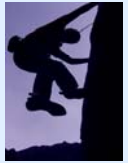


# Predictors of Lower Extremity Injury Among Climbers: A Cross-Sectional Investigation.



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## Introduction

In 1994 and 1995, the National Survey on Recreation and the Environment determined that in the United States, 7.5 million people (3.7%) participate in rock climbing and 9.0 million (4.5%) participate in mountain climbing. Even with large-scale participation in these activities, no epidemiological investigations of lower extremity injury related to climbing activities have been reported.

## Aim

The purpose of the investigation was to determine characteristics of climbers that are predictive of foot and ankle injury.

## Methods

- Climbing injury questionnaires were sent to 3,500 randomly selected members of the American Alpine Club.
- Membership in this organization is limited to those with 2 or more years of climbing experience and as such comprises a nationwide group of experienced climbers.
- 603 climbers responded by returning completed questionnaires.
- The data was compiled and a multivariable logistic regression analysis (SAS<sup>TM</sup> Version 8.02) was performed to identify predictors of injury. Strength of association was quantified using odds ratios.
- Serious injury was defined as frostbite or an ankle sprain or fracture sustained while climbing or approaching a climb.
- Minor injuries were defined as toenail pain and discoloration and foot pain and numbness not associated with serious injury.

**Climbing Injury Questionnaire**

- Name \_\_\_\_\_
- Address \_\_\_\_\_
- City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_
- Years Climbing \_\_\_\_\_ Phone # \_\_\_\_\_
- Age \_\_\_\_\_ Sex \_\_\_\_\_ Weight \_\_\_\_\_ Height \_\_\_\_\_
- Rank the following in order in which you most often participate: (1=most, 5=least)
  - Bouldering \_\_\_\_\_
  - Sport Climbing \_\_\_\_\_
  - Trad Climbing \_\_\_\_\_
  - Big Wall Climbing \_\_\_\_\_
  - Mountaineering \_\_\_\_\_
- Current level of climbing ability (eg. 5.10, A3, or V5) \_\_\_\_\_
- Days per year you climb \_\_\_\_\_
- Do you ever experience pain or discomfort in your feet while climbing? yes/no
- What type of shoes are you wearing when you experience this discomfort? \_\_\_\_\_  
Type Brand/ Description \_\_\_\_\_
- Do you experience numbness or tingling in your feet while climbing? yes/no
- What type of shoes are you wearing when you experience this? \_\_\_\_\_  
Type Brand/ Description \_\_\_\_\_
- Have you ever experienced pain or discoloration of the toenails while climbing? yes/no Please describe: \_\_\_\_\_  
What type of shoes were you wearing when you experienced this? \_\_\_\_\_  
Type Brand/ Description \_\_\_\_\_
- Have you ever sprained an ankle while climbing or approaching a climb? yes/no
- What type of shoes were you wearing when you sprained your ankle? \_\_\_\_\_  
Type Brand/ Description \_\_\_\_\_
- Have you ever broken any bones of the foot or ankle while climbing or approaching a climb? yes/no
- What type of shoes were you wearing when you broke this bone? \_\_\_\_\_  
Type Brand/ Description \_\_\_\_\_
- Have you ever experienced frostbite feet while climbing? yes/no
- What type of shoes were you wearing when you experienced the frostbite? \_\_\_\_\_  
Type Brand/ Description \_\_\_\_\_
- Please give a brief description of the most significant injury or discomfort related to the foot or ankle you have experienced while climbing, including the type of climbing activity and the footwear you were using, at the time the injury was sustained. \_\_\_\_\_

Figure 1. Climbing Injury Questionnaire as sent to study subjects.

## Results

- When considering serious injury, there was a 15% increase in risk associated with a one-point increase in climbing ability based on the Yosemite decimal system ( $p=0.02$ ).
- There was also a 4% increase in risk of serious injury for one-year increase in number of years climbing ( $p<0.001$ ).
- Adjusted for years of climbing, there was a 40% decrease in risk of any injury for a ten-year increase in age of climber ( $p<.001$ ).
- Traditional climbers were more likely to sustain serious injuries ( $p<0.001$  compared to all other climbers).
- Relative to this group, sport climbers were the least likely to sustain serious injury (odds ratio adjusted for years of climbing of 0.48,  $p=0.02$ ) followed by mountaineers (odds ratio 0.57,  $p<.01$ ). Big-wall climbers and boulderers did not have significantly different injury rates.

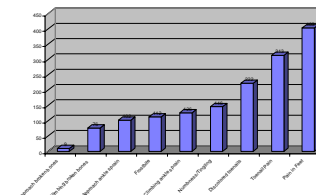


Table 1. Frequency of all injuries.

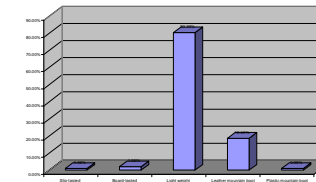


Table 2. Ankle sprains sustained when approaching a climb (n=102).

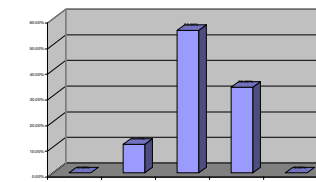


Table 3. Fractures of the foot and ankle when approaching a climb (n=9).

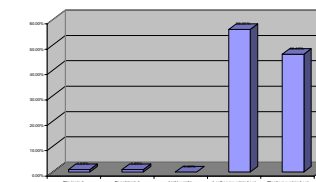


Table 4. Frostbite incidence correlated with footwear (n=112).

## Conclusion

Advanced climbing ability, younger age, and traditional climbing are independently associated with increased risk of sustaining serious injury of the lower extremity while climbing.

## Acknowledgements

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## References

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