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Health related physical fitness as a predictor of cardiovascular disease risk factors among healthy men

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ABSTRACT

Since cost factor for estimation of Cardiovascular Disease (CVD) Risk components are very high, this may not be under reach of the normal population. This is what the researcher looking forward to find out some field measurements by which we can predict the Cardiovascular Disease Risk. Therefore, this study was undertaken to find out whether Health Related Physical Fitness variables are indicator of CVD risk factors, in healthy army soldiers. A total of 120 healthy army male soldiers with mean age 34.6 years were selected as a subject for the study from 90 Armored Regiment, Gwalior, (M.P.). All subjects were examined for Cardio-respiratory Endurance (CE), Muscular Strength i.e., Leg and Back Strength, Muscular Endurance (ME), Flexibility, Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Triglycerides (TG), Total Cholesterol, High-Density Lipoprotein Cholesterol (HDL-C) and Low-Density Lipoprotein Cholesterol (LDL-C). All these measurements were taken from each subject using standard procedure. The correlation between fitness variables and CVD risk factors were examined with the help of Pearson product moment correlation and Multivariate linear regression analyses were performed to examine the independent and combined associations of selected fitness variables with CVD risk factors, using SPSS 19 version. CE showed a statistically negative significant correlation with SBP (p < .05) and TG (p < .05). Likewise, ME also showed a statistically negative significant correlation with SBP (p < .05) and DBP (p<.05). Further results of the present study indicated that fitness variables namely CE and ME would be the good predictors for the CVD risk factors specially SBP, DBP and TRIG. Therefore, we can say that fitness variables alone have no meaning to point out the risk factors in healthy adults but have some association with CVD's.

Key word: Health Related Physical Fitness, CVD Risk Factors.

INTRODUCTION

The health care needs of the world's population are likely to undergo dramatic changes due to the ongoing demographic transition. Non-communicable diseases (NCDs), such as diabetes, cancer, depression and heart disease, are rapidly replacing infectious diseases and malnutrition as the leading causes of disability and premature death [1]. Cardiovascular diseases account for high morbidity and mortality all over the world. Countries where the epidemic began early are showing a decline due to major public health interventions. On the other hand, cardiovascular diseases are contributing towards an ever-increasing proportion of the non-communicable diseases in the developing countries [2, 3]. Cardiovascular diseases have assumed epidemic proportions in India as well. The Global Burden of Diseases (GBD) study reported the estimated mortality from coronary heart disease (CHD) in India at 1.6 million in the year 2000 [4]. A total of nearly 64 million cases of CVD are likely in the year 2015, of which nearly 61 million would be CHD cases (the remaining would include stroke, rheumatic heart disease and congenital heart diseases). Deaths from this group of diseases are likely to amount to be a staggering 3.4 million [5]. In Indian urban middle-SES subjects there is high prevalence of cardiovascular risk factors [6]. There is a strong positive correlation of

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increase in coronary heart disease in India with primordial risk factors of urbanization, excessive fat intake, faulty diet, tobacco consumption, and sedentary lifestyle. Regular physical activity, fitness, and exercise are critically important for the health and wellbeing of people of all ages. Research has demonstrated that virtually all individuals can benefit from regular physical activity, whether they participate in vigorous exercise or some type of moderate health-enhancing physical activity. Even among frail and very old adults, mobility and functioning can be improved through physical activity [7].

A sedentary lifestyle is considered by various national and international organizations to be one of the most important modifiable risk factors for cardiovascular morbidity and mortality. Physical inactivity has been documented as a well-established risk factor for CAD in Western populations; a sedentary lifestyle is associated with about a two-fold increase in risk of CAD. With increasing rates of urbanization and other major changes in human behavior, the prevalence of a sedentary lifestyle has further increased particularly among the young [8]. Hence, the purpose of the present study was to find out the relationship between Health Related Physical Fitness and CVD risk factors among healthy army soldiers.

