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An Analytical Study of Physical Fitness Level in Pre-Adolescent in Reference to their Schools Types

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Abstract-- This analytical study investigates the physical fitness levels of pre-adolescent children in relation to the type of school they attend, examining how different educational environments (Central Govt., State Govt. and Private schools) may influence the physical fitness outcomes of students. The study aims to assess the fitness levels based on parameters such as Speed, Muscular strength and Cardio-vascular endurance through standardized physical fitness tests. By comparing students from various school types, the research seeks to identify significant differences in physical fitness outcomes, which might be influenced by factors such as curriculum structure, extracurricular activities, and availability of sports facilities. For fulfilling the purpose a total of 270 boys of three different age groups were selected from three different types of school as subjects. Standardized Physical Fitness Tests were used to collect the data from the pre-adolescents by maintaining test sequences for getting accurate results. After the collection of the raw data were converted into standard one by using a statistical technique 'ANOVA' test for testing of hypothesis. The result shows significant difference in physical fitness of the boys of different types of schools.

Keywords-- Analytical, Physical Fitness, Pre-adolescent, Central Govt., State Govt., Private school.

I. INTRODUCTION

Physical fitness is cornerstone of holistic development, affecting not just their physical health but also their mental, emotional, and social well-being. Pre-adolescence, defined as the age range of 12 to 15 years, is a formative stage in which health and fitness habits are developed. This developmental stage is distinguished by fast physical growth, enhanced cognitive ability, and changing social connections. Establishing good physical activity habits at this period is critical because it establishes the framework for a healthy lifestyle and avoids the early onset of lifestyle-related disorders such as obesity, diabetes, and cardiovascular issues. (Malina, Bouchard, & Bar-Or, 2004) At this age, the basis for an active lifestyle, motor skill development, and physical competency is established, making it an important time for intervention and evaluation. (Haywood & Getchell, 2020)

School environment have a tremendous impact on children's physical health. They offer regulated chances for physical exercise such as physical education sessions, extracurricular sports and everyday routines. However, there are disparities in infrastructure, policy implementation, access to qualified physical education teachers, and prioritization of fitness in the academic curriculum among various types of schools, including Central Government (e.g., Kendriya Vidyalayas), State Government, and Private Schools. These differences may impact children's exposure to and participation in physical exercise, consequently impacting their overall fitness levels. (Verma & Singh, 2019)

Socioeconomic status, which frequently coincides with the sort of school attended, exacerbates the problem. Private schools may have superior sports facilities and extracurricular activities, but they often encourage more sedentary lives owing to academic constraints and digital participation. In contrast, government school kids may participate in more unstructured physical activity, such as walking or cycling to school, but they may lack access to organized sports programs or suitable facilities. (Kumar & Mohanraj, 2018)

Concerns have increased in recent years about the decline in physical fitness among children throughout the world, which is mostly due to sedentary lifestyles, poor food habits, and insufficient physical exercise. (Kumar, Robinson & Till, 2015) Schools are one of the key settings in which systematic physical exercise is taught and supported. However, the sort of school a kid attends—whether it is a Central Government (e.g., Kendriya Vidyalayas), State Government, or Private institution—has a considerable impact on the possibilities, facilities, and focus given on physical education and fitness programmes. (Krotee & Buchar, 2007)

The National Education Policy (NEP) 2020 emphasizes the necessity of including health and physical education as a basic component of the school curriculum, recognizing that cognitive and physical development must occur concurrently. In accordance with this, programs like the Fit India Movement seek to encourage exercise culture in schools across the country.

Regardless of these efforts, the success and implementation of such activities might differ greatly between school types, potentially impacting kids' fitness outcomes. (**Government of India, 2020**)

II. OBJECTIVE

This study was analysed the physical fitness levels of pre-adolescent kids in three types of schools: central government, state government, and private schools. By assessing and comparing the fitness levels among these groups, the research seeks to identify the impact of institutional differences on children's physical development. The findings will help educators, policymakers, and health experts develop focused measures to improve physical fitness among school-age children across diverse educational systems.

III. ALTERNATIVE HYPOTHESES

There is a significant difference in physical fitness levels among pre-adolescent students of Central Government, State Government, and Private schools.

IV. RESEARCH DESIGN

The study is quantitative, comparative and cross sectional study approaches analysis, involving both descriptive and inferential statistics.

