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Inventing the hand grip strength tester for climbing and determining it`s correlation coefficient with men sport climbers ability

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ABSTRACT

The main goal of this study was inventing a new instrument for testing the hand grip strength, among sport climbers and determining it's correlation coefficient with men sport climber's ability.32sport climbers were participate voluntarily in this study with the average age of 25.6±8.5 years old with the ability of climbing in difficulty grade of 5.10a to 5.13ab in Yosemite grade. The hand grip strength test was taken from all climbers in the same condition. The hand grip strength was divided by body weight, then the result was analyzed by Spear-man correlation coefficient method. It showed a high correlation between climbing ability and the amount of hand grip strength, with the coefficient of0.803.The reliability was also determine by analyzing correlation coefficient between a pretest and post-test with a week interval and the coefficient was 0.912. According to the lack of testing instrument with high correlation between normal hand grip dynamo-meters and climbing ability; so this new instrument seems to be efficient enough as a new instrument for measuring the hand grip strength among sport climbers.

Key words: Hand grip Test, Strength, Climbing performance.

INTRODUCTION

In the race experienced by scientific and athletic fields, it is the athletic fields which are so much younger and do not have the scholarly and scientific support enjoyed by long-established fields. Sometimes, even the usual athletic methods do not meet the pertinent sport needs and new researches are required to be conducted to allow meeting them. Experts in athletics constantly test and assess their athletes in order to improve their performances[1].

Strength is the one factor which determines athletic performance and is searched for in various parts of the body including the fingers. When studying the fingers strength, we usually consider the maximum force of fingers flexors in one repetition [2].

The origination of sport Climbing dates back to 1940s. 48 countries formed the International Federation of Sport Climbing on Jan.27, 2007 and ultimately the International Olympics Committee provisionally accredited the International Federation of Sport Climbing on Dec.10, 2007 to allow the pertinent athletes attend the future Olympic competitions [3].

Since sport climber needs to use a group of small muscles in his upper body to provide the strength required to support and lift his body mass, it is desirable for him to have an upper body which is both powerful and low in mass. Usually the force of the fingers is measured by force gauge when the athlete's fingers apply pressure on the gauge which is kept by the fingers and lower part of the thumb.

Evidently precise and reliable measurement of the fingers force can be useful especially as far as sport climbing is concerned. Although researches conducted in this regard revealed correlation between maximum strength and climbing ability, the figures reported in regard with professional sport climbers are not unusually higher than figures reported in regard with their coevals or persons of the same sex [4].

Moreover, researches revealed a difference in EMG of the forearm muscle, according to dynamometry test of sport climbers' fingers [5].

Hence, it is assumed that common dynamometers and equipment imitating the bilateral pressure used in dynamometers, are not reliable enough for sport climbing. It is hoped that production of a special instrument highly similar to sport climbing conditions allows revealing of the difference between the strength of sport climbers' fingers with that of ordinary people and be used as an efficient instrument to run special tests in this athletic domain. Gaining awareness about athletes' different physical factors is the first step to design exercises and asses the success ability of exercise programs. On the other hand assessing such factors as the strength of fingers, facilitates finding talents which itself leads to more athletic successes.

The main reason underlying the production of this instrument was that no correlation was found between the findings achieved through testing the strength of athlete's fingers using the existing instruments and the real performance of sport climbers participating in this research. This results in inefficiency of talent finding processes and prevents efficient assessment of national sport climbing team's physical adequacy while in more precise levels, it may result in incapable assessment of sport climbers' weaknesses.

MATERIALS AND METHODS

The preliminary stage of designing was to develop a schematic model of the instrument. Next the instrument was designed by solid works software.

Generally, the structure or skeleton of the instrument is designed in a way that the maximum weight of the instrument is focused at its center and it allows the highest degree of stability. In general, the skeleton can be divided into three parts, the bottom part, the middle part and the upper part.

The bottom part is actually the base of the instrument and allows it to be placed on the ground almost still. It allows the stability of the instrument and other parts are assembled on this part.

The middle part functions as the heart of the instrument and includes the weighing system, laptop desk, electric keys, pneumatic and electric joints. It also carries the upper part.

