Relationship between Physical Fitness and Academic Achievement: The Case of Model School Students at Haramaya University, Ethiopia

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Abstract- The main objective of this study was to investigate the relationship between physical fitness and academic achievement among Model School students of Haramaya University. For this purpose Grade six students' physical fitness levels were compared to their academic achievement based on the idea that health related physical fitness had an impact on the ability to achieve academically. The pre and post tests on selected health related physical fitness parameters were administered for two groups (experimental group and control group). For academic achievement the first semester GPAs (grade point average) was taken as pre test and Second Semester GPAs was taken as post test for both groups. The GPAs of the groups was determined by calculating an average of all subjects. Data was collected from 20 students (10 boys and 10 girls) grade six sections A and B with aged 11-13 years old, during the 2012-2013 school year by using the health related Physical Fitness Tests and (GPA's). The training schedules were for twelve weeks for physical fitness exercises and it was arranged between the first semester final exam and Second Semester final- Exam. The intensity for exercises were low to moderate, for three days per week (Monday, Wednesday and Saturday) after their regular classes for experimental group. Data was analyzed using computerized statistical package software (SPSS) T-test and correlation was used to analyze the data. The physical fitness and academic results showed that experimental group's was greatly improved from first to second semester. But control group's decreased the mean value of GAPs from first to second semester. As exhibited in the results the correlation coefficient of experimental group on muscular strength, and flexibility showed moderate significant positive correlation with academic performance. On the other hand body composition had moderate significant negative correlation. With the exception of the cardiovascular endurance and muscular endurance results showed very high significant positive correlations with academic performance among the experimental group. This study proved that there is a significant relationship between physical fitness and academic achievement.

Index Terms- Physical fitness; Academic achievement.

I. INTRODUCTION

Physical activity during every school day is essential for numerous reasons. Physical fitness, mental health and social interaction. Regular physical activity increases the amount of oxygen delivered to the brain, which increases children's capacity to learn. In addition to these benefits of physical fitness, researchers have found relationships between physical fitness and cognitive functioning. Brain Gym exercises and balanced movements have been proven to reduce anxiety and stress [8] Physical fitness has also been linked to higher levels of self-esteem, which are associated with higher academic performance in the classroom [1].

Research has been conducted concerning physical fitness benefits. The most commonly researched use for physical fitness is certainly for the purpose of physical exercise directly impacting the body. The correlation between physical fitness and health has been researched including the importance of cardiac, muscle, joint, and pulmonary functioning and even psychological functioning [4]). Regular physical has been physical fitness proven to have a positive relationship with the healthy functioning of all of these areas [7].

In addition to the physical benefits of physical fitness, researchers have found relationships between physical fitness and cognitive functioning [2]. Past literature consistently supports participation in movement and exercise, which leads to the reduction of stress, improvement of emotional state, and helps one to function comfortably. Brain Gym exercises and balanced movements have been proven to reduce anxiety [8].
Physical fitness has also been linked to higher levels of self-esteem and lower levels of anxiety, which are associated with higher academic performance in the classroom [8][1][3]. The relationship between physical fitness and academic achievement has received attention because of the increasing number of children who are unhealthy and physically unfit. Also, schools are feeling the pressure to meet academic standards [5].

Unfortunately, students are not receiving ample amount of physical activities at school. At school level the communities like parents and teachers are giving more attention to academic areas than physical fitness activity. Understanding the relationship between physical fitness and academic success is crucial. That is why it is needed to conduct this research. Thus, this research was conducted to investigate the relationship between physical fitness and academic achievement.

II. MATERIALS AND METHODS

2.1Description of the Study Area and Period

The study was conducted at Haramaya University Model School which is found in Haramaya University main campus. The School is located at 09° 24' 27" latitudes north and 42° 02' 05" longitudes east. The mean annual rainfall, mean maximum and minimum temperature, is, 780.00 mm, 24.4 °C and 8.25 °C, respectively, (HARC 1996). The experiment was conducted in the months of March, April and May 2013. The data were taken from the designed parameters (Physical Fitness test) and academic achievement in term of their GPA's. The GPA's for the students were collected from Haramaya University Model School record office. The source of population was Model School grade sixth students. The total number of student in grade six was 63. The subjects were from different family background, homogeneous in their academic activities and at the same age level (11-13yrs).

2.2 The Study Design

The experiment design was used for this study. The training schedule was for twelve weeks for physical fitness exercises and it was arranged between the first semester final exam and Second Semester final- Exam. The intensity for exercises were low to moderate, for three days per week (Monday, Wednesday and Saturday) after their regular classes for experimental group. There was no training schedule for control group but tests were conducted for them.

2.3Sample Size and Sampling Techniques

For this study, the stratified random sampling technique was used to select the sample from 63 students. The total size of the sample was 20 (10 female and 10 male) from six grade (section A and B) students. For experimental and control group allotment of the students were done by random method. Thus, there were total two groups, one experimental and one control group. In group one 5 female and 5 male and in group two 5 female and 5 male.