V. POPULATION & SAMPLE

In this study targeted group is pre-adolescents of Central Government, State Government, Private schools of Amravati, Maharashtra whose age ranging between 12-15 years. Here, the schools are selected by convenience sampling method whereas the subjects were selected by purposive sampling method.

A total of 270 boys of three different age groups were selected from three different types of school as subjects for this study. The number of subjects examined in each age group and each type of school is presented in the table below:

Table 1: Illustrated the Size of Population as Well as Sample

Age Group (Years)	Central Govt. School	State Govt. School	Private School	Total
12-13	30	30	30	90
13-14	30	30	30	90
14-15	30	30	30	90

Variables (Conceptual Model):

Table 2: Dependent, Independent and Control Variables Used in the Study

Dependent Variables	Independent Variables	Control or Extraneous Variables
Physical Fitness Components (Speed, Muscular Strength, Cardio-vascular Endurance tests)	Type of School (Central Government, State Government, Private)	Age (12-15 yrs.) Socioeconomic status Nutritional habits Daily screen time Parental education or awareness School infrastructure Time allotted for physical Activity

VI. TOOLS FOR DATA COLLECTION

Standardized Physical Fitness Tests were used to collect the data from the pre-adolescents by maintaining test sequences for getting accurate results. Speed tests are done first as they require full energy, followed by strength tests.

Endurance tests, being the most tiring, are done last. This order ensures accurate results, reduces injury risk, and aligns with standard fitness protocols. Showing in following table:

Table 3: Test Administration of Speed, Muscular Strength and Cardiovascular Endurance

Speed (1)	Muscular Strength (2)	Cardio-vascular endurance (3)
50m Dash	Sit Ups for 1 min	800m Run and walk
Measures how quickly a student can sprint 50 meters on the starting signal by the tester. It assesses acceleration and running speed over a short distance. Scored in Second.	Measures core or upper body strength. On start signal the testee perform as many sit-ups as possible in 1 minute was counted and scored.	Assesses heart and lung efficiency. On the signal of the tester, subject run or walk 800 meters continuously, and time is recorded in minutes & second to evaluate cardio-vascular endurance capacity.

VII. ETHICAL CONSIDERATIONS

During conduction of the study, Consent from parents or school authorities have been collected. No motivational techniques were used for participation of the subjects in the test and also during the collection of data. The confidentiality of the data were must be maintained.

VIII. DATA ANALYSIS

After the collection of data from the pre-adolescent boys of selected schools of Amravati, Maharashtra, the raw data were converted into standard one by using a statistical technique 'ANOVA' test for testing of hypothesis.

Table 4: Comparison of Speed in Reference to Different Types of Schools of the School Boys

Descriptive Statistics:

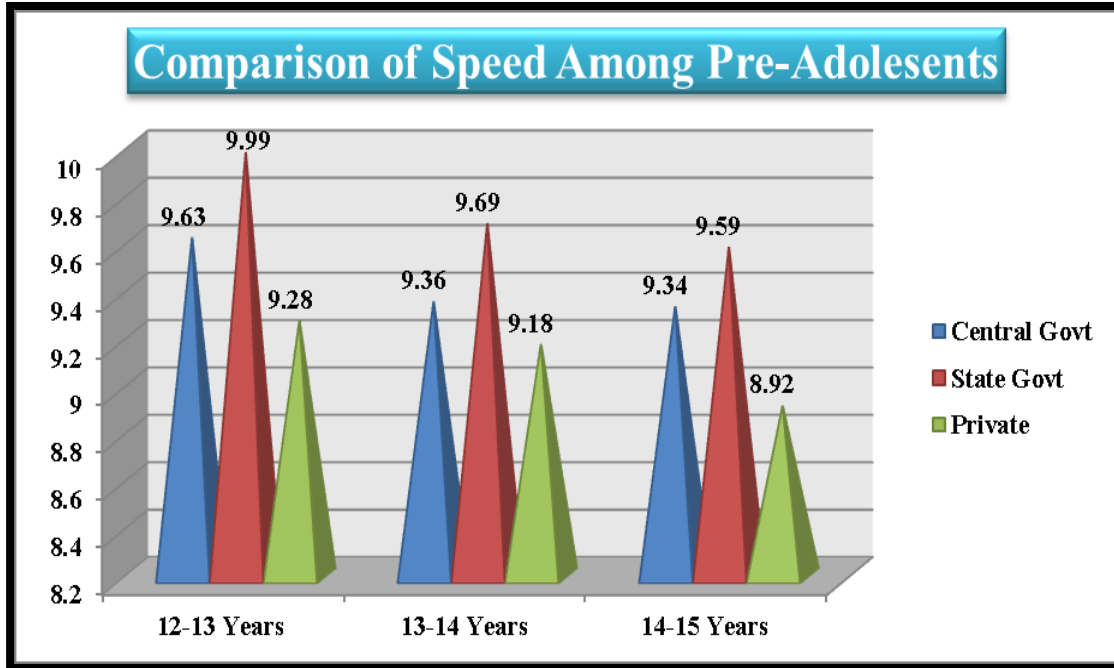
Table 4 A: Descriptive Statistics of Speed in Reference to Different Types of Schools of the School Boys

