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Comparative analysis of physical fitness levels and academic performance among secondary school students in rural and urban areas of Delanta, Ethiopia

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Abstract

Significant disparities are evident in the physical fitness levels and academic performance of students enrolled in schools located in urban settings versus those in rural regions. Thus, this research aims to perform a comparative evaluation of students' physical fitness levels and academic performance among secondary school learners from rural and urban locations of Delanta, Ethiopia. The study utilized a causal comparative research design involving a sample of 120 participants. Data were collected using various test batteries, including the 1.5 Mile run, Illinois agility, Sit and reach, Shot put, and 90-degree push-up test, while academic performance was gauged through students' cumulative grade point averages in mathematics, chemistry, biology, and physics. An independent t-test was used to compare physical fitness and academic attributes between the two groups, and the correlation coefficient was employed to analyse the association among physical fitness qualities and academic achievements. The fitness test results revealed significant disparities among rural and urban students in various aspects. The results revealed superior cardiovascular endurance, flexibility, power, and muscular strength were significantly different in a rural setting. However, agility and speed showed no significant changes among the groups. Regarding academic achievement, the difference between rural and urban students was not statistically significant. The study concludes that specific physical fitness components, particularly power, flexibility, cardiovascular endurance, and muscular strength, significantly influence academic success, with rural students outperforming urban peers in several fitness areas, while overall academic achievement remains similar between the groups.

Keywords: Physical fitness, Academic performance, Secondary school students, Rural areas, Urban Areas

Introduction

Physical fitness is clearly stated as the body's capacity to work efficiently and successfully, contributing to overall health, disease resistance, and emergency preparedness. It consists of two primary components: fundamental physical fitness qualities and performance-connected bodily fitness qualities (Hian et al., 2013). According to Britton et al. (2020), fundamental bodily fitness encompasses aerobic (heart–lung) endurance, muscle strength, muscle stamina, body fat–to–mass ratio, and joint flexibility. For children, physical fitness serves as a crucial health indicator (Ortega et al., 2008), with the advancement of physical exercise, fitness, and healthy weight among school children recognized as a global priority (Robinson et al., 2015). Physical exercise is recognized as a crucial factor in advancing the comprehensive growth of adolescents, enhancing both their bodily and psychological well-being (McMahon et al., 2017). The health status of children significantly influences their learning capacities, with higher levels of physical fitness indicating a progressive correlation with improved educational attainment (Kwak et al., 2009).

Research has revealed significant disparities in bodily fitness profiles among city and countryside children. Urban youth often exhibit lower levels of flexibility, muscular endurance, and strength, primarily due to reduced physical activity (Tinazci and Emiroglu, 2009). This suggests that a child's place of residence greatly influences their physical fitness components (Singh et al., 2016). Specifically, rural secondary school students tend to possess higher overall physical fitness levels, particularly in cardiovascular endurance and muscular strength, while urban students excel in flexibility and agility, likely due to better access to organized sports and fitness facilities (Karkera et al., 2014).

The notable disparities in bodily fitness among city and countryside area preadolescents are well-documented, indicating a disparity that can influence various aspects of health and development (Singh and Malik, 2021). Additionally, the educational disparities that persist between rural and urban settings, particularly regarding academic achievement and schooling conditions, are subjects of ongoing debate (Tayyaba, 2012).

While existing studies in South Africa and Ethiopia underscore the crucial role of physical activity and fitness components such as cardiovascular endurance and muscle strength in enhancing both physical and academic performance (Ngomana et al., 2024; Ayane and Belachew, 2023). The current secondary school physical education curriculum in East Amhara, Ethiopia, inadequately motivates students for lifelong sports participation, highlighting the need for its revision to enhance engagement and holistic development (Hailu and Krog, 2025). Additionally, access to sports resources, facilities, ICT, and safety measures

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remains limited in many areas, hindering the effective implementation of physical education programs (Abrham et al., 2024). Most studies focus broadly on physical fitness and its general influence on educational achievement without thoroughly studying socio-economic, behavioural, and infrastructural factors that may uniquely influence student performance in Ethiopia and across African nations.

