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Exercise addiction symptoms and mental health during the forced exercises deprivation in greatest COVID-19 pandemic restrictions in Poland

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Summary

Aim. The paper describes the relationship between the symptoms of exercise addiction, behavioral strategies in situations of limited workout possibilities and mental health state in exercising individuals.

Methods. The study included 391 participants, 286 women (73.1%) and 105 men (26.9%), aged 18 to 68 years. The respondents were surveyed online after 17–19 days of barriers to routine training due to greatest COVID-19 restrictions in Poland. Subjects completed the *Exercise Dependence Scale*, *General Health Questionnaire – 28* (GHQ-28) and questionnaires enabling the collection of demographic and clinical data as well as data related to exercise behaviors.

Results. The variables related to exercise addiction and some related to behavioral changes are predictors of mental health, especially in terms of anxiety, insomnia and somatic symptoms. All the introduced variables accounted for 27.4% to 43.7% of the variation in the mental health status of the subjects, depending on GHQ subscales. Breaking the restriction rules by outdoor training protected against symptoms of psychological disorders, especially in relation to somatic symptoms (Beta = –0.23; $p< 0.001$). Individual assessment of stress induction in a given situation was a predictor of results in all GHQ subscales, which was the strongest for symptoms of anxiety and insomnia (Beta = 0.37; $p< 0.001$).

Conclusions. Individuals with features of exercise addiction are at risk of deterioration of their well-being during forced abstinence. In addition, the subjective level of stress induction in a given situation is an important determinant that conditions psychological well-being,

especially the aggravation of depressive symptoms. People who ignore restrictions and have low levels of stress, experience lower psychological costs.

Key words: exercise addiction, withdrawal symptoms, mental health

Introduction

Exercise addiction is defined as a multidimensional maladaptive pattern of physical activity that leads to clinically significant impairment or distress [1]. Although exercise addiction is not described in any current classification (ICD-10, ICD-11, DSM-5) [2], it is included in the proposed group of behavioral addictions, and diagnosed by analogy with the diagnostic criteria that define addiction to psychoactive substances. The pathology of the exercise addiction is evidenced by the presence of a neuroadaptation process (appearance of withdrawal symptoms and increasing tolerance) [3]. The diagnostic criteria include such symptoms as an increase in exercise tolerance, the presence of withdrawal symptoms on cessation, lack of control over the amount and intensity of exercise, reduction in other life activities, reduced social and occupational activities, and continued exercise despite being aware of negative health and social consequences [4]. In practice, exercise patterns in addicts tend to be stereotypical and regularly repeated and, as exercise tolerance increases, their duration and intensity may increase progressively. An unplanned interruption of exercise causes discomfort in both the psychological and physical sphere, which is relieved by exercising again, even against medical advice and with awareness of the negative health consequences [5].

The results of the latest meta-review indicate identifiable physical and mental symptoms associated with excessive exercise and warrant further research in terms of behavioral addiction. The symptoms corresponded to seven of the nine DSM-5 criteria for gambling disorders and ten suggested specific criteria for exercise addiction: an increase in exercise volume, negative affect, inability to reduce, preoccupation, exercise as coping, continuation despite illness/injures, minimizing or lying about time spent exercising, relationships at risk, continuation despite recognizing consequences, guilt for not exercising [6].

The optimal level of exercise affects psychological well-being. However, excessive and vigorous exercise can be a source of mental health issues [7]. In previous reports, the most commonly reported symptoms in exercise abstinence were somatization [7], lower social functioning [7], guilt [8], irritability [9], anxiety [7, 8, 10, 11], depressed mood [7–10, 12], stress [7, 13], reduced vigor [10, 14], increased tension [15], anger [10, 14, 15], fatigue [9, 10, 14, 15], confusion [10, 12, 14, 15], and insomnia [7]. The wide spectrum of reported symptoms was related to the specificity of the studied group and the scope of the selected tool. In most of the conducted studies, the criteria and symptoms of exercise addiction and its impact on symptoms of psychological well-being were not taken into account. The reports took the form of a controlled experiment and included an analysis of the body's response to short-term abstinence (up to 2 weeks), which was predetermined and took place before the pandemic [8–11, 15].