Age Group	School Types	Count	Sum	Average	Variance
12-13 Years	Central Govt. School	30	288.98	9.63	0.54
	State Govt. School	30	299.75	9.99	0.96
	Private School	30	278.36	9.28	0.95
13-14 Years	Central Govt. School	30	280.87	9.36	0.41
	State Govt. School	30	290.75	9.69	0.76
	Private School	30	275.26	9.18	0.55
14-15 Years	Central Govt. School	30	280.28	9.34	0.53
	State Govt. School	30	287.75	9.59	0.68
	Private School	30	267.56	8.92	0.94

Low score considered better performance

From the above table it is being said that the mean time for 50 m dash of all the age group is better in private schools. The dominance of private school pre-adolescents is clear in the above table.

There is mean difference of speed between the boys of different type schools. Whether it is significant or not it can be shown by using special statistical technique 'F' test (ANOVA).



Graph: 1 Graphical Representation of Speed of the School Boys of Different Types of Schools

ANOVA Table:

Table 4B: One Way Analysis of Variance (ANOVA) of Speed in Reference to Different Types of Schools of the School Boys

	Source of Variation	Sum of Square	df	MS	F	P-value	F crit
12-13 Years	Between Groups	7.626	2	3.813	4.678*	0.0117	3.101
	Within Groups	70.910	87	0.815061			
	Total	78.536	89				
13-14 Years	Between Groups	4.100	2	2.050	3.584*	0.0319	
	Within Groups	49.764	87	0.572			
	Total	53.865	89				
14-15 Years	Between Groups	6.947	2	3.473	4.833*	0.0102	
	Within Groups	62.521	87	0.719			
	Total	69.468	89				

In the given table the value of Tabulated 'F' is 3.101 and the value of Calculated 'F' for three different age groups are 4.678, 3.584 and 4.833, which all are greater than tabulated 'F' at 0.05 level of confidence. So it is clear that there is significant difference in speed between the pre-adolescent boys of different types of school.

Hence, the alternative hypothesis given by the researcher is accepted and the null hypothesis is rejected.

As, there is significant difference in speed between the pre-adolescent boys of different types of school so, researcher further calculated the LSD for three different age groups.

Table 4 C: Post Hoc Comparison of Means of Speed in Reference to Different Types of Schools of the School Boys

	Groups		Central Govt.	State Govt.	Private	Critical Difference
			9.63	9.99	9.28	
12-13 Years	Central Govt.	9.63	0	0.36*	0.35*	0.328
	State Govt.	9.99		0	0.71*	
	Private	9.28			0	
			9.36	9.69	9.18	CD
13-14 Years	Central Govt.	9.36	0	0.33*	0.18	0.275
	State Govt.	9.69		0	0.51*	
	Private	9.18			0	
			9.34	9.59	8.92	CD
14-15 Years	Central Govt.	9.34	0	0.25	0.42*	0.308
	State Govt.	9.59		0	0.67*	
	Private	8.92			0	