The upper part contains a part of weighing system and it is considered as a base on which the simulator is installed. In general, the weighing system and the simulator linked to it should be produced in a way to prevent the force cause any deformation in the skeleton or any displacement, even a trivial one. For this purpose, the skeletal structure of this part is highly resistant and all joints are made of metal. Due to the design, the sport climber should be tested while he is in a hanging position with his/her both hands. This is highly similar to the position experienced by the sport climber as he climbs.

The weighting System:
To weight, a load cell and a PLC were merged. Load cell transmits data to PLC in the form of electric voltage and the decoded data is transferred to computer through serial gate. A customized software retrieves data and saves it on computer in the form of an excel file.

The statistical society of this research includes male sport climbers and the statistical sample includes 32 male sport climbers who participated voluntarily.

All measurements were conducted inside the sport climbing hall. At first, the sport climbers were asked to attend an information session to be familiar with the test method and to be told of the reasons and benefits of this research. At this session, their questions were answered and after the session they undersigned a letter of consent provided by the company and got practically familiar with the test stages and tools. Each test taker was weighed by the instrument after 15 minutes of warming up. To weigh, the test taker had all his required clothes and equipment on, while he was hung from the biggest simulator holds. His weight as shown by the instrument was reported to him while it was also recorded in the form. Next each sport climber was asked to do the maximum finger force test three times with two-minute intervals between each two test and using the instrument and a certain clip. For this purpose, a special rope linked at one end to the traction system, was buckled to the test taker's harness. He had to grasp the clipand moved his feet upward slowly. Seeing the test taker's feet moving upward, the tester immediately turned on the order key of the traction system and it was the time when the test taker was affected by the excess load. The weighing system were functioning all the time and received, transmitted and recorded data in the computer. Spearman correlation coefficient was used to examine the correlation between the data regarding sport climbers' ability of climbing and their fingers strength reported by sport climbers and ranked after consulting with coaches. For calculations, SPSS 18 software was used.

RESULTS AND DISCUSSION

The conducted study revealed a high degree of correlation between sport climbers' ability of climbing and the strength of their fingers as shown by the new instrument and it had a coefficient of0.803 and the reliability level of 0.010 revealed the proper efficiency of the instrument for running this test. Moreover, the correlation with performance was considered as evidence of validity in this research.

On the other hand, the reliability of the instrument was also tested. For this purpose, 30 test takers were tested again one week later. The said pre-test and post-test were analyzed through Pearson correlation coefficient statistical test and the coefficient was 0.912 which shows an acceptable reliability of the instrument.

CONCLUSION

The research findings revealed a high degree of correlation between the strength of sport climbers' fingers with their performance, however, these findings are not compatible with Kate and Bullen's research conducted in 1993. However, this incompatibility is due to the previous researchers' using of ordinary dynamometers which is not valid as far as sport climbing is concerned.

Moreover this research has made use of fingers strength to weight ratio which is compatible with Watts et al 1993. Making use of simulator in this research developed a condition similar to the real sport climbing condition and the findings were compatible with Shears' research 2001.

Spearman's correlation coefficient statistical test revealed a correlation of0.803 between fingers' strength and performance of sport climbers and this is a significant correlation. On the other hand, level of significance defined for the test was $P<0.010$ which conveys a high degree of reliability, refer to correlation coefficient between a pre-test and post-test with a week interval with the coefficient of 0.912 .The test findings conveyed that the instrument is successful and capable of running fingers strength test for sport climbers.

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REFERENCES

[1] Gharakhanlou R, Kordi MR, Gaeini AA, Alizadeh MH, Vaezmousavi MK, Kashef M, *Physical fitness, skill and psychological evaluation tests for elite Athletes*, national Olympic committee of Iranian, **2006**.
[2] Nicolay W, walker Anna L, *Grip strength and endurance, influences of anthropometric variation,* hand dominance, and gender Christopher, department of biology, university of North Carolina, **2004**.
[3] International Federation of Sport climbing web site (ifsc-climbing.org).

[4] Cuts A, Bollen Sr, *grip strength and endurance in rock climbers*, **1993**.
[5] Watts Phillip B, Jensen Randall L, Gannon Edward, Kobeinia Randy, Maynard Jeremy, Sansom Jennifer, *Forearm EMG during rock climbing differs from EMG during hand grip dynamometry*, Exercise Science Laboratory; Department of Health, Physical Education and Recreation; Northern Michigan University; Marquette, MI, USA, **2008**.