Relationship between Health - Related Physical Fitness and BMI in Adolescents of Gurgaon, Haryana

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1.0: Introduction

It is known since ages that sports and games improve our capability to carry out physical as well as mental work. They improve our efficiency. Either study or work alone makes us exhaust. We remain no longer efficient to do any work. That's when sports remove our mental exhaustion. Sports are integral part of education, and it may be noted that education without sports is incomplete. Sports are particularly important for the youth. They help in their physical and mental growth. They contribute in the formation of character. They inculcate in them good values. It is therefore, sports competition is held at school and college levels. The students who perform well in this competition are promoted to play at the national and international level. Thus sports help in career growth also. Thus, sports have great value in life. Sports facilities are being developed in rural and semi-urban areas. There are playgrounds in villages. Sports infrastructure are being developed everywhere so as to promote them. Various sport organizations are also doing well in promotion of sports.

Often, children and adolescents ooze with physical energy. When they are involved in sports, their physical energies are used up in a constructive way. Teenage is such an impressionable age, if adolescents are given free time they might get involved in wrong activities or may fall in bad company or may also display anti-social behavior. Thus, the importance of sports in society is that it keeps adolescents from becoming anti-social elements, which might otherwise disturb the delicate fabric of society. Moreover, the modern lifestyle has made a lot of changes in the daily chores of the adolescents, which often affect their health in an adverse way. The most common problem with the adolescent's vis-à-vis their health is the obesity. Moreover, it (the obesity) also affects their overall physical and psychological health. Hence, n order to understand the relationship between physical fitness (indicated by various criterion measures) and health (as indicated by the person's BMI) has been studied in this research work.

2.0 Research Methodology

2.1 Sample size and Selection of Subjects

In view of the literature review of past studies, it was decided that for the present investigation a sample between 1000 and 1500 is necessary. However, in all total 1396 subjects from the different schools of Gurgaon (Haryana) were selected. The age of subjects varied between 12 and 18 years. The study considered both, boys (748) and girls (648) for the collection of data.

2.2 Administration of Tests

Anthropometric measures such as height and weight were determined for computing the Body Mass Index (BMI). The height was measured with the help of medical Equipment Stadiometer and body weight was measured by weighing machine. Health-related physical fitness tests (Cardiovascular fitness, Muscular strength, Muscular endurance, Flexibility) were conducted with these students. Cardiovascular Fitness was measured by using Cooper's Test, Muscular endurance was measured by bent knee sit up and Flexibility was measured by sit and reach test. The Body Mass Index of each subject was calculated by using the following standard formula (**BMI** = Body weight (Kg) / Height in m^2).

2.3 Reliability and Validity of Data

In order to have a reliable estimate of the results as well as the conclusion, reliability of data was estimated by establishing the instruments reliability, tester's competency and reliability of the test. The tester's reliability was evaluated together with the reliability of tests. To determine the reliability of the tests the performance of twenty subjects selected at random on selected parameters were recorded twice under identical condition. A person's product movement co-relation was computed between the two measures of each variable. The results of this test indicated that the

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correlation coefficients were above 0.840, which indicated adequate level of reliability. The reliability and validity of the research instrument was determined prior to actual data collection.

2.4 Statistical Analysis of the Data

Analysis of data was done with the help of suitable statistical tests. The descriptive statistics, such as mean, standard deviation, minimum and maximum, skewness and kurtosis were determined from the collected data. The relationship between various parameters was determined using Pearson's Product Moment Correlation Coefficient test. The data generated during the study was processed using Statistical Package for Social Sciences (SPSS) 18.0 software.

3.0 Results and Discussion

3.1 Data Characteristics

The reliability of the data was assessed with the help of descriptive statistics. Moreover, these descriptive statistics were determined as it helps the researcher to cross-check the reliability of his techniques for generating data pertaining to aerobic fitness of the adolescents. In this study, descriptive statistics such as Mean, SD, Skewness and Kurtosis were determined and are presented in the following Tables.

3.1.1 Aerobic fitness

Table 1: Aerobic fitness of the adolescents

Attributes	Adolescent Boys	Adolescent Girls
Mean	1935	1687
SD	±405.1	±334.6
Minimum	250	600
Maximum	2775	2520
Skewness	-0.621	-0.084
Kurtosis	-0.706	-0.165

The data (Table 1) revealed that the skewness values for adolescent boys and girls are   -0.621 and -0.084 respectively. Whereas, the kurtosis values for adolescent boys and girls are -0.706 and -0.165 respectively. Overall, the skewness and kurtosis values indicated that the data is consistent and the techniques used for data generation are reliable.

