BRIEF REPORT

Characterizing the Consequences of Chronic Climbing-Related Injury in Sport Climbers and Boulderers

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Objective.—To describe the association between chronic climbing-related injuries and functional and quality-of-life impairments in chronically injured sport climbers and boulderers.

Methods.—A retrospective, cross-sectional, anonymous survey was developed to assess the association between chronic climbing-related injuries and severity of injury-related pain, impact on activities of daily living, and impact on continued pursuit of rock climbing and other athletic endeavors. This survey was administered to a convenience sample of chronically injured sport climbers and boulderers recruited from several highly trafficked rock climbing websites.

Results.—Four hundred thirty-nine respondents submitted surveys adequate for analysis. These respondents reported 863 chronic injuries. A majority of these were in the upper extremity. Approximately half of respondents reported injury-related pain or functional limitation more than 10 days a month, one quarter reported that their pain caused moderate to severe interference with activities of daily living, most altered their climbing habits as a result of their injuries, and one third indicated that their pain moderately or severely affected their ability to pursue other sports.

Conclusions.—This study is the first to suggest that a subset of chronically injured climbers exists whose injuries may cause significant pain and activities-of-daily-living and sports-related functional limitation.

Key words: rock climbing, chronic injury, sport climbing, bouldering

Introduction

Rock climbing is a sport in which rock climbers use their hands and feet to ascend rock faces. There are 3 basic styles—sport climbing, bouldering, and traditional climbing. These can be distinguished from one another by the means each uses to protect a climber in the event of a fall and by the setting in which each occurs. For example, to protect against a fall, sport climbers use ropes attached to hardware permanently affixed to the climbing surface, boulderers use ground mats and “spot-ers” (fellow boulderers whose task is to redirect or break the momentum of a falling climber), and traditional climbers use ropes attached to removable hardware temporarily affixed to the climbing surface. Additionally,

sport climbing and bouldering take place on artificial indoor surfaces as well as outdoor, natural surfaces, whereas traditional climbing occurs only on the latter.

Rock climbing has grown in popularity in recent years.¹ This may be the result of a combination of factors, including an expansion in the number of indoor rock climbing gyms, which has made climbing more accessible in locations that lack natural rock faces, and heightened public awareness of rock climbing as the sport is featured in public competitions, television shows, movies, and advertisements (Schöffl et al¹ and author’s opinion based on 15 years’ experience as a sport and traditional climber).

The risk of serious injury or death in sport climbing and bouldering is extremely low. This was demonstrated in a recent meta-analysis of more than 400 sport-specific injury studies, which found no reported fatalities and a less than 1% risk of serious injury in those studies that stratified injury severity and specifically reported on sport climbers and boulderers. The risk of minor injury also appears to be relatively low compared with other more mainstream sports. For example, a risk of 0.027 to

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[illegible]

Table 3. Average number of hours climbed per week by respondents' age and sex

[illegible]

org, www.qurank.com, www.neclimbs.com, www.squamishclimbing.com, and www.8a.nu.

The survey was administered to a convenience sample of users visiting these websites, who were eligible for participation based on prespecified inclusion and exclusion criteria. Participants were included if they were 18 years of age or older, had a climbing-related injury that had been present for at least 1 year and did not result from rockfall or groundfall, and had spent at least half of their climbing career sport climbing or bouldering. Participants were excluded if they were younger than 18 years of age, had a medical condition not caused by climbing that affected their ability to climb (for example, asthma or rheumatoid arthritis), or had a climbing-related injury that was present for less than 1 year or had been caused by rockfall or groundfall. They were also excluded if they had not spent at least half their climbing career sport climbing or bouldering.

Rock climbing difficulty is graded on a scale from 5.0 to 5.15, with subdivisions of a, b, c, and d (representing increasing levels of difficulty) assigned to each numerical grade beginning with 5.10. At the time of study

design there was no known consensus regarding an appropriate approach to stratifying survey respondents based on level of difficulty climbed. Therefore, for the purposes of this report respondents were asked to categorize themselves as, on average, able to climb 5.0-5.9, 5.10a-5.10d, 5.11a-5.11d, 5.12a-5.12d, 5.13a-5.13d, or 5.14a and above.

Questions assessing injury location were modeled after those used in previous studies.^{4,5} Severity or functional impact of climbing-related injury(ies) was assessed using 10-point scales modeled after those typically used to assess pain in emergent or inpatient settings, where a rating of 1 to 3 is a “minimal” score, 4 to 6 is “moderate,” and 7 to 10 “severe.”⁶

Survey administration was approved by the University of Vermont Committee on Human Research in the Medical Sciences.

