

PREVALENCE OF EXERCISE DEPENDENCE IN ROCK CLIMBERS AND MOUNTAINEERS

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A – study design, B – data collection, C – statistical analysis, D – interpretation of data, E – manuscript preparation, F – literature review, G – sourcing of funding

ABSTRACT

Background: Research on physical activity has extensively shown that regular exercise produces many physical and psychological benefits. However, excessively practiced physical activities can also have negative effects, both physical and psychological. One of them is the risk of becoming dependent on exercise, similar to substances such as drugs or alcohol. Most studies on exercise dependence have focused on runners and strength athletes.

Aim of the study: This study aimed to explore the prevalence of exercise dependence in climbers.

Material and methods: A group of 272 climbers (32.3±8.7 years old) participated in the study. They were divided into three groups: sport/rock climbers (59.6%), boulderers (30.2%), and mountaineers (10.3%). Data was collected using the Exercise Dependence Scale (EDS).

Results: Based on EDS scores, 44 climbers (16.2%) were classified as at-risk for exercise dependence, 183 (67.3%) as nondependent-symptomatic, and 45 (16.5%) as asymptomatic. Competitive and non-competitive climbers significantly differed in tolerance, and boulderers scored significantly higher than rock climbers and mountaineers.

Conclusions: Climbers are at risk of developing exercise dependence, especially those who participate in climbing competitions and who are boulderers. However, more research is needed to further characterize this phenomenon in the climbing community.

KEYWORDS: exercise dependence, behavioral addiction, climbing

BACKGROUND

There is widespread agreement that physical activity is an essential factor in preventive health care and affects all of its dimensions – physical, social, and psychological [1]. Therefore, the World Health Organization (WHO) recommends regularly participating in moderate to vigorous aerobic exercises, supplemented by muscle-strengthening activities [2]. Climbing is considered to be one of those activities that can offer a wide range of health benefits [3,4], although empirical data on this is scarce. However, exercise can also be undertaken in an excessive and uncontrolled manner causing negative effects, including a set of symptoms described as exercise addiction, exercise dependence (ED), obligatory exercise, etc. [5,6].

For the person addicted to exercise, the activity becomes the essence of their life resulting in the elimination of other forms of leisure. The need for exercise conflicts with work, family, and social responsibilities, and even the health of the person when they continue to exercise despite an illness or injury. This phenomenon is accompanied by neuroadaptation which also occurs during addiction to psychoactive substances and can manifest itself with withdrawal symptoms (nervousness, irritability). Like other behavioral addictions (gambling, shopping, or the Internet), it often results in physical, psychological, and/or emotional harm [7]. Based on the criteria for substance dependence described in the Diagnostic and Statistical Manual of Mental Disorder-IV (DSM-IV), Hausenblas and Downs [8] developed the Exercise Dependence Scale (EDS) and proposed di-

agnostic criteria to distinguish ED from healthy exercise patterns. The risk of addiction was considered when a person scores high in at least three of the following criteria:

- Tolerance: a need for increasing amounts of exercise to achieve the desired effects.
- Continuance: continued exercise despite being aware of the problems caused by the exercise.
- Withdrawal: anxiety and tiredness experienced when the amount of exercise decreases resulting in the exercise being undertaken to relieve or avoid these sensations.
- Intention effect: exercise is performed in more significant amounts or more frequently than intended.
- Lack of control: inability to stop or reduce normal levels of commitment to exercise.
- Reduction of other activities: skipping occupational, family, social, other leisure activities (hobbies), and obligations in order to exercise.
- Time: excessive time spent on activities related to exercise activity (eg. planning, thinking about exercise).

Excessive exercise can be secondary to other disorders, mainly anorexia nervosa or bulimia nervosa, or primary when it is an end in itself [7,9]. The etiology of exercise addiction is not completely understood, nor is its prevalence in the population, mainly due to the lack of formal criteria and diversity of diagnostic tools. Some have been constructed that are specific to a particular form of activity (e.g. running), and even those that have a universal diagnostic dimension differ in how the addiction construct is operationalized, the number of items, etc. These factors coincide with the apparent variation of this phenomenon across populations, type of activity practiced, level of engagement, and other demographic characteristics. Taking the above into consideration, this phenomenon may affect 2% to 20% and in some studies up to 40% of people who exercise regularly [10,11,12,13,14,15].

