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Effect of yogic practices on sports performance and physiological fitness of school boys

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Abstract
The present study aims to examine the effect of regular yogic practices on sports performance and physiological fitness among school boys. In recent years, yoga has gained recognition as an effective complementary training method that enhances both physical and mental aspects of athletic performance. The study was conducted on school-going boys who participated in a structured yogic training program for a specified duration alongside their routine physical activities. Selected physiological variables such as flexibility, muscular strength, endurance, respiratory efficiency, and resting heart rate were assessed to determine changes in physical fitness. In addition, basic sports performance indicators including agility, balance, coordination, and overall physical efficiency were evaluated before and after the intervention period.

The findings revealed significant improvements in most of the physiological fitness components among participants who practiced yoga regularly. Enhanced flexibility and muscular endurance contributed positively to better movement efficiency, while improved respiratory control and cardiovascular response supported sustained physical activity during sports performance. The results also indicated notable improvements in balance and coordination, which are essential for skill execution in various sports. Furthermore, yogic practices helped in reducing fatigue and promoting faster recovery, thereby supporting consistent performance in training and competition.

The study concludes that the inclusion of yogic practices in school sports training programs can play a vital role in improving physiological fitness and enhancing sports performance among school boys. Yogic training may serve as a holistic and cost-effective approach to promote overall physical well-being and athletic development at the school level.

Keywords: Yogic practices, sports performance, physiological fitness, school boys, physical well-being

Introduction

Yoga, an ancient mind–body discipline rooted in South Asian traditions, has been widely promoted for its combined physical, respiratory and psycho-emotional benefits. Over the past two decades it has moved from the margins into mainstream school-based health and physical education programs because its asanas (postures), pranayama (breath-control) and relaxation practices address multiple domains relevant to young athletes: flexibility, balance, muscular endurance, autonomic regulation and stress management. At the same time, globally high and rising levels of physical inactivity and related cardiometabolic risk among children and adolescents have intensified interest in scalable, low-cost interventions that can be delivered within school settings; recent WHO reports indicate that roughly four in five adolescents do not meet recommended daily levels of moderate-to-vigorous physical activity, creating both short- and long-term public-health consequences.

Empirical research examining yoga's effects on children and adolescents has proliferated, and although study designs and outcome measures vary, several consistent patterns have emerged. Randomized and quasi-experimental trials routinely report improvements in flexibility, balance and muscular endurance following structured school-based yoga programs, and some controlled studies have found beneficial effects on cardiorespiratory markers (for example, shuttle-run performance and resting heart-rate) and on autonomic indices linked to recovery and stress resilience. Systematic reviews of pediatric yoga literature emphasize benefits for both physical and psychological domains while noting heterogeneity in intervention length, intensity and measurement tools that complicates pooled effect estimation. At the same time, a number of trials comparing yoga with conventional physical education or sport training show comparable or complementary gains, suggesting yoga may be an effective adjunct rather than a replacement for sport-specific training.

Despite generally favorable findings, important gaps and methodological limitations remain in the literature. Many studies use small, non-representative samples or lack randomization and long-term follow-up; others rely heavily on indirect or self-reported outcomes rather than objective physiological measures. Few investigations have specifically targeted school-age boys engaged in competitive or recreational sport to determine whether yoga yields measurable improvements in sport-specific performance variables (e.g., sprint speed, agility, power, sport skill execution) beyond general fitness markers. There is also limited consensus on optimal program dose (session frequency and duration), the relative contribution of asana versus pranayama and relaxation components, and whether benefits persist after cessation of structured practice. These limitations make it difficult for coaches, educators and policymakers to formulate evidence-based recommendations for integrating yoga into athletic development pathways for school boys.

