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Alliance of Upper and Lower Body Muscular Strength With Cardio-Respiratory Endurance Among School Going Children Punjab Pakistan

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ABSTRACT

The aim of this study was to explore the Alliance between upper and lower body muscular strength as well as cardiorespiratory endurance among school going children Punjab, Pakistan 12 to 16 years of age. A sample of 1840 boys was drawn from the targeted population. Children were tested on Standing Broad Jump to measure the strength of lower body muscles, Used on handgrip to measure the strength of upper body muscles, Beep Test for cardiorespiratory endurance and height and weight to determine Body Mass Index (BMI). Multiple regression analysis depicted association of lower body muscular strength Standing broad jump with upper body muscular strength handgrip and cardio- respiratory endurance Beep Test (R = 0.010 and 0.11 respectively). The analysis reflected the significant Alliance, though weak, between lower body strength standing broad jump and upper body strength handgrip and cardio respiratory endurance Beep Test. Hence lower body muscular strength can be considered useful indicator for muscular strength and cardio-respiratory endurance among school going children Punjab, Pakistan.

Keywords: Physical fitness, handgrip, children.

INTRODUCTION

Acquisition of active life style by the people is now a dream of every nation. Surveys have confirmed the overall climate of sedentary society in which sport is more of a passively consumed mass entertainment rather than an actual activity practiced as an integral part of people's life style [1]. Studies lend support to the views of health-related benefits of physical fitness for both youth and adults. Physical fitness enables individuals to perform daily tasks with bear able fatigue and still having enough energy to carry out other tasks. Issues like cardiovascular diseases, metabolic,

diabetes, obesity, mental health and musculoskeletal abnormalities among children and people at large are emerging as serious problems that increasing reliance on the physical activities and food transformation [2]. Now cognitive development has also been associated with physical fitness. It is thought that combining physical activity with sensory enrichment has even stronger and far reaching effects on the brain [3]. Evidence has also demonstrated the importance of physical activity as an effective strategy to reduce the risk and relapse of breast cancer [4]. The health-related components of fitness are also critical to performance in different sports. These multiple factors have drawn attention of governments, national and international agencies world over for launching programs and strategies to develop knowledge, discourse and skills among children that they need to be physically active, fit and healthy throughout their life. Hence schools have become center of interest to develop awareness about the importance of physical fitness among youth and adults. Consequently, health related fitness testing of children has gained momentum. The situation in Pakistan is not different. Sedentary life style among children is considered as the major cause of ill health and diseases during later stages of life.

Body composition refers to body mass and percentage of body fat, flexibility refers to the range of motion in joints. Cardio-vascular endurance is defined as the ability of the blood vessels, heart and lungs to take in, transport and utilize oxygen. Muscular strength and endurance refer to exertion of maximum force by muscles.

Musculoskeletal fitness is multidimensional construct comprising muscle strength, endurance and power for performance. Muscle strength is considered an ability to produce measurable force during a single maximal voluntary contraction (movement). Muscle endurance is described as ability of muscle(s) to perform repeated contractions for an extended period of time whereas muscle power is a physiological construct reflecting the rate at which work is performed (force x distance) [5,6]. There are many test batteries in use which test different dimensions of physical fitness. However every test provides information of specific nature of fitness of a part of the body only. Question arises can we use results of one test as index of different parameters? Only a few studies like Milliken, Faigen Baum, Loud & Westcott have been carried out in this direction for identifying the association of upper and lower body muscle strength [7]. The present study not only attempt to affirm the relationship but extend further to elucidate the relationship between muscular fitness and cardio-respiratory endurance. Handgrip strength and knee extensor and flexor muscle strengths are useful indices of upper and lower extremity muscle strength, respectively. These upper and lower extremity muscle strength values may be useful target goals for improvement of exercise capacity, risk management, and activities of daily living in male HF (heart failure) patients [8].

Castro-Pinero conducted a study to examine relationship among different measures of upper and lower body muscular strength on Caucasian children aged 6-17 and found that standing long jump (SLJ) was strongly associated with lower body muscular strength tests (SLJ, vertical jump, squat jump and counter movement jump) and with upper body muscular strength tests (throw basketball, push-ups and isometric exercises) except handgrip. Furthermore, they had graded SLJ or SBJ test as a general index of muscular fitness in youth[9].

Castro-Pinero, was of the opinion that association between upper and lower body muscular strength in youth is contradictory and suggested requirement of further investigations[9].

Objectives of the Study:

Followings were the major objectives of the study:

- To investigate the Alliance between upper and lower body muscular strength and body composition outcomes among children.
- To assess whether the standing broad jump be a predictor of upper and lower body muscular strength.
- To analyse the association between upper and lower body muscular strength in school going children Punjab.

