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Study of correlation of hand grip strength and percentage of lean body mass in cricket players

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Abstract:

Hand grip strength has been an indicator for determining strength since 1880. The purpose of our study is to found out correlation of hand grip strength and percentage of lean body mass in cricket players. We have taken 30 healthy cricket players (15-25 years), from district sport academy, playing from last 3 years at university level. They do regular practice and don't have any abnormality of upper arm or any neurological problem, history of fracture of hand. We have measure hand grip strength with help of Sahens hand grip digital dynamometer and taken 3 readings with 1 min rest period in between. Mean of this reading was taken as a final reading. Skin fold thickness measured by Harpendence skin fold caliper at four standard side of body. By making total of skin fold thickness, we found percentage of body fat by standard table of measurement of percentage body fat. Percentage of lean body mass was calculated by standard formula i.e. 100 minus this value of percentage of body fat. We have found positive correlation in handgrip strength and percentage of lean body mass in cricket players. So we can plan to improve percentage of lean body mass which will lead to increase hand grip strength. This will lead to increase in the performance of cricketer as better hand grip strength will lead to better strength in cricket activities like batting, bowling, throwing, fielding.

Keywords: handgrip, lean body mass, skin fold thickness, dynamometry, body fat, skin fold caliper

Introduction:

A sport is a worldwide phenomenon. Amongst sports, cricket events are more popular as it is a great fun and people of all ages can enjoy it. Hand grip strength has been an indicator for determining strength since 1880. It is referred as the muscular strength and force that they can generate with their hands. It is the result of forceful flexion of all finger joints, thumbs, and wrists with maximum voluntary force that the subject is able to exert under normal bio kinetic conditions.[1,2] There are 35 muscles

involved in movement of the forearm and hand, with many of these involved in gripping activities. During gripping activities, muscles of the flexor mechanism in the hand and forearm create grip strength while the extensors of the forearm stabilize the wrist.[3] According to German Sports Scientist Weinick J[4] the characteristic structure of the hand is related to its function as a grasping tool. Grasping ability is made possible by the fact that the thumb can be opposed to the fingers. The fingers and the thumb act as a versatile pair of pliers. They need the palm of the hand as a flat base, on which the object grasped can be held. Extensor digitorum increases the joint compression and enhances the joint stability. Muscles of the hypothenar eminence that are Abductor digiti minimi, Opponens digiti minimi, Flexor digiti minimi are responsible in an active cylindrical grip.

Power grip is the result of following sequence:

1. Opening of the hand.
2. Positioning of fingers.
3. Approaching the fingers to the object
4. Maintaining a static phase that actually constitutes the grip.

Hand grip strength is a physiological variable that is affected by a number of factors including age, gender and body size, weight, height, muscle strength, fatigue, time of the day, age, nutritional status, restricted motion, and pain. Strong correlations between hand grip strength various anthropometric traits (weight, height, hand length etc.) were reported.[5,6] Lean mass is strongly correlated with maximum isometric grip force.[7,8] It is a significant predictor of performance in various sports activities. Anthropometric dimensions and hand grip strength play an important role in cricket.

Correlation of dominant and non-dominant hand grip strength and percentage of lean body mass in cricket players was studied. This study offers the opportunity to enhance, update, and clarify the understanding of the relationships between isometric hand grip strength and anthropometric dimensions.

Material and Methods:

Normal healthy cricket players playing cricket from last 3 years still playing at university level, state level or national level with age group between 15-25 years were selected for study. Subjects who were practicing in daily cricket practice for 2-3 hrs for 6 days a week were included. Subjects suffering from disease or injury or any treatment and surgery that affect upper extremity strength were excluded. Ambidextrous subject using both hands with equal ease were also excluded from study. The present study was approved by the Ethical Committee of college.

All the statistical calculations were performed using the software SPSS for windows (statistical package for social sciences) version 19.0. Pearson correlation coefficient established a correlation of anthropometric parameter with hand grip strength.

$r \geq 0.7$ = highly positive correlation.

$0.4 \leq r < 0.7$ = moderately positive correlation.

$0.4 < r$ = low positive correlation.

The hand grip dynamometry used in our study is of the Digital Hand Grip (DHD-3). Production of SAEHAN Corporation, South Korea. It is type of Electronic hand grip dynamometry. Harpenden's skin fold caliper, straight backed chair, stopwatch were also used.

A standard testing position as approved by American Society of Hand Therapist (ASHT) was being used (Innes[9] 1999, Mathiowetz[10] 1985). How to use the hand grip dynamometry was demonstrated to all subjects.[11.12] Measurements were taken for all subjects around midday i.e. 11.00 hr to 12.30 hr, as it is proved to be significantly stronger at these times.[13] Johanson[14] (1983) found a significant difference between the volume of verbal command and isometric contractions, where increased volume resulted in increased strength. Hence, same tone and volume of instructions are

given in this study each time a test is conducted. To get the maximum reliability of data collected, every subject was asked to squeeze the dynamometer for three times. Mean of these three trials were taken as the readings.[15] Innes[9] recommended a 60 sec rest period between trails on isometric tests. It is recommended that a 3 sec grip is usually sufficient to register a maximum reading hence 3 sec is taken for length of contraction time in this study.[16] Percentage of Lean body mass[17] is calculated by formula;

Percentage of Lean body mass = 100 – Percentage of body fat.