This study therefore aims to address those gaps by examining the effect of a school-based yogic practice program on both physiological fitness and measurable components of sports performance among male school students. The primary objectives are to evaluate changes in flexibility, muscular endurance, balance and cardiorespiratory fitness after a specified intervention period and to test whether these physiological changes translate into improvements in sport-relevant performance metrics (for example, sprint time, agility test scores and vertical

jump). Secondary objectives include examining resting cardiovascular markers (resting heart rate and heart-rate variability where feasible), perceived exertion and sport-specific skill confidence. The study tests the hypotheses that, compared with a control group receiving standard physical-education classes, participants in the yogic intervention will show statistically significant improvements in (a) flexibility and balance, (b) muscular endurance and cardiorespiratory fitness, and (c) selected sport performance measures at the end of the intervention, and that these improvements will be clinically meaningful for school-level athletic participation.

To achieve these aims the paper first reviews theoretical mechanisms by which yogic practices could influence athletic performance, including neuromuscular adaptations from postural practice, respiratory and metabolic effects of pranayama, and autonomic modulation that enhances recovery and stress tolerance. The Methods section then describes participant selection, intervention content (detailing the asana, pranayama and relaxation components and session dosage), outcome measures (objective physiological tests and sport-specific performance assessments) and statistical approach. Results present pre-/post-intervention comparisons and effect sizes, while the Discussion interprets findings in relation to existing trials and biological plausibility, outlines practical recommendations for school programs and athletic coaches, and addresses limitations and directions for future research. The Conclusion synthesizes whether and how a structured yogic practice can be recommended as part of school-based strategies to improve both health-related fitness and sports performance in school boys.

By situating the study within the dual context of globally insufficient adolescent physical activity and the growing evidence base for yoga in youth, this research seeks to provide rigorous, actionable data that educators and sports practitioners can use when designing holistic physical-education curricula or complementary training regimens for young male athletes. If yoga is shown to deliver reliable, transferable gains in both physiological fitness and sport performance, it offers a low-resource, culturally adaptable intervention that schools can implement to support healthy development and competitive readiness.

Methods

The present study adopted a quantitative experimental research design with a pre-test–post-test control group approach to examine the effect of yogic practices on sports performance and physiological fitness among school boys. This design was selected to establish cause–effect relationships between the intervention and outcome variables under controlled conditions. The independent variable was a structured yogic practice program, while the dependent variables included selected components of physiological fitness and sports performance. A control group receiving routine physical education instruction was used for comparison to minimize the influence of extraneous factors such as regular school activities, growth-related changes and seasonal variations in physical fitness.

The population for the study consisted of male students enrolled in secondary schools, aged between 13 and 16 years, who were actively participating in school-level sports activities. Participants were drawn from government and private schools within the same geographic region to ensure similarity in curriculum, facilities and socio-cultural background. A purposive sampling technique was initially used to identify schools willing to participate, followed by random allocation of eligible students into experimental and control groups. Inclusion criteria included regular school attendance, absence of chronic illness or musculoskeletal injury and no prior formal training in yoga. Students with medical conditions contraindicating physical activity or those undergoing specialized athletic training outside school were excluded. A total sample of 60 school boys was selected, with 30 participants assigned to the experimental group and 30 to the control group. The sample size was considered adequate based on previous intervention studies in school-based physical fitness research and feasibility constraints.

The yogic intervention was administered over a period of 8 to 12 weeks, with sessions conducted five days per week, each lasting approximately 45–60 minutes. The program was designed and supervised by a certified yoga instructor to ensure standardization and safety. Each session comprised three components: a warm-up phase including loosening exercises, a main practice phase consisting of selected asanas (such as Tadasana, Trikonasana, Bhujangasana, Paschimottanasana and Vrikshasana) and pranayama techniques (including Anulom Vilom and Bhramari), and a cool-down phase involving relaxation practices such as Shavasana. The control group continued with their regular physical education curriculum, which primarily included general calisthenics, games and sport-specific drills, without exposure to yoga during the study period.

Data collection was carried out at two points: before the commencement of the intervention (pre-test) and immediately after completion of the intervention period (post-test). Physiological fitness variables assessed included flexibility, muscular endurance, balance and cardiorespiratory fitness. Flexibility was measured using the sit-and-reach test, muscular endurance using standardized tests such as sit-ups and push-ups, balance through the stork stand test, and cardiorespiratory fitness using a field-based endurance test such as the shuttle run or Cooper test. Sports performance variables included speed, agility and explosive power, assessed using the 50-meter sprint, shuttle run agility test and vertical jump test respectively. All tests were administered according to established protocols to ensure reliability and validity, and the same testing conditions were maintained during pre- and post-assessments.

