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Change in Climbing Performance Measurements after 24 Hours of Endurance Climbing

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Background: The rise of single-day attempts of long rock climbing routes has increased in recent years, especially amongst non-professional climbers. Many rely on search and rescue teams when they become too fatigued to finish. Predicting fatigue is difficult, and there are no studies quantifying the changes in a climber's performance when fatigued.

Objectives: To measure climbers' performance before and after a climbing competition to help predict how fatigued a climber may be after 24 hours of continuous climbing.

Methods: Competitors volunteered to complete measurements of grip strength, static hang time to failure, and time to tie a figure-eight follow-through knot. Measurements were taken during the registration period either the night before or morning of the competition and again within 1 hour after the competition ended. Measurements in the pre- and post-competition period were compared using the paired T-test.

Results: 32 climbers participated. We found that grip strength decreased by 13-14 pounds ($p < 0.001$) and static hang time decreased by 53 seconds ($p < 0.001$) after the competition. There was no significant change in time to tie a figure-eight follow-through knot.

Conclusion: Climbers should expect to see a notable decrease in their grip strength and hang time after 24 hours of continuous climbing. These changes can make it difficult to climb consistently at the same level over a long objective. Future studies on shorter climbing intervals can provide more accurate data on the rate of decline in performance measures, thereby informing climbers on how to plan their climbing objectives to maximize success.