Studies of the prevalence of exercise addiction among athletes and regular exercisers have been carried out primarily in endurance (runners and triathletes) and power (bodybuilders and fitness center attendees) activities. Data on the prevalence of ED in climbers is scarce, and the specificity of this type of activity makes such estimates even more difficult. Climbing is a type of activity that is practiced in many ways, sometimes differing dramatically in the effort undertaken – intensity, volume, proportions of individual energy systems, the essence of the motor activity undertaken, etc. The most popular forms of climbing are bouldering, sport/rock climbing, and mountain climbing. The essence of bouldering is overcoming short, intense climbing routes called problems that are complex in movements and

require strength or strength endurance. On the contrary, mountaineering is practiced on mountainous terrains and requires many hours of continuous effort in difficult weather conditions. Between these extremes, there is also sport/rock climbing on routes of different lengths and nature (e.g. depending on the angle of the climbing wall) and competition climbing on artificial climbing walls. Regardless of the type of climbing, its features, such as diversity of experiences, high emotional load, novelty, element of risk, and challenges, make these forms of activities a source of experiences rarely encountered in other areas of life and social situations [16]. These elements give climbing a strong pull and are factors that can shape a person's sense of identity [17, 18]. Exercise identity, in turn, is an essential determinant of exercise behavior, making individuals less likely to drop out. However, it can foster an addiction to the exercise that gave rise to this identity [5].

AIM OF THE STUDY

Given the unknown extent of the phenomenon of exercise addiction in the climbing community, this study aimed to investigate the prevalence of exercise addictions within the climbing community in relation to the type of climbing with which climbers most strongly identify themselves.

MATERIAL AND METHODS

Study design

Participants were invited to complete a survey via the internet. The questionnaire was distributed using the forum of the most popular web portal for climbers. Its broad subject matter means that it is followed by many climbers, representing different climbing varieties, which creates significant opportunities for our research to reach a wide range of participants.

Participants

Two hundred and seventy climbers, including 87 (32%) females (Mean age=32.3, Standard Deviation=8.7), were recruited using convenience sampling. According to the main type of climbing practiced by the participants, they were classified as sport/rock climbers (n=162, 59.6%), boulderers (n=82, 30.2%), and mountain climbers (n=28, 10.3%). Of these, 122 (44.9%) participants took part in climbing competitions (bouldering and/or lead). The numbers of the different groups of climbers varied with the smallest representation being mountain-

eers, although these proportions largely reflect the popularity of this type of climbing. The classification into individual categories was based on the respondents' declarations as to the climbing discipline they identified with to the greatest extent. Of course, it does not have to exclude the occasional practicing of other forms (e.g., climbing with a rope or bouldering by mountaineers). Competitive status was assessed by asking climbers whether they participated in climbing competitions (lead, bouldering). The mean experience in climbing was 7.8 ± 7.3 years. Their climbing level was expressed by the greatest difficulties that they can overcome in the so-called RP style, i.e. without rest or falling, using the International Union of Alpine Associations (UIAA) scale (7.9 ± 1.2) [19] and the French grading system (5 to 8c). A flowchart of the participants is present in Figure 1.