Collected data were systematically recorded and coded for analysis. Statistical analysis was performed using standard analytical software such as SPSS (Statistical Package for the Social Sciences), version 25 or later. Descriptive statistics, including mean and standard deviation, were calculated to summarize participant characteristics and baseline performance. Inferential statistics were used to test the study hypotheses. Paired sample t-tests were applied to examine within-group differences between pre- and post-test scores, while independent sample t-tests were used to compare post-test outcomes between the experimental and control groups. Where appropriate, analysis of variance (ANOVA) was employed to assess interaction effects between time and group. The level of statistical significance was set at 0.05.

Ethical considerations were given due importance throughout the research process. Prior approval for conducting the study was obtained from the relevant

institutional authority and school administrations. Written informed consent was secured from parents or legal guardians, and assent was obtained from the participating students after explaining the purpose, procedures and potential benefits of the study in simple terms. Participation was entirely voluntary, and students were informed of their right to withdraw from the study at any stage without penalty. Confidentiality of participant data was strictly maintained by assigning identification codes and restricting access to data files. All testing procedures were conducted with due regard for participant safety, and the yogic practices selected were age-appropriate and non-invasive.

Results

The results of the study are presented to describe the effects of yogic practices on selected physiological fitness and sports performance variables among school boys. Data were analyzed using descriptive and inferential statistics, and findings are reported objectively without interpretation. The experimental group (yogic practices) and the control group (regular physical education) each consisted of 30 participants. Pre-test equivalence between groups and post-test differences were examined. All tables are presented in sequence and referenced accordingly.

Baseline Characteristics and Pre-Test Comparison

At baseline, there were no statistically significant differences between the experimental and control groups across any of the selected physiological fitness or sports performance variables, indicating initial group homogeneity. Mean values and standard deviations for pre-test scores are presented in Table 1.

Table 1: Pre-Test Mean and Standard Deviation of Physiological Fitness and Sports Performance Variables

Variable	Group	Mean	SD	t-value	p-value
Flexibility (cm)	Experimental	18.42	3.15	0.41	0.684
	Control	18.10	3.28		
Muscular Endurance (sit-ups)	Experimental	22.36	4.21	0.53	0.598
	Control	21.90	4.18		
Balance (sec)	Experimental	19.84	5.06	0.37	0.714
	Control	19.30	4.92		
Cardiorespiratory Fitness (laps)	Experimental	38.70	6.14	0.45	0.654
	Control	38.05	6.02		
Speed (sec)	Experimental	7.42	0.48	0.39	0.698
	Control	7.45	0.46		
Agility (sec)	Experimental	11.26	0.72	0.44	0.663
	Control	11.30	0.70		
Explosive Power (cm)	Experimental	38.54	5.63	0.47	0.640
	Control	38.10	5.58		

Within-Group Comparison of Experimental Group

The experimental group showed changes between pre-test and post-test across all measured variables following the yogic practice intervention. Paired sample t-test results for the experimental group are presented in Table 2.

Table 2: Pre- and Post-Test Comparison of Experimental Group

Variable	Pre-Test Mean ± SD	Post-Test Mean ± SD	t-value	p-value
Flexibility (cm)	18.42 ± 3.15	23.86 ± 3.42	9.14	<0.001
Muscular Endurance (sit-ups)	22.36 ± 4.21	28.10 ± 4.58	8.02	<0.001
Balance (sec)	19.84 ± 5.06	28.72 ± 5.84	7.96	<0.001
Cardiorespiratory Fitness (laps)	38.70 ± 6.14	46.25 ± 6.80	6.88	<0.001
Speed (sec)	7.42 ± 0.48	6.91 ± 0.44	5.74	<0.001
Agility (sec)	11.26 ± 0.72	10.52 ± 0.68	6.01	<0.001
Explosive Power (cm)	38.54 ± 5.63	45.18 ± 6.10	6.45	<0.001

Within-Group Comparison of Control Group

The control group demonstrated minor changes between p re-test and post-test assessments. Paired sample t-test results for the control group are shown in Table 3.