*Shows Significant

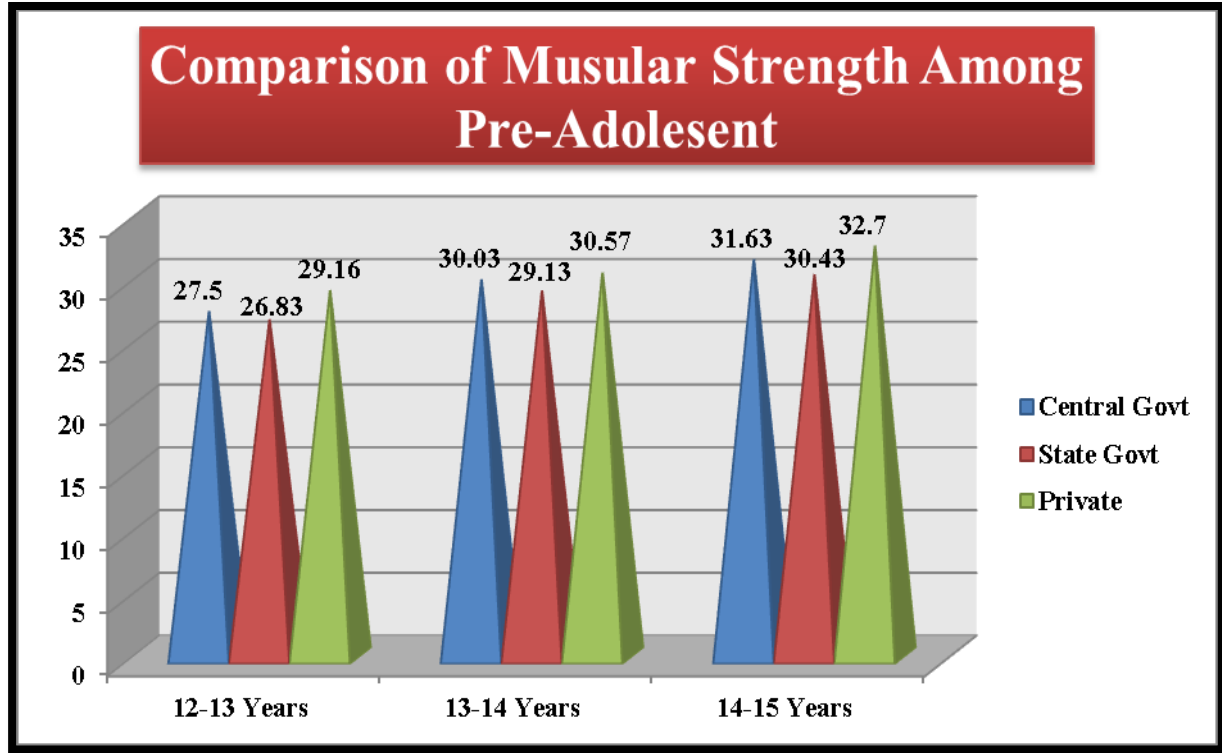
Table 5A: Descriptive Statistics of Muscular Strength in Reference to Different Types of Schools of the School Boys

Age Group	School Types	Count	Sum	Average	Variance
12-13 Years	Central Govt. School	30	825	27.5	10.47
	State Govt. School	30	805	26.83	6.21
	Private School	30	875	29.16	14.35
13-14 Years	Central Govt. School	30	901	30.03	6.65
	State Govt. School	30	874	29.13	1.91
	Private School	30	917	30.57	3.15
14-15 Years	Central Govt. School	30	949	31.73	3.83
	State Govt. School	30	915	30.50	1.64
	Private School	30	956	31.87	2.67

Higher score considered better performance

From the above table it is being said that the mean of sit ups count in 1 minute of all the age group is better in private schools. Again, the dominance of private school pre-adolescents is clear in the above table.

There is mean difference of muscular strength between the boys of different type schools. Whether it is significant or not it can be shown by using special statistical technique 'F' test (ANOVA).



Graph: 2 Graphical Representation of Muscular Strength of the School Boys of Different Types of Schools

ANOVA Table:

Table 5 B: One Way Analysis of Variance (ANOVA) of Muscular Strength in Reference to Different Types of Schools of the School Boys

	Source of Variation	Sum of Square	df	MS	F	P-value	F crit
12-13 Years	Between Groups	86.67	2	43.33	4.189*	0.0183	3.101
	Within Groups	899.83	87	10.34			
	Total	986.5	89				
13-14 Years	Between Groups	31.49	2	15.74	4.031*	0.0212	
	Within Groups	339.8	87	3.906			
	Total	371.29	89				
14-15 Years	Between Groups	32.067	2	16.03	5.912*	0.0039	
	Within Groups	235.93	87	2.71			
	Total	268	89				

In the given table the value of Tabulated 'F' is 3.101 and the value of Calculated 'F' for three different age groups are 4.189, 4.031 and 5.912, which all are greater than tabulated 'F' at 0.05 level of confidence. So it is clear that there is significant difference in Muscular strength between the pre-adolescent boys of different types of school.

