



Exercise Addiction and Major Depressive Disorder – Clinical Diagnoses and Longitudinal Course

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Abstract

Background: People at risk of exercise addiction report increased symptoms of psychopathology. The aim of this study was to clinically assess the lifetime prevalence of depressive disorders in individuals at risk of exercise addiction and to determine whether depressive symptoms tend to precede or follow excessive exercising.

Methods: Based on the Exercise Dependence Scale-21, a total of 31 individuals categorized at risk of exercise addiction underwent the Structured Clinical Interview for DSM-5 to assess major depressive disorder (MDD).

Findings: The results showed 16 of the 31 participants suffered from MDD. The onset of MDD occurred in 10 participants after excessive exercising and in 5 before excessive exercising. In one participant, the symptom onset was unclear.

Conclusion: MDD is far more prevalent in patients with exercise addiction compared to the general population and develops more often after the beginning of exercise addiction. Caution in the use of exercise to treat depression may be warranted.

Keywords: Exercise, Addiction, Major depressive disorder

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Introduction

The phenomenon of a possible “exercise addiction” has been described since the 1970s.¹ Affected individuals frequently exercise, follow a strict schedule, and are unwilling to reduce or pause their activities, regardless of the adverse effects this may have on their daily life. The reported characteristics of exercise addiction appear to resemble those of substance-related and behavioral addictions and include mood changes, development of tolerance, symptoms of withdrawal, social conflicts, and neglect of other interests.^{2,3} To date, however, exercise addiction has not been included in the Diagnostic and Statistical Manual of Mental disorders-IV (DSM-IV) or the International Classification of Diseases-11 (ICD-11) as a behavioral addiction due to insufficient evidence regarding the etiology, development, and nature of the symptoms.

Amongst the characteristics of exercise addiction requiring further study, potential comorbid psychiatric disorders represent a crucial area of investigation. Substance-related and behavioral addictive disorders are frequently accompanied by other psychiatric disorders, which influence the severity of the addiction.^{4,5} A recent literature review of 20 studies indicated depressive disorder, anxiety, and eating disorders co-occur with

exercise addiction.⁶ This provides further evidence that exercise addiction may be a distinct psychiatric diagnosis with numerous parallels to other addictive disorders. However, these initial studies do not establish clinical diagnoses, and their heterogeneity means that some comorbid disorders are only sparsely addressed.

In contrast to exercise addiction, major depressive disorder (MDD) is well-defined in the ICD-11 and DSM-5. The lifetime prevalence of MDD ranges from 15 to 30% in the general population, and the prevalence is increasing among young adults.⁷⁻⁹

In people with substance-related addictive disorders, depression is the most frequently co-occurring diagnosis and has a higher prevalence than in the general population.¹⁰ The prevalence of clinically diagnosed depression in the classified behavioral addiction gambling disorder is 25%-50%.¹¹ Furthermore, self-reported, not yet classified addictions to the Internet, gaming, or Facebook have been correlated to depressive symptoms.¹²⁻¹⁴

Despite exercise generally being an accepted part of treatment for depression, certain studies have indicated that competitive athletes show a higher risk for depression than non-athletes.¹⁵ Additionally, studies have shown a link between self-reported symptoms of depression and exercise addiction.¹⁶⁻¹⁸



The prevalence of clinically diagnosed MDD in people with exercise addiction has not yet been examined. Consequently, no attempts have been made to determine whether depressive symptoms tend to precede or follow problematic exercise behavior.

This study aimed to make a clinical assessment of MDD in individuals with exercise addiction. Furthermore, the symptom onset of both conditions was examined, providing initial insight into the natural history of exercise addiction.

Methods

Flyers, posters, and internet forum advertisements were employed to identify the individuals who exercise to excess. Those who contacted the study team were included in the study if they met the following criteria: (1) Age between 18 and 70 years; (2) More than 10 hours of exercise per week; (3) Exercise continues despite injury or illness; (4) Good command of the German language.

Eligible individuals took part in an initial screening. This involved completing questionnaires comprising demographics, exercise habits, and information on competitive sports participation as well as self-report instruments addressing exercise addiction symptoms and depressive symptoms.

Participants who were classified as at risk of exercise addiction (based on responses to the questionnaire; see below) were invited to an interview with a clinician. This comprised a detailed history of exercise habits, symptoms of problematic behaviors concerning exercise, and a diagnostic assessment of MDD. The participants received 40 CHF for completing the screening and a further 150 CHF for participating in the clinical interview.

Individuals at risk of exercise addiction were identified using the self-report Exercise Dependence Scale-21 (EDS). Being at risk of exercise addiction was defined as a score of more than 15 in 3 or more symptoms of the seven criteria for addiction (withdrawal, continuance, tolerance, loss of control, reduction in other activities, time spent, intentionality), drawn from the DSM-IV. The EDS-21 is a validated instrument with good reliability.¹⁹

Participants identified as at risk of exercise addiction underwent an interview with a detailed history about the year of onset of exercise addiction and its development, characteristics of and reasons for addictive exercising, and possible negative consequences. The exercise volume was assessed by the time spent exercising per week in hours. The interview utilized the symptom checklist developed by Colledge et al indicating an addictive relationship with exercise.²⁰ Exercise types were categorized based on main activity as strength (bodybuilding, Olympic weightlifting), endurance (triathlon, running, cycling), adventure (climbing), ball (soccer, basketball), or combat sports (boxing, karate) depending on their main feature.