This study hypothesizes that (1) rural students might not have demonstrated superior performance than urban students in fundamental fitness constituents; (2) these fundamental physical fitness constituents might not have shown a stronger positive correlation with academic performance compared to skill-related components. Thus, it aims to compare differences in physical fitness status and academic performance among secondary school students living in rural versus urban settings in Delanta, Ethiopia. The findings provided insights into how physical fitness is linked to academic performance, informing actions to improve both fitness and learning achievement in these communities.

Materials and methods

Study area

The investigation took place in the Delanta district, which is one of the 22 districts located inside the south Wollo administrative zone across the Amhara Region in Ethiopia. The district's main town, Wegel Tena, is situated approximately 98 km from Dessie, the capital city of South Wollo (Ejigu et al., 2020). Delanta is situated between approximately 11°29'–11°41' N and 39°02'–39°14' E, ranging from about 1500 to 3819 meters in elevation and enclosed by the Beshilo River, Dawunt, Wadla, Guba Lafto, and Ambasel (Abate, 2020). The district encompasses three secondary schools, with a focus on Chew-Qutir and Wegel Tena, which serve as the primary study sites. A detailed geographical outline of the research region is illustrated in Figure 1.

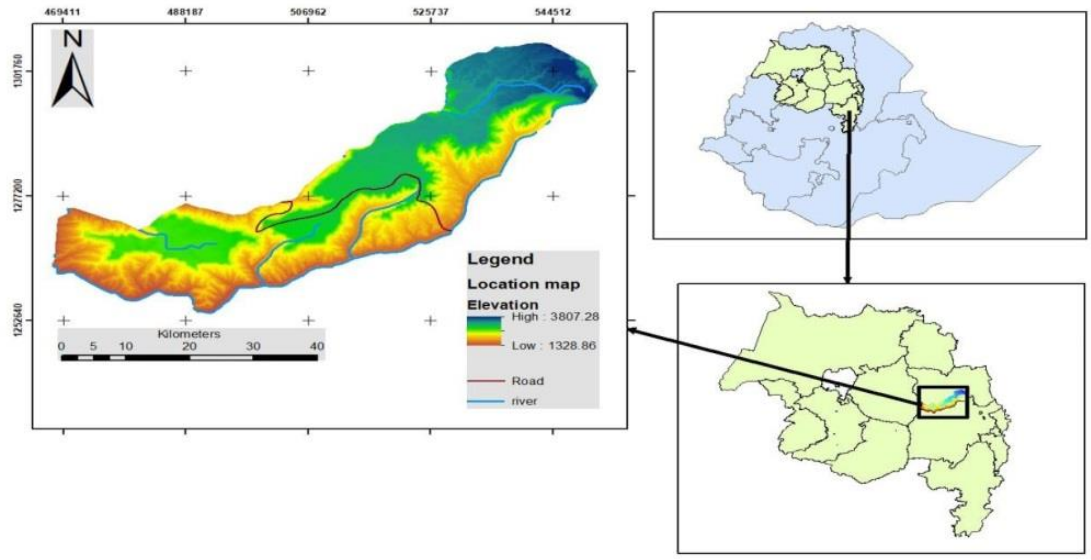

Figure 1. Map of the study area

Research design

The research design for this study was a causal comparative study exploring cause-and-effect relationship, chosen to evaluate the present physical fitness levels of secondary schools' students in both urban and rural areas and their correlation with academic performance. In Delanta Woreda, there are three secondary schools. To collect relevant data, the researcher employed purposive sampling to select two secondary schools believed to possess the necessary information for the study: Chew Qutir secondary school and Wogeltena secondary school. The study employed a quota sampling technique to select 120 students from the two rural & urban area secondary schools, ensuring representation from different settings.

Primary data were collected directly from the participants using standardized physical fitness assessment tools to evaluate various health-related and skill-related fitness variables. Specifically, the 1.5 Mile run test was used to assess cardiorespiratory endurance, the Zigzag run test for agility, the sit and reach muscles' range of motion measures, the shot-put measure for explosive power, the 50-meter run test for speed, and the 90-degree push-up measure to measure muscle strength. These instruments provided objective measures of the participants' physical fitness levels.

Secondary data on students' academic achievements were gathered from school rosters and reports provided by homeroom teachers as well as students' certificates. This information was used to analyse the association between bodily fitness and students' academic achievement. All data collection procedures were conducted in accordance with ethical standards, ensuring

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accurate and reliable measurement of the variables related to both physical fitness and academic achievement for the study sample.

