



Influence of regular climbing on depression, generalized anxiety and lower back pain

Grzegorz Zieliński^{1,A-D}, Estera Zięba^{1,A-B,D}, Wiktor Wilkowicz^{1,B,D},
Aleksandra Bys^{1,A,C}, Michał Ginszt^{2,A-B}, Oliwia Libera^{1,B}, Magdalena Zawadka^{1,D},
Tomasz Saran^{3,E-F}, Piotr Gawda^{1,A,E-F}

¹ Department of Sports Medicine, Medical University, Lublin, Poland

² Chair and Department of Rehabilitation, Physiotherapy and Balneotherapy, Medical University, Lublin, Poland

³ Department of General and Neuro Rehabilitation, Institute of Rural Health, Lublin, Poland

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Abstract

Introduction and objective. Anxiety and depression disorders are increasingly affecting society. Anxiety disorders are the most prevalent psychiatric disorders, and depressive disorders are increasing in society worldwide. Lower back pain is one of the common health problems experienced by 50–80% of adults at some point in their lives. The aim of the study was to assess the climbing environment in terms of depression, generalized anxiety and pain in the lumbar spine.

Materials and method. 139 people training on climbing walls Lublin in December 2019 were invited to participate in the study. After applying exclusion criteria, 113 people with an average age of 30±8 years, 88 men (average age: 30 years) and 35 women (average age: 30 years) were qualified for the study. They were examined by the author's own questionnaire and the PHQ-9, GAD-7 and ODI questionnaires. Statistical analyses were applied and the significance threshold was set at 0.05.

Results. Overall percentage results suggest mild depression at 27%, moderate anxiety at 27%, and mild back pain at 26% in the group of climbers tested. Climbing level and climbing sub-discipline did not affect the average results of PHQ-9, GAD-7 ($p>0.05$). Back pain was more common in boulder climbers ($p<0.05$).

Conclusions. The level of sport climbing did not affect the level of depression, generalized anxiety, and back pain. The sport climbing level did not affect the incidence of injuries. The association in climbing clubs is connected with overcoming more difficult climbing routes and a higher level of generalized anxiety. Bouldering was associated with a greater level of pain in the lumbar spine and more injuries.

Key words

pain, sport, psychology

INTRODUCTION

Depression is one of the major causes of disability and contributes significantly to the disease burden worldwide. The global incidence of depression and depressive symptoms have been increasing in recent decades. The incidence of depression over a lifetime ranges from 20% – 25% among women and 7% – 12% among men. Depression is an important determinant of quality of life and survival, which accounts for about 50% of psychiatric consultations and 12% of all hospital admissions [1].

Anxiety disorders are defined as a group of mental disorders characterized by an unpleasant feeling combined with anxiety or worry about future events, or fear of responding to current events [2]. Anxiety disorders are the most common mental disorders. According to epidemiological studies, one-third of the population suffers from an anxiety disorder at some time in their lives. They affect women more often, and their prevalence is highest among the middle-aged. These disorders are associated with a significant degree of impairment, high use of health care, and an economic burden on society [3].

Climbing, belonging to the extreme sports, can be associated with an increased level of mental tension resulting from a relatively high load of mental stress [4]. Climbing is becoming an increasingly popular form of spending free time [5]. According to the International Federation of Sport Climbing (IFSC), every day in the United States alone 1,000 people are climbing, while the Rio De Janeiro, number of people practising it regularly is estimated at 25 million [4]. At the 129th plenary session of the International Olympic Committee (IOC), in Rio de Janeiro, Brazil, it was officially announced that climbing will be accepted as an official discipline of the Olympic Games in Tokyo in 2020 [6]. Due to the inherent risk of severe injury or death and the relatively frequent occurrence of musculoskeletal injuries, sports climbing is generally considered to be a high-risk sport [7]. The anxiety felt while climbing is due to the possibility of falling and experiencing injury [8]. Climbing stress is the effect of the interaction of physiological and psychological factors dictated by the difficulty of the climbing route and experience of the climber [8]. The factor modulating the level of anxiety is also considered to be the height of the route covered, especially for beginners [9]. Studies show that long-term sport-related anxiety can have a significant negative impact on the athlete's functioning, including deterioration of training results and results during competitions, can lead to an increased risk of injury, delay and impede their

Address for correspondence: Grzegorz Zieliński, Department of Sports Medicine, Medical University, Lublin, Poland
E-mail: grzegorz.zielinski@umlub.pl

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rehabilitation and return to the training process, as well as increase risk of repeated injury during exercises and competitions after rehabilitation [10].

