Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

European Journal of Experimental Biology, 2013, 3(5):469-473

ISSN: 2248 –9215
CODEN (USA): EJEBAU

Morphological characteristics and grip strength of physical education students

Sukanta Saha

Department of Physical Education, Memari College, Memari, Burdwan, West Bengal, India

---

ABSTRACT

Physical activity is often recommended as a strategy for maintaining active life style. Although associations among physical activity and hand grip strength have been documented among adults and children, they have not been studied extensively in college aged physical education populations. This study employed an ethnically diverse sample of 290 male college level (mean age 23.70 years) physical education students from eight teacher's training institution, situated in West Bengal, India to examine the relationship among different morphological characteristics to hand grip strength. Results indicate that the mean value of the hand grip strength of physical education student was higher in the right hand (50.08) than left hand (47.37). BMI, % body fat, lean body mass, % skeletal muscle mass, endomorphy and mesomorphy were significantly positive correlations ($p \leq 0.01$) with both hand grip strength. Whereas both hand grip strength had significantly negative correlation ($p \leq 0.01$) with ectomorphy component. The mean somatotype of the physical education student is endomorphic mesomorph (3.78-4.73-2.87).

Kew words: Physical Activity, Grip Strength, Physical Education, Somatotype.

INTRODUCTION

Regular physical activity is one of the most important ways that individuals maintain and improve their physical health, mental health, and overall well-being. A student who participates in regular physical education is more likely to remain motivated to stay healthy and physically active throughout his or her adult life. Additionally, the goal is to promote life-long enjoyment and pursuit of physical activity and sports. The physical education standards that follow specify the essential skills and knowledge that all students need in order to build and maintain a healthy life style.

Physical education needs to be an integral part of every student's education. Through physical education classes, students learn not only how their bodies move and how to perform a variety of physical activities, but they learn the health-related benefits of regular physical activity. Physical education, when effectively implemented and coordinated, can provide a framework in which students can develop physically, mentally, socially, and emotionally to become confident, independent, caring, and resilient individuals. It also provides a positive avenue to build self-esteem and social responsibility keys to ameliorating a number of social ills, including crime and violence.

Regular participation in physical activity is a primary factor in the promotion of health and prevention of disease. Children are facing a major health crisis due to their sedentary lifestyle. Many healthy behaviour, initiated during childhood, are related to leading causes of disease, disability, and death. Researchers indicate that giving children an opportunity to engage in daily, vigorous exercise enables them to avoid, or at least reduce, these health risks while

enhancing their level of fitness and their academic achievement. Moreover, physical education empowers students to not only enhance their own level of fitness, but also to promote fitness in their families, schools, and communities.

Physical education is structured; it is not free play or recess. In its totality, physical education builds a foundation of practices that promote and facilitate the attainment of movement skills, fitness, and physical activities that can be maintained throughout life. Regular take part in physical activities that help to develop and maintain musculo-skeletal health, muscular strength, endurance flexibility and bone health [1]. Although associations among physical activity and strength have been documented among adults and children by the different researcher, they have not been studied extensively in college aged physical education populations. Thus, the purpose of the present study was fiend out morphological characteristics of physical education students and their relationship to hand grip strength.

MATERIALS AND METHODS

Sample:
The present study was conducted on 290 young college levels male students (age range 20-30 years) who were completed one year Bachelor of Physical Education (B.P.Ed) course and took part in obligatory physical activities under their course of study. The subjects were selected from eight colleges located in 8 different districts of West-Bengal in India irrespective of their caste, religion, dietary habits and socio-economic status.

Anthropometric Measurements:
The age of the subjects were calculated from the date of birth as recorded in their institution. Height, weight, five muscle girths (upper arm, fore arm, chest, thigh and calf), four bone diameters (humerus, bistyloid, femur and bimalleolus), and eight skinfolds thickness (triceps, sub-scapular, suprailiac, pectoral, axilla, abdominal, thigh and calf) of the subjects were measured with standard equipments and procedure. The examinations were conducted according to the guidelines of the International Society for the Advancement of Kinanthropometry (ISAK) [2]. The Technical Error of Measurement (TEM) was lower than 5% for skinfolds and 2% for the other measurements.

