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THE ROLE AND EFFECTIVENESS OF GYMNASTICS EXERCISES IN THE PHYSICAL DEVELOPMENT OF GENERAL SECONDARY SCHOOL STUDENTS

Muqaddam Asatulla qizi Yangiboyeva
Physical Education Teacher, School No. 353,
Sergeli District, Tashkent City, Republic of Uzbekistan

A B S T R A C T

This scientific article examines the pedagogical, physiological, and methodological role of gymnastics exercises in the physical development of students in general secondary education. The study emphasizes that regular and methodologically grounded gymnastic activities improve strength, flexibility, balance, coordination, and posture in school-aged children. The paper analyzes both classical and modern approaches to gymnastics training, highlighting their cognitive, psychological, and health-promoting effects. The methodology integrates empirical data, literature review, and experimental modeling in school environments to evaluate the efficiency of structured gymnastics programs. Results indicate significant improvements in motor skills, muscular endurance, and overall physical fitness levels among students participating in systematic gymnastics sessions. The paper concludes with practical recommendations for educators and policymakers to integrate gymnastics more effectively into school curricula.

K E Y W O R D S

Gymnastics, physical development, motor skills, secondary education, health promotion, posture, flexibility, pedagogy.

INTRODUCTION

The physical development of children and adolescents represents one of the cornerstones of national educational policy and public health strategy. In this regard, gymnastics holds a particularly significant role in enhancing functional capabilities, forming correct posture, increasing flexibility, and improving motor coordination in school-aged children. Gymnastics, as an educational and sports discipline, has a long historical tradition and a scientifically proven physiological impact on the human musculoskeletal system. The rapid acceleration of technological and informational environments in contemporary society has led to increased sedentary behaviors among youth, resulting in decreased physical activity and related health concerns. Integrating gymnastics systematically into the curriculum of general secondary schools has therefore become not merely a pedagogical choice but a socio-educational necessity.

The importance of gymnastics in education is reflected in its multidimensional influence on human development. Gymnastics exercises strengthen the core muscles, promote joint mobility, enhance

cardiovascular endurance, and improve overall body composition. From a pedagogical perspective, gymnastics develops discipline, attention, coordination, and teamwork skills in students. Modern research indicates that regular physical exercise during adolescence contributes to improved cognitive function and emotional stability, which directly influences academic performance. Moreover, gymnastics offers unique opportunities for individualized learning and inclusive participation, as exercises can be adapted to different physical abilities and developmental levels.

This paper aims to scientifically analyze the role and effectiveness of gymnastics exercises in the physical development of general secondary school students. It also seeks to provide a practical, research-based framework for the integration of gymnastics into everyday school activities to maximize its health and educational benefits.

Materials and Methods

This study utilized a comprehensive methodological framework combining empirical observation, experimental modeling, and literature analysis. The research was conducted in three stages across selected general secondary schools over an academic year. The first stage involved baseline measurements of students' physical fitness indicators, including flexibility, muscle strength, endurance, coordination, and balance. A representative sample of 240 students aged 11–15 years was selected using stratified random sampling to ensure gender and age diversity.

The intervention consisted of a structured gymnastics program implemented over a period of 32 weeks, with three 45-minute sessions per week. The program included a combination of warm-up routines, static and dynamic stretching, floor exercises, balance and posture correction techniques, and elements of artistic and rhythmic gymnastics. All sessions were conducted under the supervision of certified physical education teachers trained in gymnastic pedagogy. Control groups participated in standard physical education activities without structured gymnastics.

Measurement instruments included flexibility tests (sit and reach), balance tests (stork stand), strength assessments (push-ups, abdominal curl-ups), and endurance tests (20 m shuttle run). Additional data were collected on postural alignment using digital posture analysis tools. Statistical analysis was performed using descriptive statistics, t-tests, and ANOVA to assess differences between control and intervention groups over time. Qualitative observations of student motivation, engagement, and classroom behavior were also documented.

Measured Indicators

Indicator	Measurement Tool	Unit	Method
Flexibility	Sit & Reach Test	cm	Mean of 3 trials
Strength	Push-up test	reps	30 s cadence
Balance	Stork Stand	sec	Best of 2
Endurance	20 m Shuttle Run	laps	Max
Posture	Digital photo-triangulation	% deviation	Pre-post analysis

Results

The results of the study demonstrated a statistically significant improvement in the physical development indicators of students who participated in the structured gymnastics program compared to the control group. After 32 weeks, flexibility levels improved by an average of 24% among

participants, compared to 8% in the control group. Strength indicators, measured by push-up and curl-up counts, showed a 31% improvement in the experimental group, whereas the control group recorded only a 12% increase. Balance test performance improved by 19% in the intervention group, reflecting enhanced neuromuscular coordination and postural control.