In addition to the mental sphere, sport climbing can also negatively affect the physical sphere of an athlete. However, the specifics of injuries and overloads vary depending on the sport climbing sub-discipline. Bouldering usually consists of no more than eight or ten movements, performed without belaying, on a wall less than five meters high. Injuries in this sub-discipline are usually associated with falls from a height on the mattress. In turn, lead climbing (climbing with a rope) consists of many climbing movements and takes place on higher walls (>10 m), and injuries are associated with strong jerks, overloading the spine and causing pain [11, 12].

Lower back pain (LBP) is one of the common health problems that 50–80% of adults experience at some point in their lives. It is believed that working-age adults are the most vulnerable group to LBP, which is the highest ranked among the causes of disability worldwide [13]. Back pain occurs in athletes from different disciplines, affecting up to 94% of players throughout their lives, while point-to-point valority covers 18–65% of the athlete population [12]. Considering the above facts, increased interest in sport climbing can cause more stress and pain syndromes, but also changes in the human psyche.

The tests were carried out on climbers from Lublin, from where the athlete with Olympic qualification comes, which aroused even greater interest in the discussed discipline in the region [14]. Current research suggests benefits for the locomotor apparatus and balanced physical development thanks to sport climbing [5] and the positive impact of this discipline on the mental state of climbers [15–17]. However, despite the undeniable benefits of this type of physical activity, sport climbing can also have negative health effects.

OBJECTIVE

The aim of this study is to verify whether practicing sport climbing is associated with increased anxiety, depression, and pain in the lumbar spine.

MATERIALS AND METHOD

139 people training on climbing walls Lublin in December 2019 were invited to participate in the study, which was conducted according to the recommendations of the Helsinki Declaration and with the consent of the Bioethics Committee of the Medical University in Lublin (KE-0254/191/2019). The respondents were informed about the objectives of the study, and were made aware of the possibility to resign at any time. All the examined persons gave their written consent to participate in the study.

The following exclusion criteria were used: training experience of less than half a year, traumatic physical and psychological experiences determined on the basis of self-report, identified mental disorders (including anxiety disorders, bipolar disorders), incomplete completion of the questionnaire. After applying the exclusion criteria, 113 people with an average age of 30 ± 8 years, 88 men (average age: 30 years) and 35 women (average age: 30 years), were qualified for the study.

The respondents were asked to complete a questionnaire describing injuries they had suffered during 6 months and about the climbing experience in years, the most difficult path covered in their lifetime when climbing with a rope, and in bouldering, the most difficult path covered in 6 months when climbing with rope and bouldering, type of training (boulder/rope), membership in a climbing club subordinate to the Polish Mountaineering Association [18] associated with the International Climbing and Mountaineering Federation [19]. In addition, each respondent was asked to complete the Polish version of Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), Oswestry Low Back Pain Disability Index (ODI).

PHQ is a diagnostic tool based on the basic assessment of mental disorders (PRIME-MD) and used by clinicians as a method of structured interview. PHQ is the approved, self-managed version of PRIME-MD [20] which 5 modules covering 5 common types of mental disorders: depression, anxiety, somatic, alcohol and food abuse. Each PHQ module can be used separately: as a depression sub-scale (PHQ-9), as a sub-scale for generalized anxiety disorder (GAD-7), or as a sub-scale for somatic disorders (PHQ-15). Typical cut-off points, 5, 10 and 15, represent in turn mild, moderate and severe levels of the above-mentioned symptoms [21, 22]. The Polish version of PHQ and GAD-7, translated by the MAPI Research Institute, was downloaded free of charge from the Institute website [22] and used in the study.

Oswestry Low Back Pain Disability Index was used to assess the severity and frequency of pain, and the degree of reduced function caused by lumbar spine pain. The questionnaire examines the effects of back pain in 10 planes: pain intensity, self-service, carrying, walking, sitting, standing, sleeping, socializing, travelling, and changes in pain intensity. Answers are scored on a scale of 0–5. Typical cut-off points are 4, 14, 25 and 34 points, which successively represent no restrictions, light restrictions, serious disorders and disabilities [23].

Data was analysed according to the following points:

- impact of climbing level (determined on the basis of climbing transitions from the last 6 months according to the IRCRA scale [24]) the habit factor of the PHQ, GAD and ODI scales;
- 1) correlation of type of climbing (according to the UIAA Medical Commission Injury Classification for Mountaineering and Climbing Sports [25]), and climbing level (determined on the basis of climbing passes from the last 6 months according to the IRCRA scale [24]);
- 2) the impact of membership of a climbing club on the difficulty of the route, level of depression (PHQ-9) and anxiety (GAD-7);
- 3) the influence of climbing type (bouldering and rope climbing) on the level of depression, anxiety and back pain and injuries.

