

Comparison of Hand Grip Strength in Elite Rock Climbers and Novice Rock Climbers Using Dynamometer

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Highlights:

- Comparison of the hand grip strength in elite rock climbers and novice rock climbers by using dynamometer was found.
- Sample size was 30
- Three readings were taken from each participant with the interval of one minute.

Abstract

Objective:

The objective is to compare the hand grip strength in elite rock climbers and novice rock climbers by using dynamometer.

Methodology:

Sample size of 30 rock climbers was taken in this study, 15 of them were elite and other 15 were novice climbers. Data collected from different climbing arenas of Lahore. The hand grip strength was measured by hand held dynamometer. Three readings were taken from each participant with the interval of one minute. Participants were completed 5 seconds maximum contraction with the arm in neutral position. Grip strength was measured on lbs.

Results:

Mean of hand grip of right side of elite was 173.16 ± 44.97 lbs and novice climbers were 141.13 ± 38.81 lbs. Statistically significant difference was noted (p-value 0.046). Mean of hand grip of left side of elite was 160.29 ± 56.46 lbs and novice climbers were 106.58 ± 41.88 lbs. The difference was statistically significant (p-value 0.006).

Conclusion:

It is concluded that I have found statistically significant difference between right and left hand grip strength of elite and novice climbers.

Key Words:

Dynamometer, grip strength, muscle strength, elite climber, novice climber

Introduction:

The strength of muscle is acknowledged as a force that is produced during maximal contraction under certain circumstances. Hand grip (grasping) strength is a sustained muscle strain; a physical trait that is responsible for efficacy and proficiency during daily work and sports activities.¹ Muscles in our body have specialized structure that allow keeping the body in a definite position and to provide assistance in daily tasks. According to different types of work, the strength of muscular force differs. Grasping power depends on the blood supply of muscle. Indicator of body strength is hand grip strength.² Forceful flexion of thumbs, wrists and finger joints results in hand grip strength which is due to maximum force exerted by subject in normal conditions. In movement related disciplines like exercise and sports hand grip strength is most commonly used. To differentiate in the performance level of athletes during training is the basic purpose of testing.³ Psychosomatically challenging sport is rock climbing.⁴ During climbing upward or horizontally, hands and feet remain in contact with the climbing surface. Strong Upper limb is required in elite level rock climbing. Good grasping strength is highly recommended as they have to lift their body up by using hand muscles while changing positions.⁵ There is good scope in rock climbing. For climbing upper extremities are used. Through wrist shoulder and elbow forces are distributed which are applied externally. Exertion of hand muscles

should be evaluated during gripping as it is used in rock climbing.⁶ Rock climbing is of three types which are bouldering, lead climbing and top roping if there is climbing less than 15 feet then it is bouldering type. In bouldering, mats are used for protection.⁷ This type of climbing is of quick repetition. If there is secured pre placed rope involved then it is top roping type of climbing. This type allows climbing up to 80 feet. Belayers hold rope at the other end which helps to avoid falling while climbing. Rope climbing is safest form of climbing. Most advanced type of climbing is lead climbing this type rope is placed anchors on natural or artificial terrain and the rope is clipped through carabineers.⁸ The route of existing sport climbing has modified into steep, overhanging routes resulting in the need for high upper extremity strength.⁹ Some researchers have examined the impact of positional deviations of upper extremity on hand grip strength.¹⁰ The increase in grip strength is vital for the improvement in maximum grip endurance in rock climbing.¹¹ Sporting success is influenced by coordinative abilities like technical ability, skills, speed, endurance, physical status and health.¹² Dedication and discipline are strongly required for training of climbing. To prevent injury expertise and concentration is required. Closed crimp, open crimp, pinch grip and open grip are the grip positions that are required during climbing. One or two finger tips are placed into small pockets in rock climbing this is open grip type of climbing.¹³ In crimp grip type of climbing 90° flexion is required on (PIP) and hyper extension in DIP. Small ledge between fingers and thumb is used to pinch in pinch grip.¹⁴

Methodology:

In study sample size was 30 climbers, 15 of them were elite and other 15 were novice climbers were approached from different climbing arenas of Lahore. The hand grip strength was measured by hand held dynamometer. Participants were completed 5 seconds maximum contraction with the arm in neutral position. Three readings were taken from each participant with the interval of

one minute. Grip strength was measured on lbs. Statistical analysis was done by using SPSS 21.

Results:

Rock Climbers	Frequency (%)
Elite	15(50)
Novice	15(50)
Total	30(100)

Table 1: Demographics of Frequency distribution of subjects according to hand grip strength

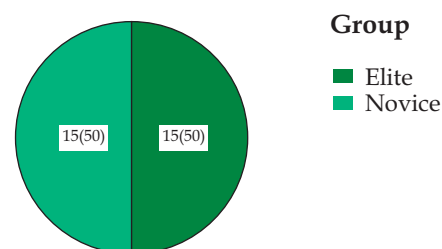


Figure 1: Total population was 30 whereas elite climbers were 15 and 15 were novice climbers.