The pandemic restrictions changed the pattern of physical activity, with negative consequences for the mental health of individuals [16]. We assume that individuals with symptoms of exercise addiction may have even more severe consequences due to risk of trigger of manifestation of withdrawal symptoms. In the ordinary, everyday conditions in which the society functions and the unlimited availability of sports clubs, fitness clubs and open recreational spaces like parks or forests, it is difficult to study the effect of exercise restrictions on large groups of people who exercise regularly with the assumption that some of these people are exercise addicts. Such conditions were created by the SARS CoV-2 epidemic. In Poland, the most restrictive bans that were to restrict the spread of SARS CoV-2 were introduced on 01.04.2020. They referred to the use of all places where physical exercise could be practiced before, including fitness clubs, parks, forests.

Considering the above, the main goal of the study was to assess the relationship between the severity of symptoms of exercise addiction and the state of mental health. Limitations in routine workout due to COVID-19 restrictions were considered as a potential additional factor inducing withdrawal symptoms. It was expected that the aggravation of exercise addiction symptoms would differentiate the level of distress/mental health during free movement restrictions (abstinence). Given the foregoing, an attempt was made to determine the relationship between the level of exercise addiction symptoms, changes in routine training (time, intensity, place), modification in behavior (use of coping strategies in this situation) and symptoms of mental health deterioration (somatic, anxiety, depressive symptoms).

Material and Methods

Participants

The assumed inclusion criteria included: consent to participate in the study, 18 years of age and older, as well as membership in social media training groups. A total of 435 people were surveyed. The analysis of the questionnaires allowed for the exclusion of persons who denied regular participation in sporting activities in at least two questions. The study group was recruited via the Internet by social media in groups of people interested in sports, intensively exercising, e.g., training marathons, ultramarathons, mountain running, triathlons, CrossFit. Finally, 391 subjects were included in the analysis, 286 women (73.1%) and 105 men (26.9%) aged 18–68 years (M = 33.70; SD = 9.93).

Study procedure

The study was conducted from 17.04.2020 to 19.04.2020, i.e., 17–19 days after lockdown had been introduced in Poland, and the restrictions in the performance of a routine exercise plan occurred. This was the maximum period of the most intense restrictions in Poland. In order to collect a sufficient amount of data in a short time

during pandemic, it was decided to conduct an online survey, while being aware of its limitations. After the subjects became familiarized with the purpose and procedure of the study and gave consent in the online form, they completed an anonymous questionnaire.

Measures

The study used a battery of proprietary questionnaires enabling the collection of demographics, clinical data and data related to changes in routine training and modification in behavior. Participants reported on their age (years), gender (female, male), education level (junior high school, vocational, secondary, higher). The questions concerning health included diagnosed chronic disease, mental disorders, addictions. The answers were provided using the multiple-choice list, with the option of selecting the answer "Other" when a specific disease or disorder was not on the list. If someone ticked the option that they take medications regularly, then they were asked to provide a name of medications. The manner of involvement in sport was assessed by asking about the relationship between education and sport, amateur or professional practicing of sport, the duration and regularity of training sessions. Nine questions with answers on the 5-point Likert scale were used for assessing the perceived impact of COVID-19 lockdown on changes in respondents' training regimen. We also asked for an assessment of the stress severity and consent with the necessity of lockdown. The *Exercise Dependence Scale* (EDS) was used to assess the severity of symptoms of exercise addiction [4]. We chose this tool due to multidimensional character, a clear conceptualization of understanding the phenomenon and its operationalization based on DSM-IV criteria for substance dependence and the availability of Polish adaptation of the EDS [17, 18]. The tool consists of 7 subscales describing the exercise addiction criteria: Tolerance, Withdrawal, Intention Effect, Lack of Control, Time, Reductions in Other Activities, Continuance. The higher the score on scales, the greater the severity of symptoms [4].

The *General Health Questionnaire – 28* (GHQ-28) has been used to assess mental symptoms and psychosocial well-being. It consists of four 7-item scales and allows you to evaluate individual functioning in four dimensions: Somatic symptoms, Anxiety and insomnia, Social dysfunction, Severe depression. Our main goal was to assess the severity of symptoms in subscales, so we decided to use the Polish version of the GHQ-28 with the use of a 4-point Likert scale. The higher subscales and general scores in the questionnaire, the greater the severity of symptoms indicating a worse mental health condition [19].