Body composition and Somatotype:
For calculating % body fat of the subjects (Jackson and Pollock-1978, body density) Siri equation (1956) was adopted. Poortman's (2005) and Drinkwater et al. (1986) formula was taken up for assessing skeletal muscle mass and skeletal mass respectively. Measurement of Body Surface Area (BSA) of the subjects Mosteller's Formula (1987) was used. Somatotype components (endomorphy, mesomorphy and ectomorphy) of the subjects were calculated according to Carter and Heath anthropometric method (1990).

Hand Grip Strength:
The grip strength of both right and left hands was measured using a standard adjustable digital handgrip dynamometer (Takei Scientific Instruments Co., Ltd., Japan) at standing position with shoulder adducted and neutrally rotated and elbow in full extension. The dynamometer was held freely without support, not touching the subject's trunk. The position of the hand remained constant without the downward direction. The subjects were asked to put maximum force on the dynamometer thrice from both sides of the hands. The maximum value was recorded in kilograms. Total grip strength was calculated by adding both hand grip strength divided by two (right hand grip strength + left hand grip strength ÷ 2). Anthropometric equipments and hand grip dynamometer were calibrated before each assessment. All subjects were tested thrice and the best of three attempts was recorded. There was a one minute resting period between each hand grip strength testing in order to overcome fatigue.

Statistical Analysis:
Descriptive statistics (mean, ± standard deviation and standard error of mean) were determined for directly measured and derived variables. Pearson's correlation coefficients were used to establish the correlations of handgrip strength with other variables in physical education students. Data were analyzed using SPSS (Statistical Package for Social Science) version 17.0. A 5% level of probability was used to indicate statistical significance.

RESULTS AND DISCUSSION

Descriptive statistics of muscle girth, bone diameter, and skinfold thickness of physical education students were presented in table 1. Table 2 shown the distribution of mean value, standard deviation (S.D) and standard error of mean (SE Mean) of body composition variables, somatotype components and hand grip strength of subjects. Pearson correlation of body composition variables and somatotype components with right handgrip and left hand grip strength was presented in Table 3. All the variables were statistically positively significant correlation either at 0.01 or at 0.05 level with right and left hand grip strength, except % skeletal mass and body surface area. Whereas both hand grip strength had significantly negative correlation ($p \leq 0.01$) with ectomorphy component.

Table 1. Descriptive statistics of anthropometric traits

Variables		Mean	S.D	SE Mean
	Age (y)	23.70	1.99	0.117
	Height (cm)	168.19	5.60	0.33
	Weight (kg)	60.17	5.52	0.325
Muscle Girth (cm)	Upper Arm	28.97	1.76	0.103
	Fore Arm	24.87	1.34	0.079
	Chest	87.44	4.83	0.284
	Thigh	50.71	3.07	0.180
	Calf	33.79	1.92	0.113
Bone Diameter (cm)	Humerus Biepicondyler	6.79	0.27	0.015
	Bistyloideus	5.34	0.29	0.017
	Femur Biepicondylar	9.51	0.48	0.028
	Bimalleolar	7.18	0.38	0.022
Skinfold Thickness (mm)	Triceps	10.06	2.14	0.126
	Subscapular	12.67	3.64	0.214
	Suprailiac	14.58	4.51	0.265
	Pectoral	10.26	3.10	0.182
	Axilla	9.94	3.01	0.177
	Abdomin	16.50	5.15	0.302
	Thigh	12.16	2.79	0.164
	Calf	10.15	6.10	0.359

Table 2. Descriptive statistics of body composition, somatotype and hand grip strength