Discussion:

In this study, I involved two groups, elite and novice rock climbers and I came to know that Mean hand grip of right hand of elite climbers was 173.16 ± 44.97 lbs and novice climbers were 141.13 ± 38.81 lbs.¹⁵ Statistically significant difference is noted (p-value 0.046) whereas Mean hand grip of left hand of elite was 160.29 ± 56.46 lbs and novice players were 106.58 ± 41.88 lbs.¹⁶ The difference was statistically significant (p-value 0.006). Similarly Grant et al., had done such study in 1996.¹⁷ The research purpose was to compare the multiple characteristics of rock-climbers. Non-climbers, elite rock climbers and recreational climbers were taken as subjects.¹⁸ Elite climbers were considered as group 1 as they led climb of highest climb grades in past one year. Group 2 comprised of recreational rock climbers who considered to be in standard grade of climbing and Group 3 includes non-climbers who are physically active but no climbing experience.¹⁹ Multiple tests were performed on subjects. These tests are endurance, flexibility, body strength and human body dimensions. Elite rock climbers had highest test score as they have more strength

endurance and flexibility as compared to recreational and non-climbers.²⁰

Conclusion:

It is concluded that there was statistically significant difference between right and left hand grip of elite and novice rock climbers.

References:

- 01- GÜRER B, YILDIZ MEJBoE. Investigation of Sport Rock Climbers' Handgrip Strength. South African Journal of Sports. 2015; 11(2).10-15.
- 02- Karakoc O, Taskın C, Yüksek S, Özçöven M. Examining hand grip strength in different sports. International Journal of Sport Studies 2015; 5(10):2-6.
- 03- Wiles C, Karni Y, Nicklin J. Laboratory testing of muscle function in the management of neuromuscular disease. Journal of Neurology, Neurosurgery & Psychiatry 1990; 53(5):4-7.
- 04- Watts PBJEjoap. Physiology of difficult rock climbing. South African Journal of Sports 2004; 91(4):61-72.
- 05- Morrison AB, Schöffl VR. Physiological responses to rock climbing in young climbers. British journal of sports medicine 2007; 41(12):52-61.
- 06- Quaine F, Vigouroux L, Martin L. Finger flexors fatigue in trained rock climbers and untrained sedentary subjects. International Journal of Sports Medicine 2003; 24(06):4-7.
- 07- Balás J, Pecha O, Martin AJ, Cochrane DJEJoSS. Hand-arm strength and endurance as predictors of climbing performance. South African Journal of Sports. 2012; 12(1): 16-25.
- 08- Giles LV, Rhodes EC, Taunton JEJSm. The physiology of rock climbing. South African Journal of Sports. 2006; 36(6):29-45.
- 09- BalásJ, Pecha O, Martin AJ, Cochrane D. Hand-arm strength and endurance as predictors of climbing performance. European Journal of Sport Science 2012; 12(1):16-25.
- 10- Richards LG, Olson B, Palmiter-Thomas P. How forearm position affects grip strength. American journal of occupational therapy 1996; 50(2):3-8.
- 11- López-Rivera E, González-Badillo JJ. The effects of two maximum grip strength training methods using the same effort duration and different edge depth on grip endurance in elite climbers. Sports Technology 2012; 5(3-4):0-10.
- 12- Michailov M. Workload characteristics, performance limiting factors and methods for strength and endurance training in rock climbing. Medicina Sportiva 2014; 18(3): 97-106.
- 13- Watts P, Joubert L, Lish A, Mast J, Wilkins BJBjosm. Anthropometry of young competitive sport rock climbers. South African Journal of Sports. 2003; 37(5): 420-4.
- 14- Kubiak EN, Klugman JA, Bosco JA. Hand injuries in rock climbers. BULLETIN-HOSPITAL FOR JOINT DISEASES NEW YORK 2006; 64(3/4):172-200.
- 15- Esposito F, Limonta E, Cè E, Gobbo M, Veicsteinas A, Orizio CJEjoap. Electrical and mechanical response of finger flexor muscles during voluntary isometric contractions in elite rock-climbers. South African Journal of Sports. 2009; 105(1): 81-92.
- 16- AKSIT T, CIRIK GJTSvED. Comparison of static and dynamic balance parameters and some performance characteristics in rock climbers of different levels. South African Journal of Sports. 2017; 19(1):1-7.

- 17- Macias KM, Brown LE, Coburn JW, Chen DDJS. A comparison of upper body strength between rock climbing and resistance trained men. *South African Journal of Sports*. 2015;3(3):78-87.
- 18- Saul D, Steinmetz G, Lehmann W, Schilling AFJJoES, Fitness. Determinants for success in climbing: A systematic review. *South African Journal of Sports* 2019;17(3): 91-100.
- 19- Laffaye G, Levernier G, Collin JMJSjom, sports si. Determinant factors in climbing ability: Influence of strength, anthropometry, and neuromuscular fatigue. *South African Journal of Sports*. 2016; 26(10):51-9.
- 20- Grant S, Hynes V, Whittaker A, Aitchison T. Anthropometric, strength, endurance and flexibility characteristics of elite and recreational climbers. *Journal of sports sciences* 1996;14(4): 01-9