The Structured Clinical Interview for DSM 5 (SCID-5-

CV) was performed to assess depressive disorders. The SCID is the most used tool for psychiatric diagnostics in research and has shown excellent reliability.²¹ Occurrence of MDD, either in the past or present at the time of the interview, was registered. MDD was defined according to the diagnostic criteria of the SCID.²²

Statistics were performed using R commander. Wilcoxon rank sum test and *t* test were used to compare numerical variables. To compare categorical variables, chi-square or Fisher's exact test was used. Due to the small number of participants fulfilling certain criteria for subsequent analyses, certain data were only assessed descriptively.

Results

A total of 156 participants were identified as eligible to participate in the initial screening and completed the questionnaires. Of these, 31 participants (16 females, 15 males) were identified as at risk of exercise addiction. The demographic data and characteristics of this sample are summarized in Table 1.

Clinically diagnosed MDD over a lifetime occurred in 16 out of 31 participants (52%). No significant difference was found between participants with MDD and without MDD concerning gender, individual vs. team sports, and participation in competition. Exercise volume was comparable between both groups, with a mean of 16 hours per week (\pm SD 9) in participants with MDD and

Table 1. The demographic characteristics of the participants

Characteristics		Participants with risk of exercise addiction (n=31)
Age at interview (y)	Mean (\pm SD)	28 (13)
Gender, No. (%)	Male	15 (48%)
	Female	16 (52%)
Marital status, No. (%)	Unwed	22 (84%)
	Married	2 (8%)
	Separated	2 (8%)
Education, No. (%) (n (%))	Compulsory school	4 (16%)
	Diploma or Matura	11 (42%)
	University	11 (42%)
Exercise volume per week (h)	Mean (\pm SD)	16 (7)
	Strength	9 (29%)
Exercise types, No. (%)	Endurance	12 (39%)
	Adventure	1 (3%)
	Combat	4 (13%)
	Ball	5 (16%)
Category, No. (%)	Individual sport	26 (84%)
	Team sport	5 (16%)
Competition, No. (%)	Yes	14 (45%)
	No	17 (55%)

15 hours (\pm SD 5) in participants without MDD.

A total of 16 participants with a diagnosis of MDD reported the mean age of onset of the first MDD episode as 22 years (\pm SD 10). The mean age at the beginning of the exercise addiction was reported as 16 years (\pm SD 7). In 10 participants, exercise addiction occurred before MDD (63%), and in 5 participants, the onset of MDD occurred first (31%). For one participant, the timeline for the beginning of exercise addiction and the onset of MDD was unclear; therefore, that participant was excluded from further analysis. In participants where exercise addiction occurred first, the mean age at onset of MDD was 24 years (\pm SD 11), and the mean age at the beginning of exercise addiction was 15 years (\pm SD 4). In participants where MDD occurred first, the mean age at onset of MDD was 16 years (\pm SD 2), and the mean age at the beginning of exercise addiction was 20 years (\pm SD 4). For both groups, the ages at the beginning of exercise addiction and the onset of the first MDD are displayed in [Figure 1](#). The group of participants in which the beginning of exercise occurred first was older at the onset of the first episode of MDD than participants in which MDD occurred first ([Figure 1](#)). However, neither the difference in age at the onset of first MDD nor the difference in age at the beginning of exercise addiction was statistically significant between the two groups. Furthermore, no difference was found in demographics, exercise type, or EDS total scores between participants where exercise addiction occurred first versus those where MDD occurred first.

Discussion

This is the first study to provide insight into the presence of clinically diagnosed MDD in a population suffering from exercise addiction. Over half of the sample reported

a past or current episode of MDD, a prevalence rate far higher than the general population's lifetime prevalence of MDD (15-30%).⁷⁻⁹ The association of depression with substance-related addictions and other behavioral addictions is well-established.^{4,5} In the general population, MDD is more common in females.⁷ However, this study found no gender difference between participants with or without MDD, which may be due to the small sample size.

The comparison of participants at risk of exercise addiction with or without MDD showed no difference in the median hours of exercise per week and the mean of the EDS total scores.¹⁸ This is a crucial finding, as it suggests that addiction seems independent of the onset or severity of depressive symptoms; in other words, it is a distinct psychological construct. Since in this population, exercise addiction preceded the onset of MDD in two-thirds of cases, exercise addiction itself may be considered a burdensome condition that might cause or increase vulnerability to other psychiatric comorbidities.