2.4 Data Collecting Instrument

The quantitative data was collected through five health related physical tests. Experimental materials such as Weight machine,, exercise mats, stopwatch, jumping ropes, wood ruler and whistle were used during training as well as for the tests in this study. For this study, the stratified random sampling technique was used to select 20 samples of subjects from 63 students

2.5Methods and Procedures of Data Collection

Quantitative data was collected through physical fitness parameters' and GPAS The data was recorded with the help of two assistance data recorders who had been Sport Science teachers at Model School. The experimental field tests and exercise procedures were strictly administered and standardized in terms of administration, organization and implementation conditions.

2.6 Physical Fitness Test Analysis

The changes in the following physical fitness variable parameters were recorded especially before and after training in terms of pre test and post test

Fitness test	Health related physical fitness
Nine meter running /walking test	Cardio vascular endurance
Ninety degree push up test	Muscular strength
Trunk lift test	Muscular strength
Sit and reach test	Flexibility
BMI	Body composition

2.7Method of Data Analysis

Academic data was collected from Grade Point Averages. GPAs were taken from first and Second Semester final-- Exam of the 2012/ 2013 school year from HUMs record office. Data was analyzed using computerized statistical package software (SPSS) for descriptive statistics mean, standard deviation, maximum and minimum values, while the relationships between the variables were determined by linear correlation coefficients. degree of relationship is expressed by coefficient which range from correlation ($-1 < r > +1$) and the standard significant value $p < 0.05$.

III. RESULTS AND DISCUSSIONS

The variables selected for the study were cardiovascular endurance, muscular strength, flexibility and BMI. For academic achievement first and second semester final exam were taken for both group. The participation rate was 100%, i.e. there was no dropout due to physical or psychological problem Demographic Characteristics and the results of the study are given in the following tables**.**

Table 1: Distribution of participants by age and sex

Sex	Age	Number of students(N)	Percent (%)
Male	11-13	10	50%
Female	11-13	10	50%
Total	__	20	100%

Table 1 showed the distribution of participants by age and sex. The distribution of student by sex group was 50% of boys and 50% girls were with the age of 11-13

Table2: The comparative mean and Standard deviation values of physical fitness parameters of experimental group and control group

PARM	EG			CG		
	Mean ± SD			Mean ± SD		
	PT	DT	PoT	PT	DT	PoT
PUT	6.9 ± 2.5	7.8 ± 2.52	11.3 ± 2.94	7.3 ± 2.	8.1 ± 2.84	8.4 ± 2.71
NMRT	9.52±187.65	10.50 ± 194.8	11.23 ±195.65	10.06 ±131.90	10.36 ± 144.4	10.26 ± 150.34
TLT	37.30± 4.27	38.60 ± 4.22	41.68 ± 3.34	38.30 ± 5.27	38.75 ± 3.02	38.38 ± 4.08
SRT	5.6±1.99	6.95±1.72	9.72±1.28	7.50±1.58	8.14±1.53	8.19±1.74
BMI	18.80±2.269	19.29±2.38	19.56 ±2.266	19.32 ±2.18	19.33±2.022	19. 25±03

Values are mean ± Standard deviation, EG=experimental group, CG= control group, PT= pre- test, DT= during test, PoT= post-test, PUT= push up test, NMRT= nine meter running test, and TLT= trunk lift test, SRT= sit and reach test and BMI= body mass index, PARM= parameters

The table 2 showed that there was an improvement of push up, trunk lift, nine meter running and sits and reach test for experimental group as compared to control group. The mean difference revealed that there was an improvement in the performance of fitness parameters due to exercise in which they were engaged in. The mean value of push up of experimental group was increased from pre to post test, in pre test push up performance was 6.9 but after 12 weeks it was recorded as 11.3.

Alike push up, nine meter running test, and trunk lift performance was increased from 9.52 to 11.23 and 37.03 to 41.68 respectively, in the same way the improvement was observed in sit and reach (5.6 to 9.72), body mass index (18.80 to 19.56) test from pre to post test. The rationale behind the improvement in physical fitness performance was due to the exercise that they took in the training schedule. The results clearly showed that exercise can have great effect on their physical fitness.

As indicated in table 2 the control group decreased on their physical fitness parameters. In BMI the control group decreased from 19.32 to19.25 and nine meter running increased from 10.06 to10.26 from pre to post tests respectively, but in other parameters slight improvements had been observed. The push up, trunk lift and sit and reach performance were increased by 7.3 to 8.4, 38.30 to 38.38 and 7.50 to 8.19 respectively. The result showed that the experimental group improved more than control group in all health related physical fitness components.