Nature of Research

The study was descriptive, quantitative and cross-sectional in nature. Evaluation of physical fitness components was carried out in secondary schools of eight districts of Punjab province of Pakistan. Selection of schools was non-random

Subjects

The target population was 12 to 16 years old school going children in Punjab province of Pakistan. This cohort is specific to secondary level schools having grades 6 to 10 as official age for grade 6 is 12 years. Hence a total of 1840 subjects from public sector secondary schools were drawn as sample for the study. From a school 125 students were participated in the study by drawing 25 students from each grade.

PROCEDURE

Laboratory-based tests are though very accurate but require purpose-built laboratory, costly equipment, qualified technical staff and access of specific group only. On the other hand, field-based tests do have reported validity and are low cost as they do not need expensive equipment. It can easily be administered and can cover vast area. Hence field-based tests were the obvious choice.

A workshop for physical education personnel was arranged before initiating field testing so as to familiarize all with the tests and to standardize the evaluation procedure. Beside lecture and discussion sessions practical demonstration was the essential part of the workshop.

Data Collection

During first phase anthropometric measurements were registered- age of subjects from school record, body weight measured in school uniform and height was calculated from naked feet to vertex point of head. During second phase subjects underwent different fitness tests. A total of 1840 children were assessed. Due to hot weather a few reports of participant's faintness were received. Some of the participants did complaint about pain or had any type of injury during study. However ever there was nothing serious.

Statistical Analysis

The data analysis was carried out by SPSS using both descriptive and inferential statistics. Characteristics of subjects were expressed as average value (means) and standard deviation (SD) unless otherwise indicated. Correlation analysis was performed to examine the association between strength of upper and lower muscles as well as muscle strength and cardio-respiratory endurance tests. The accepted level of significant was set at p < 0.05.

RESULTS

Parameters and Tests	Mean	SD
Age (Years)	13	01.41
Weight (Kg)	45.40	10.77
Body Mass Index (BMI)	17.43	03.26
Standing Broad Jump (Ft)	05.62	01.84
Handgrip (Kg)	31.19	15.63
Beep Test (Levels)	05.15	00.89

Table 1: Description of characteristics of sample (n=1840)

Table 2: Age-wise distribution	of upper and lower	muscular strength and	cardio-respiratory
	fitness narameters	2	

Parameter		12	13	14	15	16
BMI	Mean	16.76	16.70	17.61	17.63	18.43
	SD	3.17	3.19	3.50	2.93	3.18
Standing Broad	Mean	5.45	5.48	5.62	5.82	5.73
Jump (Ft)	SD	1.07	1.07	1.23	3.43	1.25
Handgrip	Mean	25.98	26.13	32.30	33.27	38.27
(Kg)	SD	13.43	13.02	13.02	15.16	16.62
Beep Test	Mean	4.97	5.06	5.23	5.32	5.20
(Levels)	SD	0.91	0.89	0.88	0.85	0.85

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Table 3: spearman correlation coefficient between anthropometric parameters, bmi, upper and lower body muscle strength and cardio- respiratory endurance

	Age	Weight	BMI	SBJ	Handgrip	
Weight	.412**	1				
BMI	.186**	.612**	1			
SBJ	.068**	.092**	.038	1		
Handgrip	.286**	.504**	.218**	.198**	1	
Beep Test	.115**	032	010	.044	002	
**Correlation is significant at 0.01 level (2-tailed)						

Table 4: ANOVA^{a,b}

	Model	Sum of Squares	Df	Mean Square	F	Sig.	
1	Regression	337.719	3	112.574	13.88	.000 ^c	
2	Residual	14163.315	1838	8.2			
3	Total	14501.025	1839				
a. Dependent Variable: SBJ							
	b. Weighted Least Squares Regression - Weighted by Age						
	c. Predictors: (Constant), BT, HG, BMI						

Table 5: Coefficients ^{a,b}

Model	Un standardized Coefficients		Standardized Coefficients	t	Sig.	
	В	Std. Error	Beta			
(Constant)	4.753	.157		30.509	.000	
Body Mass Index	.007	.007	.024	.937	.348	
Handgrip	.007	.002 .108		4.405	.000	
Beep test	.097	.021	.104	4.375	.000	
a. Dependent Variable: SBJ						
b. Weighted Least Squares Regression - Weighted by Age						

 Table 6: Paired Sample Correlation:

		Ν	Correlation N	Sig.	
Pair 1	Handgrip and Standing broad jump	1840	.107	.000	
Pair 2	BMI and SBJ	1840	.046	.061	
Pair 3	BMI and Handgrip	1840	.213	.000	
Pair 4	Handgrip and Beep test	1840	.003	.921	
Pair 5	Standing broad jump and Beep test	1840	.103	.000	
Correlation is significant at 0.01 level Paired sample correlation analysis reflects association					
	between lower and upper body muscle	strength and ca	ardiovascular endurar	ice	