Statistical analysis

In order to meet the research objectives, statistical analyses were performed with the use of the IBM SPSS Statistics 23 package. The classical threshold of $\alpha = 0.05$ was considered as statistical significance.

The analysis of basic descriptive statistics, Kolmogorov-Smirnov tests were performed. Non-Gaussian distributions were reported for all studied variables, but additional verification of the skewness values of the variable distributions confirmed that they were not significantly asymmetric with respect to the mean (falling within +/ – 2) [20]. Such skewness values were recorded for all the studied variables except for the aspect of psychoactive substance use during the pandemic. For this reason, parametric tests were used in the statistical analyses, whereas for the variable: Psychoactive substance use the analyses were performed with the use of nonparametric tests.

In the subsequent steps, a series of correlation analyses were performed with Pearson's *r* coefficient, Speaerman's rank correlation ρ, and the results of the studied variables were compared using Student's *t*-test, with regard to the variable of mental health disorders (GHQ). The analyses included the level of exercise dependence, behavioral changes in relation to the introduced restrictions, subjective cognitive assessment of the current situation (relevance of restrictions, level of stress induction), demographic, clinical and sport involvement variables. The goal of the analysis was to identify the best set of predictors of our dependent variable, not to test the theory. Therefore, it was decided to employ a hierarchical stepwise regression, which is often used in research on exploratory targets [21]. A series of hierarchical stepwise regression analyses was performed, where the best predictors from the groups of variables were entered into the model in the next steps: (1) EDS scales, (2) changes in behavior during restrictions related to COVID-19, (3) involvement in sports, (4) health variables, (5) subjects' body variables (weight, height), and (6) demographic variables. GHQ subscales scores were adopted as dependent variables (Tables 2–5). Some variables seen in the models were no longer statistically significant as a result of the inclusion of subsequent variables, or were not statistically significant but at the same time did not meet the requirements to be removed from the model.

Ethics

The study and the procedure were approved by the Bioethical Committee (no. PCN/0022/KB/73/2020) and were not considered a medical experiment. The study was prepared and carried out in accordance with generally applicable legal and ethical standards, with particular emphasis on the principles of conducting clinical trials laid down in the Helsinki Declaration. The survey was voluntary and anonymous. The participants were informed about its purpose and the scope of using the data obtained in the study. At each stage of the survey, the respondents could terminate the survey, which automatically resulted in the lack of access by our team to the partially completed questionnaire.

Results

Sociodemographic and health information

The study group was dominated by persons with higher education (269 persons; 68.8%), 110 persons had secondary education (28.6%), 10 persons – lower secondary education (2.6%), and only two persons had vocational education (0.5%). The mean BMI was 23.12 (*SD* = 3.27). Most people (308 persons; 78.7%) did not report a diagnosis of any addiction, other psychiatric diagnoses (365 subjects; 93.3%) or chronic somatic diseases (298 subjects; 76.2%). A summary of psychiatric and somatic diagnoses in the study group is presented in Table 1.

Table 1. **Mental disorders and chronic somatic diseases declared by the respondents**

Mental disorders/somatic diseases	Reported by respondents	
	N	%
Food addiction	29	7.4
Nicotine addiction	23	5.9
Exercise addiction	18	4.6
Alcohol addiction	17	4.3
Marijuana addiction	5	1.3
Other addictions	16	4.1
Depression	14	3.6
Anxiety disorders	5	1.3
Eating disorders	3	0.08
Bipolar disorder	1	0.3
Personality disorders	2	0.5
Other mental disorders	4	1
Diabetes mellitus	5	1.3
Thyroid diseases	40	10.2
Hypertension	12	3.1
Other diseases	43	11

Physical activity (intensity; frequency)

85% of the respondents (332 persons) declared amateur participation in sport activities. The remaining respondents were professionally involved in sport (27 persons; 6.9%) or studied at a sports university (20 persons; 5.1%). Most respondents had been training for at least 5 years (166 persons; 42.5%), a minimum of three times a week (314 persons; 80%), with the training lasting one hour or more (303 persons, 77%).