Data collection instruments

Physical fitness and academic performance measurements were conducted, and data were recorded. To assess physical fitness attributes, the study utilized the 1.5-mile run test for cardiorespiratory fitness, the Zigzag run (Illinois agility) test for agility, the sit-and-reach test for joint flexibility, the shot-put test for muscle power, and the 90-degree push-up measure for muscle strength. Additionally, students' cumulative grade point averages were used to evaluate their academic performance.

1.5 Mile run test of cardiorespiratory fitness

The 1.5-mile run test serves as a reliable measure of aerobic (heart–lung) fitness, with the aim of assessing aerobic endurance through the completion of a set distance in the shortest time possible. It was measured in minutes per second. The test protocol includes specific guidelines to ensure accurate and consistent results, such as conducting the test in moderate weather conditions, maintaining a steady pace, and utilizing essential equipment like a stopwatch and a track. The test protocol involves the student completing a 10-minute warm-up, running 2.4 km (equivalent to 6 laps of a 400 m track) as quickly as feasible, with the subordinate providing updates on the remaining laps, and the researcher recording the time taken for the student to complete the 2.4 km or 1.5 miles (American College of Sports Medicine. 2013).

Zigzag run (Illinois agility) test of agility

The Illinois Agility Running Test, commonly utilized in sports to assess agility development, measures an athlete’s capacity to swiftly change position and direction. This test requires 8 cones, a stopwatch, measurement tape, and writing materials, with the course typically spanning 10 meters in length and 5 meters in width. Participants navigate the course by swiftly moving around cones without displacing them, starting from a prone position and aiming to reach the finish line promptly upon the "go" command, emphasizing agility in athletic performance (Alimuddin et al., 2023).

Sit and reach test

The sit and reach measures commenced through a brief warm-up session of stretching exercises, after which participants, seated on the floor with their shoes removed and legs

extended against the foot stop of the flex meter, were asked by the researcher about any back injuries or conditions that might hinder their ability to touch their toes before starting the assessment (Liguori and American College of Sports Medicine, 2020). Once participants confirmed their readiness, they performed the flexibility test by reaching forward and touching their toes for three seconds, with the best measurement in millimetres used to classify their flexibility as positive if fingers surpassed toes or negative if they fell short, following the procedure recommended by the ACSM (2013).

Shot put test of power

The shot-put test evaluates explosive power, a key aspect of physical fitness, by measuring students' ability to rapidly generate maximum muscle contraction through the shot-put technique (Ostojić et al., 2010). The researcher chose the O'Brien linear technique over the rotational technique for its simplicity and effectiveness in assessing explosive power, conducting the test in phases of preparation, glide, throw, and recovery, with each participant given three trials to record their longest distance achieved using shot puts weighing 2.375 kg for females and 5.125 kg for males, along with necessary equipment such as a meter, assistance, and pen and paper.

50-meter run test of speed

Speed, another critical dimension of bodily fitness, measures the capacity to cover a distance quickly and respond promptly to stimuli. To evaluate students' speed capacity, a 50-meter run test was conducted using two stopwatches, two instructors for assistance, scorecards, and pens. Participants were positioned behind the starting line, with each assigned a timekeeper to record their finishing times accurately (ACSM, 2013). The test aimed to measure how swiftly individuals could traverse the distance, with times measured rounded to the closest tenth of a second to ensure precise data collection and analysis.

90-degree push-up test of muscular strength

The purpose of the upper body test was to evaluate participants' muscular strength, which is essential for performing daily activities with vigour and minimal fatigue. This test utilized the right-angle push-up, a method recommended for assessing upper body strength. Participants were instructed to perform push-ups by lowering their bodies until the arm bends to form a right-angled elbow position & pushing back up at a specified rhythm of one complete repetition every three seconds, with a modified procedure for females to ensure proper form, while the total number of correctly executed push-ups within the designated time frame was

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recorded for assessment (American College of Sports Medicine, 2013). To conduct the 90-degree push-up test for muscular strength, participants were directed to assume a push-up position on the ground with their hands shoulder-breadth apart and fully extending their legs, while supporting their body mass on their toes (Bayles, 2023). Participants were instructed to lower their bodies within 1 to 2 inches of the ground and rise back up while maintaining a straight back and moving as a unit, following a warm-up and a 2-minute recovery period before the researcher facilitated the 60-second test by counting push-ups and managing the timing, with individual results recorded at the end of the test.