In point 4, a 3-stage verification was used to qualify climbers for a given group (lead climbers, boulderers) by analysing 3 indicators: overcoming the most difficult path in life, within 6 months, and self-assessment of the type of training held over 6 months. The climber was qualified to one of the groups only if all 3 guidelines were directed at one type of climbing. A difference in at least one guideline excluded data analysis from this point.

Statistical analysis was carried out as follows: in the first place, the normality of the distribution of variables was

verified using the Shapiro-Wilk normality test. When the distribution was abnormal, the Kruskal-Wallis test was used, while when the distribution was close to normal, the ANOVA test was used. The differences were considered statistically significant if the level of test probability was lower than the assumed level of significance ($p < 0.05$).

RESULTS

Overall percentage results suggest mild depression at 27%, moderate anxiety at 27%, and mild back pain at 26% in the group of climbers tested. After division according to the level of advancement, a percentage tendency was observed for an increase in mild symptoms of depression, a decrease in mild symptoms of generalized anxiety, and an increase in mild symptoms of back pain together with the level of improvement (Tab.1). None of the results were statistically significant. After the division into groups, higher average results of the PHQ ($p=0.851$), GAD ($p=0.460$) and ODI ($p=0.387$) questionnaires were observed in the elite group; however, the results were not statistically significant (Tab. 2).

Table 1. Percentage of people showing medium, moderate and several symptoms: depression, generalized anxiety and back pain, depending on their progression

Climbing group	PHQ-9			GAD			ODI		
	Mild	Moderate	Severe	Mild	Moderate	Severe	Mild	Moderate	Severe
intermediate	22%	17%	0	39%	0	0	22%	0	0
advanced	27%	9%	0	24%	4%	3%	19%	1%	1%
elite	33%	8%	8%	17%	8%	8%	50%	0	0
Total	27%	11%	1%	27%	4%	3%	26%	1%	1%

In the studied groups, 44 people had experienced trauma while climbing during the last 6 months. The dominant area of injuries were the fingers – $n=19$ (43%), elbows – $n=7$ (16%) and shoulders – $n=6$ (14%). The injuries ranged from 1–2 according to the UIAA Medical Commission Injury Classification for Mountaineering and Climbing Sports [25]. The most injured group was intermediate, then elite, and the least advanced (Tab. 3). The results were not statistically significant. The groups did not differ in terms of climbing injuries according to the UIAA scale, the results were not statistically significant ($p=0.812$) (Tab. 4).

After dividing the subjects into unclassified and affiliated groups in a climbing club, in the group of affiliated persons more difficult climbing transitions and higher results of the PHQ and GAD scales were observed. The results of more difficult crossings in people associated in climbing clubs were on the border of the materiality threshold ($p=0.053$), while the level of anxiety ($p=0.046$) was statistically significant (Tab. 5).

Table 2. Average results of the PHQ-9, GAD-7, ODI questionnaires in 3 climbing stages

Climbing group	n	age	Men/Women	IRCRA	PHQ	p	GAD	p	ODI	p
intermediate	23	33±8	21/2	16±2	5±3	0,851 chi2 test = 0.323	4±3	0,460 chi2 test = 1.552	2±3	0,387 chi2 test = 1.896
advanced	78	29±7	55/23	19±2	4±3		4±3		3±5	
elite	12	29±7	6/6	24±2	6±6		5±4		5±5	

Table 3. Percentage of people experiencing injuries according to the UIAA Medical Commission Injury Classification for Mountaineering and Climbing Sports, according to advancement

Climbing group	injuries according to UIAA		
	1	2	All
Intermediate	22%	22%	48%
Advanced	10%	17%	27%
Elite	33%	8%	42%
Total	15%	17%	32%

Table 4. Types of events according to the UIAA Medical Commission Injury Classification for Mountaineering and Climbing Sports in 3 advanced climbing groups

Climbing group	n	age	Men/Women	IRCRA	Medium type of injury on the UIAA	p
Intermediate	23	33±8	21/2	16±2	1±1	0.812 chi2 test = 0.350
Advanced	78	29±7	55/23	19±2	0±1	
Elite	12	29±7	6/6	24±2	0±1	

Table 5. Average results of the most difficult passes over the last 6 months, PHQ-9, GAD-7 Questionnaires in associated and non-associated groups in climbing clubs

group	n	Age	Men/Women	IRCRA	p	PHQ	p	GAD	p
Non-associated	57	28±7	41/16	18±2	0.053** chi2 test = 3.732	4±4	0,310	3±3	0.046* chi2 test = 3.992
associated	56	32±8	37/19	20±3	5±3	4±3			

* statistically significant result.

