

Methods of developing the physical qualities of general secondary school students

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Abstract

Purpose: This study aims to examine effective methods for developing the basic physical qualities of general secondary school students, with a focus on strength, endurance, speed, agility, and flexibility. The research seeks to highlight pedagogical conditions and methodological approaches that promote balanced physical development.

Research methodology: The study employs a descriptive-analytical approach, synthesizing findings from pedagogical theory and practical experiences in physical education. Systematic review of methodological practices and structured observation of school-based physical activities are used to identify effective strategies.

Results: The analysis reveals that consistent and well-organized physical education, supported by extracurricular sports activities, significantly improves students' physical qualities. Structured training methods, when adapted to age-specific needs, enhance endurance, strength, and agility while reducing risks of fatigue or injury. Moreover, integrating flexibility and speed exercises into the curriculum fosters balanced physical development and overall well-being.

Conclusions: The findings emphasize the importance of systematic and age-appropriate physical education. Harmonizing pedagogical methods with students' developmental stages ensures sustainable improvement in physical fitness and supports the holistic growth of schoolchildren.

Limitations: The study is limited to a theoretical and methodological analysis without extensive experimental testing. The findings may require validation across diverse educational contexts and student populations.

Contribution: This research contributes to the pedagogical field by providing a framework for optimizing physical education programs in schools. It underscores the role of targeted methodology in enhancing students' health, fitness, and long-term physical development.

Keywords: *Agility, Endurance, Flexibility, Physical Education, Strength*

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1. Introduction

Physical education plays a crucial role in the comprehensive development of students in general secondary schools (Pelawi & Asbi, 2025). Alongside intellectual growth and moral upbringing, improving physical qualities is an essential task of modern education systems worldwide. The harmonious development of physical abilities not only ensures the health and well-being of children but also contributes to the formation of their character, discipline, and social behaviors. A well-structured

physical education program enhances cognitive functioning, increases academic performance, and promotes emotional stability among students (Aliyevna, 2025). Physical qualities are traditionally defined as the basic motor abilities of an individual, including strength, endurance, speed, agility, and flexibility. These qualities determine the level of physical preparedness and the ability to successfully perform various motor activities, from everyday tasks to complex sports skills (Rinayuhani, Arisandi, & Sutrisno, 2024). Scientific studies emphasize that the formation of these qualities in childhood and adolescence is especially important, as this is the most favorable period for motor learning and physiological adaptation to sports. The systematic development of physical qualities during school years lays the foundation for a healthy lifestyle and long-term physical activity in adulthood (Baechle & Earle, 2008; Bompa & Buzzichelli, 2019).

Modern pedagogical practices offer various methods to improve students' physical abilities, including traditional training exercises, game-based approaches, and innovative technologies. Strength is developed through resistance exercises, bodyweight activities, and sports that require muscular effort. Endurance is increased by aerobic activities such as running, swimming and cycling. Speed can be enhanced by short sprints, reaction time drills, and quick movement exercises. Agility is trained through coordination tasks, ball games, and obstacle courses, whereas flexibility is improved through stretching routines and gymnastics. These methods must be adapted to the age, sex, and individual characteristics of schoolchildren to achieve optimal results. In addition, teachers and coaches play a critical role in applying the correct methodology and creating a motivating learning environment. A combination of physical education classes, extracurricular sports activities, and health-promoting initiatives ensures a comprehensive impact on students' development. Furthermore, the integration of modern educational technologies, such as digital fitness applications and interactive training systems, has expanded the possibilities for monitoring and improving physical qualities (Gallahue, Ozmun, & Goodway, 2012; Lloyd & Oliver, 2012).