Academic measurements

Academic performance was evaluated based on students' cumulative grade point averages in four subjects: mathematics, chemistry, biology, and physics. The average results from one semester of these subjects were utilized for this study, as they were considered a reliable indicator of overall academic performance. Consequently, the researcher focused on gathering this data from the students' rosters and grade reports for a comprehensive analysis.

Ethical considerations

This study followed established ethical standards for research involving human participants before any data were collected. Participants and their parents or guardians were given comprehensive evidence regarding the objective, benefits, and potential risks of the study in Amharic, ensuring understanding and informed participation. Informed authorization was secured from every parent or legal guardian, and agreement was secured from the participants themselves. All steps were conducted in accordance with the code of conduct and research ethics guidelines. The study received institutional approval, and confidentiality was maintained throughout the research process, ensuring the safety and rights of all participants.

Methods of data analysis

The data were analysed using SPSS package by calculating the average value and to analyse the physical fitness and academic attributes among urban & rural students. Additionally, the correlation coefficient was utilized to assess the association between physical fitness qualities and academic achievements in these groups. The threshold for statistical significance in all analyses was established at p less than or equal to 0.05, at a 95% confidence interval (CI) at $\alpha = 0.05$.

Results

The demographic profile of the research subjects is presented in Table 1. Overall, the mean age for both rural and urban students was 17.66 ± 1.49 years for rural and 17.30 ± 1.40 years for urban students, with a height of 1.59 ± 0.05 meters for rural and 1.59 ± 0.04 meters for urban students, and a mean mass of 54.25 ± 3.95 kg for rural and 55.50 ± 4.48 kg for urban students.

Table 1. Demographic profile of research subjects

Group	Count	Age in year M ± Std.	Height in cm Mean ± Std.	Mass in Kg Mean ± Std.
Rural	60	17.66 ± 1.49	1.59±0.05	54.25±3.95
Urban	60	17.30 ±1.40	1.59 ± 0.04	55.50 ± 4.48

Key: cm; centimeter, Kg; kilogram, Std.; Standard deviation, M = Mean

The comparison of physical fitness test results among rural & urban male and female students is summarized in Table 2. The mean score for cardiovascular endurance levels revealed a significant difference between rural (12.03 ± 1.76) and urban students (12.901 ± 1.35, p = 0.003), with an effect size = -0.56 and $p < 0.05$. Conversely, agility marks did not differ significantly, with rural students scoring (20.03 ± 1.62) compared to urban students (19.66 ± 1.32, p = 0.172) and effect size = 0.25. However, flexibility scores indicated a significant difference, with rural students (151.09 ± 31.63) and urban students (172.22 ± 34.64, effect size = - 0.64, p = 0.001). The mean score for power also demonstrated a significant difference, with rural students scoring (7.59 ± 0.91) while urban students scored (6.16 ± 0.85, effect size = 1.64, p = 0.0001). Speed scores showed no significant difference, with rural students (8.399 ± 1.31) and urban students (8.597 ± 1.35, effect size = -0.15, p = 0.42). Lastly, muscular strength scores indicated a significant difference, with rural students scoring (10.733 ± 3.34) compared to urban students (7.950 ± 3.23, effect size = 0.85, p = 0.0001).

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Table 2. The comparison of physical fitness tests among rural and urban students

Fitness test variables	Group	Number	M ± Std.	T value	DF	*p* value	Effect size
Cardiorespiratory endurance	Rural	60	12.027 ± 1.760	-3.056	59	0.003	-0.56
	Urban	60	12.901 ± 1.348				
Agility	Rural	60	20.032 ± 1.620	1.375	59	0.172	0.25
	Urban	60	19.660 ± 1.324				
Flexibility	Rural	60	151.093 ± 31.626	-3.489	59	0.001	-0.64
	Urban	60	172.217 ± 34.635				
Power	Rural	60	7.599 ± 0.906	8.962	59	0.0001	1.64
	Urban	60	6.161 ± 0.851				
Speed	Rural	60	8.399 ± 1.312	-.812	59	0.418	-0.15
	Urban	60	8.597 ± 1.348				
Muscular strength	Rural	60	10.733 ± 3.344	4.635	59	0.0001	0.85
	Urban	60	7.950 ± 3.233				

Key: M = mean, Std. = Standard deviation, DF = degree of freedom *the average difference is statistically significant at ($p < 0.05$).