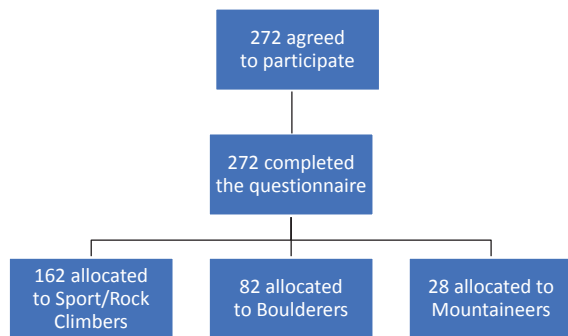


Figure 1. Flowchart of participants

Data collection

The Polish adaptation of the EDS developed by Hausenblas and Downs [11] was used to assess ED [20]. The EDS is comprised of 7 subscales, measuring seven criteria of dependence. Each subscale involves three statements rated on a 6-point Likert scale. Hausenblas and Downs [11] provided guidelines for interpreting EDS scores: individuals with scores averaging 5 or 6 for three or more subscales should be considered “at-risk” for ED, those with scores averaging 3 or 4 for three or more subscales are considered “nondependent symptomatic”, and individuals with scores averaging 1 or 2 are classified as “nondependent asymptomatic”. Cronbach’s alfa values for the following symptoms were withdrawal (0.66), continuance (0.77), tolerance (0.74), lack of control (0.76), reduction of other activities (0.72), time (0.86), and intention (0.93). The skewness ranged from 0.02 (withdrawal) to 0.44 (reduction) and the kurtosis ranged from 0.35 (reduction) to -0.92 (continuance).

Statistical analysis

Descriptive statistics (means and standard deviations) were used to describe the data obtained. To

test differences between nominal data a χ^2 test was used with Cramér’s V statistic (V-value) to measure the effect size. It was assumed that a V-value under 0.30 signifies a small effect size (weak association between variables), a V-value between 0.30 and 0.50 indicates a medium effect size (moderate association), and a value above 0.50 signifies a large effect size (strong association). For interval level data, t-tests or one-way analysis of variance (ANOVA) were used to compare groups. As a measure of effect size, Cohen’s *d* was used to describe the standardized mean difference between two variables. In assessing the relationship between dependency dimensions and continuous variables – age, climbing experience, and climbing level – regression analysis was used. A p-value of <0.05 was used to signify statistical significance. The results of the ANOVA tests were followed by post hoc comparisons, when appropriate, using the Tukey’s test. All calculations were made using the Statistica program 13.0 (Statsoft PL).

RESULTS

Based on EDS scores, 44 climbers (16.2%) were classified to be at-risk for ED, 183 (67.3%) as nondependent-symptomatic, and 45 (16.5%) as asymptomatic. There were no significant differences between male and female climbers classified as at-risk, nondependent-symptomatic, or asymptomatic ($\chi^2=3.0$, $p=0.22$). A significant difference was observed between boulder, rock, and mountain climbers ($\chi^2=14.3$, $p=0.03$, Cramer’s $V=16.2$), with the former scoring higher (24% of at-risk) than the remaining two groups (rock climbers 12%, mountaineers 7%). The prevalence rates of the seven dimensions of ED in the participants are shown in Table 1.

Rock climbers and boulderers are internally diverse groups regarding their attitude towards direct competition in climbing. The variability in this respect ranges from those who concentrate their activity on natural rock (training on artificial walls in the off-season) to make more difficult ascents without confrontation with others, to those who strive for self-realization through both indirect and direct competition, to those who hardly climb in the outdoors, to those devoting all their time to taking part in climbing competitions. The participation in direct competitions has apparent ambition and motivational implications, but does this translate into a risk of addiction? As revealed in the comparison between climbers taking part in direct competitions to those who do not, the difference was not significant ($\chi^2=3.27$, $p=0.19$). However, when comparing individual symptoms separately between competitive climbers and non-competitive climbers, they significantly differed in “tolerance” ($\chi^2=6.3$, $p=0.04$,

Table 1. Participants classified by EDS scores as at-risk of exercise dependence, nondependent-symptomatic, and nondependent-asymptomatic

Variable	Asymptomatic		Aymptomatic		Dependent	
	n	%	n	%	n	%
Withdrawal	61	22.4	163	59.9	48	17.4
Continuation	104	38.2	127	46.7	41	15.1
Tolerance	75	27.6	165	60.7	32	11.8
Control	101	37.1	141	51.8	30	11.0
Reduction in other activities	114	41.9	147	54.0	11	4.0
Time	65	23.9	133	48.9	74	27.2
Intention	103	37.9	110	40.4	59	21.7

Cramer's $V=0.15$) with the former scoring higher than the latter in terms of those at-risk (16.4% vs 8.2%).

