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## When Healthy Habits Turn Harmful: A Medical Perspective on Exercise Addiction

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### Abstract

#### Introduction:

Behavioural addictions, also known as non-substance-related addictions, encompass a range of compulsive behaviours that closely mirror substance use disorders in their effects on the brain's reward system and the individual's daily life. These addictions include, but are not limited to, gambling disorder, internet gaming disorder, compulsive shopping, and the focus of this review - exercise addiction.

Exercise addiction is characterized by an intense, uncontrollable urge to engage in physical activity, despite potential negative consequences. Unlike substance use disorders, exercise addiction often remains underrecognized, overshadowed by the widespread promotion of regular physical activity as a healthy lifestyle choice. This review aims to offer a comprehensive overview of exercise addiction, covering its psychological origin and characteristics, diagnostic criteria, co-occurrence with other psychiatric disorders, epidemiology among athletes and management strategies.

**Purpose:** The aim of this scientific paper is to review the current knowledge on the diagnosis and treatment of exercise addiction.

**Review Methods:** We conducted our study as a literature review based on information gathered from PubMed, Embase, GoogleScholar using combinations of the following

**Keywords:** physical activity; exercise addiction; behavioural addiction; depression; anxiety; cognitive-behavioural psychotherapy

**Conclusions:** Exercise addiction (EA) is a complex, often overlooked behavioural addiction with significant diagnostic and treatment challenges. While exercise is typically beneficial, the compulsive nature of EA can lead to severe consequences. Greater awareness and standardized diagnostic tools, like the Exercise Addiction Inventory (EAI), are essential for accurate identification and treatment. The high prevalence of EA among athletes, its co-occurrence with disorders like depression and anxiety, and the blurred line between healthy and pathological behaviour necessitate careful assessment.

## **Introduction**

Addiction is a term used to describe an intense urge to take a substance or perform a certain activity. Some of the core aspects of addiction include recurrent involvement in rewarding acts, neglect of other aspects in life, lack of control, persistence in action in spite of ill consequences and symptoms of withdrawal [1]. Non-substance addiction or behavioural addiction is a condition that does not have a direct neurotoxic effect, but activates the brain reward system with effects similar to those of drug abuse and resembles substance use disorders to a certain extent [1, 2].

The idea of the psychological nature of addiction and its existence even in the absence of drug abuse was popularised around 1975 by Peele [3]. Gambling disorder, formerly known as pathological gambling, is currently the only behavioural addiction formally recognized in the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders) in the new category of *Substance-related and Addictive Disorders* with internet gaming disorder included in Appendix III as a potential future addition. Non-substance addiction was listed in neither DSM-IV nor ICD-10 (International Classification of Diseases) [4, 5]. Lack of adequate research and overlap with established mental disorders makes some of the other considered behavioural addictions (like excessive sexual behaviour, exercise, tanning, overeating, compulsive buying, internet use and stealing) believed to have insufficient evidence and research to be included in official classification [6].

In 1990 Goodman tried to identify criteria for behavioural addiction with main focus on recurrence in failure to quit, increased tension before and feeling of pleasure or relief after the addictive activity and loss of control. Some of the other symptoms include preoccupation, inability to reduce or control, devotion of large amounts of time, high frequency, restlessness, tolerance and perseverance despite unpleasant consequences. These behaviours must last at least a month or longer [7]. Griffiths concluded that all addictions involve biopsychological processes and have some common components: salience, when the act becomes the main objective in life, mood modification as a consequence of certain behaviour, tolerance, which results in increased activity, withdrawal in an absence of that activity, conflict with other people or the individuals themselves and lastly relapse after facing the inability to stop [8].

## **The Exercise Addiction (EA)**

### *Definition*

Sports, exercise and regular physical activity are considered physically and psychologically beneficial, however, sometimes overindulgence in them can be harmful. We talk about a dysfunctional practice. when significant involvement in an exaggerated training volume induces loss of control and what follows adversely affects a person's health, relationships, and productivity [9, 10]. This dysfunctional behaviour has negative life consequences that can be physical, psychological, social, or a combination of the three, and determines the basis of the definition of exercise addiction (EA) [11, 12]. During the last half of the century the research interest in EA is continuously growing, especially in recent years. More than 1000 articles exist on the topic of uncontrolled training harming an individual, but without proper acknowledgment of the problem, our knowledge and research on the problem is inadequate. Despite its known dysfunctional characteristics, EA is still not recognized as a separate distinct category of psychiatric morbidity in the clinical reference manual DSM-5 by American Psychiatric Association [13]. The insufficient evidence and difficulty in categorizing aetiological and symptomatic manifestations is a reason for overlooking EA in the official classifications [12, 14, 15].

### *Diagnostic criteria*

Currently there is no official diagnostic criteria for EA, however, the diagnosis of exercise addiction is used by clinical psychiatry practitioners [16]. Many psychological and physiological theoretical models for dysfunctional forms of exercise have been created. As mentioned before, all addictions, including EA, have six shared components: salience, tolerance, mood modification, withdrawal, conflict and relapse [12, 14, 17].