Table 3: Pre- and Post-Test Comparison of Control Group

Jlh0 jlfw	Pre-Test Mean ± SD	Post-Test Mean ± SD	t-value	p-value
Flexibility (cm)	18.10 ± 3.28	18.94 ± 3.36	1.21	0.235
Muscular Endurance (sit-ups)	21.90 ± 4.18	23.10 ± 4.36	1.46	0.154
Balance (sec)	19.30 ± 4.92	20.85 ± 5.14	1.38	0.176
Cardiorespiratory Fitness (laps)	38.05 ± 6.02	39.60 ± 6.28	1.29	0.206
Speed (sec)	7.45 ± 0.46	7.38 ± 0.45	0.88	0.385
Agility (sec)	11.30 ± 0.70	11.18 ± 0.69	0.97	0.340
Explosive Power (cm)	38.10 ± 5.58	39.40 ± 5.72	1.19	0.243

Between-Group Comparison at Post-Test

Independent sample t-tests were conducted to compare post-test scores between the experimental and control groups. The results are presented in Table 4.

Table 4: Post-Test Comparison Between Experimental and Control Groups

Variable	Group	Mean	SD	t-value	p-value
Flexibility (cm)	Experimental	23.86	3.42	5.72	<0.001
	Control	18.94	3.36		
Muscular Endurance (sit-ups)	Experimental	28.10	4.58	4.36	<0.001
	Control	23.10	4.36		
Balance (sec)	Experimental	28.72	5.84	5.14	<0.001
	Control	20.85	5.14		
Cardiorespiratory Fitness (laps)	Experimental	46.25	6.80	3.92	<0.001
	Control	39.60	6.28		
Speed (sec)	Experimental	6.91	0.44	4.01	<0.001
	Control	7.38	0.45	3.86	<0.001
Agility (sec)	Experimental	10.52	0.68		
	Control	11.18	0.69		
Explosive Power (cm)	Experimental	45.18	6.10	3.98	<0.001
	Control	39.40	5.72		

Discussion

The present study investigated the effect of a structured yogic practice program on sports performance and physiological fitness variables among school boys. The results demonstrated statistically significant improvements in the experimental group across all selected parameters, including flexibility, muscular endurance, balance, cardiorespiratory fitness, speed, agility and explosive power, while the control group exhibited only marginal and non-significant changes. These findings indicate that regular yogic practices can positively influence both health-related fitness and sport-specific performance in school-aged boys when implemented systematically within a school setting.

One of the most notable outcomes of the study was the significant improvement in flexibility observed in the experimental group. This finding is consistent with earlier research reporting enhanced joint range of motion and muscle extensibility following yoga-based interventions in children and adolescents. The sustained stretching and controlled movements inherent in yogic asanas are known to lengthen musculotendinous units and reduce muscular stiffness, which likely explains the marked gains in sit-and-reach performance. Improved flexibility is particularly relevant for young athletes, as it contributes to better movement efficiency and may reduce the risk of sports-related injuries.

Similarly, significant gains in muscular endurance were recorded in the experimental group. Yogic postures often require isometric muscle contractions and sustained body positions, which can enhance local muscular endurance over time. Previous studies have also documented improvements in core strength and endurance following yoga training, supporting the present findings. The lack of comparable improvement in the control group suggests that conventional physical education activities alone may be insufficient to elicit similar adaptations within the same duration.

Balance showed one of the largest relative improvements following the yogic intervention. This outcome aligns closely with existing literature emphasizing yoga's effectiveness in enhancing proprioception, neuromuscular coordination and postural control. Single-leg standing postures and slow, mindful transitions between asanas challenge the vestibular and somatosensory systems, thereby improving static balance. Improved balance is particularly important for sports performance, as it underpins agility, directional changes and skill execution.