Mean EDS scores are displayed in Table 2. In the entire sample, the highest mean was observed in "time" and the lowest in "the reduction of other activities". Regression models using age, climbing seniority, and level of advancement as predictors of individual dimensions of addiction were significant in relation to "intentionality" ($R^2=0.08$, $F_{(3,215)}=6.20$,

$p<0.001$), "tolerance" ($R^2=0.07$, $F_{(3,215)}=5.56$, $p=0.001$), "loss of control" ($R^2=0.03$, $F_{(2,218)}=3.35$, $p=0.04$), and "time" ($R^2=0.08$, $F_{(3,215)}=6.47$, $p<0.001$). In all these cases, statistical significance was observed in relation to climbing seniority, which was a negative predictor, reaching values of the standardized β -coefficient from -0.17 (loss of control) to -0.30 (time). Therefore, these results suggest that the shorter the climbing experience, the greater the risk of exacerbating the dimensions of addiction – Table 2.

Table 2. Means and Standard Deviations for Exercise Addiction by gender, competitive experience, and type of climbing activity

Variable	Total sample	Gender			Competition			Climbing activity				Post hoc
		Male	Female	P	Yes	No	P	B*	Sc*	M*	P	
		M±SD	M±SD		M±SD	M±SD		M±SD	M±SD	M±SD		
Withdrawal	3.4±1.2	3.6±1.1	3.3±1.2	.01	3.4±1.2	3.4±1.2	.68	3.5±1.1	3.4±1.2	3.4±1.2	.34	B>Sc. M*
Continuation	3.0±1.3	3.0±1.3	3.0±1.2	.68	3.2±1.2	2.9±1.3	.07	3.2±1.2	3.0±1.3	2.9±1.3	.32	
Tolerance	3.2±1.1	3.4±1.1	3.1±1.1	.06	3.4±1.1	3.1±1.1	.03	3.5±1.1	3.1±1.1	2.9±1.1	.01	
Control	3.0±1.2	3.1±1.2	2.9±1.2	.08	3.0±1.2	2.9±1.2	.62	3.2±1.2	2.9±1.2	2.6±1.1	.17	
Reduction in other activities	2.7±1.0	2.6±0.9	2.8±1.0	.11	2.7±1.0	2.7±0.9	.96	2.7±0.9	2.7±1.0	2.7±1.1	.99	
Time	3.6±1.3	3.7±1.2	3.5±1.3	.18	3.7±1.2	3.5±1.0	.07	3.6±1.3	3.6±1.3	3.3±1.3	.40	
Intention	3.2±1.4	3.5±1.5	3.0±1.3	.02	3.4±1.4	3.0±1.4	.06	3.3±1.4	3.1±1.4	3.2±1.2	.57	

* B – bouldering; Sc – sport climbing; M – mountaineering.

DISCUSSION

The present study aimed to determine the prevalence of ED in climbers. To our knowledge, this study is one of the first to assess the prevalence of ED in people practicing various forms of climbing.

Previously, the only study on dependence in climbing we are aware of was conducted by Heirene et al. [21]. Unlike ours, it was rather qualitative. Using semi-structured interviews, the authors explored withdrawal experiences in four advanced and four intermediate male rock climbers during periods of abstinence from climbing. Their results demonstrated that advanced climbers recalled more frequent and intense cravings and negative effects during these periods than their less able counterparts.

In our research, we focused on the diagnosis of addiction among climbers, assuming the operationalization of this syndrome as proposed by Hausenblas and Downs [11], and therefore taking into account the dimensions of tolerance, continuing exercises despite problems, experiencing anxiety or tension while the exercise decreases (withdrawal), exercising longer than intended, lack of control over exercising, reducing other activities, and spending a significant amount of time on activities in preparation of exercise.