** result on the border of significance.

Analysis carried out between the group of lead climbers and boulderers showed that boulder climbers had mild depression symptoms and mild back pain as a percentage more often than lead climbers. There were no differences between the groups in generalized anxiety (Tab. 6). The group of boulder climbers showed higher average results in the PHQ, GAD, ODI scales, and the frequency of injuries. Significant statistical differences were observed in results of the ODI ($p=0.004$) questionnaire and the frequency of injuries during climbing ($p=0.020$) (Tab. 7). The average climbing level (in the last 6 months) on the IRCRA scale [24] for boulder climbers was determined to be 20 ± 3 and

Table 6. Percentage of people showing middle, moderate and several symptoms: depression, generalized anxiety and back pain, depending on type of climb

Climbing group	PHQ-9			GAD			ODI		
	Mild	Moderate	Severe	Mild	Moderate	Severe	Mild	Moderate	Severe
Lead climbing	14%	5%	5%	25%	5%	0	10%	0	0
Bouldering	31%	11%	0	25%	5%	2%	30%	0	0

Table 7. Average results of the PHQ-9, GAD-7, ODI questionnaires and the number of injuries observed in the groups of lead climbers and boulderers

Group	N	age	Men/Women	PHQ	p	GAD	p	ODI	p	Injuries (n)	p
Lead climbing	21	35±9	15/6	4±5	0,076	3±3	0,385	1±2	0,004*	4	0,02*
Bouldering	64	29±7	49/15	5±3	chi2 test = 3.152	4±3	chi2 test = 0.754	3±4	chi2 test = 8.174	30	chi2 test = 5.408

* statistically significant result

for rope climbers 11±4. Results of analysis of the impact of the difficulty of the route on ODI results in the group of lead climbers and boulderers, were not statistically significant ($p=0.395$).

DISCUSSION

The overall percentage results suggest mild symptoms of depression at 27%, mild anxiety at 27%, and mild back pain at 26% in the group of climbers tested. According to research, Wang et al. who analysed 83 cross-sectional studies involving 41.344 people, noticed that the incidence of depression or depressive symptoms was 27.0% [1]. The same result was obtained in the current study, which suggests that climbing does not affect the level of depression. The work of Bandelow and Michaelis determined the level of anxiety disorders at 33.7% [3], while the current study showed that climbers showed a mild level of generalized anxiety at the level of 27%. This suggests that climbing affects the level of generalized anxiety, a relationship also noted by Ewert and Aras [16]. The incidence of LBP in the population based on a literature review by Fatoye et al. was between 1.4–20%, respectively [13]. This result is lower than that observed in the current study – 26%, which may have been caused by sports overloads, such as: falls on the mattress and rope jerks. According to research by Trompeter et al., LBP time episodes affect 18–65% of the sports population [12]. This range is also included the original results of the presented study, which also observed differences between lead climbers and boulderers in terms of the results of the ODI questionnaire, and the percentage of people who had back pain. There have been no studies that differentiate overloads between two sub-disciplines.

However, Schweizer suggests that advanced climbing on difficult climbing routes will significantly overload the spine [26]. In the presented study, no combination of back pain and climbing level was observed. In this study, IRCRA scales were used for the quality of statistical analysis, whereas in Schweizer's study, no such scale was used, a variability that can significantly affect differences in results. Trompeter et al. noted that it is difficult to determine whether the loads for a given sport will affect the onset of pain [12].

The results of the current study indicate the occurrence of higher PHQ-9 and GAD-7 scales in the elite group, suggesting higher levels of anxiety and depression in athletes from this group; however, these results did not reach the assumed statistical significance. Current literature on the subject examining anxiety disorders in climbers indicates that tension and anxiety accompany climbers, regardless of their level of skill [4]. Research also indicates that climbers with a higher sports level have an increased level of anxiety, which is confirmed by the results of this study. According to Hardy and Hutchinson, a higher level of anxiety is associated with a higher level of effort and a proportionally higher level of performance of climbers. The authors of the above study confirmed their hypothesis suggesting that a higher level