MATERIALS AND METHODS

For the purpose of this study total of One Hundred and Twenty healthy army soldiers were selected as a subject for the study from 90 Armored Regiment, Gwalior with special permission from commanding officer of same regiment otherwise it's a restricted area. Health related physical fitness variables included Cardio-respiratory Endurance, Muscular Strength (Leg And Back Strength), Muscular Endurance and Flexibility while CVD risk factors included Blood Pressure (Systolic and Diastolic) and Lipid Profile which included Triglycerides (TG), Total Cholesterol (TC), High-Density Lipoprotein Cholesterol (HDL-C), Low-Density Lipoprotein Cholesterol (LDL-C). Cardio-respiratory Endurance was measured with the help of Cooper's 12 min run and walk test, Muscular Strength by Leg and Back Dynamometer, Muscular Endurance by Flexed Arm Hang, Blood Pressure by Sphygmomanometer and Lipid Profile by Semi Automatic Analyzer. All the blood samples from the subjects were collected by phlebotomist (who drained blood) of medical college, and analyzed by a pathologist. Written consent was taken from each subject willing to participate before the start of study. Subjects were free to withdraw their names from study at any time without asking for any reason. Measurements were made on a consecutive days between 06:30-10:00 AM. Subjects did not eat up to eight hours before testing as well as refrained from exercise for at least the previous twelve hours.

Measurements

For measuring the cardio-respiratory endurance, cooper's 12 minute run/walk test was conducted in a standard track. The maximum distance covered by the subjects in 12 minutes was measured and recorded to the nearest 10 meters. Cardio-respiratory endurance of each subject was calculated with the help of formula- Total number of rounds x distance of one lap + additional distance [Clarke, 1976].

The maximum strength of the back was measured using a leg and back dynamometer test. The subjects' was positioned with feet on the base of the dynamometer, body erect and knees bent so that the grasping hand rests at proper height. Then, by straightening the knees and lifting the chain of the dynamometer, pulling force was applied on the handle. By keeping knee straight, the subject then lifts steadily. At the end of lifting effort the back come almost straight, the reading was noted in kg from the scale down the dynamometer. The maximum strength of the legs was also measured using a leg and back dynamometer. The subjects' asked to stand erect with knees bent so that the grasping hand rests at proper height. The subjects' then lifted the handle of the dynamometer, bending his legs, and then straightened the legs. The strength of the leg muscles was recorded on the dial of the dynamometer as the best of three trials in kg. Thirty-second time intervals separated each leg strength test. The maximum lift was noted down in kg. Strength of the subject was recorded to the nearest 0.1 kilograms [9].

Muscular endurance of the subjects' was measured with the help of flexed arm hang test. The subjects' were asked to grasp the overhead bar with the palms of hand facing them. Then Subjects' were instructed to flex both the elbows by raises their chin above the bar and allowed to hold the same position for the maximum duration of time without any support. Alternatively, as a stool or bench was used to help the subjects' in order to get chin up position. Once, a correct position was taken, the stool was removed from below the feet. As the subject retained the flexed arm hang position, the stopwatch was started and it was stopped as soon as, when the subjects' chin drops below the bar. The score was the number of seconds the subject was able to maintained the correct hanging position [10].

Flexibility of the subjects was measured with the help of Sit and reach test. Sit and reach apparatus consisting of a box with 12 inches height was used. The subjects were asked to remove shoes and place his feet against the testing box while sitting on the floor with straight knees. Now the subject was asked to place one hand on top of the other hand so that the middle fingers of both hands were together at the same length. The farthest point reached in the consecutive attempts was recorded to the nearest half inch [11].

Arterial Blood Pressure was measured with a mercury sphygmomanometer after 5 min rest in the sitting position with the right forearm placed horizontal on the table. For Lipid Profile which includes HDL-cholesterol, LDL-cholesterol, triglycerides and total cholesterol a fasting 2ml venous blood sample was drawn from a superficial vein in plane vial after sterilizing the arm of the subject by using Dispo Van Disposable 24 G needle with 2ml syringe and enzymatically analyzed by Semi Automated Biochemistry Analyzer.

Statistical analyses

All data were analyzed by SPSS (Statistical Package for Social Sciences, Version 20, SPSS Inc, USA). Mean, standard deviation, Pearson's product moment correlation test and multivariate linear regression analysis were used to investigate the relationship between the Health Related Physical Fitness and CVD Risk factors. The probability value less than or equal 0.05 was considered to be significant.