Variables explaining the level of mental health deterioration in the study subjects

In the GHQ score, the introduced variables accounted for 43.7% ($R2 = 0.437$) of the variation in the anxiety and insomnia symptoms scale ($F(16, 374) = 19.94$; $p < 0.001$), 33.6% ($R2 = 0.336$) of the variation in the depressive symptoms scale ($F(15, 375) = 14.16$; $p < 0.001$), 31.5% ($R2 = 0.315$) of the variation in the somatic symptoms scale ($F(12, 378) = 15.97$; $p < 0.001$), and 27.4% ($R2 = 0.274$) of the variation in the social dysfunction scale ($F(12, 378) = 13.27$; $p < 0.001$). A series of hierarchical stepwise regression analyses of GHQ subscales are presented in Tables 2–5.

Table 2. **Variables that account for the level of results in the somatic symptoms scale**

Variable	B	SE	Beta	t	p
(Constant)	10.41	1.34		7.76	<0.001
EDS Withdrawal	0.15	0.05	0.17	3.10	0.002
EDS Tolerance	-0.03	0.06	-0.03	-0.44	0.657
EDS Time	-0.11	0.06	-0.10	-1.69	0.093
EDS Continuance	0.12	0.05	0.12	2.26	0.024
Stress induced by the epidemic	0.87	0.17	0.24	5.17	<0.001
Outdoor training despite COVID-19 restrictions	-0.58	0.12	-0.23	-4.93	<0.001
Intense exercise at home due to COVID-19 restrictions	-0.51	0.13	-0.19	-4.08	<0.001
Increased alcohol consumption during COVID-19 restrictions	0.46	0.13	0.16	3.66	<0.001
Practicing amateur sports	-1.62	0.52	-0.15	-3.10	0.002
Regular exercises regimen	-0.22	0.09	-0.12	-2.42	0.016
Permanent medication	-1.27	0.41	-0.13	-3.12	0.002
Higher education	-1.36	0.37	-0.16	-3.69	<0.001

Table 3. **Variables that account for the level of results in the anxiety and insomnia scale**

Variable	B	SE	Beta	t	p
(Constant)	16.96	5.54		3.06	0.002
EDS Withdrawal	0.26	0.06	0.23	4.48	<0.001
EDS Tolerance	-0.21	0.07	-0.17	-3.07	0.002
EDS Continuance	0.15	0.06	0.12	2.52	0.012
EDS Time	-0.17	0.08	-0.13	-2.07	0.039
EDS Reduction of other activities	0.17	0.08	0.11	2.08	0.038
Stress induced by the epidemic	1.73	0.19	0.37	8.89	<0.001
Increased alcohol consumption during COVID-19 restrictions	0.51	0.15	0.14	3.49	0.001

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Outdoor training despite COVID-19 restrictions	-0.31	0.14	-0.10	-2.23	0.027
Intense exercise at home due to COVID-19 restrictions	-0.25	0.15	-0.07	-1.74	0.083
Regular exercises regimen	-0.35	0.11	-0.14	-3.26	0.001
Practicing amateur sports	-2.03	0.61	-0.14	-3.35	0.001
Psychiatric disorders	-2.46	0.81	-0.12	-3.03	0.003
Other addictions	-2.87	1.14	-0.10	-2.53	0.012
Taking metformin	-4.37	1.76	-0.10	-2.48	0.013
Marijuana addiction	3.72	1.75	0.08	2.13	0.034
Higher education	-1.14	0.43	-0.10	-2.66	0.008

Table 4. **Variables that account for the level of results in the social dysfunction scale**

Variable	B	SE	Beta	t	p
(Constant)	21.92	3.02		7.25	<0.001
EDS Withdrawal	0.10	0.04	0.14	2.36	0.019
EDS Time	-0.26	0.06	-0.29	-4.31	<0.001
EDS Reduction of other activities	0.24	0.06	0.24	3.95	<0.001
EDS Tolerance	-0.02	0.05	-0.02	-0.28	0.778
Stress induced by the epidemic	0.73	0.15	0.23	4.91	<0.001
Intense exercise at home due to COVID-19 restrictions	-0.26	0.11	-0.11	-2.39	0.017
Focusing on eating habits due to COVID-19 restrictions	-0.27	0.12	-0.10	-2.27	0.024
Taking metformin	-3.47	1.36	-0.11	-2.56	0.011
Eating addiction	-1.35	0.58	-0.10	-2.33	0.020
Psychiatric disorders	-1.67	0.62	-0.12	-2.71	0.007
Age	-0.06	0.02	-0.16	-3.74	<0.001
Vocational education	5.88	2.13	0.12	2.76	0.006