Table 3 presents a comparative analysis of academic performance among rural and urban students. The results indicate that the mean academic score for rural students was 596.92 ± 102.01, while urban students had a mean score of 611.35 ± 70.89. However, the difference between the two groups was not statistically significant ($p = 0.37$, $p > 0.05$).

Table 3. Comparative analysis on academic performance among rural & urban students

Variables	Categories	Count	Mean ± Std.	T –value	DF	P- value
Academic performance	Rural	60	596.917 ± 102.008	0.900	59	0.370
	Urban	60	611.350 ± 70.892			

Key: M = mean, Std. = Standard deviation DF = degree of freedom *the mean difference is significant at ($p < 0.05$).

The study investigated the association among physical fitness variables & academic achievement using Pearson correlation coefficients, as summarized in Table 4. The analysis assessed the associations among cardiorespiratory endurance, agility, flexibility, power, speed, and strength. The results indicated a fairly strong positive correlation between power and academic achievement ($r = 0.64$, $p = 0.81$), suggesting that greater power levels show a relationship with better academic performance measures. Flexibility showed a moderate

correlation (r = 0.31, p = 0.70), while cardiorespiratory endurance showed a slight correlation (r = 0.27, p = 0.60). Muscular strength demonstrated a weak-to-moderate positive relationship with academic performance (r = 0.392, p = 0.590). Conversely, agility (r = 0.126, p = 0.172) and speed (r = 0.075, p = 0.418) displayed very weak correlations that were not statistically significant. Overall, these findings suggest that certain fitness components, notably power, are associated with academic achievement, although most observed relationships are weak or statistically insignificant.

Table 4. The association among physical fitness variables and academic achievement

Fitness variables		Cardiorespiratory endurance/N=120	Agility /N=120	Flexibility /N=120	Power /N=120	Speed /n=120	Muscular strength /N=120
Academic performance	Pearson Correlation (r)	0.271	0.126	0.306	0.636	0.075	0.392
	P-value	0.603	0.172	0.701	0.810	0.418	0.590

Key: very strong positive (0.80 -1.00); fairly strong positive (0.60 – 0.79); moderate positive (0.40 -0, 59); weak positive (0.20.- 0.39); very weak positive (0.00 – 0.19); very strong negative (-1.00 to - 0. 80); fairly strong negative (-0.79 to -0.60); moderate negative (-0.59 to -0,40); weak negative (-0.39 to -0.20); very weak negative (-0.19 to -0.01).

Discussion

The primary objective of this research was to draw a comparison of physical fitness levels and academic performance among high school Students in rural and urban areas. This study shows that there were notable disparities among students from rural and urban backgrounds. Students from the countryside and non-urban areas exhibited greater cardiovascular endurance, power, and muscular strength compared to their urban counterparts, and urban students performed better in flexibility with all significant. Conversely, agility and speed points did not differ significantly between the two groups.

Adolescents residing in countryside or village areas demonstrate significantly better level of heart and lung endurance yet reduced quickness of movement and diminished ability to change direction, with no significant differences in the latter compared to their urban counterparts (Sylejmani et al., 2019; Chillon et al., 2011). This superior cardiorespiratory fitness in rural children and adolescents is likely attributable to their increased engagement in habitual physical activities and spontaneous outdoor play, which are often driven by limited

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access to organized sports and fitness facilities in rural environments (Tinazci and Emiroglu, 2009). Specifically, rural children tend to exhibit higher flexibility and muscle endurance, contributing to their overall better physical fitness profiles; however, some studies report urban students having advantages in explosive power and abdominal strength and endurance when age and body size are not adjusted (Peña Reyes and Malina, 2003). Furthermore, interventions such as functional training have been shown to significantly enhance speed, endurance, strength, and agility among college male students (Shaikh and Mondal, 2012). Gender-wise, rural girls outperform urban girls in speed, endurance, and agility, whereas urban girls demonstrate greater strength and leg power, highlighting nuanced differences influenced by both environmental and gender factors (Rashid et al., 2019).

