Sicilia et al., 2022). According to the EAI, participants scoring 24 or above were divided into two groups of 25 individuals based on their age groups.

Individuals aged 45 and older who scored 24 or above on the EAI and were able to cooperate in completing the questionnaires were included in the study. Exclusion criteria included the presence of orthopedic, neurological, neuromuscular, or rheumatological diseases that would impede participation, advanced cardiopulmonary disease, respiratory failure, dementia, Alzheimer's disease, or severe cognitive impairments, as well as malignancy.

Power Analysis and Sample Size

The sample size for the study was calculated using the G*POWER (version 3.1.9.7) power analysis program. Based on the study by Bueno-Antequera et al. (2022), the effect size for exercise addiction was calculated as 0.81, indicating that a minimum of 25 individuals should be included in each group to achieve 80% statistical power at a 5% significance level. Consequently, the goal was to recruit a minimum of 50 participants for the study (Bueno-Antequera et al., 2022).

Method

In this descriptive study, data were collected using a convenience sampling method from individuals aged 45 and older residing in Turkiye who exhibit exercise addiction. Assessments were conducted either face-to-face or online through WhatsApp, Facebook, and email groups using Google Forms, with each session lasting approximately 15 minutes.

Assessments

The sociodemographic characteristics of the participants (age, height, body weight, gender, education level, employment status, physical activity status) were recorded using the "Socio-Demographic Information Form."

Exercise Addiction Inventory: The EAI was used to measure the levels of exercise addiction among participants. The inventory consists of six items, rated on a scale from 1 (strongly disagree) to 5 (strongly agree). The total score ranges from 6 to 30, with a score of 24 or higher indicating a risk of exercise

addiction. The validity and reliability of the Turkish version of the EAI were conducted by Aydin et al. (2023). The original scale had a Cronbach's alpha reliability coefficient of 0.84, while the Turkish version yielded a coefficient of 0.80 (Terry et al., 2004; Aydin et al., 2023).

Health Protective Behavior Scale (HPBS): The HPBS was developed to identify individuals' health-protective behaviors. The scale consists of 32 items and has five sub-dimensions: interpersonal relationships, general behaviors, self-information, nutrition behaviors, and healthcare. The first five questions use a binary Likert scale, while the remaining questions are scored using a 5-point Likert scale. Each dimension of the HPBS and the overall scale score are obtained by summing the responses to the questions, with total scores ranging from 32 to 145. As the score from the scale increases, the health-protective behavior also increases. The validity and reliability of the Turkish version of the scale were established by Ödek et al. (2022). The internal consistency for the Turkish version was indicated by a Cronbach's alpha coefficient of 0.85 (Ödek et al., 2022).

Health Anxiety Inventory (HAI): The HAI is an 18-item scale developed to assess health anxiety. Fourteen items inquire about individuals' mental states using four-point response options, while the remaining four items ask participants to hypothesize their mental states if they were to have a serious illness. Each item is scored on a scale from 0 to 3, with higher scores indicating higher levels of health anxiety. The Turkish validity and reliability study of the scale was conducted by Aydemir et al. (2013), finding a Cronbach's alpha coefficient of 0.92 for the Turkish version (Aydemir et al., 2013).

Death Anxiety Scale (DAS): The DAS is a 20-item scale developed to assess individuals' death anxiety. Items are formatted in a 5-point Likert scale, with 0 points assigned for a "never" response and 4 points for an "always" response. The scale is scored from 0 to 80, with higher scores indicating higher death anxiety. Scores ranging from 0 to 29 indicate low levels of death anxiety, 30-59 indicate moderate levels, and 60-80 indicate high levels of death anxiety. The internal consistency was determined with a Cronbach's alpha coefficient of 0.95 (Sarıkaya & Baloğlu, 2016).

Statistical Analysis

Data analysis was conducted using SPSS 25 (IBM SPSS Corp.; Armonk, NY, USA). Descriptive statistics (mean, standard deviation, median, count, and percentage) were provided for categorical and continuous variables. The homogeneity of variances, a prerequisite for parametric tests, was checked using Levene's test, and the normality assumption was evaluated with the Shapiro-Wilk test. Comparisons of scale scores for binary categorical variables were analyzed using Student's *t*-test when parametric conditions were met and the Mann-Whitney *U*-test when they were not. Relationships between categorical variables were assessed using Fisher's exact test and the chi-square test. A *p*-value of less than .05 was considered statistically significant.