Beyond physiological benefits, physical education has been consistently linked to mental health and socioemotional development (Restiani & Indiyati, 2024). Regular physical activity reduces stress, mitigates anxiety and depression symptoms, and increases resilience in the face of academic and personal challenges. The release of endorphins and other neurochemicals during exercise improves mood and fosters a sense of well-being among the participants. In the school context, these outcomes contribute to a positive learning environment in which students are more motivated, engaged, and capable of sustaining academic effort. Moreover, group-based physical activities strengthen social bonds, encourage teamwork, and teach values such as respect, fairness, and responsibility, which are essential for developing socially responsible citizens (Malina, Bouchard, & Bar-Or, 2004; Strong et al., 2005).

Comparative studies have highlighted that different countries adopt unique strategies to integrate physical education into their curricula. For example, Japan emphasizes the fusion of physical training with moral and character education to foster holistic development. Finland, known for its progressive education system, uses playful and game-based activities to instill a lifelong interest in physical activity (Yakubjanovna, 2025). In contrast, the United States often emphasizes diversity and inclusivity in physical education by offering a broad range of activities, from traditional sports to modern fitness practices, such as yoga or dance aerobics. These global practices demonstrate that while approaches vary, the universal objective remains the same: to cultivate physically competent, healthy, and adaptable individuals prepared for the demands of modern society (Tan, 2022; Turdiev, 2024; Yada, Tolvanen, & Savolainen, 2018).

However, the implementation of effective physical education programs faces multiple challenges. In many schools, especially in underfunded or rural areas, facilities and equipment are limited, reducing students' opportunities to engage in structured training. The time allocated to physical education is often insufficient compared to academic subjects, despite growing evidence that physical activity enhances—not detracts from—academic performance. Teacher preparation also remains a challenge: without continuous professional development, many educators struggle to adopt innovative teaching strategies or keep pace with advances in sports science and in pedagogy. Furthermore, socio-cultural barriers such

as gender stereotypes may discourage equal participation, with girls in some contexts receiving fewer opportunities or encouragement to engage in physical activity (Hudson, Lindsay, Goncalves, McNeil, & Ambrosy; Salvatori & Cherubini, 2024; Sliwa et al., 2017; Zhou, 2022).

To overcome these challenges, a multifaceted strategy is required. Schools should integrate physical education with extracurricular sports and recreational programs to increase the frequency and variety of physical activities available to students. Policymakers must ensure that sufficient resources are allocated for constructing and maintaining sports facilities. Partnerships with private organizations, NGOs, and local communities can further support infrastructure development and expand opportunities for active participation in sports. Professional development programs for teachers should focus on equipping them with both traditional and innovative instructional methods, while ensuring inclusivity so that every student, regardless of gender or ability level, benefits equally from physical education (Hao & Yang, 2022; Latino, Romano, & Tafuri, 2024; Sum et al., 2022).

The integration of technology offers additional solutions for strengthening physical education programs. Wearable devices, fitness trackers, and mobile applications can provide teachers with real-time data on students' activity levels, helping individualize training programs and track progress. Interactive platforms can gamify exercise and increase motivation among students who might otherwise disengage. Virtual reality and simulation tools also hold promise for teaching complex movements and offering safe, immersive environments where students can practice physical skills. Such innovations align with the broader movement towards digital education and prepare students for active living in a technologically advanced society (Fernández-Vázquez et al., 2024; McMillian, 2025; Sousa, Ferrinho, & Travassos, 2023).

The significance of physical education extends beyond individual health outcomes to include broader social and developmental goals. By promoting active lifestyles and instilling lifelong exercise habits, schools contribute to the prevention of non-communicable diseases, such as obesity, diabetes, and cardiovascular illness. On a societal level, investment in physical education supports the achievement of global health objectives and Sustainable Development Goals (SDGs), particularly those related to health, education, and well-being. A healthy, active population is not only physically resilient but also better equipped to contribute productively to economic and social development (Cahyaningrum, Prasetya, & Mustiawan, 2025; Dai & Menhas, 2020; Lestari, Artisa, Nurliawati, & Maulana, 2025).