Table 5. **Variables that account for the level of results in the depressive symptoms scale**

Variable	B	SE	Beta	t	p
(Constant)	41.56	7.93		5.24	<0.001
EDS Withdrawal	0.05	0.05	0.05	0.96	0.338
EDS Tolerance	-0.13	0.05	-0.13	-2.56	0.011
EDS Reduction of other activities	0.13	0.06	0.11	2.09	0.038
Stress induced by the epidemic	1.12	0.16	0.31	6.84	<0.001
Increased alcohol consumption during COVID-19 restrictions	0.35	0.12	0.13	2.91	0.004

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Relevance of the imposed restrictions	-0.45	0.13	-0.16	-3.56	<0.001
Back to previous activities or interests	0.37	0.14	0.12	2.64	0.009
Focusing on eating habits due to COVID-19 restrictions	-0.25	0.14	-0.08	-1.80	0.073
More frequent talks with people due to COVID-19 restrictions	-0.27	0.13	-0.10	-2.15	0.032
Eating disorders	-6.78	1.98	-0.15	-3.43	0.001
Other addictions	-2.35	0.93	-0.11	-2.53	0.012
Bipolar disorder	-6.73	3.26	-0.09	-2.07	0.040
Anxiety disorders	-3.13	1.52	-0.09	-2.06	0.040
Age	-0.09	0.02	-0.23	-5.37	<0.001
Vocational education	6.58	2.31	0.12	2.85	0.005

The results of a series of regression analyses indicate that the variables related to exercise addiction (EDS subscale scores) and some behavioral changes due to the need to restrict and/or change training routines in the face of COVID-19 restrictions were predictors of GHQ subscales scores.

Level of exercise addiction and behaviors associated with imposed exercise restrictions versus mental health disorders

As scores increased on the Withdrawal effect subscale, anxiety and insomnia level increased the most (Beta = 0.23), followed by somatic symptoms (Beta = 0.17) and social dysfunction (Beta = 0.14). Reduction of other pleasures was primarily a predictor of social dysfunction (Beta = 0.24), then equally of anxiety and insomnia and depression (Beta = 0.11). The more a person pursued, engaged in exercise despite obvious limitations (scale: Continuance), the higher the aggravation on the scale of somatic symptoms (Beta = 0.12), anxiety and insomnia (Beta = 0.12). Increased alcohol consumption during the period of COVID-19 restriction was associated with aggravation of somatic symptoms (Beta = 0.16), higher anxiety and insomnia (Beta = 0.14), and increased levels of depressive symptoms (Beta = 0.13).

Level of exercise addiction and behaviors associated with imposed exercise restrictions versus good mental health

An increase in the time spent exercising reduced the severity of social dysfunction (Beta = – 0.29), followed by anxiety and insomnia (Beta = – 0.13). As scores on the tolerance scale increased, the severity of symptoms of anxiety and insomnia (Beta = – 0.17), as well as depression (Beta = – 0.13) decreased. Violation of recommendations against engaging in outdoor physical activity reduced the severity of somatic symptoms (Beta = – 0.23), as well as anxiety and insomnia (Beta = – 0.10). Intensity of exercises at home was a predictor of lower scores on the somatic symptoms scale

(Beta = – 0.19). Practicing amateur sports had an impact on the less severe aggravation of somatic symptoms (Beta = – 0.15), as well as anxiety and insomnia (Beta = – 0.14). The longer the duration of regular training, the lower the level of anxiety and insomnia (Beta = – 0.14) and somatic symptoms (Beta = – 0.12). Frequent conversations with people were found to be a predictor of lower symptoms on the depression scale (Beta = – 0.10). Focusing on eating habits, on the other hand, was a predictor of less severe aggravation of social functional impairment (Beta = – 0.10).