The results obtained show that of the 272 climbers, 16% ($n=44$) can be classified as being at-risk of ED while 67% ($n=183$) as nondependent-symptomatic. While the percentage of male and female climbers classified as at-risk, symptomatic, or asymptomatic

were similar, females reported significantly higher scores on the dimensions of intentional effect. They also tended to have higher average scores on the tolerance dimension ($p=0.06$). However, it should be emphasized that the effect sizes ($d=0.37$ and $d=0.27$, respectively) indicate that the difference between the two genders is rather small. Contrary to what was expected, no differences were observed between climbers who competed in the climbing contests from those who do not. We hypothesized that competition climbers would be more likely to develop an exercise addiction syndrome as they struggle with themselves and the challenges of the rock and other climbers at the same time. The obtained results did not confirm this assumption, except that competition climbers reported higher average scores on the tolerance scale. The percentage of players who met the at-risk classification criteria was double in this group (16.4% vs 8.2%). The risk of addiction was significantly higher in climbers who identified themselves as boulderers. The percentage of people specializing in this form of climbing was 24% compared to 12% among rock climbers and 7% among mountaineers.

The answer to how the surveyed climbers compare to other forms of activity and sports is difficult due to the far-reaching inconsistency of the results of various studies. Even when studies were conducted using the two tools that are considered well-validated, the Exercise Addiction Inventory (EAI) and the EDS [6]. In a recent review of the literature on this topic, Marques et al. [15] found that regular exercisers presented a prevalence of ED risk ranging from 1.9 to 42% and 1.4 to 17% in athletes. However, most studies presented results in the 6–17% range. In the remaining groups, such as high school students, sport shop customers, and the general population, the prevalence ranged from 0.3% (general population) to 29.6% (sports shop customers). In another review that aimed to compare ED across sports, di Lodovici et al [22] found a different distribution of addiction rates depending on whether it was diagnosed using EAI or EDS. The EAI identified the highest proportion of people at risk for physical exercise addiction in endurance athletes (14.2%), followed by ball games (10.4%), fitness center attendees (8.2%), and power disciplines (6.4%). In studies using the EDS, the highest proportion of risk was found in mixed disciplines/ball games (15.3%) followed by power sports (10.7%), health and fitness activities (6.0%), and endurance disciplines (3.5%). In studies in which the diagnosis of ED used other tools, including those specific to a given activity (mainly running and body-building), high prevalence rates were often found, sometimes as high as 77% in runner studies [4]. The discrepancies between EAI and EDS are primarily due to the

differences in the internal structure of these tools. EAI evaluates 6 symptoms of addiction (tolerance, withdrawal, relapse, salience, conflict, and mood modification), each of which is assessed with one item. In comparison, EDS is based on DSM-IV and thus evaluates seven symptoms of addiction, each assessed with 3 items. Comparing the results of our research to studies that were conducted using EDS in athletes or people that regularly exercise, the climber community, in terms of the prevalence of ED, would be among the disciplines with a moderate to high addiction potential.

In contrast to other forms of activity, such as body-building and running, climbing offers intense emotional risk-related sensations that may satisfy the high sensation-seeking behavior found in drug users [21]. Thus, climbing and other extreme sports can stimulate the brain's reward system, similar to psychoactive substances, giving them an addictive quality. Climbing is also a sport that offers a great deal of variability. Each climbing route is different. Even on a given route, each capture is usually different from the previous one. The variability, lack of monotony, uniqueness of experiences, and constant satisfaction of the need for novelty is unique to climbing, whereas other spheres of life and other forms of physical activity become an area of routine monotony. Based on qualitative research conducted among climbers, Kacperczyk [16] points out that the admiration for a mountain or rocky road turns into a desire to conquer it, sometimes so strong that the climber experiences it as “an obliging and primary task, filling the entire field of attention and ruthlessly engaging”. The obsession with a route is a kind of intense tension motivating the climber to conquer it and when accomplished to look for other similar challenges. These aspects can make an activity that engages people who climb to the point where “healthy” commitment turns into the above-mentioned “obsession”. It can become all-consuming and be undertaken with disregard to illness/injury, inability to miss a climbing opportunity, risk of conflict with family/friends, etc. The present findings provide some novel insight into ED in a population of exercisers that was previously less explored.