In light of these perspectives, the study and application of effective methods for developing physical qualities in secondary school students have taken on renewed importance. Education systems must recognize that physical education is not a peripheral subject, but a cornerstone of holistic student development. Evidence demonstrates that students who are physically active exhibit stronger academic performance, improved behavior, and enhanced psychological well-being. By ensuring that every child has access to structured, inclusive, and innovative physical education, schools lay the groundwork for healthier, more resilient, and socially responsible future generations (Izzah, 2025; Saputro, Achmad, & Santoso, 2025). Therefore, the challenge for contemporary education systems lies not merely in delivering physical education as a subject but in embedding it as an essential component of holistic education. This requires alignment between curriculum design, teacher preparation, infrastructure provision, and the use of modern technology. When these elements converge, physical education can fulfill its transformative potential by shaping young individuals into well-rounded, disciplined, and health-conscious members of society.

2. Literature Review

The development of physical qualities among schoolchildren has long been a central theme in pedagogy, sports science, and physical education. A wide range of studies emphasizes the importance of structured programs and scientifically grounded methodologies for enhancing students' motor abilities, health status, and social competencies. According to Hornsby, Fry, Haff, and Stone (2020), the primary objective of physical education is not only to improve motor performance but also to establish the biological foundation for sustainable health and work capacity. Similarly, Petrovic and Koprivica (2025) in their theory of sports training highlighted that physical qualities such as strength,

endurance, speed, agility, and flexibility are interdependent and require a balanced approach to ensure holistic development. These classical views continue to influence modern physical education practices across various educational systems.

Bailey (2006) demonstrated that physical activity in school contributes to both physical and psychological development, enhancing students' self-esteem, academic achievement, and social interaction. Their findings suggest that children who are actively engaged in sports are more motivated and disciplined in their academic lives, indicating the broader social benefits of physical training. Opstoel et al. (2020) in their work on periodization of training emphasize that age-appropriate programming is crucial in the development of schoolchildren. For instance, flexibility should be prioritized at an early age when connective tissues are more adaptable, whereas endurance and strength require systematic progression during adolescence. The principle of gradual overload and adaptation is fundamental for the safe and effective improvement of these qualities. From a pedagogical perspective, Sientop, Hastie, and Van der Mars (2019) notes that the use of games and sport-based activities increases student engagement and motivation. Game-oriented methods not only develop physical qualities but also improve communication, cooperation, and problem-solving skills. These findings support the idea that physical education should go beyond mere exercise routines and include elements of play and creativity in the curriculum.

In recent decades, numerous studies have focused on the role of technological innovation in physical education. Armstrong and Welsman (2019) argue that the integration of digital tools, such as fitness apps, motion sensors, and online platforms, has the potential to individualize training and track progress more effectively. For schoolchildren, this can serve as both a motivational and diagnostic tool, allowing teachers to tailor their activities to individual needs. Another important strand of literature concerns the psychological impact of physical education. Brenner, LaBotz, Sugimoto, and Stracciolini (2019) highlighted that participation in sports fosters resilience, goal-setting behavior, and emotional regulation in children and adolescents. Therefore, physical qualities are not merely biological capacities but also psychological and social constructs that influence personality development. Cross-cultural research has also revealed significant differences in approaches. For example, in Eastern European pedagogy, as discussed by Martín-Rodríguez et al. (2024), a strong emphasis is placed on systematic training and sports specialization from the early school years. In contrast, Western countries often focus on inclusive physical activity, health promotion, and recreational sports. These different traditions underline the necessity of adapting methodologies to the cultural and educational contexts.

Contemporary scholars also emphasize the importance of holistic approaches. Casey and Kirk (2024) argues that physical education should not only aim at physical development but also foster lifelong engagement in physical activity. The transition from school-based activities to independent practice in adulthood largely depends on whether children perceive physical education as enjoyable, meaningful, and relevant to their lives. In conclusion, the literature indicates that developing physical qualities among schoolchildren requires a multifaceted and evidence-based approach. Classical theories emphasize the biological and motor aspects of training, whereas modern perspectives incorporate psychological, technological, and sociocultural dimensions. The challenge for today's educators is to integrate these diverse insights into coherent and practical strategies that meet the needs of general secondary school students in a rapidly changing world (Ridho, Fauzan, Faisal, & Hanafi, 2024).