Special English-language questionnaires have been created for the purpose of recognizing this disorder, including the Obligatory Exercise Questionnaire (OEQ), the Exercise Dependence Scale-Revised (EDS-R), The Exercise Dependence Questionnaire, and the Exercise Addiction Inventory (EAI). Professionals use them regularly to help make a correct diagnosis [16, 18, 19]. A recent review [20] identifies two assessment tools that in the best way conceptualize EA as a recognized disorder while also defining specific components: the EDS-R and the EAI. The EAI, developed by Terry, Szabo, and Griffiths, has undergone revisions, with the latest version (EAI-3) refining its structure and wording [18, 19, 21].

Both versions of EAI contain assets associated with exercise in the form of previously mentioned six items: (i) salience, estimate of the importance of exercise in the individual's life; (ii) conflict (presented in the newest EAI-3 version as concerns), arising with family and friends caused by excessive exercise; (iii) mood modification, treating exercise as a tool to change the mood (iv) tolerance, meaning increasing the level or volume of exercise to achieve the same positive effect; (v) withdrawal symptoms, which describe negative emotions and feelings occurring during decrease or stop in an exercise routine; and (vi) relapse, compensatory mechanism of exaggerating or returning to repeating the exercise routine after a pause [19, 21].

Table 1. EAI-3 components and representative questions [21]

Item	Question
i - salience, estimate of the importance of exercise in the individual's life	Exercise is the most important thing of my life
ii - conflict arising with family and friends caused by excessive exercise	Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do
iii - mood modification, treating exercise as a tool to change the mood	I use exercise as a way of changing my mood (e.g. to get a buzz, to escape, etc.)
iv - tolerance, meaning increasing the level or volume of exercise to achieve the same positive effect	Over time I have increased the amount of exercise I do in a day
v - withdrawal symptoms, which describe negative emotions and feelings occurring during decrease or stop in an exercise routine	If I have to miss an exercise session I feel moody and irritable
vi - relapse, compensatory mechanism of exaggerating or returning to repeating the exercise routine after a pause	If I cut down the amount of exercise I do, and then start again, I always end up exercising as often as I did before

Respondents answer the questions above using a five-point scale (six-points scale in the revised version). In the original questionnaire, the maximum number of points available is 30, while the cut-off point for the risk group is 13 points [18, 21].

During clinical use of the EAI evolved a thought that the questionnaire could be improved. Practitioners noticed that it misses three pathological patterns, including guilt, exercise despite injury, and experienced harm. These aspects constitute an important part of the EA problem and are extensively researched. Especially continuing to exercise despite experiencing injuries and health issues seems to be alarming. Empirical evidence indicates that in the process of the EA, patients can be exposed to physical harm, e.g., cardiovascular complications, repeated fractures, and musculoskeletal injuries [19, 21]. The sensation of guilt is considered likewise a significant psychological factor. The feelings of guilt originate in the perception of the lack of training quantity or quality as a neglected obligation and provoke the occurrence of overly increased exercise after skipping a training routine to overdo alleged faults. [19, 22].

Recently, a study was conducted with the proposed improved version EAI-3, with 3 newly added questions about these aspects.

Table 2. Additional EAI-3 item and representative questions [19]

Item	Question
vii	I feel guilty if I miss planned training or if my training does not go as well as planned
viii	I am inclined to train when (or before completely recovered from) illness or injury
ix	I have had physical, psychological and/or other issues due to my exercise regime

The ix item was excluded during the study from the final presented version of the EAI-3 [21]. The conclusion of this study is that the addition of new components suggested as valid in scientific literature, resulting in creation of the newest version of the eight-item EAI-3, gives a more detailed component model of the exercise addiction [19].

#### *Origin and characteristic of subtypes*

The problem which the scientists encounter is the heterogeneous characteristic of EA, which can be the reason why there is still insufficient progress. The presence of obsessive-compulsive aspects in the EA is observed as well [12, 14]. Exercise addiction is powered by an unhealthy obsession with physical activity inducing compulsive behaviour and the inability to regulate one's involvement with exercise. Therefore, EA fits appropriately within the obsessive-compulsive and impulsive spectrum of behavioural addictions [12, 15].

Different reasoning behind the occurrence of excessive sport intervention is a basis to divide EA on primary and secondary EA. Primary EA develops as an individual distinct problem, and its original motivations are not based on other disorders, but mainly on obsessive-compulsive mechanisms, and also involves significant stress and capacity-exceeding ambitions. The characteristic feature of primary EA is that the reward is *directly* related to and achieved by fulfilling the activity. Besides being separate behavioural addictions, EA patterns of excessive training can co-occur with other morbidities like eating disorders, including anorexia nervosa and bulimia nervosa, or various body-image dysfunctions.