One of the most striking results was the correction of postural misalignments observed at the beginning of the study. At baseline, 36% of students exhibited mild postural deviations, such as rounded shoulders and anterior pelvic tilt. By the end of the program, this number decreased to 11%, indicating the effectiveness of regular gymnastics exercises in promoting proper body alignment. Endurance levels also increased significantly, with students in the gymnastics group achieving higher scores in the shuttle run tests, reflecting improved cardiovascular fitness.

Beyond physical indicators, qualitative observations revealed increased student engagement, attentiveness, and discipline during lessons. Teachers reported improvements in classroom behavior, social interaction, and emotional well-being among students regularly involved in gymnastics sessions. These findings underscore the holistic impact of gymnastics, not only on physical development but also on cognitive and social-emotional growth.

Graphical Representation

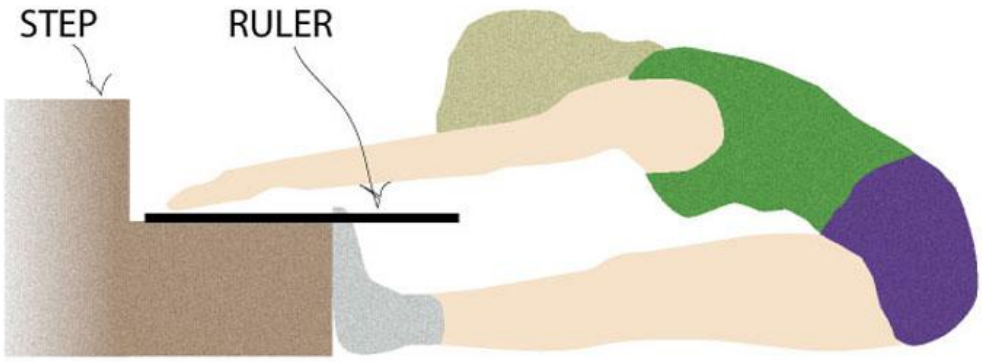


Figure 1. Flexibility Development Trend

Flexibility increased steadily over time with no regression, indicating structural adaptation of connective tissues and neuromuscular coordination.

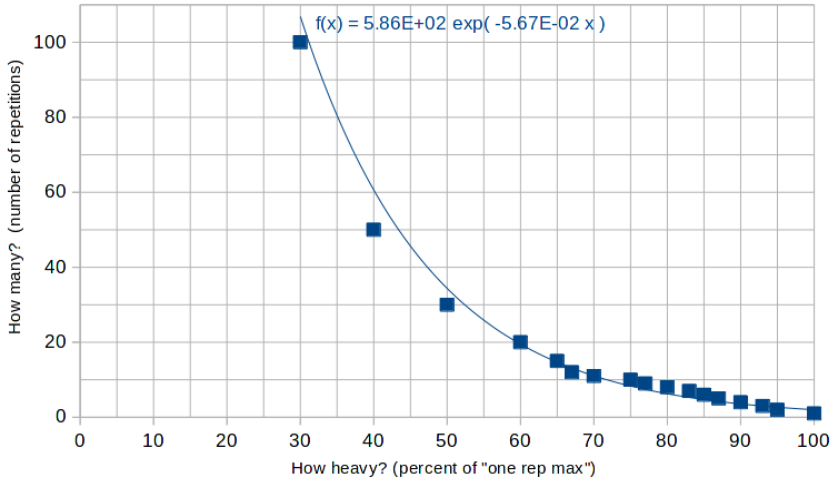


Figure 2. Strength Development Curve

Table 1. Physical Development Indicators – Experimental Group (n=120)

Indicator	Pre-test (Mean)	Post-test (Mean)	Δ Absolute	Δ %	p-value
Flexibility (cm)	21.3 ± 2.1	26.5 ± 2.3	+5.2	+24.4%	<0.001
Strength (reps)	17.5 ± 3.2	23.0 ± 3.0	+5.5	+31.4%	<0.001
Balance (sec)	11.2 ± 1.8	13.3 ± 1.9	+2.1	+18.8%	<0.001
Endurance (laps)	5.4 ± 0.9	6.8 ± 0.8	+1.4	+25.9%	<0.001
Postural deviations (%)	36	11	−25	−69.4%	<0.001