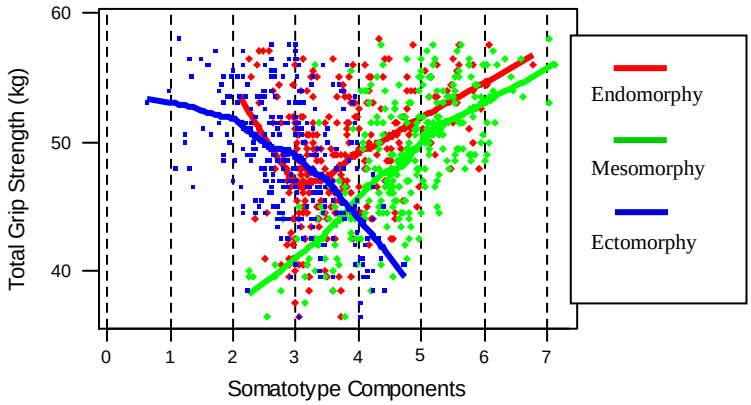
Variables		Mean	S.D	SE Mean
Body Composition	BMI	21.24	1.35	0.079
	% Body Fat	11.77	3.05	0.179
	Lean Body Mass (kg)	52.83	4.54	0.267
	% Skeletal Muscle Mass	50.30	3.54	0.208
	% Skeletal Mass	13.43	0.98	0.058
	Body Surface Area (m^2)	1.67	0.09	0.005
Somatotype	Endomorphy	3.78	0.87	0.051
	Mesomorphy	4.73	0.87	0.051
	Ectomorphy	2.87	0.74	0.043
Grip Strength	Right Hand (kg)	50.08	4.97	0.292
	Left Hand (kg)	47.37	5.11	0.300
	Total (kg)	48.72	4.81	0.283

Table 3. Pearson correlation of body composition and somatotype with hand grip strength

Variables		Grip Strength	
		Right Hand	Left Hand
Body Composition	BMI	0.404**	0.396**
	% Body Fat	0.366**	0.327**
	Lean Body Mass (kg)	0.118*	0.116*
	% Skeletal Muscle Mass	0.393**	0.427**
	% Skeletal Mass	0.016	0.003
	Body Surface Area (m^2)	0.034	0.017
Somatotype	Endomorphy	0.381**	0.340**
	Mesomorphy	0.632**	0.661**
	Ectomorphy	-0.469**	-0.465**
*** indicate p<0.01& * indicate p<0.01*			

Present study revel that the mean value of the hand grip strength of physical education student was higher in the right hand (50.08) than left hand (47.37). As the right hand of the subjects was the dominant hand, the subjects showed greater grip strength in that hand than the non-dominant hand, which might be because of difference in muscle strength between two hands. Incel et al. [3] also reported that the hand grip strength is to be higher in dominant hand with right handed subjects, but no such significant differences between sides could be documented for left handed people. However, Bagi et al. [4] noted greater grip strength in the dominant hand both in cases of right hander and left hander. The findings of this study were also supported by the research work of O'Driscoll et al. [5], Richards et al. [6] and Saha S. [7]. They reported higher grip strength values in the dominant hand compared to the non-dominant hand. However, there was a disagreement with above finding with that of the work done by Reikeras [8] and Harkonen et al. [9] who reported that there was no significant difference in grip strength of dominant hand and non dominant hand. According to Rabergs and Roberts [10], one explanation for the differences in grip strength may be due to the use of more muscle and muscular hypertrophy in the dominant hand which leads to increased strength.

Figure 1. Scatter plot of hand grip strength of physical education students in respect to their somatotype components



In the present study BMI, % body fat, lean body mass and % skeletal muscle mass of the physical education students were significantly positive correlations ($p \leq 0.01$) with both hand grip strength. The literature describes a positive association between right and left hand grip strength with weight, height, BMI, lean body mass and body surface area [11-17]. Luna-Heredia et al. [18] described that body height is directly correlated with hand grip strength, possibly because this factor is more closely related to the lean body mass. The current results were also consistent with others researches that report positive associations of body fat with handgrip strength, as evidenced by studies undertaken by Deforche et al., Casajus et al. and Artero et al. [19-21].

Figure 1 represents the scatter plot of hand grip strength of the physical education students in respect to their somatotype components. In present study the mean somatotype of the physical education students is endomorphic mesomorphy (3.78-4.73-2.87) which is similar to the previous findings reported by Saha S. and Sterkowicz-Przybycien K.L. [22-23]. Endomorphy was positively related with handgrip strength, these being the same tests in which % body fat had a positive association. Here, endomorphy expresses the degree of adiposity development [24]. Mesomorphy reflects muscle development positively associated with strength and motor performance in general [24]. This component is highly positively correlated with hand grip strength. Ectomorphy reflects linearity and muscular hypotonic [25]. On this, there were significantly negative associations for ectomorphy with hand grip strength.