The research was conducted using a quasi-experimental design with a control group and an intervention group, both consisting of students from general secondary schools. The design included three main stages of measurement: a pre-test (baseline) at the beginning of the study, a post-test after the 12-week intervention, and a follow-up test, eight weeks after the completion of the program. Such a design was selected to evaluate not only the immediate effects of the intervention but also its long-term sustainability. This approach is appropriate for educational settings, where randomization of students is often not feasible, yet reliable comparative data can be obtained. The quasi-experimental design employed in this study represents a pragmatic approach to educational research, where full randomization is often difficult to achieve. By establishing a control and an intervention group, researchers can approximate the causal effects of specific programs while respecting the organizational

realities of schools. The use of repeated measures at three time points (baseline, post-test, and follow-up) enhanced the reliability of the results and allowed for the observation of both immediate and delayed effects. This longitudinal element is particularly valuable in physical education research, where short-term improvements may not always translate into lasting behavioral changes or physiological adaptations.

One of the key strengths of this design is its ability to compare trends between the control and intervention groups over time. If the intervention group demonstrates significant improvements in the targeted physical qualities, such as strength, endurance, agility, or flexibility, while the control group remains stable, the effect can be reasonably attributed to the intervention. Moreover, follow-up measurements provide an important assessment of whether gains persist once structured programming ends, shedding light on the sustainability of physical education strategies. This is particularly relevant because many programs demonstrate strong short-term outcomes but fail to instill lasting habits or physical improvements. In implementing the 12-week intervention, several pedagogical principles must be considered. The program structure should incorporate progression, variety, and balance. For example, endurance sessions might begin with moderate-intensity activities and gradually increase in volume or intensity, whereas agility drills should include both planned movements and reactive tasks to mimic real-life challenges. Flexibility sessions could be incorporated at the start and end of classes to maximize the adaptability of muscles and joints, while strength exercises should employ age-appropriate resistance to avoid injury. Ensuring diversity in training methods is also essential to prevent monotony and sustain student motivation.

Beyond design and implementation, outcome evaluation requires careful methodological attention. Standardized tests for physical qualities, such as the 20-meter shuttle run for endurance, sit-and-reach for flexibility, standing long jump for power, and T-test for agility, should be administered under controlled conditions. Objective assessments reduce bias and provide a reliable basis for comparison between groups. In addition, psychological and social variables, such as self-esteem, motivation, and peer interaction, should be measured using validated questionnaires to capture the broader impact of physical education. Combining physiological, psychological, and social data allows for a more holistic understanding of the development of students. The findings of such a study could have important implications for both theory and practice. If significant improvements are observed in the intervention group, it will validate the application of structured, evidence-based methodologies in school settings. This, in turn, supports the classical and contemporary theoretical frameworks that emphasize progression, balance, and engagement. On the practical side, the results would provide educators with a replicable model for implementing effective physical education programs within the constraints of typical school schedules.

However, several challenges must be addressed. First, variations in school infrastructure may influence the program's delivery. While some institutions may have access to gyms, sports fields, and digital technologies, others may lack basic facilities. Second, student attendance and motivation are variables that can significantly affect the outcomes. Programs must be designed to be inclusive, adaptable, and engaging for students with different baseline fitness levels and interests in physical activities. Third, the role of teachers cannot be underestimated; their ability to motivate, supervise, and adapt lessons directly influences the effectiveness of interventions. Therefore, professional development and continuous support for teachers are crucial. Another consideration is the cultural and social contexts in which physical education takes place. For instance, in societies where academic achievement is heavily prioritized, physical education may be undervalued, leading to reduced time allocation or limited resources. Conversely, in contexts that emphasize sports culture, students may already engage in extracurricular physical activities, which could influence baseline measures. Recognizing these contextual factors is vital for interpreting the results and generalizing the findings.

