CORRELATION OF BODY MASS INDEX WITH SELECTED PHYSICAL FITNESS PARAMETERS AMONG ADOLESCENTS OF KHYBER PAKHTUNKHWA, PAKISTAN

Abdul Waheed Mughal[1], Inayat Shah[2], Abdul Qayyum Khan[1]

Abstract

The aim of this study was to evaluate the correlation of Body Mass Index and Postural balance, Handgrip Strength, Speed and Agility among school going children (Boys), aging 11 to 15 years from secondary schools of Khyber Pakhtunkhwa, Pakistan. Studies are evident that the fitness level of today's youth is becoming center of interest, as 12% of the total population of the world is obese, 33% are suffering from hypertension, and 10% of the adults are diabetic. This scenario is compelling the world leaders and policy makers to focus on enhancing the health and fitness of their youth. The sample of 1595 children (11 to 15years of age) was taken from eight districts of Khyber Pakhtunkhwa. The analysis showed mean values of 17.43 ± 3.25 kg/m2for BMI, 8.83± 4.7for postural balance in unipodal support (falls per minute (FPM)), 31.18 ± 15.63 for hand grip strength, and 13.51± 1.22 sec for the 10 x 5m Shuttle Run(SR). BMI was found inversely correlated with FPM (r= -0.049, P=0.039); and SR r= -.141, P< 0.001) and directly correlated with HGS r = .219, P<0.001.

The average BMI being a predictor of wellbeing of the sampled population is relatively low for unknown reasons but it has been assumed that the physical development of children as per national education policy has not been properly visualized and poorly implemented, therefore, serious efforts required at national level to review and revisit the entire physical development plan of the children.

Key words: Adolescents, Beep test, EUROFIT, Selected physical fitness, Flamingo, Balance test, physical fitness test

Introduction

Physical fitness is the ability of the entire body including the muscles, skeleton, heart and other organs to work efficiently with less effort. It is the capability of an individual to perform a particular task without getting tired with a quick recovery. According to Haga (2008) physical fitness is the combination of various physical attributes of an individual including ability to work, endurance and recovery. Fitness exercises improve the effectiveness of human organs and muscles in strength, flexibility, stamina and size best coordination capacity. McArdle & Katch (2010) mentioned that fitness exercises enhance the flexibility, strength, size and endurance and improves coordination. People face problems irrespective of their ages, gender and diet due to the mechanistic life with reduced physical activities. The respiratory and cardiovascular capacities are declining due to sedentary life style. Fitness cannot be measured with ordinary methods and needs

[1] Department of Sports Sciences and Physical Education, Sarhad University of Science and Information Technology Peshawar, Pakistan. dean..ss@suit.edu.pk

[2] Institute of Basic Medical Sciences, Khyber Medical University, Peshawar-Pakistan. shah.inayat@yahoo.com

technical, mechanistic and professional expertise to determine the level of fitness of individuals. A number of test batteries have been developed with standards and sets. The standard term is associated with the actual density of performance compared to other individuals of the same age and gender (Sankar Reddy, 2012).
Body mass index is considered as a predictor for many fitness parameters. Myers & Sweeney (2005a) mentioned that research take up body mass index as a sign of the wellbeing and quality of life through identifying relationships between other factors and BMI. Research indicates that there is a strong correlation and relationship between body mass index and quality of life and Obesity has a significant impact on the wellbeing of individuals (Dumuid et al., 2017).

Obesity has a very clear effect on physical mental and spiritual wellness of an individual. According to World Health Organisation (WHO) obesity is a disease with disastrous effects on health. The direct and indirect effects of obesity declare it as disease depriving individuals from the charm of life and leading to dysfunction of body parts and eventually to death (Wyatt, 2006). It is taken as major cause of chronic disease which directly affects quality of life and longevity (Schmidt, 2012). Besides health problems obesity puts economical burden in addition to physiological and Psychological burden on individuals and countries (Wyatt et al., 2006; Nestle & Jacobson, 2000).

