

EVALUATION OF POSTURE AND CORE ENDURANCE IN ELITE JUNIOR CLIMBERS

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Received: 21.01.2021; **Accepted:** 10.03.2021; **Available Online Date:** 27.05.2021

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Cite this article as: Ozdemir F, Tutus N, Kilcik MH, Arslan F, Gurer H, Akcinar F. Evaluation of Posture and Core Endurance in Elite Junior Climbers. J Basic Clin Health Sci 2021; 2: 1-5.

ABSTRACT

Objectives: Climbing, which is a popular sport in recent years, requires high performance and agility levels. The characteristics of climbers are still unclear. This study has been carried out to evaluate the posture and core endurance levels of climbers.

Methods: Forty-nine elite climbers (mean age 15.02±2.68 years) and forty-four healthy sedentary controls (mean age 14.48±1.17 years) participated in this study. Postural assessment was conducted with New York Posture Rating Chart. McGill Core Endurance Test was used to assess the core endurance levels of the participants.

Results: Of the participants included in the study, 58.2% were male and 41.8% were female. 69.3% of the climbers had been involved in climbing for more than 2 years. No statistically significant differences were found between in age, height, and body weight between the groups ($p>0.05$). A difference was observed in the core endurance scores between the groups ($p<0.05$). An increase was seen in the climbers' group when compared to the control group in the scores of the endurance levels of core flexors and right and left lateral core muscles ($p<0.05$). The postures of the climbers' group were also observed to be deteriorated when compared to the control group ($p<0.05$).

Conclusion: The studies conducted on climbing which has become highly popular in recent years are limited considering the importance of the issue. We believe that including posture exercises and endurance training in the exercise programs of the sportspeople will contribute to their climbing performances as well as their overall health.

Keywords: Posture, core endurance, elite junior climbers.

INTRODUCTION

Climbing is a sport that is performed against gravity (1). It is carried out on routes previously prepared by fixing safety points. The interest in climbing has especially increased in recent years and it has become a sports branch that is both performed as a

recreational activity and a branch that is performed on elite sports level throughout the world (2, 3).

Climbing can be defined as the activity of following a route that is created along a climbing surface. The

route does not necessarily have to be upwards all the time. It can also lean toward right and left, and some parts of the route may even include downwards climbing. However, such facts as that climbing is generally performed upwards, includes movement forms that differ from the ones utilized in daily life, and utilizes 10mm-wide strings or other thin metal materials are all risk factors for climbers. The sportsperson tries to adapt to the changing conditions of the environment and gains a dynamic posture by keeping up with climbing (4, 5).

Good posture is the placement of spinal segments and every part of the body in the optimal position in proportion to the segments adjacent to them and the whole body. The Posture Committee of the American Academy of Orthopedic Surgeons defines good posture as “the state of muscular and skeletal balance which protects the supporting structures of the body against injury or progressive deformity irrespective of the attitude in which these structures are working or resting (squat, lying, standing, etc.)” (6, 7). The cost and increased frequency of musculoskeletal system injuries have led the studies on providing good posture to increase.

Climbing is a sport that includes both static attitudes and dynamic moves and in which weight-bearing and balance come to the forefront. Thanks to this

prevent injuries is only possible if the core muscles have enough force and endurance (9). There is a two-fold relationship between climbing and the core muscle force and endurance. Climbing enhances the core muscle force and endurance by simultaneously activating major and minor muscle groups in the center. In turn, the increased core muscle force and endurance affect the performance of the climber positively.

Climbing, which is a popular sport in recent years, requires high performance and agility levels. The exact characteristics of climbers have still not come to light to this day. In this respect, the objective of our study is to pave the way for by comparing the characteristics of the climbers and similarly healthy individuals that lead a sedentary lifestyle or are not involved in any regular sports in their daily lives in terms of posture, core endurance, age, and gender.

MATERIALS AND METHODS

Study Design

The sample of this case-control study was constituted by elite climbers participating in the Turkey Championship of Turkish Mountaineering federation Sport Climbing and healthy sedentary students studying at a school bound by Xxx Provincial Directorate of National Education that were similar to

Table 1: The Socio-Demographic Characteristics of The Groups

Socio- Demographic Characteristics	Climbers group Mean ± SD	Control group Mean ± SD	p*
Age (year)	15.02±2.68	14.48±1.17	0.116
Height (m)	1.61±12.82	1.61±10.82	0.890
Weight (kg)	50.27±11.33	51.57±12.42	0.632

* Mann-Whitney U test

characteristic, it embodies both isometric and dynamic contractions. Nonetheless, the presence of postural control and stability enhances the climbing performance. Core muscle structure embodies 29 paired muscles that support the lumbopelvic hip complex to stabilize the spine, pelvis, and the kinetic chain during a functional movement and these muscles form the basis of all the organ movements (8). The contribution of the core muscles to stability is related to the abilities to perform flexion, lateral flexion, and rotation movements and control the external forces that cause extension, flexion, and rotation. Creating core stability to produce power and

the climbers in terms of age and gender. To carry out the research, the necessary permission and approval were obtained from Xxx University Health Sciences Non-Invasive Clinical Research Ethics Committee (2019/8-29). Each individual participating in the study was informed through "Informed Voluntary Consent Form" and their consent was obtained by signature. Ninety-three individuals in total, forty-nine elite climbers and forty-four sedentary students were included in the study. Climbers aged 12-18 years who have been involved in climbing for at least two years were included. Inclusion criteria for the control group were determined as not participating in regular

physical activity for at least six months and aged between 12 and 18 years. Individuals with surgical history, structural scoliosis, neurological or systemic diseases, and a body-mass index higher than 39 kg/m² were excluded from the study.