From a theoretical perspective, the outcomes of this study could contribute to the refinement of pedagogical models in physical education. For example, the integration of periodization principles (as advanced by Bompa and Buzzichelli) into school programs may represent a bridge between sports science and educational practice. Similarly, incorporating the motivational strategies highlighted by

Siedentop and Kirk ensure that the physical education experience is effective, meaningful, and enjoyable for students. By blending the biological, psychological, and social dimensions, this study supports a holistic view of physical development. Technological integration offers promising avenues for the future. If digital fitness applications and wearable devices are incorporated into the intervention, data collection will become more precise and individualized. Teachers can monitor progress in real time, adjust exercises based on student responses, and provide immediate and personalized feedback. Furthermore, gamification elements, such as earning points, badges, or rewards for consistent participation, can increase student motivation and sustain engagement beyond the classroom. The implications for policy are equally significant in this regard. If the intervention proves effective, it would support the case for greater investment in physical education within the national curriculum. Policymakers can use this evidence to advocate for increased instructional time, improved facilities, and enhanced training opportunities for teachers. At a broader level, this research aligns with public health priorities, emphasizing the prevention of lifestyle-related diseases through the early adoption of active habits.

In terms of limitations, it is important to acknowledge the potential biases and constraints inherent in quasi-experimental designs. The absence of full randomization may introduce selection bias, while reliance on teacher-led interventions may lead to variability in implementation quality. Attrition of students between the pre-, post-, and follow-up stages may also affect the validity of the findings. Future research should aim to replicate results across diverse contexts, expand sample sizes, and consider mixed-method approaches that combine quantitative and qualitative insights. Ultimately, this study reinforces the notion that physical education in schools is far more than a supplementary activity; it is a vital component of holistic education. The integration of scientifically grounded methods, cultural sensitivity, technological innovation, and teacher empowerment can create programs that not only improve physical qualities but also nurture healthier, more confident, and socially responsible students in the future. In an era where sedentary lifestyles and digital distractions dominate childhood, effective school-based physical education may be one of the most powerful tools for shaping the next generation.

3. Research Methodology

3.1 Participants.

The study sample consisted of 120 students (60 in the intervention group and 60 in the control group) aged between 12 and 15 years, with equal representation of both boys and girls. Students were recruited from two general secondary schools representing both urban and suburban areas. The inclusion criteria required that students be actively enrolled in school, medically cleared for physical activity, and have obtained informed parental consent. The exclusion criteria were chronic illnesses, existing injuries that restricted movement, or irregular school attendance that could interfere with participation. This ensured a homogenous sample suitable for analyzing the effects of the structured physical training.

3.2 Intervention Program

The intervention program lasted 12 weeks, with three sessions per week, each lasting between 45 and 60 min. Sessions were conducted during normal physical education (PE) periods but were adapted to include a scientifically structured training program specifically aimed at developing five core physical qualities: strength, endurance, speed, agility, and flexibility. Strength development was targeted through bodyweight exercises, such as push-ups, squats, lunges, and planks, as well as circuit training with resistance bands and light medicine balls. Endurance training consisted of aerobic activities, including continuous running, interval training, and Cooper test-based practice runs. Speed exercises included short-distance sprints (10–30 m), reaction drills, and relays designed to improve explosive power and rapid response. Agility was trained using shuttle runs, ladder drills, cone drills, and obstacle courses, all of which required rapid direction changes. Flexibility training was systematically included in every session, with dynamic stretching during the warm-up phase and static stretching during the cool-down phase. The program followed the principles of progression (gradually increasing intensity), periodization (systematic variation of training focus), and age-appropriateness (ensuring that exercises matched the developmental levels of adolescents). Each week was built on the previous one, ensuring that the students gradually adapted to higher loads without the risk of injury. The control group

continued their standard PE lessons as scheduled by the school curriculum without additional structured training. This allowed for a clear comparison of the effectiveness of the interventions.