Implementing well-designed physical exercise programs enhances physical fitness and promotes healthier lifestyles among youths, with research showing a significant positive correlation between fundamental fitness constituents, for example, heart and lung endurance, flexibility, and academic performance, especially in science subjects (Asonitou et al., 2018; Bayu et al., 2018; Chung et al., 2018). Physical fitness, particularly cardiovascular endurance and muscular strength, plays a vital role in academic achievement by improving cognitive functions, attention, and memory, thereby supporting school performance; however, the exact processes fundamental to the link among fitness and academic success are still not completely comprehended (Ayane et al., 2023).

The positive correlation between bodily fitness and educational achievement is primarily documented to the impact of physical exercise on mental process development, leading to enhancements in comparative reasoning, vocabulary knowledge, working memory, and short-term memory (Zenebe et al., 2020; Zenebe et al., 2019). In addition, regular physical activity has been shown to improve cognitive function, concentration, and overall mental well-being, which can further facilitate better academic results (Donnelly et al., 2016). Comprehensive strategies that provide varied opportunities for physical activity across multiple environments appear to be the most effective for enhancing cognitive health among children and adolescents (Castelli, 2022). Furthermore, studies have indicated that physical exercise can significantly enhance immediate recall and active memory capabilities (Ottoboni et al., 2021; Chaire et al., 2020).

Play Streets are an effective intervention to encourage physical exercise and active play amongst children living in rural areas that frequently do not have safe spaces, with rural children generally exhibiting higher levels of cardiovascular endurance and muscular strength

due to increased spontaneous outdoor activity, influenced by limited access to organized sports and socio-cultural factors (Meyer et al., 2019). Providing safe, accessible environments for structured and unstructured activities, including active transportation and community-based programs focusing on skill development and non-competitive options, is essential for enhancing physical fitness, especially in low-density areas where resource utilization and financial support are crucial (Ostermeier et al., 2024; Drenowatz et al., 2020). In contrast, urban students tend to excel in flexibility, likely due to greater access to organized sports and fitness centers that emphasize activities like dance and gymnastics, illustrating how environmental resources influence specific fitness components among rural and urban youth (Karkera et al., 2014; Tayyaba, 2012).

The limitations of this study include the usage of the quota method of sample selection for selecting the study sample, which could influence the generalizability regarding the results. Moreover, the researcher only assessed academic achievements in hard science subjects such as biology, mathematics, physics, and chemistry, excluding soft social science subjects, which limits the comprehensiveness of the academic assessment. The study also did not employ statistical power analysis to verify the adequacy of the sample size, raising concerns about the precision and dependability of the findings. Furthermore, the comparison was conducted between only two schools, one from a rural area and one from an urban area, restricting the broader applicability of the findings. For female students, age-appropriate shot put was not used to measure power fitness, which was a limitation in the study. Lastly, not all key elements of bodily fitness were included in the assessment, which limits the overall understanding of the students' fitness levels.

Practical implication

To improve both rural and urban students’ physical fitness and academic outcomes, local authorities should prioritize establishing and maintaining safe, accessible community spaces like parks and sports facilities to promote regular physical activity. Schools should incorporate diverse, high-quality physical education programs emphasizing key constituents, for example, power, muscle strength, cardiovascular fitness, and joint flexibility, which are strongly associated with academic success. Additionally, targeted interventions aimed at enhancing these specific fitness elements can support students' overall health, well-being, and educational achievement, helping to reduce fitness disparities across regions.

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Conclusion

The study confirmed that rural students outperformed urban students in cardiovascular endurance, power, and muscular strength, and urban students performed better in flexibility with statistically meaningful differences. No statistically meaningful differences were found in agility and speed, and academic achievement was similar across both groups. Correlation analysis showed that power had the strongest positive relationship with academic performance, while flexibility and cardiorespiratory endurance had fairly strong positive correlations, and muscular strength had moderate positive correlation. Agility and speed had minimal impact. Overall, these findings suggest that certain physical fitness components, especially power, flexibility, cardiovascular endurance, and muscular strength, are more influential on academic success, while others have limited effects. We recommend that physical fitness centres be established in urban areas, along with open and free courts and fields for physical exercise. Each resident and village in urban areas should have access to adequate physical exercise facilities to boost bodily fitness attributes of children, pupils, and urban residents of all age levels.