RESULTS

Characteristics of the subject are described in Table 1 with the help of descriptive statistics (mean and standard deviation). The scores of each of the independent selected variables of fitness were correlated with dependent/criterion variable, the cardiovascular disease risk factors (CVD), in order to find out the relationship between the dependent and independent variables, which are depicted in Table 2.

Table 1 Subject Characteristics

Charactoristic	Moon	Standard Deviation
Characteristic	Mean	Standard Deviation
Flexibility (Inches)	2.5	4.18
Leg Strength (Kg)	110.2	20.32
Back Strength (Kg)	110.3	20.95
Cardiorespiratory Endurance (Meters)	1880.9	542.03
Muscular Endurance (Seconds)	31.2	21.21
Systolic Blood Pressure (mmHg)	119.7	8.30
Diastolic Blood Pressure (mmHg)	78.2	6.70
High Density Lipoprotein (mg/dl)	35.4	7.85
Low Density Lipoprotein (mg/dl)	107.9	32.39
Triglycerides (mg/dl)	128.0	59.42
Total Cholesterol (mg/dl)	169.9	30.99

Table 2 Correlation between Health Related Physical Fitness Variables and Selected Cardiovascular Disease Risk Factors

	SBP	DBP	HDL	LDL	TRIG	ТС	
FLEX	120	125	.106	083	111	128	
CE	240*	173	015	.062	287 *	033	
LST	.124	.043	037	.024	.002	.057	
B ST	042	153	.003	010	.083	.020	
M E	342*	312 *	.058	.035	113	032	
$*_{2}$							

*significant at .05 level, $r_{.05}$ (118) = .195, *p < .05

Table 3 Multivariate Regression Analysis between Health Related Physical Fitness Variables and Selected Cardiovascular Disease (CVD) Risk Factors

CVD Risk Factors	Predictor/s	R	\mathbf{R}^2	F-statistics	p-value
SBP	ME	.342	.117*	15.613	.000
DBP	ME	.312	.098*	12.765	.00
HDL	NV	-	-	-	-
LDL	NV	-	-	-	-
TRIG	CE	.287	.082*	10.560	.002
тс	NV	-	-	-	-

Muscular Endurance (ME), Cardiorespiratory Endurance (CE), *NV= No Variable entered, *p<0.05

As shown in the Table 2, it has been observed that Cardio-respiratory endurance (CE) was negative significantly related to systolic blood pressure (SBP) and triglycerides (TRIG) whereas no significant relationship was obtained between rests of CVD risk factors. While Muscular endurance (ME) was significantly related to systolic blood pressure (SBP) and diastolic blood pressure (DBP) whereas no significant relationship was obtained between rests of CVD risk factors. Flexibility, Leg strength and back strength had no relationship with any of the CVD risk factors. Therefore it was evident that fitness variables were less contributing to CVD risk factors.

Multivariate regression analysis was performed to estimate the significance of selected predictors (Muscular Endurance, Leg Strength, Flexibility, Cardio-Respiratory Endurance and Back Strength) on CVD risk factors (systolic blood pressure [SBP], diastolic blood pressure [DBP], HDL-C, LDL-C, TC and TRIG) as shown in Table 3. In multiple regression models, predictor with value of R and percent variance (R^2) accounted by regression for CVD risk factors on the basis of fitness variables. Only one model was extracted for **SBP** and **DBP** respectively, which included only Muscular Endurance (ME) accounted for 10.9% variance (Adjusted R^2 =0.109) and 9% variance (Adjusted R^2 =0.090) respectively and both these models were also significant (p<.05). Further, one model was extracted for **TRIG**, which included only cardio-respiratory endurance (CE) accounted for 7.4% of the variance (Adjusted R^2 =0.074) and this model was also significant (p<.05). It is interesting to note that from multivariate regression analysis that none of the fitness variables had shown significant predictor status for **HDL**, **LDL** and **TC**. Therefore, the dependent variables (SBP, DBP and TRIG) can only be predicted from ME and CE respectively.

