The influence of sport climbing on depressive disorders

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Abstract

Introduction:

According to the World Health Organization (WHO), depression is the most common mental disorder, affecting a significant percentage of the adult population. The disease is associated with many negative health consequences and is one of the leading causes of disability and inability to work worldwide. Sports climbing can be a great method, complementary to psychotherapy, used to reduce the symptoms of depressive disorders.
Aim of the study:

The aim of our work is to review and summarize the most interesting conclusions from research on the impact of climbing as a complementary form of treatment for depressive disorders.

Material and methods:

We conducted a review of scientific publications published in the years 2004-2024 in English and Polish in the PubMed and Google Scholar databases. We used keywords such as "depression" and "sport climbing".

Conclusions:

Research shows that sport climbing can alleviate depressive symptoms, have a positive impact on emotion regulation and lead to changes in brain functioning.

Key words:

Depression, mental disorders, physical activity, climbing, bouldering, emotion regulation.

Introduction

Depression is one of the most common pathological conditions encountered in the population. It ranks among the 12 major causes of Disability-Adjusted Life Years (DALY) worldwide [1], leading to significant health, social, and economic consequences [2] . According to the World Health Organization, 3.8% of the population experiences depression, including 5% of adults (4% among men and 6% among women) and 5.7% of adults over 60 years old. Suicide, the fourth leading cause of death in individuals aged 15–29, is the most serious complication of depressive disorders[3]. Statistics indicate that women are twice as likely to suffer from depression and anxiety disorders [4], while men are more prone to
substance abuse and addiction [5]. Typical symptoms of depression listed in the ICD-10 diagnostic criteria include:

- lowered mood,
- decreased or loss of previous interests,
- changes in appetite and body weight,
- insomnia or excessive sleepiness,
- chronic fatigue,
- cognitive disturbances.

Additionally, suicidal thoughts and attempts may occur in patients with depression [6]. Besides the significant burden on mental health, there is increasing evidence suggesting that depression also contributes to the deterioration of somatic health [7]. It can lead to an increased incidence of cardiovascular diseases [8], diabetes [9] and neurodegenerative diseases associated with dementia [10]. Identifying the precise brain region responsible for the onset of depression symptoms is not easy. Based on the existing research, scientists point to the potential significance of dysfunction in areas such as the left dorsolateral and medial prefrontal cortex, as well as limbic system structures, primarily the amygdala [11]. There are also pathophysiological indications suggesting the essential role of the cerebellum in the development of depression [12].

Rock climbing, sport climbing, and bouldering are sports activities that have been gaining increasing popularity in recent years. The growing number of climbing gyms nationwide provides the opportunity for regular engagement in this sport regardless of the weather [13]. In sport climbing, climbers move along designated routes up to approximately 30 meters, with fixed safety points placed at sporadic intervals. To protect against the potential consequences of falling, climbers place a rope to the hanging quickdraws [14]. Another variant of sport climbing is bouldering, where route heights are limited to a few meters, and instead of a rope, special mats are used for protection, allowing climbers to safely jump [15]. Sport climbers use dedicated shoes and magnesium carbonate (magnesia) to dry and reduce hand perspiration. Completing a climbing route is recognized by successfully overcoming it without falling or intentionally hanging on the safety points, along with statically holding the last grip with both hands [16].
Climbing and Alleviating Depression Symptoms

In recent years, there has been an emphasis on the significant impact of regular physical activity on mental well-being and proper cognitive function [17]. Physical activity stimulates the sympathetic nervous system and reactivity of the hypothalamus-pituitary-adrenal axis, improving the health status in depressive disorders. Furthermore, it enhances neurogenesis and has a positive influence on brain neurotransmitters such as serotonin, dopamine, endorphins, and norepinephrine [18]. Physical exercise is said to positively affect depression by increasing the release of β-endorphins, which are responsible for a positive mood and improved well-being [19].

