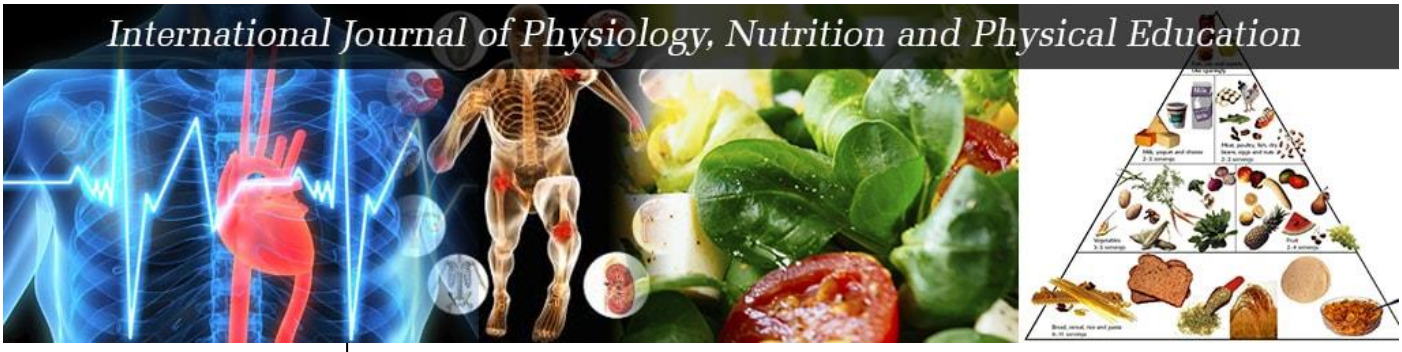

ISSN: 2456-0057
IJPNPE 2020; 5(2): 01-04

www.journalofsports.com
Received: 03-05-2020
Accepted: 05-06-2020

Manoj TI
Professor, Department of Physical Education, Kerala Agricultural University, Thrissur, Kerala, India

Arun C Nair
Assistant Professor, Department of Physical Education, College of Agriculture, Vellayani

Corresponding Author:
Manoj TI
Professor, Department of Physical Education, Kerala Agricultural University, Thrissur, Kerala, India

The seated medicine ball throw as a test of upper body strength in undergraduate students

Manoj TI and Arun C Nair

Abstract
The purpose of this study is to correlate the usefulness of Seated Medicine ball throw (SMBT) as a reliable alternate test to evaluate upper body strength using grip dynamometer of the both hands in a healthy adult sample of male and female under graduate students of Kerala Agricultural University. Subjects selected for the study consist of 141 undergraduate students of College of Agriculture, Vellayani, Thiruvananthapuram, Kerala, India. The sample consist of 98 female and 41 male students. Seated Medicine Ball Throw is also called the medicine ball chest pass performance was taken from the participants using 3 kg and 2 kg medicine ball for male and female students respectively. Peak grip strength of each hand were taken using Digital Dynamometer in Kg. The total grip strength was calculated by adding the average of best performance of each hand in Kg. In this study there were 141 participants (98 female and 41 male students) for SMBT and grip strength variables. SMBT having mean of 2.217 ± 0.788. The grip strength total (average grip strength) having a mean of 28.607 kg ± 10.573. Pearson product-moment analyses revealed significant correlation between participants seated medicine ball throw (SMBT) performance with grip strength left (r= .737), grip strength right (r= .713) and grip strength total (r= .738). Simple regression analysis also indicated that SMBT emerged as a significant predictor of total grip strength and based on the results β the linear prediction equation was developed. The predictor explained 64.4% of variance in SMBT (Adjusted R Squire = 0.644), which means that model is strong enough and SMBT can be used as an alternate test for upper body strength among the under graduate students.

Keywords: Seated medicine ball throw (SMBT), grip dynamometer

1. Introduction
Upper body Strength is the sign of confidence in an individual. Our day to day activity is lot depended on how strong our upper body is. The easiness in activity is directly proportionate to the upper body strength of an individual. "Upper body explosiveness is an essential ability for a wide variety of populations and contributes greatly to activities of daily living that involve reaching, pushing, pulling, lifting, and stabilization (Harris, C., *et al.*, 2011) [8]". The upper body strength is also depended on the size of skeletal muscles and anaerobic endurance. Upper body strength plays a vital role in majority of sporting events. Hence the importance of having sound upper body strength is inevitable in sports and also in daily life. Various studies have been conducted for the development of the performance of an athlete by increasing the upper body strength.

Now the question is how you will assess your upper body strength. The most commonly used and reliable testing technique is 1RM bench press. Limitation of this test is that it requires quite a lot of weights which is expensive. Mayhew, *et al*. 1999) suggested that "1RM bench press test can be time consuming and may increase the possibility of injury including fractures, torn ligaments, and the growth plates of young participants". Another method of testing is modified pull up which requires a bar which is not that expensive compared to 1RM bench press test but it is a bit difficult to handle the equipment.