Limitations of the study

However, there are some limitations to our study that have to be mentioned. First of all, comparisons between particular groups of climbers are biased due to their unequal numbers, especially the relatively low number of mountain climbers. This affects the possibility of making comparisons between the different groups. However, it is essential to remember

that the disparity in the size of the different groups of climbers reflects the popularity of the particular activities in real life. Another limitation affecting the possibility of generalizing the results of comparisons between the groups is the adopted method of classifying them. In the research, we adopted the participant's declaration of their "dominant identity". There are declared lovers of only one activity (e.g. boulder climbers who do not even have a climbing rope or other similar equipment, only climbing shoes and a chalk bag). However, many climbers practice two or more activities in parallel, with varying levels of involvement (e.g. bouldering and rock climbing, summer and winter mountain climbing). Similarly, some climbers mainly train to participate in competitions and participate almost without touching a natural rock. However, many rock climbers pursue their passions in nature.

Future research should be performed on larger groups and consider different groups and subgroups. Our study did not consider variables such as training frequency, which may also influence addiction. Because of the complex nature of exercise addiction and the equally complex nature of climbing, additional research is needed. Nevertheless, we believe that our

study can contribute to future research of this type in the climbing environment.

CONCLUSIONS

Our data support the hypothesis that climbing may be a form of activity that can engage its enthusiasts so much that it can become an addiction. The probability of this occurrence is at least partly dependent on the climbing discipline, with bouldering being the most prominent risk factor. The reasons for this, however, are not obvious. While it can be assumed that the frequency of mountaineering is the lowest of the climbing activities (distance from the mountains, limitation to certain weather conditions, high logistical commitment, etc.), bouldering, due to the spread of artificial boulder walls, offers the highest frequency of contact with this type of climbing. It is also rock climbing that offers the greatest variety of movement and motor challenges. Whether it is these factors that lead to exposed people becoming addicted, should be sought and requires further research. We believe that our research can provide the basis for future research.