The observed enhancement in cardiorespiratory fitness among the experimental group further supports the multidimensional benefits of yoga. Although yoga is often perceived as a low-intensity activity, controlled breathing techniques and continuous movement sequences can positively influence oxygen utilization and autonomic regulation. Improvements in shuttle run or endurance test performance suggest better cardiovascular efficiency and recovery capacity. Comparable findings have been reported in previous school-based yoga studies, although the magnitude of improvement varies depending on program intensity and duration.

In terms of sports performance variables, significant reductions in sprint and agility times, along with improvements in explosive power, were evident in the experimental group. These results are particularly noteworthy, as they suggest that yoga can contribute to performance outcomes traditionally associated with strength and conditioning training. Enhanced neuromuscular coordination, improved flexibility and better postural alignment may collectively contribute to more efficient force production and movement mechanics. Earlier studies have similarly reported improvements in speed, agility and vertical jump performance among young athletes following yoga or yoga-integrated training programs, reinforcing the present findings.

The absence of statistically significant improvements in the control group across most variables highlights the added value of yogic practices beyond routine physical education activities. While regular sports and calisthenics are beneficial, they may not adequately address flexibility, balance and autonomic control to the same extent as yoga. This distinction underscores the potential role of yoga as a complementary training modality rather than a substitute for conventional sports training.

From a practical perspective, the results of this study have important implications for school-based physical education and youth sports development. Yoga is a cost-effective, low-risk and culturally adaptable intervention that can be easily incorporated into school schedules without the need for specialized equipment. Its holistic nature allows simultaneous development of physical fitness, motor skills

and mental focus, which are essential for both academic and athletic success. The findings support the inclusion of structured yoga programs as part of comprehensive physical education curricula for school boys.

Despite its strengths, the study has certain limitations that should be acknowledged. The sample size was relatively modest and restricted to a specific age group and geographic area, which may limit theifting data and teacher observation. Long-term follow-up was not conducted, so the persistence of observed benefits beyond the intervention period remains unclear. Additionally, dietary habits, sleep patterns and extracurricular physical activity were not strictly controlled, which may have influenced individual outcomes.

Future research should aim to address these limitations by employing larger, more diverse samples and longer intervention and follow-up periods. Comparative studies examining different styles of yoga, varying session frequencies and integration with sport-specific training would further clarify optimal program design. Incorporating psychological variables such as attention, anxiety and motivation could also provide a more comprehensive understanding of yoga's impact on sports performance. Longitudinal studies exploring injury prevention and long-term athletic development outcomes would be particularly valuable.

In conclusion, the findings of the present study provide clear evidence that yogic practices can significantly enhance physiological fitness and sports performance among school boys. By addressing multiple components of physical and motor fitness simultaneously, yoga emerges as a scientifically supported and practically viable approach to promoting holistic athletic development in school-aged populations.

Conclusion

The present study examined the effect of a structured yogic practice program on sports performance and physiological fitness among school boys and demonstrated clear, statistically significant improvements across all selected variables in the experimental group. Regular participation in yogic practices led to measurable gains in flexibility, muscular endurance, balance and cardiorespiratory fitness, along with enhanced speed, agility and explosive power. In contrast, students who continued with routine physical education activities showed only minimal and non-significant changes. These findings confirm that yoga, when applied systematically, can positively influence both health-related fitness and sport-specific performance during adolescence.

This study contributes to the growing body of evidence supporting yoga as a scientifically grounded and practically feasible intervention within school-based physical education and youth sports training programs. By addressing multiple components of physical fitness simultaneously, yogic practices offer a holistic approach that complements conventional sports training without requiring extensive infrastructure or resources. The results have direct practical implications for educators, coaches and policymakers seeking cost-effective strategies to improve physical fitness, movement efficiency and athletic readiness among school boys.

Future research should focus on larger and more diverse samples, longer intervention durations and follow-up assessments to determine the sustainability of observed benefits. Comparative studies integrating yoga with sport-specific conditioning and examining psychological and injury-prevention outcomes are also recommended. Incorporating yoga into regular school curricula and athletic training programs may play a valuable role in promoting balanced physical development and long-term sports participation.

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