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Determining the index of injuries requiring specialist treatment during boulder climbing on an artificial climbing wall

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Abstract
Introduction: Climbing was accepted as the official discipline at the Olympic Games in Tokyo in 2020. It is a sport that is becoming one of the most popular from extreme sports. The aim of the study is to assess the climbers' reported injuries during bouldering climbing, requiring specialized treatment (calls to the emergency medical team, hospitalization, surgical sewing).
Material and methods: Materials for analysis were made available by the Climbing Center. Climbers were registered in the period from November 2018. until August 2019. All climbers expressed a conscious desire to participate in climbing classes, knew the risks associated with practicing the sport and took full responsibility for their activities, which was confirmed in writing. The trained staff was present during all climbing classes.
Results: Data were collected for 272 days, during which the climbing wall was open 1805 hours. At that time, 4,315 people with diverse experience climbed it. Three injuries requiring intervention of

the emergency medical team and hospitalization were registered. This represents 1.66 injuries per 1000 hours of climbing and 0.7 injuries per 1000 people.
Conclusions:
• Bouldering climbing on an artificial wall is characterized by an injury index requiring specialized treatment in the value of 1.66 injury per 1000 hours of climbing.
• Further studies should also focus on comparing different extreme disciplines in terms of injury rates.
• Further studies on the frequency of injuries in climbing should be characterized by a normalized system of assessment of injuries and time of event registration depending on the type of discipline (difficulty climbing, bouldering), location (hall, rock climbing) and season.

Key words: climbing, bouldering, injuries, accidents, indicator

Introduction

The climbing sports group has become one of the most popular extreme sports (1). In Brazil, in Rio De Janeiro, at the 129th plenary session of the International Olympic Committee (IOC), it was announced that climbing was accepted as the official discipline at the Olympic Games in Tokyo in 2020 (2). Sport climbing is divided into difficulty climbing, time climbing and bouldering. The last of these disciplines is climbing to low heights with a mattress in the form of belaying (1,3). During climbing, the musculoskeletal system is subjected to many loads, thanks to which this sport has a good effect on the balanced development of various parts of the body. Climbing has many physical benefits that have been studied in numerous studies (2,4). Positive influences on the psyche are also noticeable, in the form of reducing the level of anxiety and depression (5). Mastering moves to perfection and increasing difficulty of climbing walls will also lead to injury. Some studies suggest that as experience increases, climbers are exposed to more injuries (3). These issues are increasingly attracting the interest of scientists who in their studies focus on understanding the etiopathology of climbing injuries (1,3).

The aim of this study is to assess the injuries reported by climbers during boulder climbing, requiring specialized treatment (calls to the emergency medical team, hospitalization, surgical sewing).

Material and methods

Materials for analysis were made available by the Climbing Center. The wall at the highest point is 4.5 meters high. It had the required safety approvals established in accordance with the provisions of Polish law. Climbs were registered in the period from November 2018. until August 2019. All climbers expressed a conscious desire to participate in climbing classes, knew the risks associated with practicing the sport and took full responsibility for their activities, which was confirmed in writing. The trained staff was present during all climbing classes. Injuries requiring specialized treatment (medical emergency team calls, hospitalization, surgical suturing etc.) were recorded.

Results

Data were collected for 272 days, during which the wall was open 1805 hours. At that time, 4,315 people with diverse experience climbed it. Three injuries requiring intervention of the emergency medical team and hospitalization were registered. Two people were experienced climbers (climbing experience> 2 years (6.7)), one injured had an 8-month climbing experience. This represents 1.66 injuries per 1000 hours of climbing and 0.7 injuries per 1000 people. They were 2 women (aged 24 and 23) and one man (aged 26). The man suffered injury in the form of dislocation of both elbow-brachial joints, the first woman fractured the tibia and fibula in 1/3 of the distal, the second woman cut the skin in the anterior side of the lower leg, which required surgical suturing. All accidents were related to falling from a height.

Discussion

In the author's study, the injury rate per 1000 hours was equal to 1.66 in boulder climbing on an artificial wall. This result is lower than in the study of Backe et al. who determined it to be 4.2 injuries (per 1000 hours) (8). Research by Kubiak et al. notices that climbing on artificial walls occurred between 0.027 and 0.079 injuries and accidents per 1000 hours (9). On the basis of their research on sport climbers, Neuhof et al. estimate that for every 1000 hours of climbing there is 0.2 injury. Researchers note that the risk of acute injuries per 1,000 hours of participation in sport was lower than in previous studies on general rock climbing and higher than in indoor climbing on artificial walls (10). The observation of Neuhof et al. may explain the author's observation. Van Middelkoop et al., who examined 426 recreational climbers climbing in climbing halls, also presents the etiopathology of climbing injuries in their work. The incidence of climbing-related injuries during the annual observation was 42.4%, with 13 injuries per 1000 hours of climbing. The observed differences in injury rates may also be due to the time of recording events, which was different in each study.

All the injuries described in this work were associated with falling from a height. This relationship is observed by Schöffl et al. who as the most common cause of acute injury in climbing will determine a fall from height (11). Neuhof et al. notes that years of climbing experience ($p < 0.01$), level of difficulty ($p < 0.01$), climbing time per week in summer ($p < 0.01$) and winter ($p < 0.01$)) were correlated with the injury indicator. However age ($p < 0.05$ ($p = 0.034$)), years of climbing experience ($p < 0.01$) and average climbing level ($p < 0.01$) were correlated with the severity of injury (10). In the author's study, the victims usually had significant climbing experience and an average level of climbing, which is consistent with the observations of Neuhof et al. (10). The work of Backe et al. lists the following risk factors for injury: overweight, bouldering, male gender. This study recognizes that older climbers have a lower risk of re-injury (8). According to the author's research, there is no noticeable male predisposition to more frequent injuries. Practicing bouldering on an artificial wall was not characterized by a greater risk of injury in comparison with research on other sports disciplines (8,10,12).

Compared to other extreme sports, boulder climbing on an artificial wall has a low injury rate. According to research by Ernstbrunner et al. canyoning has a rate of 4.2 per 1000 hours (13). Wanke et al. By assessing parkour, determined the risk of injury resulting from it at 5.5 (per 1000 hours) (14), and kite surfing injuries were variable and ranged from 5.9 to 18.5 / 1000 hours (15-17)). It is worth noting that the above-mentioned researchers recorded all injuries, and the author's study focused only on injuries requiring the intervention of a medical rescue team or hospitalization. In mentioned studies, there were also different assessments of injury classification.

Conclusions

- Bouldering climbing on an artificial wall is characterized by an injury index requiring specialized treatment in the value of 1.66 injury per 1000 hours of climbing. The verification of this observation requires further research on the discussed problem, due to the growing popularity of this sport.
- Further studies should also focus on comparing different extreme disciplines in terms of injury rates.
- Further studies on the frequency of injuries in climbing should be characterized by a normalized system of assessment of injuries and time of event registration depending on the type of discipline (difficulty climbing, bouldering), location (hall, rock climbing) and season.

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