The physical education students of the present study have grater hand grip strength in both hands than the district and state level cricketers of Amritsar as reported by Koley et al. [16]; and Physiotherapy students of Bangalore [26] whereas lower grip strength was found than the college football players as reported by Futbol et al. [27].

CONCLUSION

Physical education students can be regarded as a group of the population with a large volume of physical activity, therefore a significant development of their physical build and strength was observed. It was concluded that physical education students from different countries have similar patterns of dominant mesomorphy and moderate endomorphy, but differ with respect to grip strength. As the present study is examine relationships between grip strength and various morphological characteristics in men physical education college aged students of few districts in India, so more research on larger area and other sex is needed to confirm or refute this finding.

Acknowledgments
I would like to express my gratitude to my research guide, Prof. Brajanath Kundu who always guides me. The author would like to thanks all Physical Education students for their selflessness job and voluntary participation in this investigation as the subjects.

REFERENCES

[1] Biddle S, Sallis JF, Cavill N, *Health Education Authority*, London, **1998**.
[2] Ross WD, Marfell-Jones MJ, *Kinanthropometry*, London: Human Kinetics, **1991**.
[3] Incel NA, Ceceli E, Durukan PB, *Singap Med J*, **2002**, 43, 5, 234-237.
[4] Bagi JC, Kundachi PS, Goudar SS, *Al Ameen J Med Sci*, **2011**, 4, 1, 87-91.
[5] O'Driscoll SW, Horii E, Ness R, *J Hand Surg*, **1992**, 17, 1, 169-177.

[6] Richards LG, Olson B, Palmiter-Thomas P, *Am J Occup Therap*, **1996**, 50, 2, 133-138.
[7] Saha S, *OIIRJ*, **2013**, 3, 4, 94-103.
[8] Reikeras O, *Archv Orthop Trauma Surgery*, **1983**, 101, 223-224.
[9] Harkonen R, Piirtomaa M, Alaranta H, *J Hand Surg*, **1993** 18, 1, 129-132.
[10] Rabergs G, Roberts L, *Archv Phys Med Rehab*, **1997**, 76, 410-414.
[11] Chatterjee S, Chowdhuri BJ, *J Hum Ergol*, **1991**, 20, 41-50.
[12] Koley S, Singh J, Sandhu JJ, *J Hum Sport & Exer*, **2010**, 5, 389-99.
[13] Koley S, Singh J, Kaur S, *Surb J Sports Sci*, **2010**, 5, 35- 40.
[14] Belgin B, Tuncay C Aydin O, *Okajimas Folio Anat Jpn*, **2003**, 8, 63-70.
[15] Benefice E, Malina R, *An Hum Biol*, **1996**, 23, 307-21.
[16] Koley S, Yadav MK, *Facta universitatis: Phy Edu and Sports*, **2009**, 7, 113-23.
[17] Koley S, Kaur N, Sandhu JS, *India. J Life Sci*, **2009**, 1, 57-62.
[18] Luna-Heredia E, Martin-Pena G, Ruiz-Galiana J, *Clinical Nutrition*, **2005**, 24, 250-258.
[19] Deforche B, Lefevre J, De Bourdeaudhui I, et al. *Obes Res*, **2003**, 11, 434-441.
[20] Casajus J, Leivia M, Villarroya A, et al. *Ann Nutr Metab*, **2007**, 51, 3, 288-296.
[21] Artero E, Espana-Romero V, Ortega F, et al. *Scand J Med Sci Spor*, **2010**, 20, 3, 418-427.
[22] Saha S, *Annals of Biological Research*, **2013**, 4, 3, 95-100.
[23] Sterkowicz-Przybycien KL, *Biol. Sport*, **2010**, 27, 195-201.
[24] Malina R, Bouchard C, *Champaign, Illinois*, Human Kinetics, **1991**.
[25] Dumith S, Ramires V, Souza M, et al. *J Phys Act Health*, **2010**, 7, 641-648.
[26] Parvatikar VB, Mukkannavar PB, *J of Ex Science and Physiotherapy*, **2009**, 5(2): 67-75.
[27] Futbol K, et al. *J of Sport Sciences*, **2009**, 20, 1, 16-23.