The co-existence of EA in these cases is treated as instrumental. It functions to achieve a non-exercise-related goal, such as losing weight or changing the body image, which plays a significant role in mentioned other disorders. Therefore the reward is only *indirectly* associated with exercise fulfilment. Because of these meaning differences, some scientists suggest to unlink secondary EA from addiction to achieve a clearer, more individual scientific approach to both types of the EA [14].

#### *Co-existence with other psychiatric disorders*

Depression and anxiety are frequently coexisting with addiction, in particular with alcohol and substance use disorder, as well as eating disorder and exercise addiction [23, 24]. An interesting paper in the matter was published by Alghamdi et al [25]. The authors discovered the prevalence exceeding 25% of moderate to severe depressive symptoms among participants suffering from the EA. Moreover, in cases of primary depression they demonstrated that excessive exercise may worsen the depressive symptoms.

These discoveries carry valid information considering the fact that treating a single clinical condition without highlighting the others is associated with a worsening of the prognosis [25, 26]. Studies indicate high comorbidity of the EA with eating- and body-image disorders. Among individuals exercising more than 10 h weekly the exhibits of obsession or compulsion are more often present. They demonstrate a high prevalence of depression (56%), personality disorders (47%), and obsessive-compulsive disorders (31%) [14, 27].

#### *Occurrence in sport population*

The general occurrence of EA among exercise practitioners is estimated at 3% prevalence, but the percentage depends on many elements, one of which is the type of the physical activity [27]. Studies examining specific physical activities establish sport disciplines with the biggest and lowest prevalence of the EA. The highest occurrence of the EA was observed among endurance athletes (14,2%) succeeded by ball game players (10.4%), then fitness centre attendees (8.2%), and lastly power disciplines (6.4%) [14, 28, 29]. In the group of endurance disciplines the highest results were observed at 13.3% among indoor cyclists [30] and 15.4% among marathon runners [31]. The distinction between professional, occupational athletes and amateurs was also noted: the professional athletes are more exposed to the risk of EA. In a group of elite athletes from 15 different sport disciplines competing at a national level the occurrence of symptoms of EA was set at 7,6% [32]. Scientists warn that those figures may not reflect the true range of problem, mistaking disorders with admired strong dedication, high commitment, and passion for sport or exercise activity [14, 27].

#### *Treatment*

Treatment of EA, like most other addictions, is based on psychotherapy, especially a cognitive-behavioural approach. Nevertheless, the effectiveness of this kind of intervention needs to be evaluated [16]. Because of the diversity of the problem and often co-existence with other psychiatric disorders, integrative models explaining the occurrence of the EA are still necessary. The crucial step would be to officially define EA and list it in the official classifications like DSM-V or ICD-11, and to create common, scientific-based diagnostic criteria and recommendations as a consequence [14, 16].

#### **Conclusions**

Exercise addiction represents a complex and often underrecognized behavioural addiction that poses significant challenges for both diagnosis and treatment. Although physical activity is generally associated with numerous health benefits, the compulsive nature of EA can lead to severe physical, psychological, and social consequences. This review highlights the need for greater awareness and understanding of EA within the medical community, particularly given its similarities to other behavioural addictions like gambling disorder and internet gaming disorder. The current lack of official diagnostic criteria and the ongoing debate over its classification underscore the necessity for further research. Developing standardized diagnostic tools and criteria, such as EAI and its revised versions, is crucial for accurate identification and treatment.

The existence of primary and secondary subtypes of EA, along with its frequent co-occurrence with other psychiatric disorders such as depression, anxiety, and eating disorders, further complicates the clinical picture and demands a more nuanced approach to diagnosis and management. The prevalence of EA, especially among athletes and individuals engaged in endurance sports, indicates a need for targeted interventions. However, the line between healthy dedication and pathological behaviour remains blurred, necessitating careful assessment by healthcare providers. In terms of treatment, cognitive-behavioural therapy remains the most promising approach, but its effectiveness must be rigorously evaluated. Given the high comorbidity with other psychiatric conditions, an integrative treatment model that addresses the full spectrum of associated disorders is essential. The formal recognition of EA in diagnostic manuals like the DSM-5 or ICD-11 would be a pivotal step forward. This would not only facilitate the development of evidence-based diagnostic criteria but also promote more effective treatment strategies, ultimately improving outcomes for individuals suffering from this debilitating condition.

## **Disclosures**

### **Author's contribution**

Conceptualization: Izabela Hądzlik Methodology: Klaudia Wojtyła Software: not applicable; Check: Marta Barg Formal analysis: Klaudia Wojtyła Investigation: Izabela Hądzlik and Klaudia Wojtyła Resources: not applicable; Data curation: Marta Barg Writing - rough preparation: Izabela Hądzlik Writing - review and editing: Marta Barg Visualization: Klaudia Wojtyła Supervision: Marta Barg Project administration: Izabela Hądzlik Receiving Funding: not applicable

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