Table 7: Correlation coefficient (*r*), un standardized multiple regression coefficient (β), standard error (SE), and coefficient of determination (\mathbb{R}^2) examining the association of lower body muscle strength -standing broad jump (SBJ) with upper body muscular strength and cardio-respiratory endurance in school going children aged 11-15 years

Dependent Variable	Independent Variable	r	В	SE	р	R ²	
SBJ	BMI	.046	.012	.007	.060	.003	
	HG	.107	.007	.002	.000	.011	
	BT	.103	.096	.021	.000	.010	
HG	BMI	.212	.989	.111	.000	.045	
	SBJ	.107	2.013	.452	.000	.011	
	BT	.003	.043	.423	.920	.000	
BT	BMI	017	005	.007	.496	.000	
	SBJ	.103	.110	.027	.000	.010	
	HG	.003	.000	.002	.920	.000	
Correlation is significant at 0.01 level							



Figure 1: Regression analysis indicates that Lower body muscle strength has weak correlation with upper body muscle strength and even cardiovascular endurance (Table 7). However, upper body muscle strength show no correlation with body mass index (BMI).

DISCUSSION

Another indication of good muscle tone and strength is the attainment of age-appropriate motor development. [8] has concluded from their study that these upper and lower body muscle strength could be useful target for improvement of exercise capacity, risk management and activities of daily life.

The age associated gain or loss in muscle strength is usually attributed to increase or decrease in number and size of muscle fibers. Power gain or loss mainly depends on physical function of muscles. There is a possibility that physical activity may increase the time and speed of response from childhood to adulthood where as these changes are opposite in aging situation [10].

Previous research on institutionalized elderly has established a relationship between physical activity and muscle strength and concluded that there was an association between increased muscle strength (knee extensor muscles) and respiratory muscle strength (as measured using maximal respiratory pressure) as well as between walking capacity. [9,11].

CONCLUSION

The data reflects positive correlation but weak. Hence it does not seem appropriate to declare lower body strength to be indicator of upper body strength as well as cardio-respiratory endurance.

The study supported that no single measure adequately sums up overall level of body's muscular strength. All dimensions need to be assessed individually and then interpreted in an integrated and unified assessment of overall fitness.

On the bases of the study it is purposed that a larger group may be involved in cross sectional study to identify lower body strength as indicator of upper body strength and cardio-vascular endurance.

REFERENCES

- 1. Ales, S.,Sedentary. society: sociological aspects of active modes of transport. 1st Euro-Pak International Conference on Sports Sciences and Physical Education. 2017. 10:6-8.
- 2. Ruiz, J.R., et.al., Predictive validity of health-related fitness in youth: a systematic review. *Britis Journal of Sports Medicine*. **2009**. 43 (12): 909-23.
- 3. Hockelmann, A., and Gujjar, T., A-cyclic movement combinations improve sensor motor network connectivity and neur plasticity- a paper presented in 1st Euro-Pak International Conference on Sports Sciences and Physical Education. **2017**.10: 6-8, 2017.
- 4. Ortegaa, J.A.F., Possible biological mechanism of action of physical activity on breast cancer- an abstract presented in *1st Euro-Pak International Conference on Sports Sciences and Physical Education*. **2017.** 10: 6-8.
- 5. Knuttgen, H.G., and Kraemer, W.J., Terminology and measurement in exercise performance. *Journal of strength and Conditioning Research*. **1987** 1(1): 1-10.
- 6. Kell, RT., Bell, G., and Quinney, A., Musculoskeletal fitness, health outcomes and quality of life, *Sports Medicine*, **2001**. 31(12): 863-73.
- 7. Milliken, L.A., et.al., Correlates of upper and lower body muscular strength in children, *Journal of Strength and Conditioning Research*. **2008.** 22(4): 1339-1346.
- 8. Izawa, K.P., et.al., Upper and lower extremity muscle strength level associated with an exercise capacity of 5 metabolic equivalent in male patient with heart failure, *Journal of Cardiopulmonary Rehabilitation and Preventio.* **2012.** 32(2): 85-91.
- 9. Castro-Piñero, J., et.al., Assessing muscular strength in youth: usefulness of standing long jump as a general index of muscular fitness. *Journal of Strength & Conditioning Research.* **2010.** 24(7): 1810-7.
- 10. Metter, E.J., et.al., Age-Associated loss of power, and strength in the upper extremities in women and men, *Journal of Gerontology: Biological Science*. **1997.** 52 (5): 267-76.
- 11. Simões, R. P., et.al., Prevalence of reduced respiratory muscle strength in institutionalized elderly people. *Sao Paulo Medical Journal*. **2009**. 127 (2): 78-83.