According to American Diabetes Association (2000), early detection of fitness disorders in the ability to achieve between children and adolescents is necessary. Diagnostic and interventional approaches to correct such disabilities are deemed necessary for better outcome of the individuals and society.
According to education statistics of Pakistan 2015, there are about 9.5 million children (male and female) between the ages of 11 and 15 years, (Assessment, 2015). Physical training program is an essential part of the curriculum for physical development of children. All schools have an obligation to provide physical training program for children with a focus on developing physical abilities in children. However, there are few research studies to take into account the impact of these programmes on the capabilities of the physical condition of children.

Rationale for the Study

The purpose of this study is to measure fitness level of school going children of age 11 and 15 years in correlation of their BMI. The early adolescence is the most important phase of life. The physical wellness supports an individual to function healthier and portray pleasant environment. Myers (2000) defines wellness as phase of life with complete package of heath, mind, and soul focused towards goal achievements and streamlining. The statistics on the physical fitness and BMI of the school going children is scanty in local population and this study may provide the necessary information for policy making and taking steps towards improving the national youth health and fitness.

Objectives of the Study

The objectives of the study are as follow.

1. To assess the fitness level of 11 to 15 years old children of the KP province.

2. To evaluate the correlation of BMI with Postural balance, Handgrip Strength and Speed and Agility among Adolescents of Khyber Pakhtunkhwa, Pakistan.
3. To determine strengths & weak areas of the fitness abilities of target children.

Methods and Materials

This cross sectional study was conducted regarding physical fitness abilities of school going children with age ranging between 11 years to 15 years in correlation to their BMI. The research design was based on inductive, evaluative, quantitative, one shot, and survey study. A specially designed standardized evaluation tool EUROFIT test battery was used for measuring the desired abilities among children of target population.

School going children of Khyber Pakhtunkhwa age ranging between 11 to 15 years were recruited after ethical approval from was taken. The sample of 1595 children was taken through stratified random sampling including both public and private schools of KP.

Physical fitness test battery- a survey tool

Standardized test battery "EUROFIT Physical Fitness Test Battery" was used for measuring physical abilities of the children which included following test:

1. Body Mass Index (BMI)
2. Flamingo Balance Test – Single leg balance test
3. Handgrip Test – Measures static arm strength
4. 10 x 5 m Shuttle Run – Measures running speed and agility

Pilot Testing

A preliminary pilot testing on 50 students were carried out for checking the validity and reliability of the EUROFIT battery in local population. Calculated Cronbach Alpha measured for the battery was 0.8.

Data Collection

The study was conducted with the help of 30 Physical education teacher from across the province. All the desired tests were conducted under the supervision of well experienced and trained professionals of physical education. During the study they were in close liaison with the department of Sports Sciences and Physical Education SUIT Peshawar.

Data Analysis/ Statistical Analysis

The data obtained was analyzed using SPSS Version 20. Simple descriptive statistic (Mean and Standard deviation) were used for numerical variables. Pearson Correlation was used for determining the correlation of BMI with other parameters.

Results

Results were obtained for all the individuals and normality of the data was checked. Descriptive statistics for all the parameters are given in table 1 below. Year wise correlations of the BMI with all different parameters were determined

through Pearson correlation statistics. These are outlined in table 2. It is pertinent to mention that BMI has a consistent significant negative correlation with Falls per minute (FPM) and Shuttle run (SR) at age 14 and 15 years. This is obvious when the whole date for BMI was analyzed with FPM *(r= -0.049, P=0.039)* and SR (r= -.141, P< 0.001). Moreover, the positive correlation of Hand Grip strength (HGS) can be appreciated in all the children beyond 12 years of age (r = .219, P<0.001 for whole data). Other parameters such SBJ, SnR and ET were not significantly influenced by BMI.