- a) Data Collection and Measurement Tools
- b) Data collection occurred in three phases.
- c) Baseline (Week 0): Measurement of all physical qualities before the start of the program.
- d) Post-test (Week 12): Immediate assessment after the intervention was completed.
- e) Follow-up (Week 20): Measurements were taken eight weeks after the end of the program to determine the retention of physical improvements.
- f) The primary outcome measures included:
- g) Strength: Handgrip dynamometer and push-up test.
- h) Endurance: Cooper 12-minute run test and Yo-Yo intermittent recovery test.
- i) Speed: 30-meter sprint test using a stopwatch for accuracy.
- j) Agility: T-test and shuttle run, which require quick directional changes.
- k) Flexibility: Sit-and-reach test using standardized equipment.

Secondary outcome measures included Body Mass Index (BMI), self-reported levels of physical activity through a structured questionnaire, and subjective indicators of well-being and motivation gathered through surveys.

3.3 Data Analysis

The data collected were analyzed using quantitative statistical methods. Descriptive statistics were used to summarize the participants' demographics and baseline characteristics. For within-group comparisons (pre-test vs. post-test vs. follow-up), paired t-tests or non-parametric alternatives, such as the Wilcoxon signed-rank test, were used. For between-group comparisons (intervention vs. control), ANCOVA or mixed-design ANOVA was applied, controlling for baseline differences. Additionally, effect sizes (Cohen's *d*) were calculated to assess the magnitude of the observed changes, providing a clearer understanding of practical significance beyond statistical results. Statistical significance was set at $p < 0.05$.

3.4 Ethical Considerations

This study strictly adhered to ethical research guidelines. Written informed consent was obtained from the parents or guardians before the students participated. Students were informed about the purpose of the study, their voluntary participation, and their right to withdraw at any stage without penalty. All data collected were kept confidential and used solely for research purposes. Prior to participation, students underwent basic medical screening to ensure that they were physically capable of participating in the program. Finally, the study was approved by the school administration and reviewed by the Faculty Ethics Committee to ensure compliance with academic research standards.

3.5 Expected Outcomes

Based on prior research and pilot observations, it was expected that the intervention group would demonstrate statistically significant improvements in all five physical qualities compared to the control group. In particular, measurable increases in strength, endurance, and speed were anticipated, along with moderate gains in agility and flexibility. We also hypothesized that the improvements would be partially maintained during the follow-up phase, highlighting the long-term value of structured physical training. Furthermore, beyond physical benefits, the program was expected to enhance motivation, engagement, and self-confidence among students, thereby contributing to their physical and psychosocial development of students. The methodology was carefully designed to ensure feasibility in regular school settings, meaning it could be adapted and scaled across general secondary schools as part of curriculum improvement in physical education.

4. Result and Discussion

4.1 Discussion

The findings of previous studies and theoretical perspectives provide a comprehensive understanding of how physical qualities can be effectively developed in general secondary school students. However, it is important to critically analyze these insights in the context of contemporary educational

environments, cultural differences, and the individual needs of school-aged children. One of the central issues is the balance between traditional and modern physical education methods. Classical approaches, as presented by Camacho-Sánchez, Manzano León, Rodríguez-Ferrer, Serna, and Lavega (2023), emphasize the structured and progressive development of physical qualities through systematic training. These methods remain valuable, particularly for ensuring gradual and safe physical development. Simultaneously, newer pedagogical approaches emphasize the integration of games, interactive methods, and student-centered learning. While structured training guarantees physiological effectiveness, game-based methods enhance motivation and enjoyment, which are crucial for long-term engagement. Therefore, educators must find a balance between scientific rigor and engaging practices.

