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Socioeconomic Inequalities and Adolescent Fitness: Examining the Association Between SES, BMI, and Physical Fitness in Chandigarh Schools

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Abstract—This non-experimental study examined the relationships among socioeconomic status (SES), body mass index (BMI), and physical fitness in senior secondary school students in Chandigarh. The sample consisted of 50 students (25 males and 25 females) selected from five government model senior secondary schools. Data were collected using the AAHPER Physical Fitness Test (1984), the Socio-Economic Status Scale (Aggarwal et al., 2005), and BMI measurements. Product-moment correlation analysis was employed to determine the associations among variables. Results indicated strong correlations between lower body strength and abdominal strength, and significant interrelations among endurance, speed, and agility. Upper body strength showed limited associations, while SES was positively correlated with agility and negatively with abdominal strength. BMI demonstrated a weak negative correlation with upper body strength. These findings underscore the influence of socioeconomic factors on adolescents' physical fitness and health. The study contributes to evidence-based strategies aimed at improving physical fitness, reducing obesity, and promoting health equity among school-aged populations.

***Index Terms*—Socioeconomic Status, Body Mass Index, Physical Fitness, Adolescents, Health Equity.**

1. Introduction

Physical fitness is a vital component of adolescents' health, influencing not only physiological well-being but also cognitive function, emotional health, and academic performance. Adequate physical fitness during adolescence is linked to improved cardiovascular health, muscular strength, flexibility, and body composition, all of which contribute to long-term health outcomes. Socioeconomic status (SES) and body mass index (BMI) are key determinants of physical fitness, as students from lower socioeconomic backgrounds often face barriers to physical activity, limited access to recreational facilities, and suboptimal nutrition, leading to lower fitness levels and higher BMI. Conversely, higher SES is generally associated with better access to resources, healthier lifestyles, and enhanced physical outcomes.

Despite the recognized importance of these factors, the relationships among SES, BMI, and specific components of physical fitness—including strength, endurance, agility, and speed—remain underexplored, particularly in the context of senior secondary school students in Chandigarh. Understanding these relationships is critical for designing interventions that target at-risk populations and promote equity in health and fitness outcomes. Research in this area can inform educational policies, school-based fitness programs, and public health initiatives, emphasizing the importance of integrating physical activity into adolescents' daily routines.

The present study aims to examine the interrelationships among SES, BMI, and physical fitness, identify high-risk groups, and provide evidence to guide interventions and policy development. Specifically, it investigates correlations between SES, BMI, and various fitness components, identifies students at risk of low fitness due to socioeconomic or anthropometric factors, and informs the development of targeted strategies to enhance physical fitness, promote healthy lifestyles, and support academic achievement. The study tested the null hypotheses that no significant relationships exist among the physical fitness components, BMI, and SES.

By examining these relationships, this research seeks to contribute to the understanding of how socioeconomic and anthropometric factors influence adolescent health and physical fitness, providing a foundation for evidence-based interventions aimed at promoting overall wellbeing, health equity, and lifelong healthy habits among adolescents. This study is particularly relevant in the Indian context, where rapid urbanization, lifestyle changes, and disparities in access to health-promoting resources can influence adolescent physical development and long-term health outcomes.

2. Methodology

A. Participants

The study was conducted among senior secondary school students in Chandigarh. A total of 50 students were selected as the sample, comprising 25 boys and 25 girls from five government model senior secondary schools. The participants'

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ages ranged from 15 to 18 years. Purposive sampling was employed to ensure representation from multiple schools and to facilitate the administration of physical fitness tests and questionnaires.

B. Procedure

Prior to data collection, formal permission was obtained from the Department of Education (DEO), Chandigarh, to conduct the study in five Government Model Senior Secondary Schools. The DEO allotted the schools and coordinated with school authorities to schedule the testing sessions. The objectives and purpose of the study were clearly explained to the students to ensure informed participation and cooperation.

Data collection was conducted during April 2025, while students were engaged in their regular academic activities. Testing was carried out during theory class hours to minimize disruption to their schedules. Participants were not given prior training or practice to ensure that their performance reflected natural physical fitness levels. The study involved the administration of three standardized tools:

Physical Fitness Test (AAHPER, 1984): Each participant completed the AAHPER Physical Fitness Test, which included tasks measuring lower body strength, upper body strength, abdominal strength, agility, speed, and endurance. Specific test items included push-ups for upper body strength, sit-ups for abdominal strength, shuttle runs for agility, and timed runs for speed and endurance. The performance of each student was carefully timed, counted, and recorded according to AAHPER standardized procedures to ensure accuracy and reliability.

Socio-Economic Status (SES) Scale (Aggarwal et al., 2005): Students completed the SES questionnaire under the supervision of the researcher. The scale collected information regarding parents' education, occupation, family income, and living conditions. Responses were scored according to the SES scale guidelines to obtain a composite SES score for each participant. These scores were used to categorize students into socioeconomic strata, facilitating correlation analysis with physical fitness and BMI.

Body Mass Index (BMI): Height and weight of each participant were measured using standardized equipment. BMI was calculated using the formula:

$$\text{BMI} = \text{Weight (kg)}/\text{Height (m)}^2$$

These measurements were recorded and used to examine associations between body composition, physical fitness, and socioeconomic status. All data were collected and recorded systematically on the same day for each school to maintain consistency. After completion of testing, the data were compiled for statistical analysis.