DISCUSSION

Considering the rising amount of individuals who are experiencing CVD throughout their lifetime [12], it is crucial to implement healthy lifestyle practices at an early age. Understanding which health risks most greatly affect risk for CVD in males is yet to be determined. The present study was performed to investigate which health related physical fitness correlated with CVD risk factors among healthy soldiers. The results of this study suggest that there are lifestyle behaviors that will hinder one's cardiovascular health. The findings of the present study showed that among health-related physical fitness variables cardio-respiratory endurance was negatively related to systolic blood pressure and triglycerides, which agrees with results from previous studies (13, 14, 15, 16, 17). It means as fitness increases chances of being suffered from CVD gets decreases, and vice versa.

Likewise, Muscular endurance was significantly related to systolic blood pressure and diastolic blood pressure these findings are also in a line with several studies that have assessed the relationship between fitness indicators and CVD risk factors in India and other countries (18, 19, 20) these results clearly indicated that muscular endurance also play somewhat role in identifying the CVD risk. So, by maintaining the endurance whether it may be Cardiorespiratory or muscular endurance, individual can reduce the risk of CVD. While no correlation was found between other fitness variables and CVD risk factors.

The results of the present study was found different from few other studies as they revealed that there as insufficient evidence to conclude that superior fitness has a positive effect on lipid and lipoprotein status in young people (21), but even the smallest of links might be important in health terms. In this study a significant correlation was seen when few health related physical fitness variables correlated with CVD risk factors. This indicated that Cardiorespiratory and muscular endurance can be used as a screening test for predicting the cardiovascular risk.

Further Regression analysis also revealed that Cardiorespiratory and muscular endurance only fitness variables that predicts the CVD risk among individuals. These findings are partial consonant of the studies done by Janelle Schilter and Lance Dalleck [22]. Hence, the results from this study may be a good indicator that the sedentary lifestyle of individuals might have contributed to their CVD risk factors. Early identification, can lead to successful prevention and treatment of obesity in childhood and thus reduce the adult incidence of CVD [23]. Furthermore, the risks of cardiovascular disease, hypertension and myocardial infarction occur together, and are all linked with fitness and obesity. Therefore, controlling fitness during childhood and adolescence will help prevent and reduce the risk of CVD risk in the future.

Regular physical activity throughout life, for example, by walking daily, is fundamental to reducing chronic diseases such as cardiovascular disease (24, 25). A 50% decreased in CHD risk by regular walking, and 84% decreased in the incidence of CVD in women through lifestyle modification, including regular physical activity was reported by Sawyer and Castaneda-Sceppa (2010).

CONCLUSION

This study is novel in that it focused on using non-invasive, inexpensive, field-based fitness measures in relation to CVD risk in healthy soldiers. It is especially unique in that it included a variety of health related physical fitness tests in the field based measures that may solve the cost factor problem of the individual. So, we come on the conclusion that as we concentrate on few fitness variables i.e., cardio-respiratory and muscular endurance of the individual, reduction in the risk of CVD in healthy men will be achievable. Sports scientist and physical educationist must designed the programs in such a way that they give more emphasis on to increase cardio-respiratory activity through lifestyle modification, including diet, may have significant in reducing the incidence of CVD risk in these populations.

Policies that encourage healthy lifestyles should be emphasized to create awareness, especially among young people. However, longitudinal studies are necessary to elucidate more clearly the relation of body fitness with future CVD risk factors. Such information is very important as it would be useful in formulating policies to improve CVD risk factors among the youth. Adolescents should make extra effort to keep trim throughout their lives. For this, they would have to exercise regularly to maintain fitness. Since there is clear evidence that selected CVD risk factors are associated with the adolescent body fatness (26). Hopefully, with early intervention, successful prevention and assessment of fitness in childhood and adolescence can reduce the incidence of CVD during adulthood.

Several limitations of the present study warrant further discussion. Self-selection bias is a concern because participants volunteered for the study. Future investigations aimed at confirmation of finding from the present study should incorporate random sampling. A single sample of blood pressure and blood lipids/glucose was obtained for each participant due to time and resource considerations. Duplicate measures of these parameters would have strengthened our findings.

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