Most participants (63%) with MDD in the past or present reported the beginning of their current exercising behavior during their teenage years and before the onset of their first MDD episode in their mid-twenties. Endorphins, which are endogenous opioids, are known to be released during exercising, possibly leading to the phenomenon of "exercise euphoria" and it could be speculated that some individuals initially sought to suppress subclinical depression with excessive exercising, eventually resulting in MDD due to exercise addiction.²³ As with internet addiction, there might be a bidirectional relationship between excessive exercise and depression whereby initial subthreshold depressive symptoms motivate an exercising behavior, resulting in further depression.²⁴

It is known that competitive athletes show a higher rate

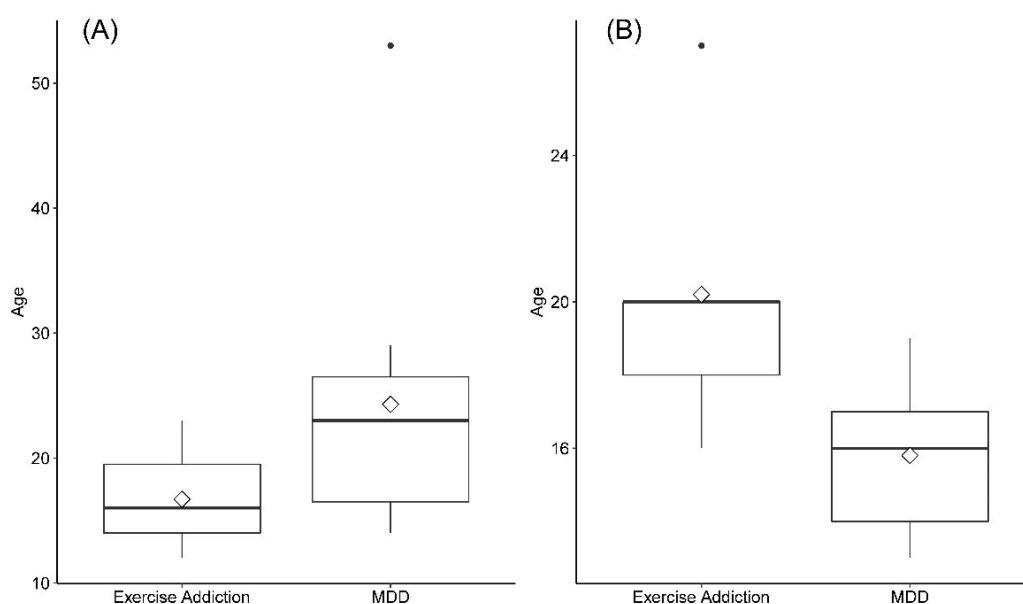


Figure 1. Age at onset of MDD and exercise addiction. (A) Exercise addiction occurred first (n=10) and (B) MDD occurred first (n=5). The diamond marks mean ages

of depression than non-athletes.¹⁵ However, in our small and heterogeneous sample, non-competitive participants were equally affected.

It is essential to mention that exercise is a well-established and effective treatment modality for depression.²⁵ However, the present study suggested that, as with other treatments such as medication, care must be taken so that excessive patterns do not develop.

As most of our sample developed a problematic relationship with exercise before MDD onset, the relevance of our findings in sports psychology and sports medicine may be important. Exercise without proper recovery and treatment of injury can lead to a reduction in fitness, illness, and overtraining syndrome. This latter syndrome is characterized by negative effects, loss of motivation, and depressive symptoms thought to be induced by the physical exhaustion response to training with insufficient recovery.²⁶ The interplay of overtraining and exercise addiction has received little attention. It would be valuable for sports and medical professionals to be aware of exercise addiction and implement screening tools if overtraining or depression is suspected.

One of the limitations of this study was recruitment using flyers, posters, and online advertisements, which can lead to convenience sampling. Besides, the assessment of MDD prevalence and the time course of exercise habits were limited due to the relatively small number of participants and diagnosis being based on reported symptoms rather than purely objective medical records. Consequently, statements made in this study must be interpreted with caution. Prospective and longitudinal studies are needed to investigate whether exercise addiction is a predictor of depression or vice versa.

Of 31 study participants at risk of exercise addiction, 16 had a clinical diagnosis of current or past MDD. Of these 16 individuals, 10 reported that the beginning of problematic exercise behavior preceded the onset of depression. This indicates that excessive exercise may cause physical and psychological changes, which lead to MDD. Furthermore, it contributes to the emerging picture of exercise as a behavioral addiction by providing clinical evidence for its role as not merely resulting from but also preceding depressive disorders. Further research with follow-up interviews is needed.

Conclusion

This pilot study showed a high prevalence of MDD (52%) in patients with exercise addiction, which is far more prevalent than in the general population. In two-thirds of patients suffering from both disorders, exercise addiction preceded MDD. This should be considered when recommending exercise as a therapy for MDD.

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Authors' Contribution

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Resources: Marc Walter.

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Visualization: Amos Tschopp.

Writing—original draft: Amos Tschopp.

Writing—review & editing: Marc Walter, Amos Tschopp.

Competing Interests

There is no conflict of interest to declare.

Ethical Approval

The study is in line with the Declaration of Helsinki and was approved by the local ethics committee "Ethikkommission Nordwestschweiz" (EKNZ, approval number 2019-00603).

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