

"Correlation Between Upper Body Strength and Abdominal Endurance in 9-Year-Old School-Going Girls"

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ABSTRACT

This study examines the relationship between muscular strength of upper body and muscular endurance of the abdominal area in 9-year-old school-going girls. A sample of 500 female students from various DAV schools in Delhi NCR. Upper body strength was measured using the Modified Pull-Up Test, while abdominal endurance was assessed with the Sit-Up Test. The results indicated significant variation in upper body strength, with an average of 4.38 pull-ups (SD = 2.64), ranging from 0 to 11. Abdominal endurance was more consistent, with an average of 9.41 sit-ups (SD = 1.22), ranging from 7 to 12. There were no significant relationship obtained between upper body strength and abdominal endurance ($r = -0.024$, $p = 0.599$). The study concludes that these fitness components develop independently, suggesting the need for balanced fitness programs in schools.

Keywords: Fitness, Independently, Upper, Strength

INTRODUCTION

Health is a state of complete physical, mental, social and emotional wellbeing and not merely absence of disease or infirmity (WHO). Health is more than the absence of illness; it encompasses a state of complete physical, mental, and social well-being. Muscular strength and endurance are two key components of physical fitness essential for daily tasks and overall health. Upper body strength enables the body to exert force, while muscular endurance allows a muscle to sustain repeated activity over time. For children, particularly girls, developing these aspects of fitness is crucial for supporting physical development and preventing long-term health issues. In today's age, where screen time dominates children's routines, a noticeable decline in physical activity affects their physical fitness. Prolonged screen exposure is linked to poor motor skills, low physical fitness levels, and psychological problems. Therefore, understanding how different components of physical fitness relate can help design programs that effectively promote children's health.

This study explores the relationship between muscular strength of upper body and muscular endurance of the abdominal area in 9-year-old school-going girls, a relatively under-researched area. By evaluating these fitness components, we can establish a better understanding of how to enhance physical fitness in growing children.

METHODOLOGY

Subjects: 500 female students, all aged 9, from DAV schools in Delhi NCR were selected as the subject of the study. The participants were selected based on their ability and willingness to participate in fitness testing. Variables: The study focused on two health-related fitness components: Upper Body Muscular Strength – measured using the Modified Pull-Up Test. and Abdominal Muscular Endurance – measured using the Sit-Up Test.

Procedure

Permission was obtained from the schools, and testing was conducted during the students' morning zero period. The researcher, along with physical education teachers, administered the tests. All participants were tested on the same day to ensure consistency in the results.

Data Collection and Analysis

Data were collected through the Modified Pull-Up Test and Sit-Up Test. The reliability of these tests was confirmed using the test-retest method, which yielded high-reliability scores: $r = 0.928$ for pull-ups and r

= 0.857 for sit-ups. Minimum and maximum scores, mean and standard deviation were computed for modified pull-up and sit ups. Pearson’s coefficient of correlation was used to determine the relationship between upper-body strength and abdominal endurance.

Table 1. Tester’s Reliability by test-retest method for selected Musculoskeletal Fitness Components tests.

Test Name	r-value
Modified pull –ups	.928
Sit up test	.857

Table 2. Mean and standard Deviation values of Musculoskeletal Fitness for 9 years School Children Delhi NCR.

Musculoskeletal Components Of School Going Girls of Delhi [Mean ± SD]		
Test Item	9 Yrs	
	Mean	Standard Deviation
Modified Pull-Up	4.38	± 2.64
Sit-up Test (number)	9.41	± 1.22

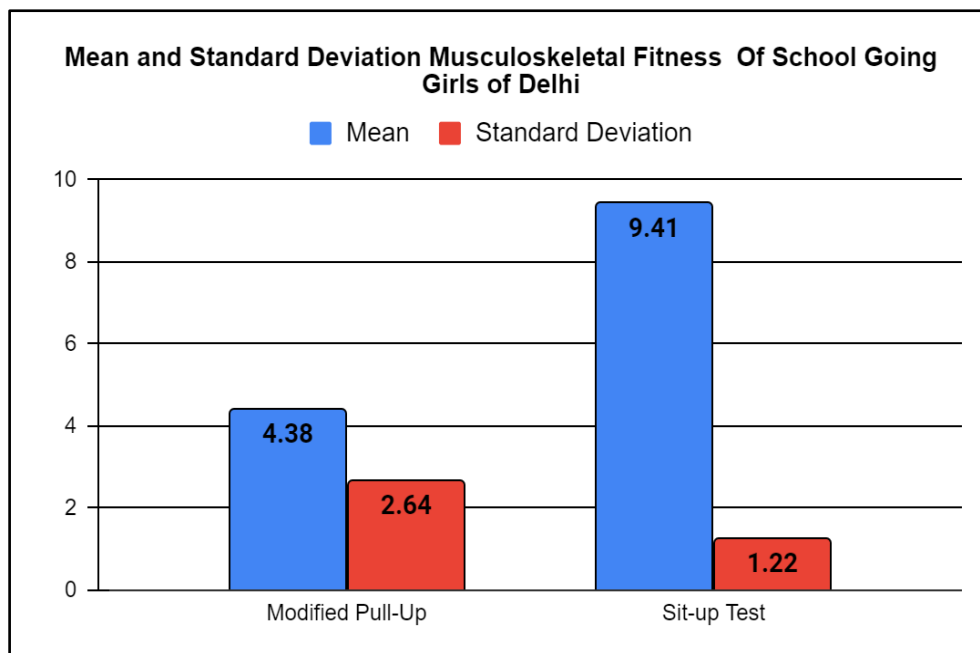


Fig 1. Graphical presentation of Mean and standard Deviation values of MusculoskeletalFitness for 9 years School Children Delhi NCR.