of cognitive anxiety affects higher achievement in climbers [27]. These results are confirmed by Sanchez, Borchker and Llewellyn, in which 19 male elite sports climbers were assessed for their mental state prior to a competition. The authors suggest that the mental state preceding the competition seems to be an important factor determining success – climbers with better results during the competition reported a higher level of somatic fear of climbing, and climbed the most difficult part of the route more slowly compared to weaker competition [28]. According to the above studies, adaptation to stress present during climbing is not observed in advanced competitors. The results of research by Fryer et al. [29] are different from those by Hodgson et al. [30]. Results of the work of Fryer et al. suggest that advanced climbers do not treat climbing with lower belay as more stressful than with upper belay, which was manifested in the absence of differences in the indicators of mental and physical stress between both methods of belay [29]. At the same time, in the research by Hodgson et al., lower belaying was more mentally and physically stressful for intermediate climbers than climbing with upper belay [30]. This suggests that advanced climbers who practice regular climbing are used to the possibility of falling, resulting in a lower level of stress compared to intermediate climbers. The differences in the results of the above studies and the current study may be due to the fact that the latter does not specify the division into boulderers and lead climbers when comparing the levels of anxiety and depression in different stages of advancement. This is caused by too great a diversity between theoretical subgroups, and too few of them for statistical analysis. Therefore, in future research on psychological factors in climbers, listing the different types of climbing is suggested.

Analysis of the PHG-9 and GAD-7 questionnaires indicate higher levels of anxiety and depression in boulder climbers compared to rope climbers, but the results did not reach a specific statistical significance. There are many studies on the therapeutic effect of lead climbing and bouldering and their effect on the relief of mental disorders, including depression and anxiety disorders, but most of these studies have provided only very low-quality evidence [31]. Recent studies of high-quality evidence about a new method supporting the treatment of depression -boulder psychotherapy (BPT) – suggest that even short-term BPT may reduce depressive symptoms in patients [31, 32]. According to Schwarz et al., the effect of short-term BPT training may last for up to 12 months [33].

However, as mentioned above, there is a lack of high-quality evidence regarding the effect of lead climbing on relieving depression and anxiety disorders. To compare the impact of both types of climbing on mental health, attention should be paid to the development of research on lead climbing and its effect on depressive disorders. Undoubtedly, the limits of the current study are the small number of people included in the intermediate and elite groups, as well as gender-mixed groups. The authors suggest that future studies should focus on and analyse one level of climbing advancement.

Higher levels of anxiety measured on the GAD-7 scale were also obtained by climbers associated with sports clubs, and the results achieved statistical significance. According to Magier et al., completing the climbing route causes mental and physical stress, as well as social pressure on the climber [34]. This may suggest that the social pressure caused by training in a large group (which is common in sports clubs) may increase the level of anxiety in such climbers. However, a limit of the current study is the question about the number of training partners in the study group is not included in the survey; therefore, the authors only suggest a possible explanation for the results.

Lead climbing and bouldering are characterized by various injuries and their etiopathology [35]. Differences in the scope of injuries were noted in the current study in which the climber experienced statistically significantly more frequent injuries. According to research on outdoor bouldering, climbers experience a much higher percentage of injuries to the lower limbs, head (especially concussion), and spine. There is a much higher risk of fractures and sprains in outdoor bouldering [35, 36] caused by an incorrect fall on the mattress [36]. Bouldering is also characterized by more frequent injuries per year [36, 37]. Earlier research by the authors of the presented study on accidents on an artificial boulder wall determined the peak of the above-mentioned indicator at 1.66 injuries per 1,000 hours [38]. Injuries from the 3/4 grade were qualified for the study according to the discussed scale [25]. For comparison, according to studies by Schöffel et al., the rate of injury when climbing with a rope is estimated at 0.29 injuries per 1,000 hours [39].

As mentioned, the limitations of the presented study also include the lack of gender division; subsequent studies should therefore focus on depression, generalized medicine, and back pain, depending on the gender of the climber. In the original study in groups, the ratio of women to men was insufficient to conduct statistical analyses.

Climbing is becoming an increasingly popular sport but those who partake often lack information about the risks associated with it and its variants. The average percentage results show a beneficial effect of climbing in reducing anxiety, compared to epidemiological data. This may suggest recommending this sport to people who have the above-mentioned disorders. Bouldering, however, is not recommended for anyone suffering from backaches. Undoubtedly, further research on a bigger group of climbers should be conducted for a better understanding of the impact of climbing on the psycho-emotional state and biomechanical overload. This will allow the specification of recommendations and contraindications for practising these sports which may improve the health of active individuals.

CONCLUSIONS

- The level of sport climbing does not affect the level of depression, generalized anxiety, and back pain.
- The level of sport climbing does not affect the incidence of injuries.
- Association with climbing clubs is connected with overcoming the more difficult climbing routes, and a higher level of generalized anxiety.
- Bouldering is associated with a greater level of pain in the lumbar spine, and with more injuries.

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