Results

The sociodemographic data of the participants are presented in Table 1 according to groups. Significant differences were observed among the groups in terms of age, employment status, and the presence of chronic diseases ($p < .05$).

The comparison of questionnaire scores (EAI, HPBS, HAI, Turkish Death Anxiety Scale [TDAS]) between groups is presented in Table 2. Exercise Addiction Inventory scores were significantly higher in the elderly group (25.88 ± 1.75) compared to the middle-aged group (24.80 ± 1.86) ($p = .001$). Similarly, HPBS scores were elevated in the elderly group (124.69 ± 14.97) relative to the middle-aged group (117.73 ± 15.84) ($p = .041$). Furthermore, HAI scores were significantly higher in the elderly group (22.04 ± 10.77) than in the middle-aged group (14.05 ± 9.77) ($p = .002$). Turkish Death Anxiety Scale scores also followed a similar pattern, being significantly greater in the elderly group (37.77 ± 17.66) compared to the middle-aged group (27.61 ± 22.45) ($p = .047$).

In the middle-aged group, there was no significant relationship between exercise addiction and health protection behavior, health anxiety, and fear of death ($p > .05$) (Table 3). However, in

Table 1. Comparison of the sociodemographic data of the groups

	Middle-Aged Group (n = 41)	Elderly Group (n = 26)	p
Age (mean ± SD), years	51.41 ± 4.36	70.19 ± 4.56	<.001a*
BMI (mean ± SD)	24.79 ± 3.38	24.73 ± 2.90	.545a
Sex			
Female (n (%))	24 (58.5)	9 (34.6)	0.058b
Male (n (%))	17 (41.5)	17 (65.4)	
Education			0.060b
Primary school	3 (7.3)	2 (7.7)	
Middle school	1 (2.4)	2 (7.7)	
High school	7 (17.1)	11 (42.3)	
University	19 (46.3)	6 (23.1)	
Postgraduate	11 (26.8)	5 (19.2)	
Employment status			<0.001b*
Not working	3 (7.3)	1 (3.8)	
Working	28 (68.3)	4 (15.4)	
Retired	9 (22)	20 (76.9)	
Unemployed	1 (2.4)	1 (3.8)	
Chronic disease			0.005b*
No (n (%))	37 (90.2)	16 (61.5)	
Yes (n (%))	4 (9.8)	10 (38.5)	
Regular physical activity			0.638b
No (n (%))	2 (4.9)	2 (7.7)	
Yes (n (%))	39 (95.1)	24 (92.3)	

Note: BMI = Body mass index; SD = Standard deviation.
aMann–Whitney U-test.
bChi-square test.
*p < .05.

the elderly group, a moderate significant association was seen between exercise addiction and health protection behavior and fear of death (r = 0.454, p = .020 and r = 0.425, p = .030, respectively), as well as a strong significant relationship between health anxiety (r = 0.717, p < .001) (Table 4).

Discussion

The aim of this study was to investigate exercise addiction among middle-aged and older adults and examine the psychological, social, and biological factors influencing this addiction. The findings revealed that in elderly individuals, exercise addiction is closely associated with psychological and behavioral factors such as health anxiety, health-protective behaviors, and fear of death.

Studies on exercise addiction have primarily focused on athletes, while those examining recreational exercisers have often aimed to explore the underlying etiology of addiction risk. For instance, a study investigating the association between exercise addiction risk and psychological distress in recreational exercisers aged 13-65 reported that individuals at high risk for exercise addiction experienced greater depression and emotional stress (Lichtenstein et al., 2018). Another study assessed psychiatric disorders accompanying exercise addiction in adults, revealing that individuals with exercise addiction exhibited various mental health disorders. Furthermore, the comorbidity of mental disorders was linked to the level of exercise addiction (Meyer et al., 2021). Similarly, in middle-aged individuals engaging in more than 10 hours of exercise per week, exercise addiction risk was found to be associated with depression, attention deficit hyperactivity disorder, and childhood traumas (Colledge et al., 2021).

Table 2. Comparison of the questionnaire scores of the groups

	Group		p
	Middle-Aged (n = 41) Mean ± SD	Elderly Group (n = 26) Mean ± SD	
EAI	24.80 ± 1.86	25.88 ± 1.75	.001
HPBS	117.73 ± 15.84	124.69 ± 14.97	.041
HAI	14.05 ± 9.77	22.04 ± 10.77	.002
TDAS	27.61 ± 22.45	37.77 ± 17.66	.047

Mann–Whitney U test was used.
Note: EAI = Exercise Addiction Inventory; HAI = Health Anxiety Inventory; HPBS = Health Protection Behavior Scale; SD = Standard deviation; TDAS = Turkish Death Anxiety Scale.