Table 1. ***Anthropometric Data of the Children***

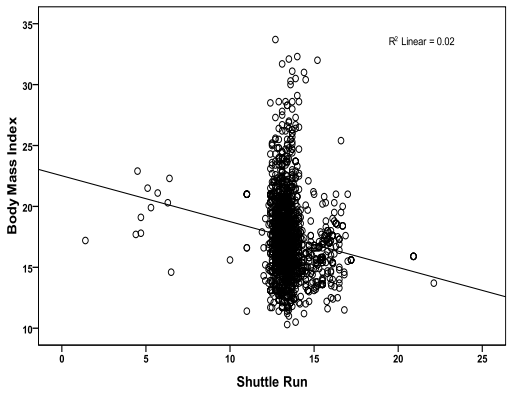
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	1750	11.00	15.00	13.00	1.41
Body mass index	1750	10.30	33.70	17.43	3.25
Falls per minute	1750	0.00	30.00	8.83	4.71
Hand grip strength	1750	4.9	105.0	31.18	15.63
Shuttle run	1750	8.40	14.12	11.51	1.22

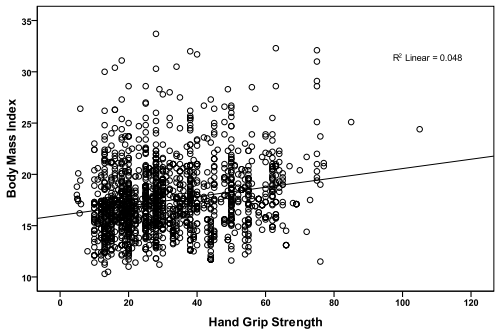
Table 2. ***Correlation of BMI with other parameters on the basis of Age***

Age of participants	**n**		**FPM**	**SnR**	**SBJ**	**HGS**	**SU**	**SR**	**ET**
11 year	350	r	-.025	0.054	0.093	0.065	0.098	0.098	**0.116***
		P	.390	0.314	0.084	0.222	0.067	0.067	**0.031**
12 year	350	r	-.055	**-.113***	.068	**.157****	-.068	-.043	-.004
		p	.305	**.034**	.206	**.003**	.207	.421	.938
13 year	350	r	.085	**.129***	-.040	**.324****	.005	-.061	-.093
		P	.114	**.015**	.461	**.000**	.919	.253	.083
14year	350	r	**-.167****	-.057	.024	**.146****	.057	**-.166****	-.036
		P	**.002**	.287	.651	**.006**	.285	**.002**	.496
15 year	350	r	**-.141****	.063	.065	**.131***	**-.049***	**-.219****	**-.133***
		P	**.008**	.242	.224	**.014**	**.039**	**.000**	**.013**
total	1750	r	**-.049***	.036	.040	**.219****	.040	**-.141****	-.009
		P	**.039**	.137	.096	**.000**	.098	**.000**	.698

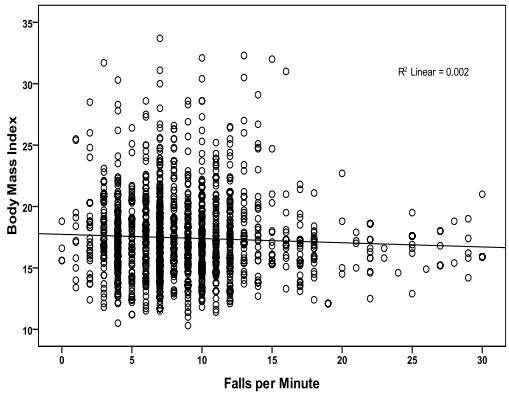
BMI VS SR



BMI VS HGS



BMI VS FPM



Discussion

With the aim of finding a correlation between the BMI and selected physical parameters, this study took up the adolescents of KP. Mean BMI for all the participants were determined and found to be (17.43 ± 3.25). The value aims towards a healthy and mildly underweight population. However, the findings were comparable with the published standards for the Pakistani population (Mushtaq et al., 2012). However, the range of the BMI reveals the upper limit of BMI as 33.70 kg/m^2. On further analysis, the data revealed that 3% of the participants (52/1750) were with BMI more than 25 and 65% kg/m^2 of the participants (1138/1750) had a BMI less than 18 kg/m^2. These statistics are pointing towards significant malnutrition (both under and over) in Pakistani population and raises the importance of proper nutritional advice in this age group. The consumption of inappropriate food at this age group has been reported frequently with alarming statistics and burden of obesity in affluent and non-affluent society of Pakistan (Aziz et al., 2009).