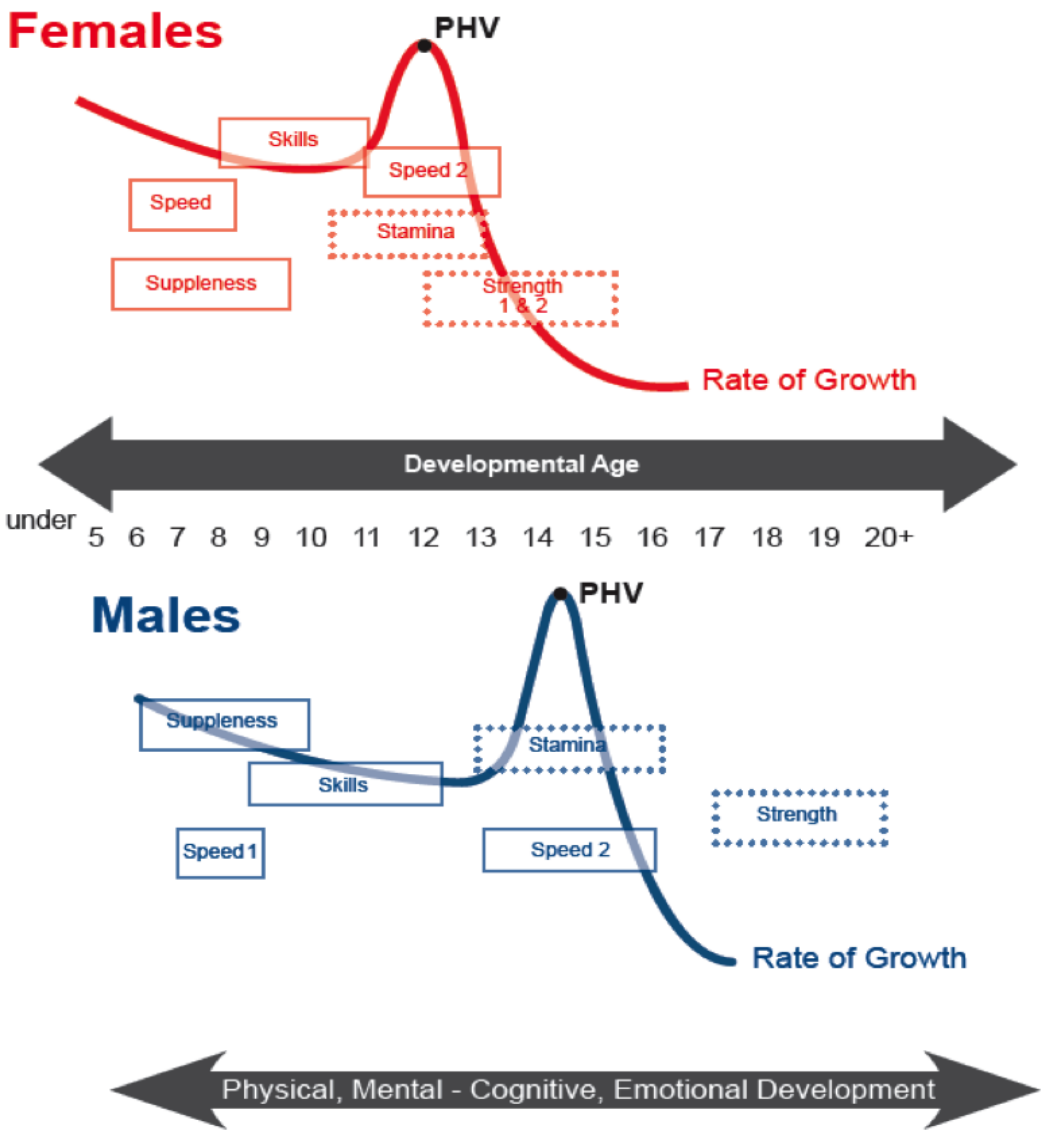
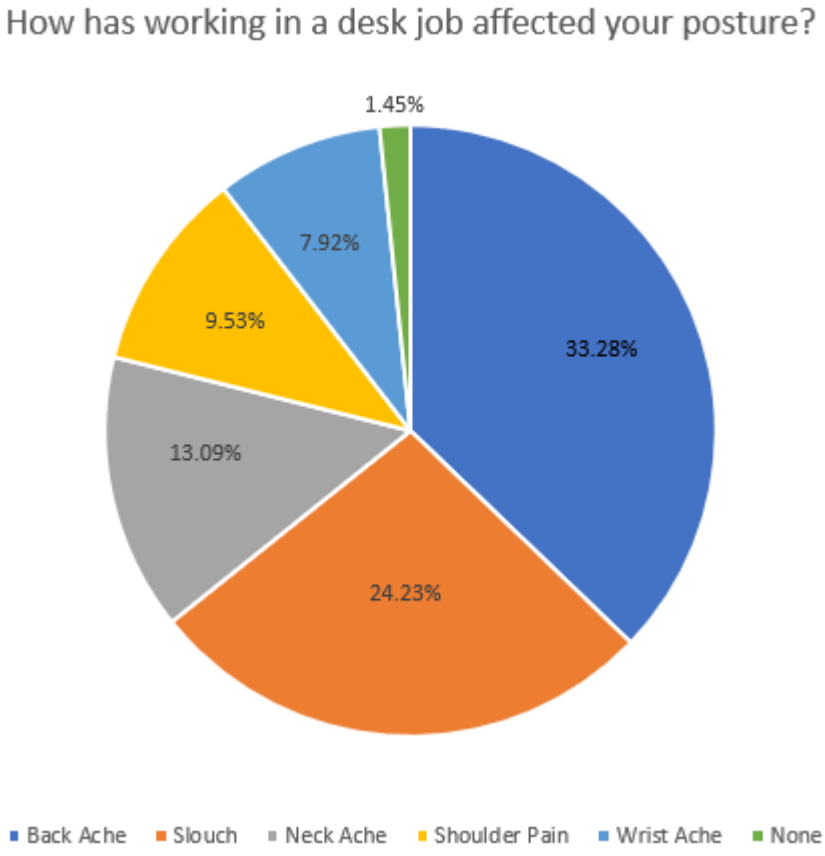