Among the variables we sought to control in the study, the cognitive assessment of the severity of pandemic stress is particularly noteworthy, as it proved to be the best predictor of the severity of anxiety and insomnia symptoms (Beta = 0.37), depressive symptoms (Beta = 0.31), somatic symptoms (Beta = 0.24) and social dysfunction (Beta = 0.23). The sense of relevance of the introduced restrictions was associated with a decrease in depressive symptoms (Beta = – 0.16). With regard to demographic variables, age was significant – the older a person was (Beta from – 0.23 to – 0.16), the better their mental health.

Discussion

Studies of populations of people who exercise regularly show changes in their daily behavior during the pandemic related to restrictions and health concerns [22]. Publications on regular physical activity in recent months have unequivocally highlighted its important role in sustaining health, especially resilience to stress, and in offsetting symptoms of depression and anxiety [13, 23]. Physical activity can be a means to maintain good health and well-being, but if it becomes a strategy of coping with emotions, and then part of an addiction mechanism, its impact on all areas of life can become destructive. People who exercise intensively and regularly, including those who are addicted to exercise, are particularly vulnerable to negative mental health-related consequences in situations of imposed abstinence associated with the pandemic [24, 25].

The aim of this study was to identify predictors of well-being among regular exercisers in different aspects of mental health. Unlike other reports, the structure of our study accounted for the factor of addiction level, behaviors that compensate for exercise deprivation and subjective assessment of perceived stress during the pandemic. The study showed that exercise addiction characteristics have a significant impact on psychological well-being in conditions where compulsive exercise needs are prevented. This may be related to an inflexible way of coping with tension, especially in difficult situations, and the presence of withdrawal symptoms in addicts and those at risk of addiction [26, 27].

Variables related to exercise addiction in the EDS subscales and the need to reduce exercise have been shown to be predictors of current mental health status, which is consistent with research that confirms the association of exercise addiction with psychological well-being during abstinence [9–11, 15]. Previous studies on individuals whose training is regular and intense indicate that symptoms of anxiety and insomnia

were clearly observable in situations of deprivation [8, 12]. These reports are consistent with our results, where the severity of withdrawal symptoms and engagement in exercise despite obvious health limitations (scale: Continuance) were strong predictors of symptoms of anxiety and sleep disorders. Additionally, analyses showed that the more a person engages in exercise despite obvious limitations, in addition to an increase in anxiety, somatic symptoms appear.

Another factor that worsen mental health during lockdown is alcohol consumption, which worsens somatic functioning, increases anxiety and insomnia and causes states of depressed mood. Compulsive exercise, like any addiction, based on a mechanism of coping with emotions, requires the presence of a factor that relieves mental tension [2, 5]. Due to a narrow spectrum of stress coping strategies that are available to addicts, replacement strategies are often found as an *ad hoc* aid to restore well-being when addiction is not pursued. Reports on alcohol consumption among exercise addicts are often contradictory (which is related to the study methodology). For instance, according to Sussman et al. [28], 15% of exercise addicts are also tobacco, alcohol and drug addicts. This is contradicted by a study by Szabo et al. [29], in which the link between substance dependence and risk of exercise addiction was not confirmed. On the other hand, the conclusion that an increase in alcohol consumption during the pandemic period can be observed to be harmful at a health, emotional and social level [30, 31], is unambiguous. The findings of our study indicate that increased alcohol consumption was present in 19.5% of participants during the period of COVID-19 restrictions and negatively affected somatic functions, level of anxiety and insomnia, as well as resulted in lower mood.

The relationship between physical activity and depressive symptoms is confirmed and treated as bidirectional [32, 33]. In our study, EDS scores were the least likely to explain the aggravation of depressive symptoms. Previous reports have supported the presence of depressive symptoms in a situation of exercise abstinence but have not included a factor related to the COVID-19 restrictions [14, 34–36]. Our study took into account the additional circumstances associated with a pandemic situation. Here, changes in behavior related to mobility restrictions, age and the cognitive aspect: assessing the level of stress induction in the situation of the pandemic and the relevance of the imposed restrictions, proved important. It is difficult to determine to what extent the level of depressive symptoms is related to the pandemic situation and lockdown, given the numerous reports on depressive symptoms in the course of addiction [37, 38]. Our study included self-reports of well-being over the past few weeks. We showed that, besides the severity of symptoms of exercise addiction, the situational aspect, especially the individual assessment of perceived stress during a pandemic and coping with it, was of great importance for depressive symptoms. The study also showed that more frequent conversations with people during lockdown were found to improve mood.