Several prospective studies have been published to investigate the impact of climbing as a supportive method in the therapeutic process for patients with depressive disorders. One example is the study by Schwarz and colleagues. In this study, the presence and severity of symptoms were assessed using the Beck Depression Inventory – Second Edition (BDI-II) [20]. The BDI is designed for individuals aged 13 and older, consisting of 21 questions. Each item corresponds to a specific depression symptom, and respondents select statements that best reflect their state over the past two weeks. Responses are scored from 0 to 3 points, based on symptom intensity. The overall score determines the degree of depression as none, moderate, or severe [21]. Results from the study by Schwarz et al. indicate a positive short- and long-term impact of bouldering on the severity of depression. Over the 8-week period, during which participants engaged in climbing once a week for 3 hours, the severity of depressive symptoms, as assessed on the Beck scale, decreased by 7.21 points. The level of depression moved from moderate to mild, and this effect persisted over the 12-month observation period [20].

In the study by Luttenberger and colleagues, two objectives were outlined: the development of an eight-week program that combines psychotherapeutic interventions with bouldering and the assessment of the role of this physical activity in individuals with depression [22]. The study included 22 participants in the experimental group and 25 in the control group. Similar to the study by Schwarz et al., the intervention took place once a week, lasting three hours, over an eight-week period. Participants completed the Beck Depression Inventory II (BDI-II), the Symptom Checklist-90 (SCL-90) questionnaire, the questionnaire on resources and self-management skills (FERUS), and the d2-R attention test. It was determined that depressive symptoms were reduced by an average of 6 points on the BDI-II
scale [22]. Furthermore, the effect of this intervention on the severity of depression was evaluated, showing comparable outcomes to other short-term group therapies [23].

Another study that examined the impact of bouldering on the treatment process of depression was conducted by Stelzer and colleagues. They assessed its effectiveness in reducing depressive symptoms considering general physical activity [24]. The study involved 27 participants, while the control group consisted of 29 individuals. The intervention lasted for 8 weeks, with participants meeting once a week for a three-hour training session. All sessions were supervised by at least two mental health therapists experienced in bouldering and rock climbing. Each of the eight sessions focused on a specific psychological process that, according to the researchers, could play a role in reducing depressive symptoms. Evaluation of all participants was conducted at the beginning of the study and after 8, 16, and 24 weeks. The Beck Depression Inventory II (BDI-II), The Symptom Checklist-90-R (SCL-90-R), and the questionnaire on resources and self-management skills (FERUS) were used to analyze the presence and severity of depressive symptoms. Physical activity intensity was assessed using the FitBit Zip device. The authors observed a decrease in the severity of depression, measured by the SCL-90-R questionnaire, by 6.74 points and by 8.26 points in the BDI-II compared to the results collected before the start of training. All participants averaged 6515 steps per day, considered as "low activity." The conclusions state that the conducted research confirms that bouldering therapy can be effective in treating depression. Even considering other variables such as psychotherapy, the use of antidepressant medications, and the overall level of physical activity, bouldering still proves to be a significant independent factor in reducing depressive symptoms [24].

In climbing, maintaining a high level of concentration and coordination is necessary. These are factors that can successfully counteract cognitive deficits in patients with depression [25]. Focusing on the activity provides an opportunity to temporarily divert attention from negative thoughts and worries, giving a sense of relief [22]. Due to the often-present obsessive thoughts, known as rumination, in depressive disorders, strengthening mindfulness can be helpful in the therapeutic process [26].

**Emotion regulation**

Emotion regulation can be defined as the processes through which individuals influence the emotions they have, when and how they experience them, and how they express it [27]. It
has been proven that deficits in emotion regulation are a significant mechanism in depression [28]. Kleinstäuber and colleagues assessed the relationship between rock climbing and emotion regulation in patients with severe depression. To assess the level of depression, criteria from The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the Patient Health Questionnaire-9 (PHQ-9) were used. Participants engaged in rock climbing for 7 months, once a week for 2.5 hours. It was observed that after completing the training, the numerical results of questionnaires assessing the severity of disorders were significantly lower. The authors concluded that climbing positively influences the ability to regulate emotions, which is crucial in maintaining the effects of depression treatment [29].