Table 3. Correlation of the exercise addiction with other questionnaire scores of the middle-aged group

	EAI	
	r	p
HPBS	0.191	.232
HAI	0.009	.954
TDAS	0.164	.305

Spearman correlation analysis was used.
EAI = Exercise Addiction Inventory; HAI = Health Anxiety Inventory; HPBS = Health Protection Behavior Scale; r = correlation coefficient; TDAS = Turkish Death Anxiety Scale.

Table 4. Correlation of the exercise addiction with other questionnaire scores of the elder group

	EAI	
	r	p
HPBS	0.454	.020
HAI	0.717	<.001
TDAS	0.425	.030

Spearman correlation analysis was used.
EAI = Exercise Addiction Inventory; HAI = Health Anxiety Inventory; HPBS = Health Protection Behavior Scale; r = correlation coefficient; TDAS = Turkish Death Anxiety Scale.

This study found that among middle-aged adults, exercise addiction was not associated with health-protective behaviors, health anxiety, or fear of death. This suggests that in this group, exercise addiction may not stem from health-related concerns or preventive behaviors but instead may be driven by emotional and psychological factors. For middle-aged individuals, exercise often serves as a coping mechanism for stress, a tool for emotional regulation, or a pursuit of psychological relaxation, rather than being motivated by health concerns or fear of death. These findings highlight the need to view exercise addiction not just as a physical health issue but also as one deeply connected to psychological well-being, emphasizing the importance of psychological interventions in its management.

The literature review revealed a notable lack of studies focusing specifically on exercise addiction in elderly populations. However, this study identified a relationship between exercise addiction and factors such as health-protective behaviors, health anxiety, and fear of death in elderly individuals. The absence of these associations in middle-aged adults may be due to their relatively lower levels of health-related concerns, which influence their motivations for exercise differently. In middle adulthood, exercise is more likely driven by lifestyle, higher life satisfaction (Petry, 2002) and social motivations rather than by health anxieties at levels associated with addiction. In contrast, the heightened exercise addiction observed in older adults may be associated with the increased prevalence of health concerns and elevated death anxiety commonly linked to aging. A study by Cho (2002), aligning with the current results, found that elderly individuals engaged in regular exercise more frequently than their middle-aged counterparts (Cho & Kim, 2020).

A study aimed at exploring healthy lifestyle behaviors among elderly individuals and examining the relationship between these behaviors and geriatric depression among rural populations found that many elderly people do not engage in sufficient health-protective activities, such as exercise. Regular physical activity was associated with lower geriatric depression scores, with physically active elderly individuals exhibiting better overall mental health outcomes and fewer depressive symptoms. However, physical discomfort and lack of social support were identified as significant barriers to

engaging in health-protective behaviors like exercise (Chang et al., 2013).

This study also found a moderate relationship between exercise addiction and health-protective behaviors. This suggests that regular physical activity contributes not only to physical health but also to mental health and social support, enhancing overall quality of life. Thus, promoting exercise programs among elderly individuals and addressing barriers such as physical discomfort and lack of social support could effectively encourage healthy lifestyle behaviors. Developing targeted strategies to overcome these challenges may help improve the physical and mental well-being of elderly individuals while reducing their risk of exercise addiction.

Health anxiety is characterized by the tendency to interpret common physical sensations negatively, often leading to excessive worry, even in the absence of a diagnosable medical condition (Aydemir et al., 2013). It is commonly believed that health-related concerns and anxiety increase with age, as individuals may become more preoccupied with their physical well-being and potential illnesses (Yang et al., 2022). Supporting this notion, studies have demonstrated that older adults often report higher levels of health-related anxiety, particularly when diagnosed with an anxiety disorder (Lindesay et al., 2012; Montorio et al., 2003). Similarly, this study found that health anxiety index scores were higher in the elderly group compared to the middle-aged.

Interestingly, some research challenges the assumption that health anxiety uniformly increases with age. While objective health metrics often decline in older adults, many adjust their subjective health assessments, perceiving themselves as healthier than their medical conditions might suggest (Pinquart, 2001). For instance, Bourgault-Fagnou and Hadjistavropoulos (2009) reported no differences in health anxiety levels between older and young adults, highlighting the complexity of health perceptions in aging populations.