REFERENCES

1. Dishman R, Washburn R, Heath G. Physical activity epidemiology. Champaign: Human Kinetics; 2004.
2. WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization 2020. <https://doi.org/10.1136/bjsports-2020-102955>.
3. Siegel SR, Robinson JM, Johnston SA, Lindley MR, Pfeiffer KA. Health-related fitness and energy expenditure in recreational youth rock climbers 8-16 years of age. *Int J Exerc Sci* 2015; 8(2): 174-183. <https://doi.org/10.1177/1559827615592345>.
4. Siegel SR, Fryer SM. Rock climbing for promoting physical activity in youth American. *J Lifestyle Med* 2015; 11(3): 243-251.
5. Murray LA, McKenzie K, Newman E, Brown E. Exercise identity as a risk factor for exercise dependence. *Br J Health Psych* 2013; 18: 369-382. <https://doi.org/10.1111/j.2044-8287.2012.02091.x>.
6. Szabo A, Griffiths MD, De La Vega R, Mervó B, Demetrovics Z. Methodological and conceptual limitations in exercise addiction research. *Yale J Biol Med* 2015; 88: 303-308.
7. Bamber D, Cockerill IM, Carroll D. The pathological status of exercise dependence. *Br J Sports Med* 2000; 34: 125-132. <https://doi.org/10.1136/bjsm.34.2.125>.
8. Hausenblas HA, Downs DS. How much is too much? The development and validation of the exercise dependence scale. *Psychol Health* 2002; 17(4): 387-404. <https://doi.org/10.1080/0887044022000004894>.
9. Trott M, Jackson SE, Firth J, Jacob L, Grabovac I, Mistry A, et al. A comparative meta-analysis of the prevalence of exercise addiction in adults with and without indicated eating disorders. *Eating Weight Disord - Studies on Anorexia, Bulimia and Obesity* 2021; 26: 37-46. <https://doi.org/10.1007/s40519-019-00842-1>.
10. Berczik K, Szabó A, Griffiths MD, Kurimay T, Kun B, Urbán R, et al. Exercise addiction: symptoms, diagnosis, epidemiology, and etiology. *Subst Use Misuse* 2012; 47(4): 403-417. <https://doi.org/10.3109/10826084.2011.639120>.
11. Symons Downs D, Hausenblas HA, Nigg CR. Factorial validity and psychometric examination of the Exercise Dependence Scale-Revised. *Measurement Phys Educ Exerc Sci* 2004; 8: 183-201. doi:10.1207/s15327841mpee0804_1.
12. Lejoyeux M, Guillot C, Chalvin F, Petit A, Lequen V. Exercise dependence among customers from a Parisian sport shop. *J Behav Addict* 2012; 1(1): 28-34. <https://doi.org/10.1556/JBA.1.2012.1.3>.
13. Magee CA, Buchanan I, Barrie L. Profiles of exercise dependence symptoms in Ironman participants. *Psych Sport Exerc* 2016; 24: 48-55. <http://dx.doi.org/10.1016/j.psychsport.2016.01.005>.
14. Lichtenstein MB, Jensen TT. Exercise addiction in CrossFit: prevalence and psychometric properties of the Exercise Addiction Inventory. *Addictive Behav Report* 2016; 3: 33-37. <https://doi.org/10.1016/j.abrep.2016.02.002>.
15. Marques A, Peralta M, Sarmiento H, Loureiro V, Gouveia ER, de Matos GM. Prevalence of risk for exercise dependence: a systematic review. *Sports Med* 2019; 49(2): 319-330. <https://doi.org/10.1007/s40279-018-1011-4>.

16. Kacperczyk A. Working on emotions as a part of climbing and mountaineering. *Przegląd Socj Jakosc* 2013; 9(2): 70–103. <https://doi.org/10.18778/1733-8077.16.4.02>. (In Polish).
17. Erickson B. Style matters: explorations of bodies, whiteness, and identity in rock climbing. *Sociol Sport J* 2005; 22: 373–396. <https://doi.org/10.1080/14775085.2012.729898>.
18. Robinson V. *Everyday masculinities and extreme sport: male identity and rock climbing*. Oxford: Berg Publishers; 2008.
19. Draper N, Canalejo JC, Fryer S, Dickson T, Winter D, Ellis G, et al. Reporting climbing grades and grouping categories for rock climbing. *Isokinetics Exerc Sci* 2011; 19: 273–280.
20. Danych K, Polok M, Guszowska M. Polish adaptation of Exercise Dependence Scale. In: M. Guszowska, Z. Gazdowska, N. Koperska. *Measurement tools in sport psychology*. Warszawa: AWF 2019; 107–121. (In Polish).
21. Heirene RM, Shearer D, Roderique-Davies D, Mellalieu SD. Addiction in extreme sports: an exploration of withdrawal states in rock climbers. *J Behav Addict* 2016; 5(2): 332–341. <https://doi.org/10.1556/2006.5.2016.082>.
22. Di Lodovico L, Poultais S, Gorwood P. Which sports are more at risk of physical exercise addiction: a systematic review. *Addictive Behav* 2019; 93: 257–262. <https://doi.org/10.1016/j.addbeh.2018.12.030>.

Word count: 3287

• Tables: 2

• Figures: 1

• References: 22

Sources of funding:

The research was funded by the authors.

Conflicts of interests:

The authors report that there were no conflicts of interest.

Cite this article as:

Sas-Nowosielski KJ, Gutek M.
Prevalence of exercise dependence in rock climbers and mountaineers.
Med Sci Pulse 2022;16(3): 64–70. DOI: 10.5604/01.3001.0015.9811.

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Received: 23.06.2022

Reviewed: 06.09.2022

Accepted: 06.09.2022