Hence, the alternative hypothesis given by the researcher is accepted and the null hypothesis is rejected.

As, there is significant difference in muscular strength between the pre-adolescent boys of different types of school so, researcher further calculated the LSD for three different age groups.

Table 5 C: Post Hoc Comparison of Means of Muscular Strength in Reference to Different Types of Schools of the School Boys

	Groups		Central Govt.	State Govt.	Private	Critical Difference
			27.5	26.83	29.16	
12-13 Years	Central Govt.	27.5	0	0.67*	1.66*	1.168
	State Govt.	26.83		0	2.33*	
	Private	29.16			0	
			30.03	29.13	30.57	CD
13-14 Years	Central Govt.	30.03	0	0.9*	0.54	0.718
	State Govt.	29.13		0	1.44*	
	Private	30.57			0	
			31.63	30.43	32.7	CD
14-15 Years	Central Govt.	31.63	0	1.2*	1.07*	0.598
	State Govt.	30.43		0	2.27*	
	Private	32.7			0	

*Shows Significant

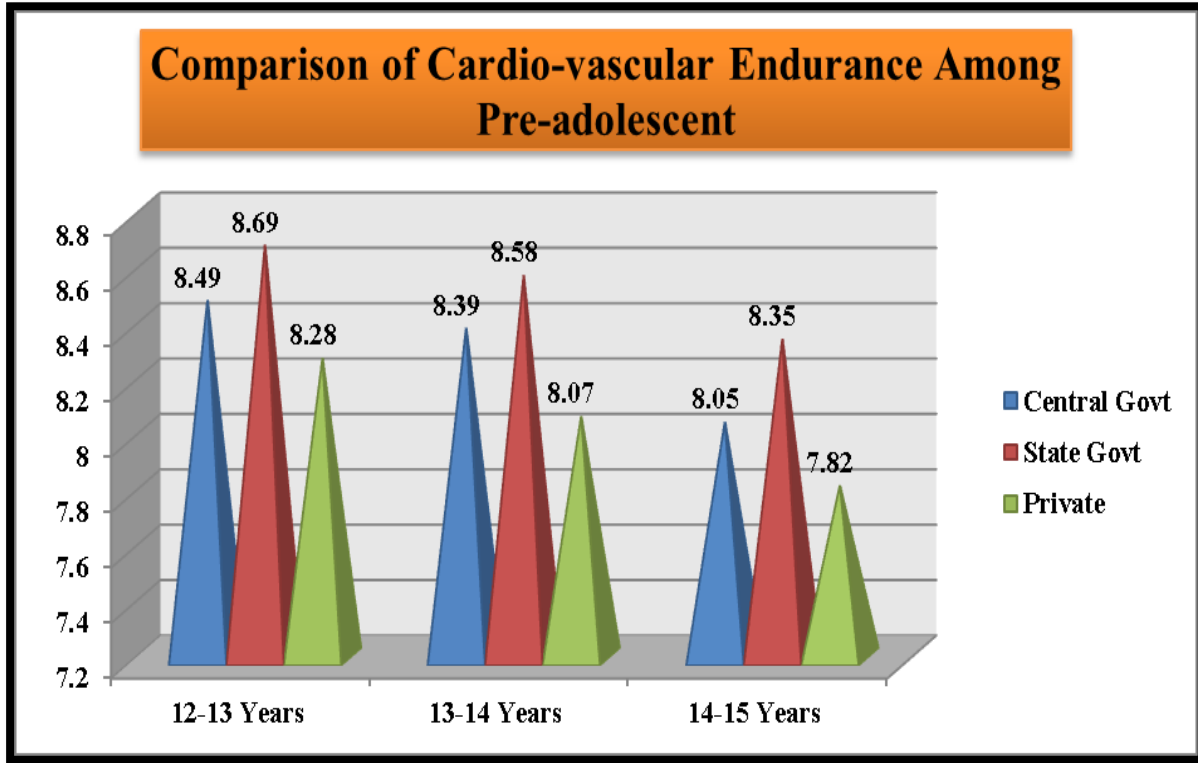
Table 6 A: Descriptive Statistics of Cardio-vascular Endurance in Reference to Different Types of Schools of the School Boys