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Competing interests

The authors have declared that they have no competing interest.

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References

Abate N. 2020. The role of rural women in natural resources management and utilization: A case of Delanta District, South Wollo Zone, Ethiopia. J Ecol Nat Environ. 12(3): 104–116.

Abrham T, Asrat B, Gashu D, Birhanu Z, Bogale A, Teshome G, Mengist G. 2024. Learning opportunities of physical education at primary and secondary schools in Amhara Regional State of Ethiopia. Ethiop J Sport Sci. 5(1): 43-52.

Alimuddin A, Yudiramawan Y, Komaini A, Gemaini A, Haris F. 2023. The effectiveness of shuttle-run and zigzag run training on the agility of football players. Sports Med Curios J. 2(2): 69–75.

American College of Sports Medicine (ed.). 2013. ACSM's health-related physical fitness assessment manual. Lippincott Williams & Wilkins.

Asonitou K, Mpampoulis, T., Irakleous-Paleologou, H, Koutsouki D. 2018. Effects of an adapted physical activity program on physical fitness of adults with intellectual disabilities. Adv Phys Educ. 8(3): 321–336.

Ayane B, Wondirad S, Belachew A. 2023. Health-related physical fitness and academic performance in Asgori Secondary School, Southwest Shewa Zone, Ethiopia Ethiop J Sport Sci. 4(1): 56–72.

Bayu WI, Hasmara PS. 2018.The relationship between physical fitness and academic achievement in physical education, sport, and health. Proceedings of the 2nd International Conference on Sports Science, Health and Physical Education. ICSSHPE 2017.

Britton U, Issartel J, Fahey G, Conyngham G, Belton S. 2020. What is health-related fitness? Investigating the underlying factor structure of fitness in youth. Eur Phys Educ Rev. 26(4): 782–796.

Castelli DM. 2022. Physical activity, fitness, and cognitive function in children and adolescents. In: Sport and fitness in children and adolescents – a multidimensional view. IntechOpen.

Chaire A, Becke A, Düzel E. 2020. Effects of physical exercise on working memory and attention-related neural oscillations. Front Neurosci. 14: 239.

Chillon P, Ortega FB, Ferrando JA, Casajus JA. 2011. Physical fitness in rural and urban children and adolescents from Spain. J Sci Med Sport. 14(5): 417–423.

Chung QE, Abdulrahman SA, Khan MKJ, Sathik HBJ, Rashid A. 2018. The relationship between levels of physical activity and academic achievement among medical and health sciences students at Cyberjaya University College of Medical Sciences. Malays J Med Sci. 25(5): 88.

Donnelly JE, Hillman CH, Castelli D, Etnier JL, Lee S, Tomporowski P, Szabo-Reed AN. 2016. Physical activity, fitness, cognitive function, and academic achievement in children: a systematic review. Med Sci Sports Exerc. 48(6): 1197.

Drenowatz C, Hinterkörner F, Greier K. 2020. Physical fitness in Upper Austrian children living in urban and rural areas: a cross-sectional analysis with more than 18,000 children. Int J Environ Res Public Health. 17(3): 1045.

Ejigu AA, Ketemu DG, Endalew SA, Assen WY. 2020. Challenges in utilization of precious opal in Ethiopia: a case study from the Delanta Area, South Wollo, Ethiopia. Abyss J Sci Technol. 5(2): 14–21.

Greier K, Drenowatz C, Ruedl G, Kopp M, Burtscher M, Greier C. 2020. Effect of daily physical education on physical fitness in elementary school children. Adv Phys Educ. 10(2): 97–105.

Grissom JB. 2005. Physical fitness and academic achievement. J Exerc Physiol Online. 8(1).

Hailu AA, Krog S. 2025. Physical education and lifetime sport practice: a case of physical education teachers and higher education students in East Amhara, Ethiopia. Afr J Phys Act Health Sci. 31(2): 307–325.

Hian TC, Mahmud ZF, Choong TY. 2013. Physical fitness level between urban and rural students: a case study. Procedia Soc Behav Sci. 90: 847–852.

Karkera A, Swaminathan N, Pais SM, Vishal K, Rai BS. 2014. Physical fitness and activity levels among urban school children and their rural counterparts.Indian J Pediatr. 81: 356–361.