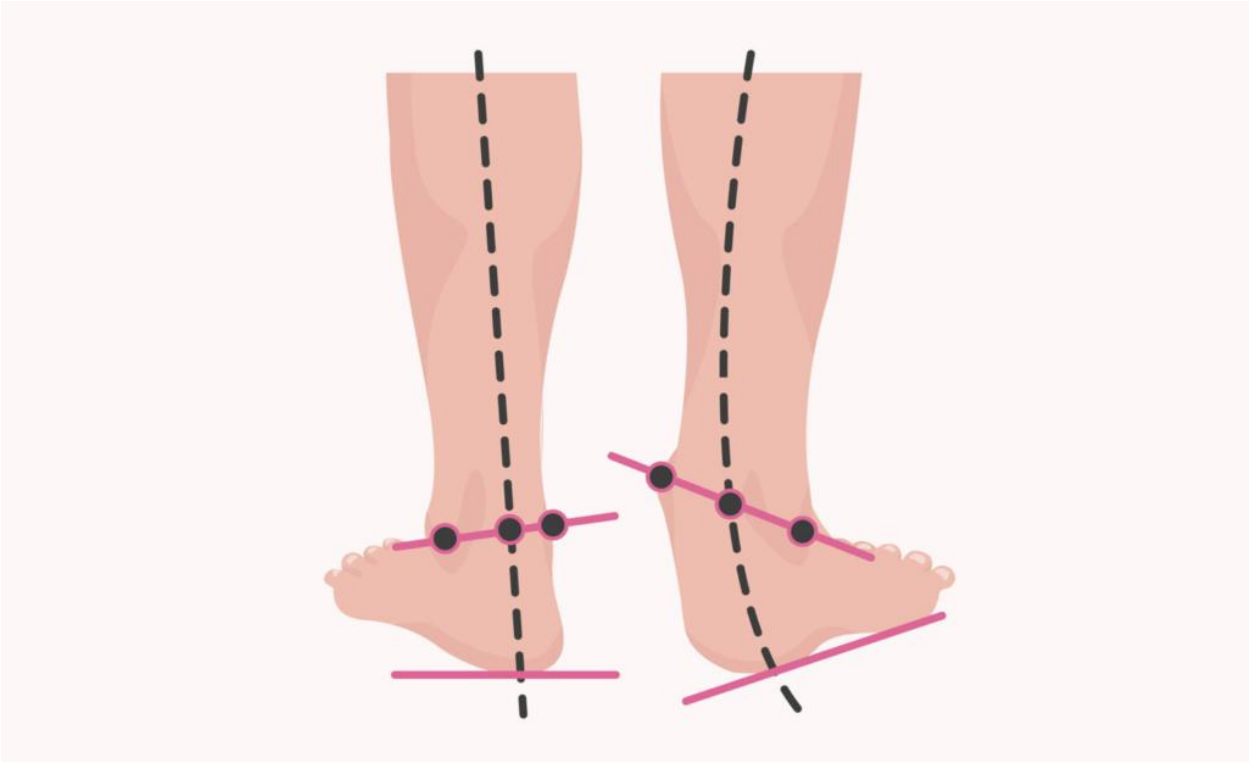
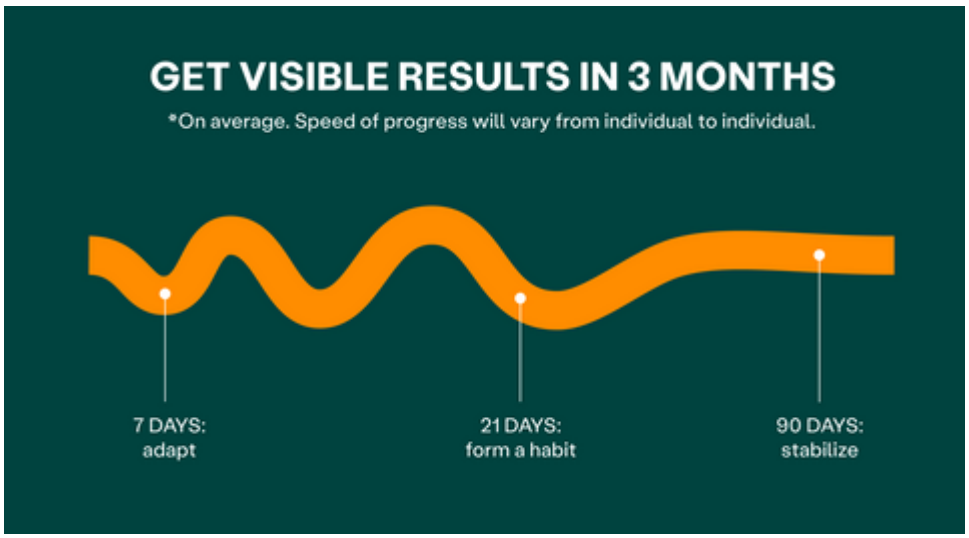