Results

There were 1059 responses to this survey. Of those, 461 were disqualified based on inclusion or exclusion crite-

Table 4. Average grade climbed by respondents' age and sex[illegible]

Table 5. Distribution of injuries by location, sex, and age

Injury location by sex	Age				Subtotal by sex and location
	18–24	25–34	35–54	55+	
Finger/hand					
Male	62	119	51	5	237
Female	6	21	11	2	40
Elbow					
Male	36	76	45	2	159
Female	4	5	10	0	19
Shoulder					
Male	28	76	48	3	155
Female	9	15	16	3	43
Neck					
Male	4	12	5	2	23
Female	0	3	4	0	7
Lower back					
Male	7	12	2	1	22
Female	1	2	0	0	3
Knee					
Male	5	20	11	1	37
Female	2	3	4	1	10
Foot/ankle					
Male	14	19	8	0	41
Female	3	7	3	1	14
Arm (not elbow)					
Male	4	9	4	0	17
Female	0	0	0	0	0
Wrist					
Male	6	11	2	0	19
Female	0	2	0	0	2
Other ^a					
Male	3	5	2	1	11
Female	2	2	0	0	4
Total injuries reported					863

^a Note: A majority of original responses classified as “other” were reclassified into appropriate anatomic categories. Remaining “other” responses included injuries to hips, the iliotibial band, obliques, and middle/upper back.

ria, and 159 provided surveys too incomplete to analyze. Four hundred thirty-nine eligible respondents provided complete or nearly complete surveys adequate for analysis (Table 1). A majority of these respondents (84%) were male. The most-represented age group was 25 to 34 years old (49% of respondents). Most had been climbing for 1 to 5 years or 6 to 10 years (34% and 29% of respondents, respectively), climbed between 3 and 7 or more than 7 hours per week (54% and 37% of respondents, respectively), and climbed on average between 5.10a and 5.12d (82% of respondents; Tables 2–4). They had an average body mass index (BMI) of 23 (SD, 2.4). They reported a total of 863 climbing-related injuries. A

majority of these were in the upper extremity, with 32% being in the finger or hand, 21% in the elbow, and 23% in the shoulder (Table 5).

A majority of respondents (52%) reported that their climbing-related injury(ies) caused them pain or functional limitation 10 days or fewer in a given month. However, for 22% and 19% of respondents, injury-related pain or functional limitation occurred between 11 and 20 days, and greater than 20 days a month, respectively (Table 6). Four hundred thirty-five respondents indicated that on days they were experiencing pain from their climbing-related injury(ies), this pain rated an average of 3.9 (SD, 1.6) on a scale of 1 to 10. However, 8.7% reported severe pain (a rating of 7–10). For most respondents, this pain interfered minimally with their ability to carry out normal daily activities like walking around, driving a car, and lifting heavy objects—an average level of interference was 2.6 (SD, 1.7) on a scale of 1 to 10, but 22% of respondents indicated moderate or severe interference (a rating of 4–10). Most respondents had moderately modified their climbing habits in response to this pain—an average level of modification was 5.7 (SD, 2.5) on a scale of 1 to 10, and experienced moderate effects on their ability to pursue other athletic activities as a result of it—an average of 3.4 (SD, 2.5) on a scale of 1 to 10 (Table 7).

Discussion

A majority of the population was males in the 25- to 34-year-old age group with “normal” range BMIs, they had been climbing less than 10 years, for an average of 3 to 10 hours per week, and most climbed at an “intermediate” level of 5.10a to 5.12d. Although problems of methodology limit the generalizability of demographics reported by prior authors, this population was broadly similar to those discussed in other reports.^{4,5,7,8}

Injuries experienced by the respondents were also broadly consistent with previous reports—most occurred in the upper extremity, with a minority occurring elsewhere.^{3,4,8–10} Although 1 recent report found a more equal distribution of upper and lower extremity injuries

Table 6. Frequency of pain or functional limitation caused by climbing-related injury(ies) in a month

Days experiencing pain	N (%)
10 days or fewer	226 (52)
11–20 days	97 (22)
More than 20 days	85 (19)
0 days	31 (7)

Table 7. Responses to 4 questions^a asking respondents to rate their experiences of pain related to their chronic climbing-related injury on a scale from 1 to 10

Question number	Percentage of respondents selecting severity scale rating of 1–10										Sample statistics		
	1	2	3	4	5	6	7	8	9	10	N	Avg rating	SD
Q1	3.2	16.1	28.7	21.8	14.7	6.9	6.7	0.9	0.5	0.5	435	3.9	1.6
Q2	27.9	34.1	16.1	7.8	5.8	3.9	1.8	1.4	0.7	0.5	435	2.6	1.8
Q3	3	10.8	10.8	11.5	11.7	9.4	13.1	14	6.4	9.2	435	5.7	2.5
Q4	30.5	20	12.4	6.4	9.4	5.3	5.7	6.4	1.1	2.8	435	3.4	2.5

^a Q1: On days when you are experiencing pain from your climbing-related injuries, please indicate how severe your pain is on a scale of 1 to 10; Q2: On days when you are experiencing pain from your climbing-related injuries, please indicate on a scale of 1 to 10 how severely this pain limits your ability to carry out normal daily activities such as walking around, driving a car, lifting heavy objects, and so on; Q3: Please indicate on a scale of 1 to 10 the degree of modification of climbing habits secondary to climbing-related injury; Q4: Please indicate on a scale of 1 to 10 the degree of impact of climbing-related injuries on ability to pursue other athletic activities.

in rock climbers (approximately 43% and 41%, respectively), it explicitly focused on acute, not chronic, injuries,⁷ whereas previous studies were less likely to draw a distinction between the two and, therefore, may not be representative of the population captured in this survey.