Assessment of Posture

To evaluate the posture, the New York Posture Rating Chart was used in our study. This chart observes possible posture changes to occur in 13 different parts of the body, including the head, neck, shoulder, back, waist, hip, and ankle. Based on the observation results, the individual is scored with five (5) if they have a good posture, three (3) if they have a mildly deteriorated posture, and one (1) if there is a serious deterioration. The total points obtained as a result of the study range from 13 to 65. The standard assessment criteria developed for this test are “very good” for a total score of ≥45; “good” for 40-44, “average” for 30-39, “low” for 20-29, and “poor” for ≤19 (10).

For data analysis, the packaged software IBM SPSS Statistics 22.0 for Windows (SPSS Inc., Chicago, IL) was used. In descriptive statistics, the quantitative and qualitative data were summed as mean ± standard deviation and numbers/percentages respectively. The fitness of the variables for normal distribution was examined with the Shapiro-Wilk test. The Mann-Whitney U test was used to compare the data. The p<0.05 value was regarded as statistically significant. In the performed posthoc power analysis, the power of the study (1-β) was found to be 97% when the statistical significance alpha and confidence interval were taken as 5% and 95% respectively in two-tailed hypothesis test (12).

RESULTS

Of the participants included in the scope of the study, 58.2% were male and 41.8% were female. 69.3% of the climbers had been involved in climbing for more than 2 years. The socio-demographical

Table 2: The Comparison of Core Endurance and Posture Scores of the Groups

	Climbers group Mean ± SD	Control group Mean ± SD	p*
Mc Gill Core Endurance Test (s)			
Trunk flexion (s)	72.68±54.60	48.81±52.12	0.034
Trunk extension (s)	37.25±19.23	21.20±14.74	0.001
Right side bridge (s)	34.66±20.45	18.89±14.41	0.001
Left side bridge (s)	42.73±48.82	38.59±32.10	0.634
Posture			
New York Posture Rating scores	40.72±12.32	57.36±5.65	0.001

* Mann-Whitney U test

Assessment of Core Endurance

The McGill Core Endurance Test was used to assess the core endurance levels. The endurance tests were the trunk flexor test, trunk extensor test, and bilateral side bridge tests. The results of previous studies have shown that core isometric endurance tests have a perfect reliability coefficient as follows; the intraclass correlation coefficient of 0.97 for core flexor muscle endurance and back extensor muscle endurance and 0.99 for right and left lateral core muscle endurance. The cases were encouraged to yield isometric postures as long as they could for each test position. The duration during which they kept the correct position was recorded in seconds (11).

Data Analysis

characteristics of the groups included in our study are shown in Table 1. No statistically significant differences were found between in age, height, and body weight between the groups (p>0.05).

Table 1: The Socio- Demographic Characteristics of The Groups

The core endurance test and posture scores and results of the climber and control groups in our study are presented in Table 2. A difference was observed in core endurance scores between the groups (p<0.05). An increase was seen in the climbers' group when compared to the control group in the scores of the endurance levels of trunk flexors and right and left lateral core muscles (p<0.05). The postures of the climbers' group were also observed to be deteriorated when compared to the control group (p<0.05).

DISCUSSION

In the study assessing the posture and core endurance of elite climbers, it has been observed that posture is deteriorated in climbers but their core flexor and lateral core muscle endurance levels are significantly higher.

The results of our study have shown that there were significant differences in postures between the climbing individuals and the sedentary control group matched with them in terms of age and gender. The number of studies assessing the postures of climbers in the literature is limited, and these studies have only assessed sudden postural changes during climbing. Sudden postural changes have been reported to be observed in relation to changes in force (13,14).

Anthropometric features are known to play an important role in posture organization from birth and during the childhood period (15, 16). These features have been reported to show changes in climbers in numerous studies in the literature (17, 18). These support our view that anthropometric changes observed in climbing individuals may lead to postural deformity. Besides, the inclusion of posture exercises in the exercise regimes of these sportspeople is highly important.

Core endurance has a significant effect on a sportsperson's ability to constitute and convey force against extremities (19). The upper and lower extremity muscular force is related to the core endurance of sportspeople and should be assessed as a whole (20). The results of our study have yielded significant differences in favor of the climbers' group compared to the control group in terms of core endurance. Saeterbakken et al. have reported that a ten-week dynamic or isometric core training program enhances the climbing performance among highly trained mountaineers (21). It is known that there is a two-fold relationship between climbing and core muscle force and endurance. Climbing enhances the core muscle force and endurance by simultaneously activating minor and major muscle groups in the center. In turn, the increased core muscle force and endurance affect the performance of the climber positively. We are of the opinion that including endurance training in the exercise programs of the sportspeople will contribute to their climbing performances.

Limitations

Although this study will shed light on the studies to be carried out on the subject, the main limitation of this

study is that the posture of the participants are not evaluated with more objective methods. Another limitation is that our study is a cross-sectional study. Further follow-up studies are needed on this subject.

CONCLUSION

The exact characteristics of the sport of climbing, which has become popular in recent years, are not clear. The studies conducted on this sport are limited considering the importance of the issue. The strength of our study, as far as we know, is the first study in the literature on this subject. We think that our study, in which we determined the changes observed in climbers, will form the basis for further studies on this subject. There is a necessity to determine changes observed in professional sportspeople, choose the right exercise programs, and conduct advanced randomized controlled studies assessing the efficiency of these programs.

Conflict of Interest: The authors declare that they have no competing interest.

Peer-review: Externally peer-reviewed.

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