"Measurement of grip strength can also be an important component in body strength evaluation and can provide us a quick assessment of athlete's upper body strength. Grip strength is correlated with the strength of the upper extremity, general body strength and some anthropometric measurements (Rantanen, 1992) [10] and "therefore is often accepted as an objective measure of upper extremity function (Balogun *et al*., 1991; Bohannon, 1997) [1, 2]".

The most common method of assessment for grip strength is the use of a handheld dynamometer. Handheld grip strength dynamometry is used to measure the muscular force generated by flexor mechanism of the hand and forearm. While running, blocking, tackling, and kicking are the major portions of the game, catching and carrying the ball is becoming increasingly important, so grip strength tends to be one of the most neglected aspects of strength training. Caterisano *et al*. (2001) [3], for example, "found that grip strength correlated with a 1RM bench press in untrained and trained college age males and females". Tietjen-Smith *et al.,* (2005) [16] also found a "direct correlation in grip strength and overall body strength in old females". Moreover, Fry *et al*., (2006) [6] found a correlation between grip strength and performance in American Men Junior Weightlifters. As the assessment of upper body strength is a determining factor while scouting the athletes, a PE teacher in a Government school in India can't afford buying these many weights or equipment. Here comes the need of an inexpensive alternate mode of testing the upper body strength of the students.

The Seated Medicine Ball Throw (SMBT) has been used frequently in performance testing to quantify upper body explosiveness, owing to its feasibility in the practical setting. The SMBT is a relatively simple and easy-to-master movement that can be applied to many different populations including children (Davis, K.L., 2008), athletes (Stockbrugger, B.A. and Haennel, R.G., 2003, Cronin, J. B., and Owen, G. J., 2004), healthy adults (Sato, K., 2018, Vossen, J.F., 2000), and older adults ((Harris, C., *et. al.*, 2011) [8].

Seated Medicine Ball Throw (SMBT) is gaining acceptance as it is an inexpensive, easy way of testing the upper body strength. Another peculiarity of SMBT is that the risk involved in administering the test is very less compared to 1RM Bench press test. Davis KL., *et al.,* (2008) [5] found that," the medicine ball throw test seems to be a valid and reliable measure of upper-body strength for kindergarten children". Harris, C *et al.,* (2011) [8] also found that, "the SMBT is an inexpensive, safe, and repeatable measure of upper body power for the older adult". The findings also suggest that the medicine ball throw test is a valid and reliable test for assessing explosive power for an analogous total-body movement pattern and general athletic ability (Stockbrugger BA and Haennel RG., 2001) [15]. Therefore, the purpose of this study is to correlate the usefulness of SMBT as a reliable alternate test to evaluate upper body strength using grip dynamometer of the both hands in a healthy adult sample of male and female under graduate students of Kerala Agricultural University.

2. Methods and Materials

2.1 Participants

Subjects selected for the study consist of 141 undergraduate students of College of Agriculture, Vellayani, Thiruvanathapuram, Kerala, India. The sample consist of 98 female and 41 male students. The subjects were tested during the regular Physical Education classes. The inclusion criteria adopted was that the subjects should not have any upper body injury in the last six weeks, also they should have participated in the structured exercise as a minimum of once per week, and had not performed any strenuous upper body exercise in the last 48 hours prior. Written consent was taken from the subjects after being briefed verbally on the study procedures.

2.2 Testing Procedures

Seated Medicine Ball Throw is also called the medicine ball chest pass. Purpose of this test measures upper body (arm) strength and explosive power (https://www.topendsports.com/testing/tests/medicine-ball-throw-seated.html)". Intention is to test the strength of the arms only. Equipments required were a medicine ball, 3 kg and 2 kg medicine ball for boys and girls with the back resting against a wall. The medicine ball is held with the both the hands in front of respectively. As per the procedure, the athlete sits on the floor in long sitting position, feet 60 cm apart and the chest. The forearms are positioned parallel to the floor. The participant throws the medicine ball as vigorously, far and straight forward as she/he can. The back should not move away from the wall during this time. The distance from the heal to where the ball lands is recorded. The measurement is recorded to the nearest centimetre (other protocols have used the nearest 0.5 foot or 10cm). The best result of three throws were taken.