Percentage of Body Fat is calculated[18] by Skin fold calipers a device which measure thickness of a fold of skin with its underlying layer of fat. Bicep skin fold thickness, tricep skin fold thickness, suprailiac skin fold thickness and subscapular skin fold thickness were measured.

Photograph 1: SAEHAN Digital Hand Grip Dynamometer

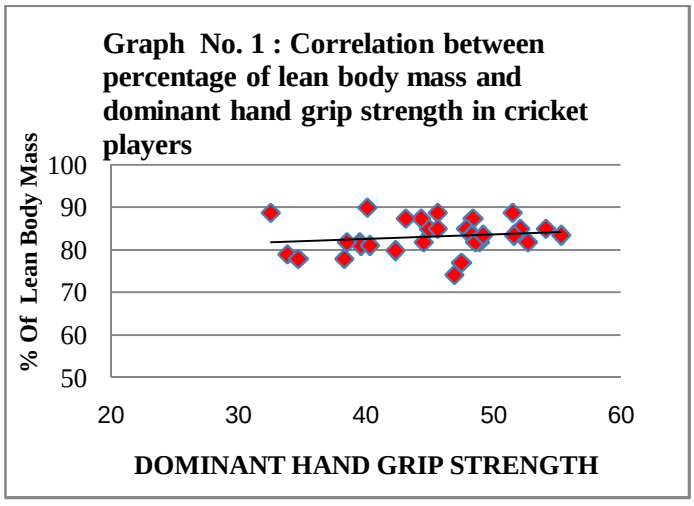
Photograph 2: Measurement of hand grip strength using hand grip dynamometer

Photograph 3: Measurement of skin fold thickness by Harpenden's Skin fold caliper.

Result and Discussion:

Table No. 1: Correlation between percentage of Lean body mass and dominant hand grip strength of Cricket players

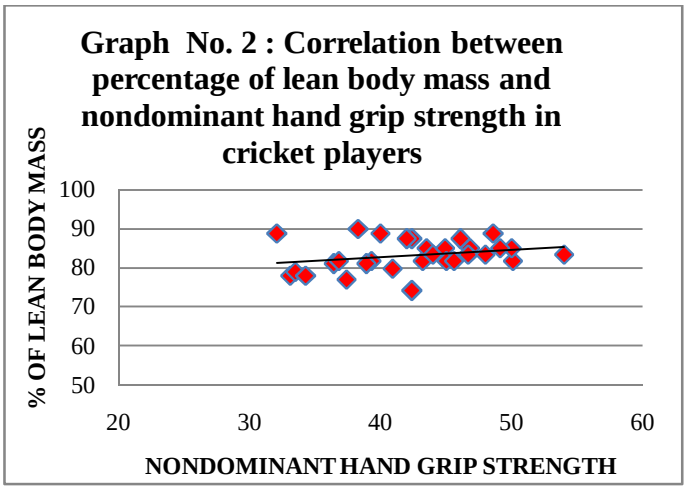
	Cricket players
N (Sample size)	30
Correlation coefficient (r)	0.16
t test	0.88
P value	P >0.05



There is low positive correlation observed between percentage of Lean body mass and dominant handgrip strength in Cricket players which is statistically non significant (P > 0.05).

Table No. 2: Correlation between percentage of Lean body mass and non-dominant hand grip strength of Cricket players

	Cricket players
N (Sample size)	30
Correlation coefficient (r)	0.27
t test	1.50
p value	P >0.05



There is low positive correlation observed between percentage of Lean body mass and non dominant handgrip strength in Cricket players which is statistically non significant (P > 0.05).

Our results shows that dominant and non dominant hand grip strength (DM and NDM HGS) continued to be increased with increase in percentage of lean body mass in cricketers. For dominant hands, in cricketers r = 0.16, t = 0.88 (table 1, graph 1) and for non dominant hands, in cricketers r = 0.27, t = 1.50 (table 2, graph 2). Similar result with our finding i.e. hand grip strength is positively correlated with percentage of lean body mass was shown by Fallahi AA[18] (2011, r = 0.536). Dissimilar result with our finding i.e. hand grip strength is negatively correlated with percentage of lean body mass was shown by author Koley S[19] (2009) (for right hand r = -0.400 and for left hand r = -0.372). More lean body mass will lead to more muscle area, so more lean mass is present in hands also.

As per Klausen K[20] (1990) the maximum force or tension produced by a muscle depends on the cross-sectional area of all the muscle fibres within the muscle- considered as the physiological cross-sectional area. Number of muscle fiber, length of muscle fiber is more when muscle mass is more. Thus, a muscle with a large cross sectional area is able to produce greater maximal force than a muscle with a small cross-sectional area. This may lead to positive correlation of percentage of lean body mass and hand grip strength. So percentage of lean body mass should be maintained within normal range to get proper hand grip strength. Better hand grip strength lead to better performance of cricket players. So proper and specific training, methodologies, diet plans, nutrition factors, practicing hours should be considered and appropriate plan of guideline given to the player. The coach should take daily follow up of all above factors to get better performance.

Summary and Conclusion:

All anthropometric parameters like percentage of lean body mass should be assessed by coach periodically. They should consider all factors affecting it i.e. nutrition, motivation, practicing hours, economical condition, type of exercise. They should give proper guideline to player and arrange proper training programs for gaining percentage of lean body mass. More is understood from demands of the game; training programs are merely based on trial and error and not grounded in science. This means that it is probable that players are not getting adequately prepared for play so there is need for more communication and cooperation between sports scientists involved in cricket research and coach of the game to ensure mutual benefit.

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