Table 2: The mean value difference and significance results between experimental and control groups from pre to post test

Variables Test	EGMD	EGS (p)	CGMD	CGS (p)
Push up test	4.4	0.000	1.1	0.12
Nine meter run test	1.71	0.000	0.20	0.451
Trunk lift test	4.38	0.000	0.08	0.902
Sit & Reach test	4.12	0.000	0.69	0.94
Body mass index test	0.76	0.000	0.07	0.519

EGMD=Experimental Group Mean Difference EGS=Experimental Group Significance, CGMD=Control Group Mean Difference CGS=Control Group Significance

As data (table 3) indicated that there was significant difference in experimental group performance as compare to the control group. The experimental group showed big change on physical fitness after 12 weeks of exercise schedule as compared to control group. The mean value difference of pre to post test among experimental group for pushups, nine meters run test, trunk lift test, sit and reach test and BMI was 4.4,1.71,4.38,4.12 and 0.76, respectively, whereas, for control group the mean differences were 1.1,2.01,0.08.0.69 and 0.07 for each physical fitness parameters, respectively.

The mean value difference of experimental group showed that their muscular strength was improved higher than control group. In the same way the mean value difference of nine meter running was 1.71 for experimental group and 0.20 for control group. This showed experimental group increased their cardiovascular endurance than control group. Alike other parameters experimental group showed great mean values difference on trunk lift and sit and reach test, the recorded mean difference was 4.38 and 4.12 for experimental group and 0.08 and 0.69 for control group. This proved that the experimental group showed that a great improvement on flexibility and muscular endurance than control group. The mean value difference of experimental group BMI was 0.76 and control group was 0.07. This mean difference value showed that experimental group higher improved their body mass index than control group.

Table 3: The measured and calculated mean values of academic achievement of experimental group and control group, 2012\2013 school year.

	Experimental Group		Control Group			
Academic Test Variables	Mean ± SD	P	Mean ± SD	Mean ± SD	Mean ± SD	P
GAPS	FSGPA	-	SSGPA	FSGPA	SSGPA	-
	79.77 ±11.27	0.000	83.16 ± 11.32	78.44 ± 5.87	77.49 ± 5.65	0.14

GAPs=grade average points, FSGAP = first semester grade average point, SSGAP = second semester grade average point, SD= standard deviation.

As indicated in Table 4, the experimental group's GAPs mean value was increased from the first to the second semester (79.77→83.16). The rationale behind this improvement might be the exercise in which the students engaged in. Whereas, the control group participants decreased their GAPs mean value of from first to second semester (78.44 →77.49).

Table 5 Correlation coefficients and significant of academic measurements with physical fitness parameters among experimental and control groups of Model School of Haramaya University

			Experimental Group		Control Group	
No	Variables	N	correlation	Significant	correlation	Significant
1	PUPRT &FSGAP	10	0.566	0.0207	0.271	-0.300
2	PUPOT & SSGAP	10	0.614	0.0183	-0.314	-0.106
3	NMRPRT & FSGAP	10	0.705	0.0137	0.151	-0.039
4	NMRPOT & SSGAP	10	0.981	0.009	0.312	-0.164
5	TLPRT & FSGAP	10	0.894	0.049	0.374	0.356
6	TLPOT & SSGAP	10	0.967	-0.015	0.314	0.316
7	SRPRT & FSGAP	10	0.418	0.0457	0.015	0.235
8	SRPOT & SSGAP	10	0.685	0.0289	0.274	0.147
9	BMIPRT & FSGAP	10	0.399	-0.0350	0.122	-0.256
10	BMIPOT & SSGAP	10	0.825	-0.0300	0.267	-0.380

FSGAPS =first semester grade average points, SSGAPS =second semester grade average points, PUPRT =push up pre test, PUPOT=push up post test, NMRPRT=nine meter run pre test, NMRPOT= nine meter run post test TLPRT=trunk lift pre test, TLPOT=trunk lift post test, SRPRT=sit and reach pre test, SRPOT=sit and reach post test, BMIPRT=body mass index pre test, BMIPOT=body mass index post test, EG= experimental group, CG=control group the degree of relationship is expressed by coefficient which range from correlation (-1< r > +1) and the standard significant value p< 0.05.

The results showed that there was an improvement of push up, trunk lift, nine meter running and sit and reach test for experimental group when it was compared from pre to post test measurements. The control group also improved in some aspects but it was not that much. The academic results showed that experimental group's GAPs were greatly improved from first to second semester. But in control group the mean value of GAPs from first to second semester was decreased. The significance results showed that experimental group improved academic achievement (GPAs) due to participation of physical activities. In other hand the results indicated that there was slight improvement had been observed on their physical fitness except BMI .

The correlation coefficient of experimental group on muscular strength and flexibility showed moderate significant positive correlation with academic performance. And body composition had moderate significant negative correlation. With the exception of the cardiovascular endurance and muscular endurance results showed very high significant positive correlations with academic performance among the experimental group.

IV. Conclusions

Regular participation in physical activity had a significant effect on the improvement and enhancement of physical fitness performance and improved academic achievements. The school participants, who took part in the regular physical activity had improve their physical fitness and academic achievement as compared to control group. Participation in regular exercises is very important for school children for overall development. There was a strong correlation between academic achievement and physical fitness. The improvements in academic achievements and physical fitness were clearly shown during pre and post test of the study

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