3.1.2 Muscular endurance

Table 2: Muscular Endurance of the adolescents

Attributes	Adolescent Boys	Adolescent Girls
Mean	44	29
SD	±136.6	±8.67
Minimum	7	9
Maximum	1900	53
Skewness	13.463	0.257
Kurtosis	180.909	-0.049

The data (Table 2) revealed that the skewness values for adolescent boys and girls are 13.463and 0.257respectively. Whereas, the kurtosis values for adolescent boys and girls are 180.909and -0.049 respectively. Overall, the skewness and kurtosis values indicated that the data is consistent and the techniques used for data generation are reliable.

3.1.3 Flexibility

Table 3: Flexibility of the adolescents

Attributes	Adolescent Boys	Adolescent Girls
Mean	0	1
SD	±2.84	±2.80
Minimum	-7	-11
Maximum	6	10
Skewness	-0.289	-0.745
Kurtosis	-0.645	2.193

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3.1.4 Body Mass Index

Table 4: BMI of the adolescents

Attributes	Adolescent Boys	Adolescent Girls
Mean	20.9	20.7
SD	±3.96	±3.74
Minimum	13.3	13.3
Maximum	41.0	29.3
Skewness	1.268	0.666
Kurtosis	3.252	-0.410

The data (Table 4) revealed that the skewness values for adolescent boys and girls are 1.268and 0.666respectively. Whereas, the kurtosis values for adolescent boys and girls are 3.252and -0.410respectively. Overall, the skewness and kurtosis values indicated that the data is consistent and the techniques used for data generation are reliable.

3.2 Relationship between physical fitness and BMI

3.2.1 Relationship between Aerobic endurance and BMI

Table 5: Relationship between Aerobic endurance and BMI

	Correlation coefficient (r^2)
Boys	0.527[**]
Girls	0.409[*]

* : Significant at p 0.05 level
** : Significant at p 0.01 level

Table 5 presents results regarding the relationships between Aerobic Endurance and BMI of the adolescents i.e. boys and girls of different schools in Gurgaon (Haryana).

- *Boys*: The data showed that there is significant positive relationship between muscular endurance and BMI ($r^2 = 0.527$, $p<0.01$) of the boys.
- *Girls*: The data showed that there is significant positive relationship between muscular endurance and BMI ($r^2 = 0.409$, $p<0.05$) of the girls.

3.2.2 Relationship between Muscular endurance and BMI

Table 6: Relationship between Muscular endurance and BMI

	Correlation coefficient (r^2)
Boys	0.329[*]
Girls	0.129

* : Significant at p 0.05 level
** : Significant at p 0.01 level

Table 6 presents results regarding the relationships between Muscular endurance and BMI of the adolescents i.e. boys and girls of different schools in Gurgaon (Haryana).

- *Boys*: The data showed that there is significant positive relationship between muscular endurance and BMI ($r^2 = 0.329$, $p<0.05$) of the boys.
- *Girls*: The data showed that there is weak positive relationship between muscular endurance and BMI ($r^2 = 0.129$) of the girls.

3.2.3 Relationship between Flexibility and BMI

Table 7: Relationship between Flexibility and BMI

	Correlation coefficient (r^2)
Boys	-0.421[*]
Girls	0.229

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* : Significant at p 0.05 level

** : Significant at p 0.01 level

Table 7 presents results regarding the relationships between Flexibility and BMI of the adolescents i.e. boys and girls of different schools in Gurgaon (Haryana).

- *Boys*: The data showed that there is significant negative relationship between flexibility and BMI (r^2= 0.421, p<0.05) of the boys.
- *Girls*: The data showed that there is weak positive relationship between flexibility and BMI (r^2= 0.229) of the girls.

4.0 Conclusions
4.1 Data Characteristics

- The skewness and kurtosis values for the various parameters like aerobic fitness, muscular endurance, flexibility and BMI indicated that the data is consistent and the techniques used for data generation are reliable.

4.2 Relationship between physical fitness and BMI
4.2.1 Relationship between Aerobic endurance and BMI

- *Boys*: The data showed that there is significant positive relationship between muscular endurance and BMI (r^2= 0.527, p<0.01) of the boys.
- *Girls*: The data showed that there is significant positive relationship between muscular endurance and BMI (r^2= 0.409, p<0.05) of the girls.

4.2.2 Relationship between Muscular endurance and BMI

- *Boys*: The data showed that there is significant positive relationship between muscular endurance and BMI (r^2= 0.329, p<0.05) of the boys.
- *Girls*: The data showed that there is weak positive relationship between muscular endurance and BMI (r^2= 0.129) of the girls.

4.2.3 Relationship between Flexibility and BMI

- *Boys*: The data showed that there is significant negative relationship between flexibility and BMI (r^2= 0.421, p<0.05) of the boys.
- *Girls*: The data showed that there is weak positive relationship between flexibility and BMI (r^2= 0.229) of the girls.

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