Peak grip strength each hand were taken using Digital Dynamometer, with the subject seated upright with feet completely resting on the ground, hip as far back in chair as possible, and the hip and knees positioned approximately at 90º angle . The elbow was on the armrest at approximately 90° and the shoulder of gripping arm was maintained in adduction; the elbow was flexed at ease between about 90° angle and 120°angle. The wrist was positioned between 0º and 30º of extension, and between 0º and 15º ulnar deviation. The dynamometer was held with index finger at the top of the grip, while keeping all fingers on the grip band. Subjects were instructed to exhale during the grip exertion and the grip was held for 3 seconds. A rest period of 15 seconds was allowed between the grip repetitions. The grip strength score was recorded in nearest Kg from the dynamometer. Three repetitions were taken, the maximum reading was noted as the peak grip strength of each hand. Dominant hand was tested first and, the same process was repeated on the other hand, each hand was tested alternately. The total grip strength was calculated by adding the average of best performance of each hand in Kg (Gaurang Baxi, *et al.*, 2017) [7].

2.3 Statistical Analysis

Four (4) different statistical analyses were conducted. Descriptive statistics were administered to provide general characteristics of the sample. The Pearson product moment coefficients of correlation were computed to determine relationship between SMBT and grip strength variables. A simple linear regression was administered to further examine such relationship. SMBT served as a predictor variable and gender and grip strength served as a criterion variable. A multiple linear regression model was developed to predict the SMBT from the criterion variables viz gender and grip strength. It is important to analyse the regression model before inferences based on the model undertaken. The coefficient of determination (R^2) is a measure of the amount of variability in the data accounted for by the regression model. "Adjusted R^2 is more appropriate when evaluating model fit (the variance in the dependent variable accounted for by the independent variables) and in comparing alternative models in the feature selection stage of model building (Shieh, Gwowen (2008) [12].

3. Results

Table 1: Descriptive Statistics of Undergraduate Students

Variables	Mean	Std. Deviation	N
Seated medicine Ball Throw(SMBT)	2.217	0.788	141
Grip Strength Left	27.914	10.693	141
Grip Strength Right	29.300	10.850	141
Grip Strength Total	28.607	10.573	141

In this study there were 141 participants (98 female and 41 male students) for SMBT and grip strength variables. SMBT having mean of 2.217 ± 0.788. The grip strength total (average grip strength) having a mean of 28.607 kg ± 10.573 (see Table 1).

Table 2: Correlation between the predictor and criterion variables

Variables	Seated medicine Ball Throw (SMBT)	Grip Strength Left	Grip Strength Right	Grip Strength Total
Seated medicine Ball Throw (SMBT)	1.000	0.737	0.713	0.738
Grip Strength Left		1.000	0.927	0.981
Grip Strength Right			1.000	0.982
Grip Strength Total				1.000

As shown in Table 2, Pearson product-moment analyses revealed significant correlation between participants seated medicine ball throw (SMBT) performance with grip strength left (r= .737), grip strength right (r= .713) and grip strength total (r= .738). Simple regression analysis also indicated that SMBT emerged as a significant predictor of total grip strength and based on the results β the linear prediction equation was developed.

Table 3: Coefficients of dependent variable Seated medicine Ball Throw (SMBT)

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
		β	Std. Error	Beta		
1	(Constant)	4.417	0.165		26.824	0.000
	Sex	-1.298	0.094	-0.761	-13.847	0.000
2	(Constant)	2.763	0.350		7.888	0.000
	Sex	-0.811	0.127	-0.476	-6.404	0.000
	Grip Strength Total	0.029	0.006	0.389	5.233	0.000
a. Dependent Variable: Seated medicine Ball Throw (SMBT)						
Gender = Male -1, Female-2, GST= Grip Strength Total						
Equation: SMBT = 2.763-0.811(Gender) X 0.029(GST)						

4. Discussion and Conclusion

Although there are several researches examining the grip strength of athletes (Giardina *et al*., 1997; Fry *et al*., 2006; Tietjen-Smith *et al*., 2005) [6, 16], the relationship between grip strength and upper body performance has not been clearly explained. The medicine-ball throw test was designed to assess upper-body power (Stockbrugger, B., and Haennel, 2001) [14]. Harris C, *et al.*, (2011) [8] found that, for the older adult, the SMBT appears to be highly reliable test of upper body power. The SMBT is an inexpensive, safe, and repeatable measure of upper body power for the older adult. No significant difference was found between mean throw distance and age; therefore, upper-body power did not change with age. Mayhew *et al*. (1999) [9] and Viitasalo (1998) also found "that age was not a contributing factor to upper-body power in young athletes". Therefore, the purpose of this study, specifically, was to investigate if the Seated Medicine Ball throw (SMBT) could be used to predict upperbody strength of under graduate students of Kerala Agricultural University.