One of the most frequently mentioned neurotransmitter systems whose dysregulation is observed in depression is the dopaminergic system [30]. Researchers seek a connection between reduced dopaminergic transmission and increased processing of negative emotional stimuli [31]. Numerous studies have confirmed the impact of learning on dopamine release [32]. When climbing, individuals experience continuous learning of movements, sequences, body positioning, or gripping techniques [33]. As a result, there is a post-training significant increase in dopamine levels [34].

Another advantage of rock climbing is that it can evoke intense positive emotions, such as pride [35]. It is a sport that requires a significant time investment, as well as long-term planning and organization [36]. These factors give participants a sense of fulfillment, satisfaction, and the belief in their ability to achieve goals. Individuals may realize that they are capable of overcoming challenges independent of them (e.g., a difficult, demanding route) and conquering their fears (e.g., fear of heights) [36]. Such experiences contribute to building self-esteem, which is often significantly reduced in depressive disorders [35].

**The role of the cerebellum in depression**

It has been proven that emotionally charged events are easier to remember than neutral events due to their encoding and vivid memories [37]. This phenomenon is known as emotional memory enhancement [38]. Abnormalities in emotional memory have been observed in patients with severe depressive disorders [39]. Individuals with depressive disorders tend to remember or process information that aligns with their mood state.
Therefore, patients with depressive symptoms show an increased tendency to recall negatively charged memories and a decreased tendency to recall positive ones [40]. Xu et al.’s study demonstrates that among individuals with severe depression, emotional memory and the severity of depressive symptoms are associated with structural changes in both the posterior and anterior regions of the gray matter in the cerebellum [41]. The recorded abnormalities within this structure include abnormal activity [42], reduced regional homogeneity [43], increased functional connectivity between the cerebellum and temporal poles [44] and reduced cerebellar volume [45]. Considering these observations, one can hypothetically explain the impact of cerebellar stimulation on the effectiveness of therapy in individuals with depression. Animal studies have compared the vermis of adult rats subjected to challenging acrobatic training with rats subjected to intense physical exercises or those that were inactive. An increase in the size and number of synapses of Purkinje cells was observed in animals undergoing acrobatic training compared to the other two groups of rats. This suggests that learning new motor skills, as opposed to practicing other physical activities, generates new synapses in the cerebellar cortex [46]. On the other hand, impairment of Purkinje cell function leads to abnormal social and motor behaviors [47].

Social Functions of Climbing

Rock climbing requires collaboration between individuals, social interaction, and trust in one's climbing partner. This cooperative aspect contributes to building relationships and bonds with other people [29]. Additionally, in bouldering therapy, participants are trained in mutual support, securing each other, working together to find possible routes, and providing feedback and appreciation for fellow participants. Social interaction can thus serve as a powerful therapeutic element in bouldering therapy [22].

Contact with nature

It is worth noting that rock climbing takes place in a natural environment, outdoors, often in picturesque settings. The contact with nature elicits a decidedly positive emotional response. Moreover, time spent in nature, or even just viewing nature-related scenes, improves concentration and cognitive functioning [48]. Numerous meta-analyses have shown that individuals who regularly experience contact with nature feel more happiness, energy,
and life satisfaction [49]. The positive impact on relationships with others, personal development, and vitality is also emphasized [50].

**Summary**

Further studies focusing on assessing the impact of rock climbing on the therapeutic process of individuals suffering from depression are necessary. The proposed physical activity appears promising as a complementary form of treatment to pharmacological and psychotherapeutic approaches to treating depression.

**Author's contribution**

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