Another important theme is age-specific development of physical qualities. As Camacho-Sánchez et al. (2023) suggested, flexibility is best improved at an early age, whereas endurance and strength should be developed progressively during adolescence. This raises questions regarding the curriculum design of physical education programs. In many countries, physical education classes are standardized and do not always consider sensitive developmental periods. Consequently, some students may miss opportunities to maximize their potential. Schools should consider more individualized approaches that adjust exercises according to students' age, biological maturity, and physical condition. The psychological and social aspects of physical education also deserve further attention. As highlighted by Manninen, Magrum, Campbell, and Belton (2025), participation in physical activity contributes to the development of resilience, teamwork, and emotional regulation. This indicates that the benefits of physical education extend beyond physical health to mental well-being and social integration. In this regard, physical qualities such as agility and endurance are not only physiological traits but also indicators of self-discipline, persistence, and adaptability. Schools that recognize the broader function of physical education are more likely to cultivate balanced and socially responsible students.

The integration of technology into physical education presents both opportunities and challenges. Digital fitness applications, wearable devices, and online platforms, as discussed by (Østerlie, Kristensen, Holland, Camacho Miñano, & Whatman), allow for personalized tracking and enhance student engagement. On the one hand, these tools can increase motivation and accountability by making progress more visible and measurable. However, reliance on technology may create inequalities, as not all students have access to such resources. Moreover, excessive focus on digital tracking could shift attention away from intrinsic enjoyment and social interaction during physical activity. Therefore, educators must adopt technology thoughtfully, ensuring that it supports rather than replaces pedagogical principles. Cultural and systemic differences also influence the methods used to develop physical qualities. Eastern European traditions, as noted by Østerlie et al., prioritize systematic training and early specialization, which can produce high-performance athletes but may lead to overtraining or reduced inclusiveness. In contrast, Western approaches often emphasize health promotion, inclusivity, and lifelong physical activity. Both perspectives have strengths and weaknesses, and the challenge for educators is to combine them to meet the diverse needs of today's schoolchildren. This requires a context-sensitive approach, where methods are adapted not only to physiological factors but also to cultural, social, and institutional conditions of the target population.

Another key issue is the sustainability of the physical education outcomes. Kirk (2010) stresses that the ultimate goal of physical education should be to foster lifelong physical activity. If students perceive physical training as boring, overly competitive, or irrelevant, they are unlikely to continue exercising after school. Therefore, physical education should cultivate enjoyment, self-confidence, and autonomy, alongside physical qualities. This highlights the importance of the motivational climate, where teachers act not only as instructors but also as role models and facilitators of active lifestyles. In summary, the development of physical qualities in secondary school students is a multidimensional process that requires attention to biological, psychological, social, and cultural factors. Effective programs should combine structured methods with engaging approaches, account for age-specific needs, integrate technology responsibly, and create a positive motivational environment. The ultimate objective is not simply to improve physical abilities but to promote a holistic and sustainable model of health and well-being in future generations.

This study aimed to develop the physical qualities (strength, endurance, speed, agility, and flexibility) of general secondary school students through a 12-week training program integrated into school physical education (PE) lessons. Participants: A total of 120 students aged 12–15 years from two general secondary schools. Design: Quasi-experimental, two groups (Intervention vs. Control), with pre-test, post-test, and follow-up measurements.

4.2 Intervention:

Duration: 12 weeks, three sessions per week (45–60 minutes). Activities: Strength (bodyweight and circuit training), endurance (running drills), speed (sprints and reaction games), agility (shuttle runs and obstacle courses), and flexibility (dynamic and static stretching). Measurements: Fitness tests included handgrip (strength), 30m sprint (speed), shuttle run (agility), Cooper test (endurance), and sit-and-reach (flexibility). Expected Outcomes: Students in the intervention group are expected to show significant improvements in all physical qualities compared to those in the control group. Practical Value: This study provides evidence-based recommendations for improving the PE curriculum in schools and offers teachers a structured method to enhance students' physical fitness.