The results of this study showed that Seated medicine ball throw (SMBT) test successfully predict the upper body strength of under graduate college students when used the grip strength test as a standard test to measure upper body strength of participants. This result is in consistent with some studies (Tietjen-Smith *et al*., 2005; Fry *et al*., 2006) [16, 6] "indicating a direct correlation in grip strength and upper body strength". Moreover, Harris C, *et al.*, (2011) [8] found that, "for the older adult, the SMBT appears to be highly reliable test of upper body power. Its validity relative to the maximal force exerted during the explosive push-up (EPU) is modest". The effect size of this analysis (d=3.52) was found to exceed Cohen's (1988) convention for a small effect size. The predictor explained 64.4% of variance in SMBT (Adjusted R Squire = 0.644), which means that model is strong enough and SMBT can be used as an alternate test for upper body strength among the under graduate students. Because the present study is one of the few studies to examine relationships between seated medicine ball throw and upper body strength (grip strength) in a under graduate college students setting, more research is needed to confirm or refute this finding.

References

1. Balogun JA, Akomolafe CT, Amusa LO. Grip strength: effects of testing posture and elbow position. Archives of Physical Medicine and Rehabilitation. 1991; 72:280-283.
2. Bohannon RW. Reference values for extremity muscle strength obtained by hand-held dynamometer from adults aged 20 to 79 years. Archives of Physical Medicine and Rehabilitation. 1997; 78:26-32.
3. Caterisano A, Yurich S, Bonfiglio C, Fowler A, Greer B, Brown CW. The correlation between maximal grip strength and 1RM bench press: the effects of Sport specific resistance training and gender. Medicine & Science in Sports & Exercise. 2001; 33(5(S1)):S244.
4. Cronin JB, Owen GJ. Upper-body strength and power assessment in women using a chest pass. Journal of Strength and Conditioning Research. 2004; 18(3):401-404.
5. Davis KL, Kang M, Boswell BB, DuBose KD, Altman SR, Binkley HM. "Validity and reliability of the medicine ball throw for kindergarten children," Journal of Strength Conditioning Research, 2008, 2004; 22(6):1958-1963.
6. Fry AC, Ciroslan D, Fry MD, LeRoux CD, Schilling BK, Chiu LZ. Anthropometric and performance variables discriminating elite American junior men weightlifters.

Journal of Strength and Conditioning Research. 2006; 20(4):861-866.
7. Gaurang Baxi, Shamika R Tigdi, Tushar J Palekar, Soumik Basu, Kedar Sule. Static and Dynamic handgrip Endurance in Young Adults. Available from: https://www.researchgate.net/publication/322424192_Static_and_Dynamic_Handgrip_Endurance_in_Young_Adults [accessed May 19 2020], 2017.
8. Harris C, Wattles AP, De Beliso M, Sevene-Adams PG, Berning JM, Adams KJ. The seated medicine ball throw as a test of upper body power in older adults, J Strength Cond Res. 2011; 25(8):2344-8
9. Mayhew JL, Ware JS, Bemben MG, Wilt B, Ward TE, Farris B *et al*. The NFL-225 test as a measureof bench press strength in college football players.Journal of Strength and Conditioning Research. 1999; 13:130-134.
10. Rantanen J. "Occupational Health Services in Europe" NIVA Nordic News Letter. 1992; 4:2-6.
11. Sato K, Carroll KM, Wagle JP, Lang HM, Smith AP, Abbott JC, Hierholzer KM, Stone MH. "Validation of inertial sensor to measure velocity of medicine balls," Journal of Trainology. 2018; 7(1):16-20.
12. Shieh, Gwowen. "Improved shrinkage estimation of squared multiple correlation coefficient and squared cross-validity coefficient". Organizational Research Methods. 2008; 11(2):387-407.
13. Stockbrugger BA, Haennel RG. Validity and reliability of a medicine ball explosive power test., J Strength Cond Res. 2001; 15(4):431-8.
14. Stockbrugger BA, Haennel RG. "Contributing factors to performance of a medicine ball explosive power test: a comparison between jump and nonjump athletes," Journal of Strength Conditioning Research. 2003; 17(4):768-774.
15. Stockbrugger B, Haennel R. Validity and reliability of a medicine ball explosive power test. J Strength Cond. Res. 2001; 15:431-438.
16. Tietjen-Smith T, Smith S, Martin M, Henry R, Weeks S, Bryant A. Grip strength in relation to overall strength and functional capacity in very old and oldest females. Physical and Occupational therapy in Geriatrics. 2005; 24(4):63-78.
17. Viitasalo J. Evaluation of explosive strength for young and adult athletes. Res. Q. Exerc. Sport. 1988; 59:913.
18. Vossen JF, Kramer JF, Burke DG, Vossen DP. "Comparison of dynamic push-up training and plyometric push-up training on upper-body power and strength," Journal of Strength and Conditioning Research. 2000; 14(3):248-253.
19. Corresponding Author: Dr. Manoj TI. Professor & Head, Dept. of Physical Education, Kerala Agricultural University, KAU.P.O., Thrissur-680 656, Email: manoj.ti@kau.in, Mobile: 9447063339.