C. Statistical Analysis

Descriptive statistics, including mean and standard deviation (SD), were computed for all variables. To examine relationships among variables, Pearson's product-moment correlation was applied. The significance of results was evaluated at the 0.05 level of significance.

3. Results

Descriptive statistics indicated that the participants' mean scores for physical fitness components, BMI, and socioeconomic status (SES) were as follows: lower body strength (M = 1.41, SD = 0.40), abdominal strength (M = 25.80, SD = 9.94), upper body strength (M = 6.17, SD = 7.03), agility (M = 14.52, SD = 2.04), speed (M = 10.92, SD = 2.35), endurance (M = 218.50, SD = 46.66), BMI (M = 18.94, SD = 3.32), and SES (M = 43.64, SD = 10.39).

Pearson's product-moment correlation analysis (Table 1) revealed several significant relationships among the variables. Lower body strength was strongly positively correlated with abdominal strength ($r = 0.455$, $p < 0.01$) and negatively correlated with upper body strength ($r = -0.642$, $p < 0.01$), agility ($r = -0.622$, $p < 0.01$), speed ($r = -0.577$, $p < 0.01$), and endurance ($r = -0.199$, $p < 0.01$), while its correlation with BMI was not significant ($r = -0.117$, $p > 0.05$). Abdominal strength showed negative correlations with upper body strength ($r = -0.476$, $p < 0.01$), agility ($r = -0.355$, $p < 0.01$), speed ($r = -0.307$, $p < 0.01$), endurance ($r = -0.231$, $p < 0.01$), and BMI ($r = -0.159$, $p < 0.05$), but no significant correlation with SES ($r = 0.084$, $p > 0.05$). Upper body strength did not demonstrate significant correlations with SES, speed, endurance, or BMI.

Agility was positively correlated with SES ($r = 0.521$, $p < 0.01$), speed ($r = 0.560$, $p < 0.01$), endurance ($r = 0.209$, $p < 0.01$), and BMI ($r = 0.252$, $p < 0.01$), indicating that higher agility was associated with higher SES and better performance in other fitness components. Speed also correlated positively with SES ($r = 0.546$, $p < 0.01$) and agility, while its relationships with endurance and BMI were non-significant. Endurance exhibited a weak positive correlation with SES ($r = 0.130$, $p < 0.05$) and non-significant correlations with BMI and speed. Overall, BMI showed weak or non-significant correlations with most fitness components and SES.

These findings suggest that lower body strength is closely related to abdominal strength but inversely associated with other fitness components, while agility and speed are positively linked to SES. The results highlight the complex

Table 1
Pearson correlations among physical fitness components, BMI, and Socioeconomic status (N = 250)

Variable	1	2	3	4	5	6	7
Lower body strength	—	0.455**	-0.642**	-0.622**	-0.577**	-0.199**	-0.117
Abdominal strength		—	-0.476**	-0.355**	-0.307**	-0.231**	-0.159*
Upper body strength			—	0.045	0.046	-0.113	-0.029
Agility				—	0.560**	0.209**	0.521**
Speed					—	0.110	0.546**
Endurance						—	0.130*
BMI							—

Note: *p < 0.05, **p < 0.01

interrelationships among physical fitness variables, BMI, and socioeconomic status among senior secondary school students in Chandigarh.

4. Discussion

The present study examined the interrelationships among socioeconomic status (SES), body mass index (BMI), and physical fitness components in senior secondary school students in Chandigarh. The results indicate that physical fitness is influenced by both intrinsic and extrinsic factors, with distinct patterns emerging for strength, agility, speed, and endurance.

Lower body strength was positively associated with abdominal strength but inversely correlated with upper body strength, agility, speed, and endurance. This suggests that while core strength is interconnected, performance in certain fitness domains may vary independently, highlighting the multifaceted nature of physical fitness among adolescents. Agility and speed, in particular, showed strong positive correlations with SES, indicating that students from higher socioeconomic backgrounds tend to have better access to resources, training opportunities, and health-promoting environments that support the development of these fitness components.

BMI showed weak or non-significant correlations with most physical fitness measures and SES, suggesting that body composition alone may not fully capture differences in adolescent fitness levels within this population. This finding aligns with prior research indicating that socioeconomic and environmental factors can exert stronger influences on physical activity participation and fitness outcomes than BMI alone.

The study's findings have important implications for educational policy and intervention programs. Students from lower socioeconomic backgrounds may be at higher risk of reduced agility and speed, potentially limiting their overall physical fitness and health outcomes. Schools and policymakers should consider implementing targeted, inclusive fitness programs that provide equitable access to training facilities, structured physical education, and health education. Emphasizing multi-component fitness training—encompassing strength, endurance, agility, and speed—can help address disparities and promote holistic adolescent health.

In conclusion, the study highlights the complex interplay among SES, BMI, and physical fitness components in adolescents. While core and lower body strength are interrelated, agility and speed appear particularly sensitive to socioeconomic factors. These findings underscore the need for evidence-based interventions that account for socioeconomic disparities, promoting equitable opportunities for physical development, lifelong health, and academic success among students.

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