The pandemic situation is a source of stress in many aspects of life [39, 40]. The severity of anxiety about one's own health and the health of loved ones, social and emotional problems, and disorganization of life routines are related to personal-

ity traits and individual psychological resilience [41]. The general knowledge of the pandemic is directly linked to the assessment of the relevance of imposed restrictions and the associated anticipation of the threat. The lower the sense of security, the more catastrophic the thinking, which is exacerbated by long-term stress and has a negative impact on well-being. Conversely, it can be concluded that the lower the awareness of danger, the better the psychological well-being, while the discipline in complying with restrictions is possibly reduced. The assessment of the situation as not threatening correlated negatively with the level of anxiety and insomnia scales and depressive symptoms. Accepting lockdown restrictions as rational and justified was associated with a lower level of depressive symptoms. It is not clear to us what the relationship between these two cognitive assessments is. The question regarding the legitimacy of the imposed restrictions assumed that those who accept them would adhere to them more strictly as opposed to those who deny them. This would be associated with a change in lifestyle, as well as a risk of withdrawal symptoms when restrictions were strictly adhered to. This was confirmed by an inverse relationship: outdoor training despite restrictions, intensive training at home, amateur sports, and longer duration of regular training are predictors of good mental health. Individuals with such behavioral style had lower level of anxiety, better sleep and fewer somatic complaints. This was further supported by the long duration of exercise and its high frequency and high exercise tolerance.

With regard to some of the GHQ scales (i.e., depressive symptoms and social dysfunction), the results suggested a small positive effect of some declared mental disorders (eating disorders, addictions, psychiatric disorders) on the mental well-being of the subjects. This could be explained by the lack of limitations in the realization of another addiction during lockdown, e.g., food addiction, or the effect of psychiatric treatment. However, it is worth noting that the analyzed clinical variables (somatic diseases, psychiatric diseases, drugs, etc.) involved a very small number of people, so despite statistically significant results, no definitive conclusions can be drawn from these analyses. However, it is worth emphasizing the need to monitor these variables in future studies and the need to involve more people with other diagnoses that could potentially affect mental health in different types of crisis situations.

An important limitation of the study was its cross-sectional nature, which made it impossible to assess mental health before the emergence of pandemic restrictions. Therefore, it is difficult to conclude with certainty that the symptoms of mental health deterioration in the study group are related to movement restrictions. The level of experienced stress may have depended on a number of individual and environmental factors that were not analyzed in the study. The online survey allowed to obtain a sufficiently large group and ensured the anonymity of the respondents, discretion and the possibility of expression unhampered by the presence of the person conducting the survey in direct contact. However, it is associated with another limitation, which is relying in the analyses solely on the subjective assessment of one's own mental state, behavioral changes and the severity of exercise addiction symptoms. Conducting further research

to strengthen the diagnostic position of exercise addiction requires a combination of questionnaire methods with face-to-face testing, multiple assessments of mental state and behavior over time and in relation to changing environmental requirements.

Intensive and prolonged exercise, without health benefits, carries a risk of harm to mental health. Being aware of this mechanism may help to create optimal exercise patterns and sensitize to early symptoms that may indicate the formation of an addiction pattern. This is important in the field of psychoeducation of both exercisers and their trainers, physiotherapists and doctors. It can also help to answer the question about the sources of psychological deterioration, helping to avoid misdiagnosis and therapy.

Conclusions

1. Features of exercise addiction have a significant impact on psychological well-being in lockdown conditions. They best explain increased anxiety and insomnia.
2. The subjective assessment of stress experienced during the pandemic, withdrawal symptoms, reduction in other pleasures, exercising despite injury, and increased alcohol consumption are the best predictors of mental health deterioration.
3. Factors that favor the maintenance of well-being include longer, more intense and more frequent training, training at home and outdoor training despite the restrictions, and amateur sports. The sense of justification for lockdown and older age play a protective role against the development of depressive symptoms.
4. The results justify a further search for specific symptoms, mechanisms and consequences of exercise addiction.

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