This study further revealed a strong correlation between exercise addiction and health anxiety in the elderly group, indicating that frequent exercise may serve as a coping mechanism for managing health-related concerns. Elderly individuals might engage in exercise as a way to alleviate anxiety about their health and maintain a sense of physical well-being. In contrast, this association was not observed in the middle-aged group, who may have different motivations for exercise. For middle-aged individuals, exercise could be influenced by factors such as lifestyle, aesthetics, or social interactions, as they typically experience fewer immediate health concerns compared to older adults. These findings highlight the importance of addressing health anxiety and its impact on exercise behaviors, particularly in aging populations, to support both mental and physical well-being.

Death anxiety is a normal part of the human experience, yet it can develop into a debilitating phobia in older adults (Iverach et al., 2014). Several factors contribute to the intensity of death anxiety, including life satisfaction, quality of life, age, gender, religious beliefs, physical health, and cultural background (Dadfar & Lester, 2015). Poordad et al. (2019) reported a moderate-to-high prevalence of death anxiety among older adults, which aligns with the findings of this study, where elderly participants demonstrated significantly higher death anxiety scores than those in middle age. However, contrasting results have also been observed in other studies, which suggest that death anxiety increases during middle age and declines in later years (Bengtson et al., 1977). These differences may be due to discrepancies in study settings, sample sizes, and the specific populations examined.

This study further revealed a moderate correlation between exercise addiction and death anxiety scores in the elderly group. While there is limited research directly linking exercise addiction with death anxiety, studies by Mackenbach et al. and Griffin et al. indicate that life expectancy and indicators such as healthcare access, mental health, family relationships, marital status, social participation, and support are important factors influencing death anxiety (Griffin et al., 2013; Mackenbach et al., 2013). Lockhart's study (2001) suggests that individuals with poorer mental and physical health may experience lower degrees of death anxiety, potentially due to a greater acceptance of mortality.

In the context of these findings, the correlation between exercise addiction and death anxiety in elderly individuals may be explained by the desire to prolong life and maintain health. This motivation could lead some individuals to engage in exercise to an addictive extent, seeking to reduce their anxiety about death through physical activity. Death anxiety may, therefore, act as a driving force for excessive exercise, as older adults seek to enhance their well-being and extend their lifespan.

One of the strengths of the study is its in-depth evaluation of the association between exercise addiction and health-related behaviors. This research contributes a unique perspective to the literature by providing an updated view of the link between exercise addiction and health-protective behaviors. It sheds light on how psychological factors, such as death anxiety, can influence exercise patterns in older adults, furthering the understanding of exercise addiction within this population. Exploring finer subgroups within the elderly, such as those with specific health conditions or social support levels, could further elucidate these associations, but aging-related declines in reading comprehension and patience may limit the feasibility of comprehensive assessments, potentially restricting subgroup analyses in this study.

Limitations

This study has several limitations. One limitation is the lack of standardization in the scales used to measure exercise addiction. Exercise addiction is a multidisciplinary phenomenon, and the content and focus of scales used by different researchers may vary. This can make it difficult to ensure consistency in measurement results and to compare them with widely accepted frameworks. While the scale used in this study effectively measured a specific dimension of

exercise addiction, it may have offered a limited perspective compared to scales used in other studies. The process of cultural adaptation of scales and their suitability for local contexts is another factor that should be considered. In the future, research could focus on comparative analysis of variable scales or the development of more comprehensive measurement tools.

The cross-sectional design of this study makes it difficult to determine a causal relationship between exercise addiction and psychological variables. Additionally, the questionnaires and scales used in the data collection process rely on participants' subjective self-reports, which may affect the accuracy of responses. The study did not consider the influence of cultural differences on exercise addiction, which limits the applicability of the findings to different cultural contexts.

Author contributions

Conception: Ö.S., K.K., E.A.; Design: Ö.S., K.K., G.A.; Data acquisition: K.K., G.A., E.A.; Data analysis: K.K., G.A., E.A.; Data interpretation: G.A., E.A.; Drafting of the manuscript: Ö.S., E.A.; Critical revision of the manuscript: K.K., G.A. All authors reviewed the results, approved the final version of the manuscript, and agreed to be accountable for all aspects of this study.

Ethical approval

This study was approved by the Ethics Committee for Non-Interventional Health Sciences Research at Istanbul Okan University (Date: September 11, 2024, Decision/Protocol No: 180). Informed consent was obtained from all participants involved in this study.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare that this study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Generative AI statement

The authors declare that no generative AI or AI-assisted technologies were used in the writing or preparation of this study.

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