Approximately half of respondents reported injury-related pain or functional limitation more than 10 days a month. Severe pain was reported by 8.7% of respondents, and 22% reported that their pain caused moderate to severe interference with activities of daily living. Most respondents had moderately altered their climbing habits as a result of their injuries, and 37% indicated that their pain moderately or severely affected their ability to pursue other sports.

LIMITATIONS

This study has several limitations. First, chronically injured climbers were explicitly recruited. It is possible that these respondents were more likely to have more serious injuries than the broader injured population; the extent of this selection bias is unknown. Also, chronic injuries were defined as those lasting 1 year or longer. A more common time frame used to define chronicity is 6 months or longer. Although choosing 1 year as a cutoff may have selected for respondents with more serious injuries, it also may have excluded respondents who would have been classified as “chronically injured” using a less-restrictive definition. Second, although the inclusion criteria explicitly recruited climbers with a climbing-related injury that had been present for at least 1 year, that same time frame was not made explicit when recruited climbers were then asked to list their injuries (online [Supplementary Appendix](#), questions 9–15). Therefore, it is impossible to say with certainty which injuries in this group of chronically injured climbers truly represent the “chronic” injuries with which respon-

dents qualified for the survey. The true prevalence of chronic injury may have been overestimated as a result. The survey also failed to include space to describe bilateral injuries, which may have led to an underestimation of the prevalence of chronic injury. Because injury prevalence cannot be precisely estimated in this population, the descriptive power of the results is limited. However, the general conclusions and recommendations of the report remain valid. Third, the survey was designed as a convenience sample collected from popular climbing websites; for this reason as well it may not be representative of the broader climbing population. Finally, the study did not attempt to correlate demographic factors with prevalence or experience of chronic injury—nor could this have been done reliably, given the inability to precisely estimate injury prevalence. Therefore, how prevalent chronic climbing-related injuries are, or a prediction of who is more likely to suffer them, is difficult to state.

Conclusions

This study is the first to suggest that a subset of chronically injured climbers exists whose injuries may cause them significant pain and activities-of-daily-living and sports-related functional limitations. This information may be valuable to clinicians with climbers as patients for several reasons. First, clinicians should now recognize that sport climbers and boulderers may have chronic, debilitating injuries as a result of their athletic pursuits. A useful focus of future research on this topic might quantify how frequently sport climbers and boulderers visit healthcare providers and how frequently a chronic, climbing-related injury is the reason for the visit. Second, clinicians may wish to counsel their sport climbing and bouldering patients regarding the potential long-term pain and functional limitation their athletic

pursuits may produce. To add clarity to the counseling message clinicians can deliver, future work in this area should attempt to determine which demographic and sport-specific features (for example, age, sex, difficulty climbed, ratio of indoor to outdoor climbing, and so on) place climbers at higher risk of both chronic injury and pain or functional limitations resulting from chronic injury. Finally, future work should focus on prevention strategies aimed at reducing the prevalence of chronic climbing-related injuries, as well as treatment strategies aimed at reducing the pain and functional limitation of climbers already suffering from such injuries.

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Supplementary data

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.wem.2012.11.010>.

References

1. Schöffl V, Morrison A, Schwarz U, Schöffl I, Kupper T. Evaluation of injury and fatality risk in rock and ice climbing. *Sports Med*. 2010;40:657–679.
2. Backe S, Ericson L, Janson S, Timpka T. Rock climbing injury rates and associated risk factors in a general climbing population. *Scand J Med Sci Sports*. 2009;19:850–856.
3. Jones G, Ashgar A, Llewellyn DJ. The epidemiology of rock-climbing injuries. *Br J Sports Med*. 2008;42:773–778.
4. Josephsen G, Shinneman S, Tamayo-Sarver J, et al. Injuries in bouldering: a prospective study. *Wilderness Environ Med*. 2007;18:271–280.
5. Paige TE, Fiore DC, Houston JD. Injury in traditional and sport rock climbing. *Wilderness Environ Med*. 1998;9:2–7.
6. Gomella LG, Haist SA. Pain management. In: Gomella LG, Haist SA, eds. *Clinician's Pocket Reference*. 10th ed. New York: McGraw-Hill; 2007:323–340.
7. Neuhofer A, Hennig FF, Schöffl I, Schöffl V. Injury risk evaluation in sport climbing. *Int J Sports Med*. 2011;32:794–800.
8. Maitland M. Injuries associated with rock climbing. *J Orthop Sports Phys Ther*. 1992;16:68–73.
9. Wright DM, Royle TJ, Marshall T. Indoor rock climbing: who gets injured? *Br J Sports Med*. 2001;35:181–185.
10. Rooks MD, Johnston RB 3rd, Ensor CD, McIntosh B, James S. Injury patterns in recreational rock climbers. *Am J Sports Med*. 1995;23:683–685.