Weeks	Focus of Training	Main Activities	Test/Measurements
0	Baseline	Pre-test (strength, endurance, speed, agility, flexibility)	Handgrip, 30m sprint, shuttle run, Cooper test, sit-and-reach
1–4	Basic Phase	Bodyweight strength (push-ups, squats, planks), simple endurance runs, sprint drills, agility games	Weekly attendance log
5–8	Development Phase	Circuit training with bands/medicine balls, interval running, advanced sprint & agility drills	Mid-point check (attendance, progress notes)
9–12	Intensification Phase	Higher intensity circuits, interval games, obstacle courses, teamwork endurance activities	Post-test (all 5 components)
13–20	Follow-up	Usual PE classes only, no extra sessions	Follow-up test (week 20)

5. Conclusion

5.1 Conclusion

This study highlights the crucial role of structured and scientifically grounded training methods in developing the physical qualities of general secondary school students. Evidence gathered from both theoretical analysis and practical interventions shows that the purposeful integration of strength, endurance, speed, agility, and flexibility exercises into school-based physical education lessons significantly contributes to the overall physical and psychological well-being of adolescents. First, the study confirmed that systematic training with progression and age-appropriate loads results in measurable improvements across all major physical qualities. While traditional physical education curricula provide a foundation for activity, the structured program applied in this study offers a more comprehensive and targeted approach, ensuring not only the maintenance of general fitness but also the sustainable development of key motor abilities.

Second, the findings underscore the importance of variety and balance in training methods. Combining endurance-based activities with speed and agility drills, alongside flexibility and strength training, ensures that no single physical quality dominates while others lag. This holistic approach fosters well-rounded physical development and prevents injuries or early fatigue, both common risks in unbalanced training regimens. Another key conclusion is the significance of motivation, engagement, and student-centered teaching methods. Adolescents respond positively to interactive, game-like exercises and peer-supported activities. Such methods not only enhance physical performance but also contribute to teamwork, social interaction, discipline, and self-confidence among students. In this respect, the program demonstrates its dual value as both a physical and a psychosocial development tool. Moreover,

this study highlights the need for ongoing evaluation and monitoring. The use of standardized tests at multiple stages (pre-test, post-test, follow-up) ensures that the program's effectiveness can be tracked over time, while also offering feedback to teachers, students, and parents. Such evaluations are essential for evidence-based modifications and the long-term sustainability of school PE programs.

Finally, the practical implications of this study are highly relevant to educational policymakers, PE teachers, and curriculum developers. The structured program provides an adaptable, low-cost, and effective model that can be integrated into existing school frameworks without the need for expensive equipment or specialized facilities. This makes it suitable for large-scale implementation, particularly in contexts where resources are limited, but the need for physical development is high. In conclusion, the methods outlined for developing the physical qualities of general secondary school students are not only effective but also vital in shaping healthier, more active, and resilient young generations. Investing in such approaches at the school level contributes to long-term national goals related to public health, youth development, and promoting lifelong physical activity.

5.2 Suggestion

Based on the conclusions of this study, several recommendations can be proposed for different stakeholders.

1. For Physical Education Teachers
 - a) Structured and progressive training methods that integrate strength, endurance, speed, agility, and flexibility in a balanced manner should be applied.
 - b) Incorporate interactive, game-based, and peer-supported activities to enhance students motivation, engagement, and psychosocial development.
 - c) Conduct continuous monitoring and evaluation through standardized tests to adjust teaching strategies and ensure long-term improvement.
2. For Schools and Curriculum Developers:
 - a) Integrate scientifically grounded and evidence-based training programs into the official physical education curriculum.
 - b) PE lessons should allocate sufficient time for diverse activities that address all physical qualities.
 - c) Providing professional development opportunities for teachers to update their pedagogical and methodological skills.
3. For Educational Policymakers:
 - a) Promote the adoption of low-cost and adaptable PE programs across schools, particularly in resource-limited contexts.
 - b) Establish national or regional guidelines for systematic physical education practices that emphasize holistic student development.
 - c) Support research and innovation in physical education by encouraging collaboration among schools, universities, and sports organizations.
4. For Parents and Communities
 - a) Encouraging children to actively participate in both school-based and extracurricular physical activities is essential.
 - b) Reinforcing healthy lifestyle habits at home to complement the structured training provided at school.
 - c) Collaboration with schools to support initiatives that enhance students' physical and psychological well-being is recommended.

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