RELATIONSHIP OF HAND-GRIP STRENGTH SCORE WITH SQUAT AND BENCH PRESS 1RM SCORE AMONG ACTIVE FEMALE

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Abstract - This study was conducted aiming to determine the relationship between handgrip strength with various elbow angle and the upper and lower body strength score. 200 university active female were recruited as study participants and performed the 1RM test for bench press and squat. Pearson Correlation was conducted to determine the relationship between handgrip strength and these tests. Results showed that only bench press was significantly correlated with all the handgrip strength test in different elbow angle. Squat on the other hand was found to be significantly correlated with handgrip strength at 180º flexion at dominant hand and full flexion at non-dominant hand. However, the correlation value was found to be low. As shown in the results, although several variables were shown to be significantly correlated, the levels of correlation are very week. Thus, handgrip strength test is not a suitable strength assessment instrument among the active female.

Keywords: *handgrip strength, upper body strength, lower body strength*

1. INTRODUCTION

Physical fitness has been associated with health components (1-3) and physical performance (4, 5). There are evidences demonstrating that physical fitness could predict cardiopulmonary and metabolic disorders (6, 7) and cognitive function (8, 9). As a way to obtain physical fitness profiling, there are many tests that can be conducted in which each of the tests were shown to reflect each

fitness component such as muscular strength, muscular endurance, cardiovascular endurance and many more. Muscle strength is defined as the ability to exert force (10). Having great muscle strength is important as this will easier individuals to perform daily tasks or any other activities that require pushing, pulling and many more.

Various tests exists on determining the muscular strength profile. Despite of the various tests that exist, it is important to select one test that is easy to conduct, not time consuming and put less risk of injury. Female population usually do not want or refuse to join if the test is difficult, seems dangerous and requires too much effort. Among athletes or trained populations, the level of strength was usually tested using different test for each part of body. For example, 1RM bench press for the upper body strength and 1RM squat for lower body strength. Due to its low cost and may be used in a time-efficient manner with unsophisticated equipment, handgrip strength test might be recommended as the test to measure total body strength (11, 12). The question now is that, before proposing handgrip test as the single strength test, does this test really relate to the outcomes that been measured by other tests?

As 1RM bench press is conducted to measure upper body strength and squat to measure lower body strength, will handgrip test that just involve gripping can reflected both these body parts strength? And if so, will the position of elbow during the handgrip test affected the outcomes? This study will be conducted aiming to determine whether handgrip strength with various elbow angle will have significant relationship with the other strength tests score.

2. METHODOLOGY

2.1 Participants

200 females (aged 18-25 years old) from a public university were recruited as study participants. Participants were recreationally active (currently involve in physical activity at least 2 times per week), have knowledge and ability to perform bench press and squat with good technique and free from any injury. Purposive sampling were used, in which students that currently or previously involved in Physical Conditioning course were the priorities to be recruited as study participants. All the participation was based on the volunteerism. Participants were screened prior to testing using The Physical Activity Readiness Questionnaire (PAR-Q). Each participant should read

and signed an informed consent for testing. All the participants were informed that they are allowed to withdraw from the study without having to give any justification. Declaration of Helsinki (2013) has been referred in determining the procedures in this study.

2.2 Procedures

Participants first performed the handgrip strength test with various elbow flexion angle position. Handgrip strength test was performed by participant standing straight with shoulder also straight at the side of the body. Participants performed the tests for three trials, with both dominant and non-dominant limb. Three different elbow flexion angles were performed by them (0, 90, & full degrees) in counterbalanced order. Then, participants performed 1RM test for bench press and squat. All these tests were conducted based on the procedures recommended by National Strength and Conditioning Association (13).

2.2.1   Bench press

The participants positioned themselves supine on the bench and gripped the bar approximately greater than their shoulder width with arms extended. The elbows were positioned out and wrists straight. The bar was slowly lowered through flexion at the elbow joint until the bar touched the chest in line with the nipples. From this position the bar was raised until the arms were fully extended again.

2.2.2   Squat

The participants positioned themselves under the bar with the bar aligned across the middle portion of the trapezius and posterior to the deltoid. The hands grasped the bar at a comfortable point. Upon setting the feet the subject lifted the bar from the rack and began to lower the bar through flexion at the knee joint until the bottom of the thighs were parallel to the floor. When the bottom of the thigh was parallel to the floor and the participants ascended back to the starting position, this were considered as a complete repetition.

2.3 Statistical analysis

Descriptive analysis was used to determine the mean and standard deviation of physical characteristics and data score. Pearson Correlation was used to determine the relationship between handgrip strength and bench press, squat and 5 level sit up score. Statistical significant was accepted at alpha level of less than 0.05. All the statistical analyses were conducted using Statistical package

3. RESULTS

Table 1 showed the physical characteristics of participants involved in this study.

Table 1. Physical Characteristics of Participants

Variables	Mean ± SD
Age (years)	21.40 ± 0.93
Body Mass (kg)	49.06 ± 3.34
Height (cm)	159.80 ± 4.50

Table 2 showed the correlation value of right and left handgrip strength in three different elbow flexion angles (0˚, 90˚ and full degrees) with the 1RM bench press, 1RM squat and 5 level sit up.

Table 2. Correlation of handgrip strength with 1RM bench press, 1RM squat and 5 level sit up

	Bench Press		Squat	
Elbow Angle	r	p	r	p
180 Right	.222	.002	.151	.032
90 Right	.198	.005	.120	.091
Full Right	.207	.003	.091	.199
180 Left	.191	.007	.123	.082
90 Left	.214	.002	.121	.087
Full Left	.218	.002	.181	.010

Results showed that only bench press was significantly correlated with all the handgrip strength test in different elbow angle. Squat on the other hand was found to be significantly correlated with handgrip strength at 180º flexion at right hand and full flexion at left hand. However, the correlation value was found to be low.

4. DISCUSSION

The aim of this study was to determine the relationship between handgrip strength and the 1RM bench press and squat score. As previous study has shown that there were significant differences of score when using different elbow position (11), we include three types of elbow flexion position in this study.

The results showed that handgrip strength was significantly correlated with the 1RM bench press score in all elbow flexion position for both dominant and non-dominant hand. However, despite the significant relationship, the correlation level was shown to be weak. Besides that, correlation analysis on the 1RM squat score showed significant lower relationship in two hand conditions.

From the results, we can say that no matter what hand position was used, using handgrip strength score as a simple tool to measure total body strength seem to be not efficient especially if been used among athletes. This finding is important, to prevent over claiming the efficiency of handgrip strength score in measuring total body strength.

As bench press and squat tests might be a demanding tasks to be performed especially among a team with large number of members or among a team with lack of appropriate equipment and place, researchers could think on other equipment or technique that can be used to make the test easier to be conducted.

5. CONCLUSIONS

As shown in the results, although several variables were shown to be significantly correlated, the levels of correlation are very week. Thus, handgrip strength test is not a suitable strength assessment instrument among the trained female.

6. ACKNOWLEDGEMENT

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