The study also looked at the influence of BMI on the selected physical parameters including (FPM, SnR, SBJ, SU, SR and ET) with aim of having an insight of the degree of effect of BMI on these selected parameters. It was found that BMI has a negative correlation with falls per minute (FPM r= -0.049 P=0.039). Falls per minute also referred as Flamingo balance test, is the tool to assess the balance of individuals and shows coordination of the different muscle groups including hip, pelvis and trunk. These findings are thought provoking because majority of our participants in this study had a BMI less than 25(97%). Falls are associated with low lower leg strength, low muscle mass and poor balance (De Rekeneire et al., 2003). As majority of our participants were reported with BMI less than 18 (65%), the statistics points towards a decreased muscle mass and strength in lower limbs. However, this study has not considered the segmental body composition.

In addition the study also finds out a significant negative correlation of BMI with Shuttle run (r= -.141, P< 0.001). Shuttle run is a measure of the cardio respiratory fitness of the individuals (Polkey et al., 2013) and has been reported previously to be affected by BMI (Matsuzaka et al., 2004, Olds et al., 2006). A higher BMI above the normal limit often

means deposition of fats in the body which has harmful effects on different systems of the body and is considered as a prerequisite for chronic conditions including hypertension and diabetes (Friel et al., 2007). The findings in our study are significant as it points towards the harmful effects of obesity on the cardio respiratory fitness of individuals in very early stage of life.

Moreover, the BMI showed a direct correlation with Hand grip strength ($r = .219$ $P < .001$). Handgrip strength shows the power of the individual muscles of the hand and upper extremities. Increase in BMI means an increase in muscle mass and an imminent increase in hand grip strength (Massy-Westropp et al., 2011). The findings in our study are comparable with the study done by (Wind et al., 2010) and (Albon et al, 2010). It was reported that increase in BMI has a direct correlation with gross motor performance.

Other parameters including SBJ, SU and ET were found to be show insignificant correlation with BMI. These findings could be due to the fact that the age group selected in this study is comprised of the participants where their physical activity is at the peak in the overall life cycle. The participants are engaged in these activities regularly and for appreciation of any correlation in these parameters requires a study based on a larger sample size. It is worthwhile to mention that this study successfully determined the fitness level of adolescent of KP and its correlation with BMI. Among the week area of concerns were the high prevalence of malnutrition status (underweight and overweight) and problems of coordination of balance and cardio respiratory fitness.

Conclusion

In conclusion the study successfully determined all the parameters and pointed out a massive inappropriate nutritional status in the adolescents of KP with a negative effect on some of the fitness parameters including Falls per minute and Shuttle run. These findings are alarming and require special attention by the parents and policy makers.

Recommendations

1. It is immensely felt the there is a lacuna between the curriculum presage and achievements, therefore, it is recommended on the basis of the perceived facts that the physical component of our national curriculum needs a meticulous review and revision, either the content, the methodology or the evaluation.
2. There is a dire need of creating awareness among the masses especially the heads of institutions and parents about the importance of nutrition and fitness among the adolescents, without their due contribution, the national goals and international standards cannot be achieved.
3. The low level of fitness not only affects their health, it has very adverse effects on their cognition also. There is a famous saying "healthy mind in a sound body". Therefore, the fitness level may be kept under consideration during formulation and designing different courses.
4. A special package of exercises may be introduced for improvement of balance and cardio-respiratory fitness of adolescents in schools, as directly affect the cognitive process.
5. It is also recommended that the same study may extend to national level for authentication and generalization. This may give more career picture of the fitness abilities of the adolescents in the country.

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