Age Group	School Types	Count	Sum	Average	Variance
12-13 Years	Central Govt. School	30	254.75	8.49	0.49
	State Govt. School	30	260.55	8.69	0.90
	Private School	30	248.53	8.28	0.90
13-14 Years	Central Govt. School	30	251.92	8.40	0.38
	State Govt. School	30	257.55	8.59	0.64
	Private School	30	242.23	8.07	0.61
14-15 Years	Central Govt. School	30	241.45	8.05	0.38
	State Govt. School	30	250.45	8.35	0.68
	Private School	30	234.65	7.82	0.32

Low score considered better performance

From the above table it is being said that the mean of cardio-vascular endurance of all the age group is better in private schools. In cardio-vascular endurance the dominance of private school pre-adolescents is clear in the above table.

There is mean difference of cardio-vascular endurance between the boys of different type schools. Whether it is significant or not it can be shown by using special statistical technique 'F' test (ANOVA).



Graph: 3 Graphical Representation of Cardio-vascular Endurance of the School Boys of Different Types of Schools

ANOVA Table:

Table 6 B: One Way Analysis of Variance (ANOVA) of Cardio-vascular Endurance in Reference to Different Types of Schools of the School Boys

	Source of Variation	Sum of Square	df	MS	F	P-value	F crit
12-13 Years	Between Groups	2.409	2	1.204	1.574	0.213	3.101
	Within Groups	66.557	87	0.765			
	Total	68.967	89				
13-14 Years	Between Groups	4.003	2	2.002	3.702*	0.0286	
	Within Groups	47.033	87	0.541			
	Total	51.036	89				
14-15 Years	Between Groups	4.187	2	2.094	4.552*	0.0132	
	Within Groups	40.015	87	0.460			
	Total	44.203	89				

In the given table the value of Tabulated 'F' is 3.101 and the value of Calculated 'F' for 13-14 years and 14-15 years age groups are 3.702 and 4.552, which are greater than tabulated 'F' at 0.05 level of confidence, except 12-13 years age group, which is 1.574. So there is significant difference in cardio-vascular endurance between the pre-

adolescent boys of 13-14 and 14-15 years age group of different types of school.

As, there is significant difference in cardio-vascular endurance between the pre-adolescent boys of different types of school so, researcher further calculated the LSD for two age groups which are significant.

Table 6 C: Post Hoc Comparison of Means of Cardio-vascular Endurance in Reference to Different Types of Schools of the School Boys

	Groups		Central Govt.	State Govt.	Private	Critical Difference
			8.39	8.58	8.07	
13-14 Years	Central Govt.	8.39	0	0.19	0.32*	0.267
	State Govt.	8.58		0	0.51*	
	Private	8.07			0	
			8.05	8.35	7.82	CD
14-15 Years	Central Govt.	8.05	0	0.3*	0.23	0.246
	State Govt.	8.35		0	0.53*	
	Private	7.82			0	

*Shows Significant

IX. RESULT

Descriptive statistics revealed that students from Private schools demonstrated higher mean scores in speed, muscular strength, and cardiovascular endurance compared to their Central and State Government counterparts. The analysis of variance (ANOVA) confirmed statistically significant differences among the three school types for all measured fitness parameters ($p < 0.05$).

Post hoc comparisons using Tukey's HSD test indicated that Private school students significantly outperformed State Government school students in speed and endurance tests, while Central Government school students showed intermediate performance levels. These findings suggest that institutional factors and available resources may positively influence physical fitness outcomes.

X. DISCUSSION

The present findings align with existing literature highlighting the influence of school environment on physical fitness (Kumar & Mohanraj, 2018; Verma & Singh, 2019). The superior performance observed among Private school students could be attributed to better sports infrastructure, structured physical education curricula, and greater emphasis on extracurricular activities.

Conversely, State Government schools, often constrained by limited facilities and resources, showed lower fitness levels. The intermediate results for Central Government schools may reflect a balance of these factors.

These results have important implications for policy development. Enhancing physical education programs, investing in sports facilities, and promoting active lifestyles across all school types are essential to improving the holistic development of children.

XI. CONCLUSION

This study demonstrates clear disparities in physical fitness among pre-adolescent boys attending different types of schools, underscoring the critical impact of educational environment and institutional support on children's physical health. Targeted interventions are warranted to address these inequalities and promote equitable access to quality physical education.

Future research should explore longitudinal effects and incorporate broader demographic variables to better understand determinants of youth fitness.

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