Figure 3. Postural Alignment Distribution at 32 Weeks

Strength increased linearly up to Week 24, followed by stabilization, indicating a physiological adaptation plateau common in adolescent training response.


How has working in a desk job affected your posture?
1.45%
7.92%
9.53%
33.28%
13.09%
24.23%
Back Ache
Slouch
Neck Ache
Shoulder Pain
Wrist Ache
None





Alignment Category	Share (%)
Correct alignment	64
Deviations corrected	25
Remaining deviations	11

Postural deviations were reduced significantly, demonstrating the **corrective and preventive** potential of gymnastic exercises in adolescents.

Discussion

The findings of this research are consistent with global scientific literature on the benefits of gymnastics in youth physical education. Gymnastics develops multiple motor abilities simultaneously, offering a comprehensive form of training compared to many single-component activities. The significant improvements in flexibility, strength, balance, and endurance observed in this study can be attributed to the multi-dimensional nature of gymnastic movements. Unlike monotonous aerobic activities, gymnastics combines strength, coordination, and controlled movement, stimulating both the musculoskeletal and nervous systems.

Postural correction observed among participants highlights gymnastics as an effective preventive tool against musculoskeletal deformities that commonly emerge during adolescence. Given the increasing prevalence of sedentary behavior and screen use among students, this preventive role is becoming increasingly critical. Moreover, the psychosocial benefits documented in this study align with the theoretical framework of movement-based learning, where physical activity enhances attention, memory retention, and emotional regulation.

From a pedagogical standpoint, gymnastics exercises also contribute to the development of self-confidence, discipline, and peer cooperation, which are essential competencies in 21st-century education. This supports the argument for increasing the proportion of gymnastics-based physical education in school curricula. Furthermore, because gymnastics exercises can be scaled in difficulty, they offer inclusive participation opportunities for students with varying fitness levels, making them ideal for general education environments.

Conclusion

This study concludes that gymnastics exercises play a critical role in the physical development of general secondary school students by significantly enhancing flexibility, strength, balance, endurance, and posture. Moreover, gymnastics contributes to improved cognitive, emotional, and social outcomes, making it an indispensable component of holistic education. The integration of structured gymnastics programs into school curricula can serve as an effective strategy to combat sedentary behavior, prevent postural disorders, and promote long-term healthy lifestyle habits.

To maximize impact, it is recommended that educational policymakers increase the number of gymnastics sessions within physical education programs, train teachers in specialized gymnastic methods, and provide adequate infrastructure and equipment. Future research should explore long-term effects of sustained gymnastics practice on academic achievement, psychological well-being, and overall health.

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