Kwak L, Kremers SP, Bergman P, Ruiz JR, Rizzo NS, Sjöström M. 2009. Associations between physical activity, fitness, and academic achievement. J Pediatr. 155(6): 914–918.

Liguori G, American College of Sports Medicine. 2020. ACSM's guidelines for exercise testing and prescription. Lippincott Williams & Wilkins.

McMahon EM, Corcoran P, O'Regan G, Keeley H, Cannon M, Carli V, Wasserman D. 2017. Physical activity in European adolescents and associations with anxiety, depression and well-being. Eur Child Adolesc Psychiatry. 26: 111–122.

Meyer MRU, Hamilton CNB, Prochnow T, McClendon ME, Arnold KT, Wilkins E, Porter KMP. 2019. Come together, play, be active: physical activity engagement of school-age children at Play Streets in four diverse rural communities in the US. Prev Med. 129: 105869.

Ngomana N, Themane M, Kibirige I. 2024. Academic performance and physical activity among rural high school learners in South Africa. Soc Sci Educ Res Rev. 11(2): 346–353.

Ortega FB, Ruiz JR, Castillo MJ, Sjöström M. 2008. Physical fitness in childhood and adolescence: a powerful marker of health. Int J Obes. 32(1): 1–11.

Ostermeier E, Gilliland J, Irwin JD, Seabrook JA, Tucker P. 2024. Developing community-based physical activity interventions and recreational programming for children in rural and smaller urban centres: a qualitative exploration of service provider and parent experiences.BMC Health Serv Res. 24(1): 1017.

Ostojić SM, Stojanović M, Ahmetović Z. 2010.Vertical jump as a tool in assessment of muscular power and anaerobic performance.Med Pregl. 63(5–6): 371–375.

Ottoboni G, Ceciliani A, Tessari A. 2021. The effect of structured exercise on short-term memory subsystems: new insight on training activities. Int J Environ Res Public Health. 18(14): 7545.

Özdirenç M, Özcan A, Akin F, Gelecek N. 2005. Physical fitness in rural children compared with urban children in Turkey. Pediatr Int. 47(1): 26–31.

Peña Reyes ME, Tan SK, Malina RM. 2003. Urban–rural contrasts in the physical fitness of school children in Oaxaca, Mexico. Am J Hum Biol. 15(6): 800–813.

Rashid S, Hayyat FS, Pathak MKA. 2019. Comparative study of physical fitness between rural and urban high school girls of Pulwama District. Pramana Res J. 9(11): 132–147.

Robinson LE, Stodden DF, Barnett LM, Lopes VP, Logan SW, Rodrigues LP, D'Hondt E. 2015. Motor competence and its effect on positive developmental trajectories of health. Sports Med. 45: 1273–1284.

Shaikh A, Mondal S. 2012. Effect of functional training on physical fitness components on college male students – a pilot study. Humanit Soc Sci. 1(2): 1–5.

Singh A, Malik N. 2021. Comparison of health-related physical fitness between urban and rural preadolescents in Punjab.

Singh KM, Singh M, Singh S. 2016. Study of physical fitness among rural and urban children from Punjab. Int J Phys Educ Sports Health. 3(3): 475–478.

Sylejmani B, Myrtaj N, Maliqi A, Gontarev S, Georgiev G, Kalac R. 2019. Physical fitness in children and adolescents in rural and urban areas.

Tayyaba S. 2012. Rural–urban gaps in academic achievement, schooling conditions, student, and teachers' characteristics in Pakistan. Int J Educ Manag. 26(1): 6–26.

Tinazci C, Emiroglu O. 2009. Physical fitness of rural children compared with urban children in North Cyprus: a normative study. J Phys Act Health. 6(1): 88–92.

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Zenebe K, Legesse K, Mandal S, Mahmud M, Aragaw K. 2020. Effects of sixteen weeks of resistance exercises on some selected cognitive variables development in adolescents with intellectual disabilities.Turk J Kinesiol. 6(1): 26–31.

Zenebe K, Mondal S, Legesse K, Abdulkader M. 2019. Impacts of aerobic exercises on cognition developments of students with intellectual disabilities. Int J Innov Sci Res Technol. 14(1): 145–149.