Table 3. Minimum and Maximum value of Musculoskeletal Fitness for 9 years School Girls of Delhi

Musculoskeletal Fitness Components Of School Going Girls of Delhi [Minimum (Min.) and Maximum (Max.) values]		
Test Item	Age Groups	
	9 Yrs (n=500)	
	Min	Max
Modified Pull-Up (number)	0	11
Sit-up Test (number)	7	12

Table 4. Pearson's correlation of coefficient of Musculoskeletal Fitness for 9 years School Girls of Delhi
Correlations of Musculoskeletal Fitness Components Of School Going Girls of Delhi

		ME	MS
Muscular Endurance	Pearson Correlation	1	-.024
	Sig. (2-tailed)		.599
	Sum of Squares and Cross-products	743.128	-37.868
	Covariance	1.489	-.076
	N	500	500
Muscular Strength	Pearson Correlation	-.024	1
	Sig. (2-tailed)	.599	
	Sum of Squares and Cross-products	-37.868	3469.558
	Covariance	-.076	6.953
	N	500	500

RESULTS

The mean and standard deviation for modified pull ups was 4.38 ± 2.64 . The minimum and maximum score obtained was 10 and 11 respectively. The mean and standard deviation for Sit ups was 9.41 ± 1.22 . The minimum and maximum score obtained was 7 and 12 respectively. This indicates more consistent abdominal endurance across the participants.

There were no significant correlation obtained between upper body strength and abdominal endurance ($r = -0.024$, $p = 0.599$). This indicates that upper-body strength and abdominal endurance develop independently in this age group (9 years).

Discussion of Findings

The findings from this study provide insight into the physical fitness of 9-year-old girls. The wide variation in upper body strength suggests that while some girls have developed adequate strength, others may require focused interventions to improve in this area. In contrast, abdominal endurance appeared to be more uniform across the sample, possibly due to the more common integration of core exercises into children's routines. Several research studies support the findings that upper-body strength and abdominal endurance can vary independently, particularly in children and adolescents. Research conducted by Lubans et al. (2010) supports the idea that different components of physical fitness, such as muscular strength and endurance, may develop independently in children. Their study found that while muscular strength and endurance both contribute to overall fitness, they may not be directly correlated, particularly in younger populations where developmental factors play a significant role. A study by Ortega et al. (2008) examined the levels of physical fitness among the children and adolescents across different regions in Europe and reported similar variability in upper body strength and abdominal endurance, with children often displaying greater consistency in abdominal endurance. This suggests that certain muscle groups, such as those involved in core stability, may develop more uniformly due to common physical activities like walking and sitting, whereas upper body strength shows more variability. Malina et al. (2004) also observed that muscular strength and endurance in children are influenced by different factors. Strength is more related to muscle mass and neuromuscular coordination, which can develop unevenly, while endurance tends to be linked to metabolic efficiency. Their study supported the idea that the two components do not necessarily develop in tandem, reinforcing the lack of correlation observed in the current research.

These studies highlight that particularly in young children, muscular strength and endurance are distinct components of fitness and can show significant variation due to developmental differences, lifestyle, and physical activity levels. The lack of a significant relationship between upper body strength and abdominal endurance, as found in your study, aligns with these broader research findings. The lack of correlation between upper body strength and abdominal endurance suggests that these fitness components do not develop simultaneously. This could be due to different training patterns or the distinct nature of the muscles involved. The results underscore the importance of incorporating a diverse range of exercises into physical education programs to target different aspects of fitness.

CONCLUSION

Based on the findings, several key conclusions can be drawn:

1. The mean number of pull-ups performed (4.38) with a high standard deviation (2.64) indicates significant variation in upper body strength among the participants. This suggests that some girls have developed adequate upper body strength, while others lag, potentially requiring targeted interventions. This could be attributed to differences in physical activity levels, genetics, or the emphasis on upper body strength in their regular activities.
2. In contrast, the mean number of sit-ups performed (9.41) with a lower standard deviation (1.22) demonstrates more consistent abdominal endurance across participants. This consistency may reflect the natural integration of core stability exercises into everyday movements such as walking and sitting, as well as the regular use of core muscles in physical education.
3. The lack of a significant correlation between upper body strength and abdominal endurance ($r = -0.024$, $p = 0.599$) indicates that these two fitness components develop independently in this age group. Upper body strength is largely influenced by muscle mass and neuromuscular coordination, while abdominal endurance may be tied to metabolic efficiency and daily activities that naturally engage the core muscles. This finding supports the notion that muscular strength and endurance are distinct aspects of physical fitness and should be trained separately.
4. The results highlight the importance of diverse training programs that address different components of fitness. Since upper body strength and abdominal endurance do not develop in tandem, physical education programs need to include a variety of exercises targeting both strength and endurance in different muscle groups. This approach will help ensure balanced physical development in children. These conclusions emphasize the need for a well-rounded fitness regimen in children, particularly in early childhood development, to promote balanced strength and endurance.

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